CULTURAL LANDSCAPE REPORT • HISTORIC STRUCTURE REPORT

Apostle Islands National Lakeshore – Bayfield, Wisconsin

VOLUME II OF VI: MICHIGAN ISLAND CLR/HSR

APOSTLE ISLANDS NATIONAL LAKESHORE
LIGHT STATIONS OF MICHIGAN ISLAND, OUTER ISLAND, DEVILS ISLAND, LONG ISLAND AND SAND ISLAND

JULY 2011

CULTURAL LANDSCAPE REPORT, HISTORIC STRUCTURE REPORT AND ENVIRONMENTAL ASSESSMENT

VOLUME II

APOSTLE ISLANDS NATIONAL LAKESHORE

BAYFIELD, WISCONSIN

LIGHT STATIONS OF MICHIGAN ISLAND, OUTER ISLAND, DEVILS ISLAND,
LONG ISLAND AND SAND ISLAND

JULY 2011
UNITED STATES DEPARTMENT OF THE INTERIOR

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LONG ISLAND AND SAND ISLAND

APOSTLE ISLANDS NATIONAL LAKESHORE

NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

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CHAPTER 1: INTRODUCTION

ORGANIZATION OF THE VOLUME

This volume presents the overall Light Station History, the Cultural Landscape Report (CLR), and the Historic Structure Report (HSR) for the Michigan Island Light Station. This document is one of six volumes that present the comprehensive CLR/HSR for five of the six light stations in Apostle Islands National Lakeshore (park or APIS). The five light stations are Michigan Island, Outer Island, Devils Island, Long Island, and Sand Island. The light station at Raspberry Island was addressed previously in a separate report.

This volume presents detailed documentation of the light station's physical evolution and historical development; an evaluation of existing condition for its associated buildings, structures, features and vegetation; an analysis of the cultural landscape and historic structures; and the recommended treatment for the Michigan Island Light Station. Supplemental information applicable to all of the light stations, including Michigan Island, is presented in Volume I, *Introduction and Overall Development History.*

The island history is presented first, followed by the CLR and finally the HSR. Together, the combined CLR/HSR will guide the treatment of the significant resources associated with the Michigan Island Light Station and provide guidance for the continued management of these resources consistent with the park's General Management Plan (GMP).

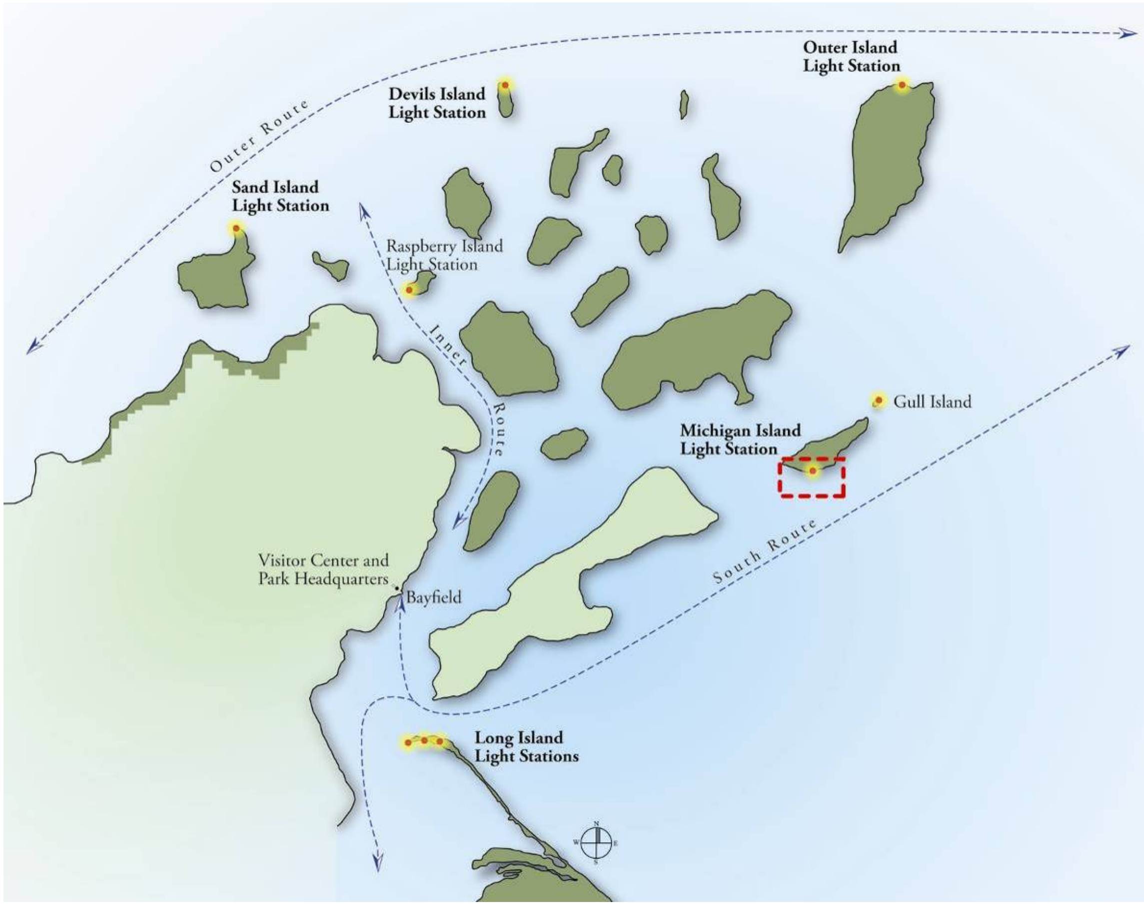
STUDY AREA

Michigan Island is one of seven islands within the park, which includes the six light stations and Gull Island, and provides navigational aid for ships on Lake Superior. The study area includes the Michigan Island Light Station Reservation and Gull Tower on Gull Island.

Michigan Island is 3.5 miles long, 1.1 miles wide, 1,578 acres, and located at the eastern edge of the park, approximately 16 miles from Bayfield, Wisconsin and 26 miles from Little Sand Bay. The Michigan Island Light Station Reservation is on the southern shore of the island and occupies 152 acres. The remainder of the island, outside the light station reservation, is part of the Gaylord Nelson Wilderness area, designated in 2004. Gull Island is approximately 3,000' northeast of Michigan Island and contains the Gull Island Light Tower.

The Michigan Island Second Tower and Gull Island Tower are the first navigational aids encountered on the south route when traveling southwest toward Bayfield. The light station is located on a bluff above Lake Superior and is surrounded by maturing second-growth northern hardwood forest. The grounds consist of historic clearings, buildings, structures, features and vegetation.

Today, the island's land use is as the Apostle Islands National Lakeshore under the jurisdiction of the National Park Service (NPS). The light station and the Gull Island Tower continue to serve as aids to navigation with the automated lights operated and maintained by the United States Coast Guard (USCG). The NPS maintains the site and buildings, and the light station is frequented by visitors and park staff for its cultural and natural resources.



Michigan Island Light Station Context (Source: MBD 2010)

SIGNIFICANCE OF MICHIGAN ISLAND

Michigan Island Light Station is the first light station developed in the archipelago (1856). The period of significance is 1856 to 1943, beginning with the initial development of the light station and continuing until automation of the Second Tower. The entire 152 acres of the Michigan Island Light Station Reservation comprises its cultural landscape. The majority of the contributing features occur on a core area of 1.5 acres associated with the light station grounds.

Seven contributing buildings on the List of Classified Structures include the Old Michigan Island Lighthouse, Second Tower, Keepers Quarters, Assistant Keepers Quarters and Workshop, Power House, Shed, and Privy. Contributing features include the historic clearing, vegetation, organization of buildings and structures, tramway, tram tracks, concrete walks, small scale features and the bluff.

With many of its original features intact and in good condition, the Michigan Island Light Station clearly portrays the history of the light station as an aid to navigation. It continues to convey the development of navigational technology, the story of the people who resided at the light station and its management.

TREATMENT RECOMMENDATIONS SUMMARY

The treatment recommendations for the Michigan Island Light Station are focused on revealing the role the light station had in the navigational history of the Apostle Islands, and in conveying the historical significance of the light station's cultural landscape and structures. The treatment recommendations are addressed in detail in the CLR/HSR.

Rehabilitation has been identified as the general treatment approach for the Michigan Island Light Station, as it is a holistic approach that addresses the island's extant cultural resources and the relationships between those resources. This approach protects those characteristics and features that convey the island's full historical and cultural significance, while allowing for those repairs, alterations, and additions necessary for the compatible use of the island.[1]

Rehabilitation also allows for noncontributing, compatible features to remain, and for the removal or relocation of noncontributing, noncompatible features. While the overall treatment intent of the cultural landscape is one of rehabilitation many individual treatment recommendations focus on preservation of existing features. Treatment recommendations include the following.[2]

1) Reestablish a portion of the historic cleared area of the light station;
2) Reestablish views from Lake Superior to the light station;
3) Repair circulation features including the tramway, tram tracks and concrete walks;
4) Retain the boat dock location;
5) Reestablish missing landscape plantings;
6) Remove noncompatible features;
7) Rehabilitate the Old Michigan Island Lighthouse, Michigan Island Second Tower, Keepers Quarters and Privy;
8) Preserve the Assistant Keepers Quarters and Workshop, Power House and Shed.

The recommendations for treatment are comprehensive and are intended to address all aspects of the cultural landscape and historic structures. To achieve full implementation of these recommendations a phased approach for construction activities will be required. Initial actions may include basic preservation measures to protect and stabilize contributing features followed by more detailed repair measures as park resources allow.

In addition to recommendations for physical improvements, actions are proposed to provide for improved visitor access, improved efficiency of park operational and maintenance activities, and improved protection of the light station's natural systems.

[1] Page et al 1998
[2] A glossary of terms used to describe treatment recommendations is included in the appendix of this volume.

CHAPTER 2: LIGHT STATION HISTORY

LIGHT STATION HISTORY

Old Michigan Island Lighthouse (LCS ID 006371) and Associated Development

A circuitous chain of events gave Michigan Island the first lighthouse in the Apostle Islands. On February 8, 1851, Wisconsin Senator Orasmus Cole requested an appropriation of $5,000 to build a lighthouse at La Pointe on Madeline Island.[3] Congress approved the request, and the 1853 annual report of the Lighthouse Board noted that a survey and the related title work had been initiated for the site.

District Inspector, Captain Lorenzo Sitgreaves, visited the site and observed the visibility limitations. He nixed the La Pointe location in favor of a position on Long Island. The Long Island lighthouse (still called LaPointe) was included in a package of lighthouse buildings advertised for competitive bids.

The Milwaukee firm of Alanson Sweet, Luzerne Ransom, and Morgan E. Shinn won the contract to build 11 lighthouses at prices ranging from $2,940 at Round Island to $4,650 at Rock Harbor (Isle Royale). At $4,500, the LaPointe Tower was one of the more expensive. [4] The specifications for LaPointe matched those for Rock Harbor (extant), Portage River (replaced in 1870), Grand Island (replaced date unknown), and Point Iroquois (replaced in 1871).

In 1855, Shinn sold his partnership to a man named J.B. Smith and the firm's name changed accordingly. Their construction foreman, Noel Brooks, arrived in 1856 to start construction only to find the local representative for the Lighthouse Board, Abraham Smolk, wanted the lighthouse constructed at a site on Michigan Island. The new location was about 17 miles farther out on the lake and on a construction site located more than 80' above the water. Although they protested the unexpected change, the contractors moved their workforce to Michigan Island and completed the project by October of 1856. The next year Smolk had a 3.5 order Fresnel lens installed. He also hired a keeper. The light operated in 1857, but District Inspector Sitgreaves was not pleased with the new location and rejected the station, ordering the contractors to build a station at the previously designated Long Island site.[5]

The contractors reluctantly agreed to the demand for a new station and built a much less expensive wood-framed facility at Long Island. Just who was in the right is not clear in the historical record, but in a complaint filed after the work was completed, the contractors noted their 38-man crew and their boats loaded with construction materials could not be paid to wait around until the matter was cleared up.[6]

The original plans and the list of additional expenses claimed by the contractor illuminate our understanding of the construction of the Michigan Island lighthouse.[7] The original specifications for all of the lighthouses called for a 45' high rubble stone tower with 3' thick base walls tapering to 2' thick at the top. The LaPointe and Rock Harbor lights were an exception. They were to be 65' high, with walls tapering from 4' thick at the base to 2' thick at the top. All wall exteriors were "to be well plastered with Roman Cement and white washed twice." Six windows with 12 glass lights, each measuring 8" by 10" and a 6' by

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[3] Pepper, Terry. Lighthouses of Lake Superior website accessed September, 2009 at www.terrypepper.com/lights/superior/michigan_old/index.htm

[4] Copy of Specification Document in Apostle Islands National Lakeshore offices subject files on Long Island and Michigan Island.

[5] Busch, Jane C. "People and Places: A Human History of the Apostle Islands; Historic Resource Study of Apostle Islands National Lakeshore" Bayfield: Apostle Islands National Lakeshore. 2008. Pages 126.

[6] Letter dated December 15, 1863 from J.B. Smith to Light House Board in Snyder, David L. "A Compendium of Written Communication of the Lighthouse Board for the Twelve Light Stations of the Midwest Region, the National Park Service, 1839-1881."

[7] Copies of the original plans and the contractor's complaint, enumerating additional expenses are located in the Apostle Island National Lakeshore office topical files on Long and Michigan islands.

3' door would be used with dressed stone caps and sills for the doors and windows. The specifications also called for "A lightning rod of ½-inch copper, to extend 4' above the lantern and 4' into the ground."

The contractors' enumerated additional expenses at Michigan included the following:

- The tower ended up 7'5" taller than expected.
- An additional sewer was installed to drain the cellar and the foundation of the tower.
- Additional cellar work included a cellar door, door frame with caps and sills in and outside, and walling up the cellar way.
- Another "add on" required underpinning the laundry room with stone and finishing it with lath and plaster.
- An additional 10' by 16' "wood house" was built beside the laundry. The "house" was "enclosed" and had a shingle roof.
- Instead of procuring stone on-site, as had been anticipated for the Long Island location, "the stone had to be procured some 10 miles away, loaded on a vessel and shipped" to the site.

The greatest construction challenge appeared to be the remote and exposed building site, which was atop a bluff, far from any sources of building materials and subject to gale force winds. Freighting and hoisting supplies to the site and delays and challenges from bad weather added to the expenses, which ended up at $12,064. The total was almost $7,600 more than the original estimated cost.

In spite of the twisting turn of events that twice changed the LaPointe Lighthouse location, the completed building is quite similar to the Lighthouse Board's specifications. The Michigan and Rock Harbor lighthouses are the two remaining lighthouses that represent the original specifications for the 11 lighthouses.

After one year of operation, the Michigan Light Station closed and the valuable Fresnel lens was removed. The lighthouse sat vacant for 10 years until changes in shipping routes on the lake caused the Lighthouse Board to reactivate the light. On July 20, 1868, Congress approved the Board's request for $6,000 to refurbish the building and install a new lens. The repair crew faced a daunting task after 10 years of fierce weather, no maintenance and scavengers. Lighthouse Board correspondence noted "All the doors and windows have since been carried off and hardly anything remains of the buildings but the bare walls."[8] In the 1869 restoration project, crews installed new doors and windows. The roof was "fitted with projecting eaves," and reshingled. A new kitchen, wood shed and privy were also constructed. In the tower the crew installed a new cast iron deck plate measuring 14' in diameter. The crew also repaired the original wooden stairway.[9] The work also included a new metal lantern manufactured by the Detroit Locomotive Works. The 3.5 order Fresnel lens, manufactured by the Henry Lepaute Company of France was installed in the tower which operated for the first time on September 15, 1869.[10]

The first lighthouse keeper, Roswell H. Pendergast, was hired on July 15 at $560 per year. One of a small stream of hopeful settlers and homesteaders, Roswell and his wife, Helen, planted more than 1,000 specimens of trees and shrubs to determine what would thrive. The Pendergasts developed an orchard and raised nursery stock, specializing in apple trees. In 1872 they sold more than $3,000 of trees and shrubs. Pendergast remained at Michigan Island until he resigned his post in June of 1874 and moved his family to Minneapolis. Historian Arnold Alanen noted that Pendergast's landscape legacy remained at the light station for many decades, "…as evidenced by several large crabapple trees, a few cherry trees and a pear

[8] Construction estimate to complete repairs in a letter dated March 24, 1869 in Snyder, David L. "A Compendium of Written Communication of the Lighthouse Board for the Twelve Light Stations of the Midwest Region, the National Park Service, 1839-1881."
[9] We could not locate information regarding when the wood stairway was replaced with metal, but news stories in 1889 referred to the metal stairway.
[10] Mannikko, Nancy Farm and Robert W. Mackreth. "Apostle Islands Light Stations," National Historic Landmark Nomination—Draft.

tree."[11] Ed Lane, the lighthouse keeper from 1902 to 1939, expanded Pendergast's flower and vegetable gardens, and added "...more cherry trees, several lilac bushes, a cedar hedge and a croquet green." [12]

The station employed a keeper and an assistant keeper, who must have shared the living quarters. The close living arrangement might have contributed to the frequent turnover of assistant keepers until Mrs. Pendergast took over the job in 1872 and held it until the family left in 1874. The next keeper and assistant keeper were also a husband and wife team, Pliny and Matilda Rumrill, who remained until 1883. Men and their families shared the quarters after that time with some turnover in position until Keeper Edward Lane began his term in 1902.[13]

The keepers experienced some excitement resulting from the attached light tower. In 1889 a lightning bolt hit the tower and the electrical current flowed down the metal spiral staircase and out onto the concrete. A separate account told of the electricity flowing down the tower from a bolt of lightning and tearing the keeper's bed to pieces.

Periodic improvements to the station were noted in the Lighthouse Board correspondence and reports. The District Engineer wrote in 1881 that sidewalks were laid that year to connect the house to the privy. A new 5 by 8 by 8 foot cistern was also installed that year. In 1889 the Lighthouse Board report recognized the need for an oil house. By 1894 an oil house had been constructed (just south of the cast iron skeletal light tower), but was torn down on August 30, 1929 as part of changes to the site when the skeletal tower was installed.

Other minor changes occurred. Leaks in the lantern roof required a new tin hood, and the barn (aka the Shed, LCS ID 006373) was built or rebuilt in 1901 or 1902.[14] Plans on file at park offices show dormers added to the upstairs in 1914.

Although small, one of the more important buildings on the island was the Privy (LCS ID 006385). A two-holer, this vital feature was built in Detroit – complete with a casement window – and delivered by the *Amaranth* lighthouse tender ship sometime between 1901 and 1912. Many years later the arrival of the Privy was recalled with glee by the lighthouse keeper's daughter who lived on the island between 1901 and 1912. [15] The privy presumably replaced an older outhouse.

Dock

The current dock at Michigan Island is a modern installation. The first dock was located about 45' to the east and had steps that climbed the slope to a point fairly close to the Old Michigan Island Lighthouse.[16] The constant barrage of wind, water and ice required many repairs. In 1890 the 446-foot-long wooden walk and stairway was rebuilt, followed by two rebuilding projects of the dock in 1897 and 1902.[17] Between 1902 and 1917, the 96 wooden steps were rebuilt.[18]

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[11] All information and quotes regarding Pendergast are taken from Alanen, Arnold R. and William H. Tishler. "Farming the Lake Superior shore: agriculture and horticulture on the Apostle Islands, 1840–1940," Wisconsin Magazine Of History. Volume: 79 /Issue: 3 (1995–1996) Pages 175-176.

[12] Letter from the Superintendent of Lighthouses, Fred P. Dillon to Edward J. Lane, Keeper, Michigan Island Light Station establishes Lane's retirement date; on file at Apostle Islands administrative offices.

[13] Lighthouse keepers are listed at www.terrypepper.com/lights/superior/michigan_old/keepers.htm based on research provided by Phyllis L. Tag.

[14] Light House Board records show approval of rebuilding the barn in 1901, Terry Pepper's research at www.terrypepper.com/lights/superior/michigan_old/index.htm indicates a new barn was built in 1902.

[15] Information supplied by Susan Mackreth of the park staff based on a letter located in the Lakeshore's museum accession files.

[16] Mannikko, Nancy Farm and Robert W. Mackreth. "Apostle Islands Light Stations," National Historic Landmark Nomination—Draft

[17] Pepper, Terry. Lighthouses of Lake Superior website www.terrypepper.com/lights/superior/michigan_old/index.htm

[18] From APIS Museum Collection Photos, #2384.

The current dock location was in use by 1929. The dock was rebuilt in 1987, replacing a timber crib structure. Additional work in 1993 further altered the 1987 dock and extended the stair and tram to the dock.

Nearby Activity

After World War I the increased demand and prices for lumber justified logging on remote Michigan Island. The Schroeder Lumber Company purchased much of the island, excluding the lighthouse reservation, and logged from 1919 to 1923. The operation included a railroad across the island and a lumber camp at the southwestern end. Crews worked in the summer and transferred to other islands in the winter. Schroeder moved the railroad to Outer Island when logging finished in 1923.

The Second Tower (LCSID 006372) and Associated Development

The demand for a taller light tower and for a fog station increased with the ever growing ship traffic. The 65-foot-tall light tower on Michigan Island was not visible to the lake traffic to the north. The local *Bayfield County Press* expressed this complaint in a 1908 article, reinforced by a December 4, 1908 report from Charles Keller, the Lighthouse District Engineer, recommending a light and fog signal at a new location on the island.

The Lighthouse Board deliberated over placing a tower on nearby Gull Island, and eventually settled on a plan to build a new station with multiple buildings on Michigan Island. The estimated cost was $100,000. The Board embarked on a 20-year campaign of annual requests of Congress to appropriate enough money for a new station. In the midst of their crusade, in 1918, the Lighthouse Board acquired a 112-foot-tall cast iron skeletal tower from Schooner Ledge on the Delaware River. The tower, which had been first constructed in 1880 and came from the Phoenix Iron Company of Philadelphia, was disassembled and stored at Michigan Island in 1919.

The Lighthouse Board modified the Michigan Island plan by eliminating a proposed diaphone fog signal and installing a combination of navigational aids including the Schooner Ledge Tower, a new radio beacon on Michigan Island and an unmanned acetylene powered light on Gull Island. The recycled 112-foot-tall Schooner Ledge Tower would be the tallest in the Apostle Islands. The revised estimated costs came to $85,000 for the light tower, beacons and support buildings for the light station.

***The Schooner Ledge Tower** as it looked on the Delaware River (Source: Coast Guard archives – accessed at http://www.uscg.mil/history/CG_Photo_Index.asp). Photo date unknown.*

Congress approved the revised plan and construction began +/- 1927 -1928. The project included the brick two-story Keepers Quarters (LCS ID 006389), a two-story wood-framed building with storage and a bathroom on the first floor and a residence on the second floor (Assistant Keepers Quarters and Workshop; LCS ID 006388), a wood-framed boat house to replace the old boat house and a dock/tram installation and extension. The plans also included remodeling of the interior of the old lighthouse, and a new brick powerhouse (LCS ID 006386) to accommodate generators, fuel and water storage, an electric hoist mechanism and machinery for the radio beacon. The estimated costs for the project came in at $55,000. The reported actual costs were $61,041.[19]

In May and June of 1928 light keeper Ed Lane reported in his keeper's logs that "Mr. Bellamy" and his crew surveyed for the tram and the new tower foundation. They tested the visibility of the proposed tower site by floating helium filled balloons from the tower site and viewing them from the water.

In September 1928 the *Amaranth* made multiple trips to the island, delivering construction supplies, including large quantities of bricks and sacks of cement. The tram was installed on the steep slope up from the dock to the bluff to transport materials up the hill. Work on the tram was underway by October 1. The concrete mixer started up on October 2, and by October 4 the work crew had started placing concrete. Crew members completed the foundation of the power house by October 15 and continued to lay bricks in October, until wintry weather ended the 1928 construction season and forced them off the island.

The crew returned to Michigan Island on May 11, 1929, along with more supplies from the *Amaranth.* The *Bayfield County Press* closely followed the work and reported in an article on June 27, 1929, that local mason Hans Erickson was in charge of the brick work and that Ed Lough of Detroit was the construction superintendent. The keeper's log entries clearly showed his bias, as many of the mundane construction

[19] Data on 1929 plans from architectural plans and copies of general specifications for the structures were found in the topical files of the park offices.

details were omitted, while the arrival of the new lantern for the lighthouse merited an entry in the log on August 26, 1929. Edna Lane Sauer recalled in a letter that a temporary cook shack was built for the crew.[20]

The September 23, 1929, the log noted a team of horses was landed on the island and that the keeper worked on the "new dwelling." The keeper's family moved into their new brick home (the Keepers Quarters, LCS ID 006389) on September 27, and the keeper kept busy varnishing the floors. The electricians arrived to wire the house on October 6.

On October 29, 1929, Keeper Lane excitedly recorded the completion of the new light tower in his log. The 3.5 order Fresnel lens in the old light tower had been removed and installed in the new tower. "Started up new tower at sunset," he wrote. "Everything in good shape but station looked odd, the old tower being dark for the first time in navigation in 72 years. NEW TOWER IN COMMISSION TONIGHT." The new 24,000 candlepower electric lamp (bulb), the first electric light in the Apostle Island lighthouses, placed on the much taller structure increased the light's visibility range to 22 miles.

The Gull Island Station was lit on September 30, 1929. The Michigan Island radio beacon went into commission at 11 p.m. on November 3.

The next two years saw some adjustments to the new construction. The light keeper's logs have numerous entries about problems and solutions for the diesel engines (a Kohler and a Cummings) in the power house. Between the mechanical break downs, life went on at the station. The keeper planted pine trees on the north side of the track on October 9, 1930. On October 24, he set up the new oil stove in the Keepers Quarters kitchen and was pleased with the results. The stove is no longer extant but two historic stoves do still remain in the Old Lighthouse and the Assistant Keepers Quarters and Workshop.

The files at the park offices contain a map with hand written amendments noting the radio beacon tower was moved in 1931 from a location north of the tram tracks to a location just east of the Power House. The notes on the map indicate a second tower was placed near the old lighthouse. The bases of these two beacon towers are still on the site.

The Gull Island light station, an automated acetylene-powered light with a carbon dioxide fog signal, was also under the care of the Michigan Island lighthouse keeper, who periodically checked on Gull Island and replaced the gas tanks.

Electrification and automation reduced the workload. In 1939, the Coast Guard took over lighthouse operations in the Apostle Islands and throughout the country. Michigan Island became a one-man station. In 1943, the light was automated and the keeper left the island. A Coast Guard crew, based on Devils Island, monitored the Michigan Island light. Kitchen cabinets and a sink were scavenged from one of the Michigan Island residences and show up on the 1946 work plans for the second floor of the Keepers Quarters at Devils Island. The Fresnel lens was removed in 1972 and is now on display at the park Visitors Center. A DCB-224 aerobeacon replaced the Fresnel lens. The current optic is a Sabik 350 two-tier solar-powered LED beacon.

HISTORIC EVIDENCE

The historic photos date back to 1913 and show the non extant boat house, wood stairs to site, and various changes to the buildings, such as the Keepers Quarters' boarded-over windows and the Shed's change in grade. For more detailed descriptions of the photos, see the CLR and each building's Chronology of Alterations and Use in the HSR.

[20] Information supplied by Susan Mackreth of park staff based on a letter located in the Lakeshore's museum accession files.

Historic plans date back to 1869 with the original construction drawings for the Old Michigan Island Lighthouse. This sheet also has the 1914 addition of the dormers drawn over the original (HSR Historic Drawing MI-01). There are drawings that also show details for the Schooner Ledge Range Light, which would later be moved to Michigan Island and become the Second Tower (HSR Historic Drawings MI-02 and 03). A set of specifications for the Second Tower's Lantern is also available and mentions the use of curtains in the tower (HSR Historic Drawing MI-04). In 1929, the construction set for the erection of the Second Tower and its Light Base, alterations to the Old Lighthouse, and the new plans for the Keepers Quarters, the Assistant Keepers Quarters and Workshop, and the Power House were created (HSR Historic Drawings MI-5 to MI-12).

OVERVIEW OF DEVELOPMENT AND USE

Date	Work Described
1852	Congress authorizes construction of first lighthouse in the Apostle Islands (J. Busch 2008)
1856	Michigan Island Lighthouse constructed, placed into service in 1857 (LCS 2009; J. Busch 2008)
1858	Lighthouse taken out of service, replaced by LaPointe Light Station on Long Island (J. Busch 2008)
Annual Report of 1867	"This light was discontinued in 1857, but it seems to be desirable to reestablish it. Since its discontinuance the buildings have fallen somewhat into decay, and a small appropriation to put them in good order again. The requisite estimate is submitted herewith." ("1867 Annual Report of the Lighthouse Board," Michigan Island Light in annual reports 1850–1920)
Annual Report of 1868	"During next season it is proposed to renovate and relight this station, in accordance with the provision of the act of Congress approved July 20, 1868." ("1868 Annual Report of the Lighthouse Board," Michigan Island Light in annual reports 1850–1920)
Annual Report of 1869	"The light here, discontinued and abandoned since 1858, was put in operation again on the 15th of September last. The repairs required amounted to but little less than rebuilding it." ("1869 Annual Report of the Lighthouse Board," Michigan Island Light in annual reports 1850–1920)
1869	New "summer kitchen" added to lighthouse quarters (1869 Letter of Alterations) New "wood-shed" added to lighthouse quarters (1869 Letter of Alterations) New doors and windows installed in lighthouse quarters (1869 Letter of Alterations) Privy built (LCS 2009) Shed built (LCS 2009) New lantern installed with 14-foot-diameter cast iron deckplate and wood tower stair repaired (1869 Letter of Alterations)
c.1870	Orchard planted by lighthouse Keeper Roswell Pendergast (J. Busch 2008) Top of bluff cleared of tress, increase visibility of Old Lighthouse (1877 Reservation Boundary map)
1881	Sidewalks laid from the Lighthouse to the Privy (1881 District Engineer Letter)
1894	Brick Oil House constructed west of Old Lighthouse, concrete sidewalk constructed to Oil House from Old Lighthouse, and area east of Old Lighthouse cleared but not manicured (Historic Photos, 1904, 1908, and 1913, APIS Archives IID4C)
Annual Report of 1894	"The walk and stairway, 446 feet long, leading from the dwelling to the boathouse, was rebuilt, and various repairs were made." ("1894 Annual Report of the Lighthouse Board," Michigan Island Light in annual reports 1850–1920)
Annual Report of 1895	"A brick oil house was erected with metal roof, door and shelving, located 75 feet west of the dwelling. Various repairs were made." ("1895 Annual Report of the Lighthouse Board," Michigan Island Light in annual reports 1850–1920)
1894–	Original manicured area adjacent to Old Lighthouse expanded, fences removed and replaced to

Date	Work Described
1908	include Brick Oil House in manicured areas (Historic Photos, 1904 and 1908, APIS Archives IID4C)
1901	Lighthouse Board records show approval of rebuilding the Shed in 1901; according to Terry Pepper's research, a new shed was built in 1902 (Terry Pepper, www.terrypepper.com/lights/superior/michigan_old/index.htm)
1901-1912	1869 Privy replaced with Detroit-made two-holer with casement window (1978 Letter from Edna Lane Sauer, from Mannikko, Nancy Farm and Robert W. Mackreth. "Apostle Islands Light Stations," National Historic Landmark Nomination—Draft. Bayfield, WI.: Apostle Islands National Lakeshore, n.d.).
1902–1917	96 steps from the dock to the site replaced by Ralph Tinkham (APIS Museum Photo 2384)
1907, Feb 7	"This Department has the honor to acknowledge the receipt of the committee's letter of February 1, 1907, inclosing for examination and report thereon a copy of Senate bill No. 8251, "For the establishment of a lighthouse and fog signal station at the easterly end of Gull Island, Apostle Group, westerly end of Lake Superior, Wisconsin." In reply this Department has the honor to state that the Lighthouse Board, to whom this was referred, recommends the establishment of this lighthouse and fog signal on Gull Island. Vessels bound for Ashland from Keweenaw Point are unable to see Michigan Island light until abreast of it, and this difficulty is increased in time of fog, as there is no fog signal at Michigan Island. Several vessels have run aground in this vicinity during storms. If there had been a light and fog signal there, the wrecks might have been prevented. The Lighthouse Board reporting also that a light and fog signal can be built here at a cost not exceeding $85,000, this Department recommends that after being so amended this bill do pass. The Board is now of the opinion that the bill should be amended as to provide for the establishment of a lighthouses and fog signal at or near the easterly end of Gull Island." ("1907 Annual Report of the Lighthouse Board," Michigan Island Light in annual reports 1850–1920)
Annual Report of 1908	"Gull Island Light Station, Lake Superior, Michigan. – The act of May 27, 1908 appropriated $2,000 to make a survey and estimate the cost and report upon the feasibility and need of establishing a light and fog signal station upon Gull Island, or the easterly end of Michigan Island, Apostle Group. The survey has been completed, and upon consideration of the data furnished the conclusion has been reached that the light should be established on Michigan Island and the fog signal on Gull Island, and the Board recommends that an appropriation of $150,000 be made for the construction of a light and fog signal station at the points mentioned." ("1908 Annual Report of the Lighthouse Board," Michigan Island Light in annual reports 1850–1920)
1914	Dormers added to east and west elevations of Old Lighthouse (1914 Michigan Island Elevations)
1919	Second Light Tower moved from Pennsylvania to Michigan Island, stored (LCS, 2009)
Annual Report of 1920	"Michigan Island, Wis., Light Station. – Establishing and improving aids to navigation at or near Michigan Island, Lake Superior, Wis., $85,000. NOTE. – The act approved May 27, 1908 (35 Stat., 332), appropriated $2,000 to make a survey and estimate of cost and report upon the feasibility and need of establishing a light and fog signal upon Gull Island or the easterly end of Michigan Island, Apostle Group. As a result of this survey, the conclusion has been reached that the eastern end of Michigan Island is the better site. The act of June 17, 1910 (36 Stat., 536), authorized the construction of a light and fog signal station at Michigan and Gull islands at a cost not to exceed $140,000, but no appropriation has been made therefor. A further study indicates that the best plan is to elevate the present light near the westerly end of Michigan Island, add a fog signal, and establish a nonattended acetylene light on Gull Island. This arrangement would serve as a better guide to vessels passing in either direction. The project now contemplated will both cost as much as the

Date	Work Described
	amount authorized. Detailed estimate: Foundation, main light =$3,000 Dwellings for three keepers =20,000 Tower complete (erection only) =6,000 Minor light =9,495 Illuminating apparatus. =10,000 Fog signal and hoisting apparatus =13,550 Fog signal building, boathouse, and other buildings =13,455 Boats, tramway, walks, etc. =9.500 Total =85.000" ("1920 Annual Report of the Lighthouse Board," Michigan Island Light in annual reports 1850–1920)
1927	1½-story wood-framed Assistant Keepers Quarters built (J. Busch, 2008)
1927–1929	Assistant Keepers Quarters and Workshop constructed. (Documentation varies between keeper's logs vs. construction drawing's date.)
1927–1936	Documented varnishing of floors eight times, possibly less due to terminology used by Keeper E. Lane; including: Old Tower stairway; Old Quarters in general, specifically kitchen, dining room, and hallway ("linoleum in hallway," 5/1/28); Keepers Quarters in general, specifically kitchen; and Second Tower steps ("Varnished Tower steps," 7/16/25) (E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936)
1928, May 28	Survey crew comes to Island: surveys for Gull Island Light, foundation for Second Tower and height for Second Tower, and new tramway. Leaves June 10, 1928 (E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936)
1928–1936	Documented whitewashed buildings four times; including at times the following buildings: Old Keepers Quarters and Tower, Shed, and concrete base of Second Tower (E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936)
1928–1936	Documented painting of the interior of buildings eight times; including at times the following buildings: Old Quarters (specifically mentioned the dining room, stairway, and bathroom), Old Tower (specifically mentioned Lantern, floor, and window sash), Second Tower (specifically mentioned Lantern, window sash, and Tower Base's floor), Keepers Quarters (specifically mentioned kitchen, wood work in living room, and porch floor), Power House (specifically mentioned window sash and floor), and Assistant Keepers Quarters and Workshop (specifically mentioned floors and stairway) (E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936)
1928–1936	Documented painting of the exterior of buildings eight times; including at times the following buildings: Old Quarters, specifically mentioned screen doors, window shutters, dormer windows, chimney, and eaves and downspouts (called "scupper pipes," 7/29/30); Second Tower, specifically mentioned Lantern, railing, trim (painted black), tower base and trim; Keepers Quarters, specifically mentioned back entry, storm doors, and porch screen frames; Power House, specifically mentioned chimney flashing; and Tramway, specifically mentioned railing and track. (E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936)
1929	Second Tower erected, Power House built, tramway constructed up bank and through grounds, Keepers Quarters rehabilitated. Old Lighthouse altered to become First Assistant Quarters and oil house removed. (J. Busch 2008; 1928 Drawing of Tramway Plan and Details)
1930	Pine trees transplanted in a line on north side of tram track by Keeper Lane, adds to formal enclosure and marks manicured grounds (Michigan Island Keepers Log)
c.1930	Keeper Lane adds ornamental plantings in small beds, linear hedge in southwest corner near Keepers Quarters and foundation plantings along Keepers Quarters (Historic Photos, c.1930, APIS Archives IID4C)
1933, Nov 28	"Finished installing winter Light and, weather permitting, Mechanic O.H. Joyner will leave for town." (E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936)
1939	Bureau of Lighthouses eliminated, Coast Guard takes over management (Michigan Island Keepers Log)

Date	Work Described
1943	Second Tower light automated, keepers leave Island (J. Busch, 2008)
1962–1970	Don Bliss, private citizen, occupied the light station (D. Cooper, 2010)
c.1968	Last logging occurred for yellow birch (report from 1979 meeting of volunteer and owner of cabin on Island, Mel Van Fit; from "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 2)
1970	Apostle Islands National Lakeshore authorized
1972	Second Tower's Fresnel lens replaced by automated light (LCS, 2009)
1973	Second Tower's brass mullions and lantern glass removed by the Coast Guard (APIS/NPS Business Office File D3423)
1974	Vegetation cleared and shutters installed on Old Lighthouse (APIS/NPS Business Office File D3423)
1975	Stabilization of Old Lighthouse, Shed, Privy, Power House, Assistant Keepers Quarters and Workshop, and Keepers Quarters (APIS/NPS Business Office File D3423)
1976	Repair drainage at Keepers Quarters and Old Lighthouse (APIS/NPS Business Office File D3423)
1977	Emergency stabilization of Second Tower (APIS/NPS Business Office File D3423)
1979	June 13th: general building maintenance, including painting and tuck pointing (from "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 2)
1979	Emergency stabilization of Keepers Quarters brick at porch and northeast stoop, repair foundation and paint exterior walls of Shed, repair and paint exterior walls of Keepers Quarters and Assistant Keepers Quarters and Workshop, repoint Power House and repoint and paint exterior wall of the Old Lighthouse (APIS/NPS Business Office File D3423)
1981	Asbestos roofing installed at the Keepers Quarters, Assistant Keepers Quarters and Workshop and the Power House (APIS/NPS Business Office File D3423)
1982	Reshingle Power House roof, reroute propane lines and install new hoses, install gasoline storage cabinets (APIS/NPS Business Office File D3423)
1983	July 9: new pit dug for Privy and Privy moved to new site; July 19: met with the Coast Guard in regard to painting, possibly Old Tower; July 20: sand blasting "on sidewalk and steps" (unknown where, Tom Caines); July 25: "monitored painting operations" (Tom Caines, from "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 4)
1985	July 16: sunk post for solar collector that charges the batteries for the alarm system; August 21: finished installation of "burglar-smoke alarm system" (Terry Blomberg, from "Excerpts from Michigan Island Volunteer Logs- 1978–1999," pages 7 and 8)
1985	July 26: "Maintenance workers were out today taking final measurements for the new electric winch and generator, etc. to be installed next week. They were discussing how they could remove the old donkey engine and whether it should be left there for historic purposes." (Terry Blomberg, from "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 7)
1985	August 10: ,",,maintenance crew added more steps up the bluff…" (Sandy Massett, from "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 8)
1986	June 24: Coast Guard removed two underground gas tanks at base of Second Tower and old batteries thrown over south hill (from "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 9)
1987	Electrical line run from Keepers Quarters to Power House and new kitchen floor and sink plumbing installed in Keepers Quarters (from "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 10)
1987	August 27: "Bill Eldridge stopped in this afternoon. He is the project supervisor for the new dock…A barge is to be sunk as a breakwater tomorrow. Also rocks by landing are to be used as well. Landing is to stay, but steps will go down to new dock" (Lynn France); dock completed November 2, 1987 (from "Excerpts from Michigan Island Volunteer Logs- 1978–1999," p 11, 14)

Date	Work Described
1988	September: digging began for drains around both lighthouses; drain tile installed once digging completed (from "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 14)
1988–1989	Moisture mitigation in Old Lighthouse (from "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 15)
1989	July: whitewash (unknown areas, "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 15)
1990	June 19: Historic American Building Survey (HABS) team surveying (from "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 16)
1990	August 29: "pouring cement for new outhouse; trading out outhouses," "…what a job – to get that old one down the hill and on the boat…" (Pat Dekker, from "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 17)
c.1990	Bottom portion of tramway modified with track/steps/ handrail extending to new dock (NPS Drawing, Tramway Details, 1992, APIS Archives)
1992	August 5: Guests arrive, locals had told the Park Service that they needed to build the dock with open spaces so the water could go through; disappointed the Park Service did not listen, now dock has to be rebuilt; guest requested the tram system be rehabilitated so the "area could be accessible by the elderly and handicapped." (Barbara and Jack Childers, from "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 20)
1993	Dock rebuilt (from "Excerpts from Michigan Island Volunteer Logs- 1978–1999," pages 20-21)
1993	August 13: wooden steps and platform leading to concrete steps torn out (from "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 21)
1994	The Park Service reinstalled the lantern glass (APIS/NPS Business Office File D3423)
1994	September 1 and 2: Asbestos crew removes asbestos in basements of Keepers Quarters and Old Quarters (from "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 22)
1996	Interior of Second Tower sand blasted and repainted (APIS/NPS Business Office File D3423)
1998–1999	July 9: Old Lighthouse exterior under maintenance, interior cleaned and all equipment and material removed ("Excerpts from Michigan Island Volunteer Logs- 1978–1999," pages 24-25)
1999	June 22: "…[repairing] the fractured concrete sidewalk slabs leading to the steps of the 'New Tower'…" (Gene Wilkins, "Excerpts from Michigan Island Volunteer Logs- 1978–1999," p 25)
2004	Rehabilitation of Keepers Quarter's interior floors (HSPT Reports, 2009)

CHAPTER 3: CULTURAL LANDSCAPE REPORT

MICHIGAN ISLAND EXISTING CONDITIONS

Introduction

The cultural landscape of the Michigan Island Light Station is a composition of features that remain from its development over the last 155 years as a light station and aid to navigation. As the first of six light stations constructed in the Apostle Islands, the Michigan Island Light Station played an important role in the initiation and development of the system. The intent of the Cultural Landscape Report (CLR), in conjunction with the Historic Structures Report (HSR) is to guide treatment and use of the aboveground resources associated with the light station. The CLR provides park managers with a comprehensive understanding of the physical evolution of the cultural landscape and provides guidance for its management.

The CLR was conducted at a thorough level of research, investigation and documentation. This level of research uses select documentation of known and presumed relevance, including primary and secondary sources that are readily available. The periods of landscape change are described using narrative text, historic photographs and annotated historic drawings and maps. Archeological investigations are not included.[21] A more detailed description of the CLR methodology is included in Volume I, Chapter 2: *Methodology*.

The CLR begins with a description of the site development of the Michigan Island Light Station that documents the physical changes that have occurred on the light station reservation and light station grounds. The light station reservation is the land initially set aside for the development of the light station. The portion of the reservation that contains structures and buildings is referred to as the grounds in the CLR. These in total are referred to as a light station. The site development is presented by the five periods of landscape change.

The second section presents the existing condition and analysis of the cultural landscape. This section is organized by cultural landscape characteristics. In September 2009, field investigations were conducted to document the existing condition of the cultural landscape characteristics: spatial organization, topography, views and vistas, circulation, buildings, structures, small scale features and vegetation. The documentation of the island's existing condition is illustrated with existing condition plans, diagrams and photographs that document its cultural landscape.

The analysis compares the island's history with its existing condition, and identifies those landscape characteristics that retain integrity and contribute to the significance and integrity of the Michigan Island Light Station.

The existing condition plans and period plans were created in AutoCAD using a variety of sources including: historic and current maps and photographs provided by the NPS APIS Archives, field work conducted in September 2009, and additional information was provided by park staff.

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[21] Page et al. 1998.

SITE DEVELOPMENT

A period of significance of 1852 to 1972 is recommended for the light stations of the Apostle Islands as a whole. This timeframe recognizes the role of the light at each island as a part of a connected system of navigational aids for Lake Superior. The beginning date is the initial act of Congress authorizing construction of the first lighthouse in the Apostle Islands in 1852. The period of significance for the Michigan Island Light Station begins with the construction of the Old Michigan Island Lighthouse in 1856 and ends with the Second Tower's automation in 1943. Five periods of landscape change document the evolution of the Michigan Island Light Station cultural landscape. Of these, three of these five periods are within the Michigan Island Light Station's period of significance of 1856 to 1943, these periods are noted by italics.

- Pre-Lighthouse (1852–1855)
- *Early Lighthouse (1856–1928)*
- *Light Tower (1929–1938)*
- *Coast Guard and Automation (1939–1969)*
- Park Service (1970 to present)

The beginning and end of each period of landscape change corresponds to major physical changes related to the site's use, technological advances, and/or governmental control of the island. The periods consider the social history of the island, however physical change in the cultural landscape is the primary rationale in defining the beginning and end of each period.

Brief narrative text, graphic illustrations (where applicable), and historic maps and photographs (where available), describe each period of landscape change. Additional information regarding the period of significance for the Apostle Islands light stations is presented in Volume 1, Chapter 3: *Context, Current Designations, and Park Significance.*

Pre-Lighthouse (1852–1855)

This period began in 1852 with Congress authorizing the construction of the first lighthouse in the Apostle Islands, originally to be built at La Pointe Harbor on Madeline Island.[22] The location of the lighthouse was later revised to Long Island. Before construction began, the location was again revised, and the first lighthouse was ultimately built on Michigan Island in 1856. No physical improvements related to the light station were built on Michigan Island during this period.

Early Lighthouse (1856–1928)

This historic period began in 1856 with the establishment of the lighthouse reservation and the construction of the Old Michigan Island Lighthouse. This period documents the time when the light station had only one lighthouse (Site Image MI-01).

The Old Michigan Island Lighthouse, the original lighthouse and oldest building on the island, was built in 1856 and placed into service in 1857.[23] After operating for just one year, the lighthouse was then taken out of service in 1858, and was replaced by the newly built LaPointe Lighthouse on Long Island.[24] For a 10 year period, between 1858 and 1869, the lighthouse was out of service, vacant, and uninhabited.

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[22] Busch, Jane C. "People and Places: A Human History of the Apostle Islands; Historic Resource Study of Apostle Islands National Lakeshore" Bayfield: Apostle Islands National Lakeshore. 2008. Page 124.
[23] Ibid, page 126.
[24] Ibid, page 126.

In 1869, the Old Michigan Island Lighthouse was repaired, as it had been looted and exposed to weather during its abandonment, and returned to service.[25] Roswell Pendergast was engaged as the lighthouse keeper and remained on the island until 1874. During this period, much of the bluff and light station reservation was cleared of trees to allow the lighthouse to be seen by passing ships. The area immediately around the lighthouse was fenced and manicured as a lawn by Pendergast and subsequent keepers. Outside of the fenced area the forest was cleared and parts of the reservation were farmed by Pendergast. He planted oats, potatoes, beans, corn and raised cattle and chickens. Fences, walks, and other small scale features were added around the Old Michigan Island Lighthouse. Lighthouse Keeper Pendergast was an avid horticulturist, establishing an orchard east of the Old Michigan Island Lighthouse. Pendergast planted apple, cherry, peach, plum and pear trees in the 1870s and also grew nursery stock trees and shrubs.[26] The keepers and their families added domestic landscape plantings to the site including one prominent white spruce tree planted by the Pendergast family to the south of the Old Michigan Island Lighthouse.

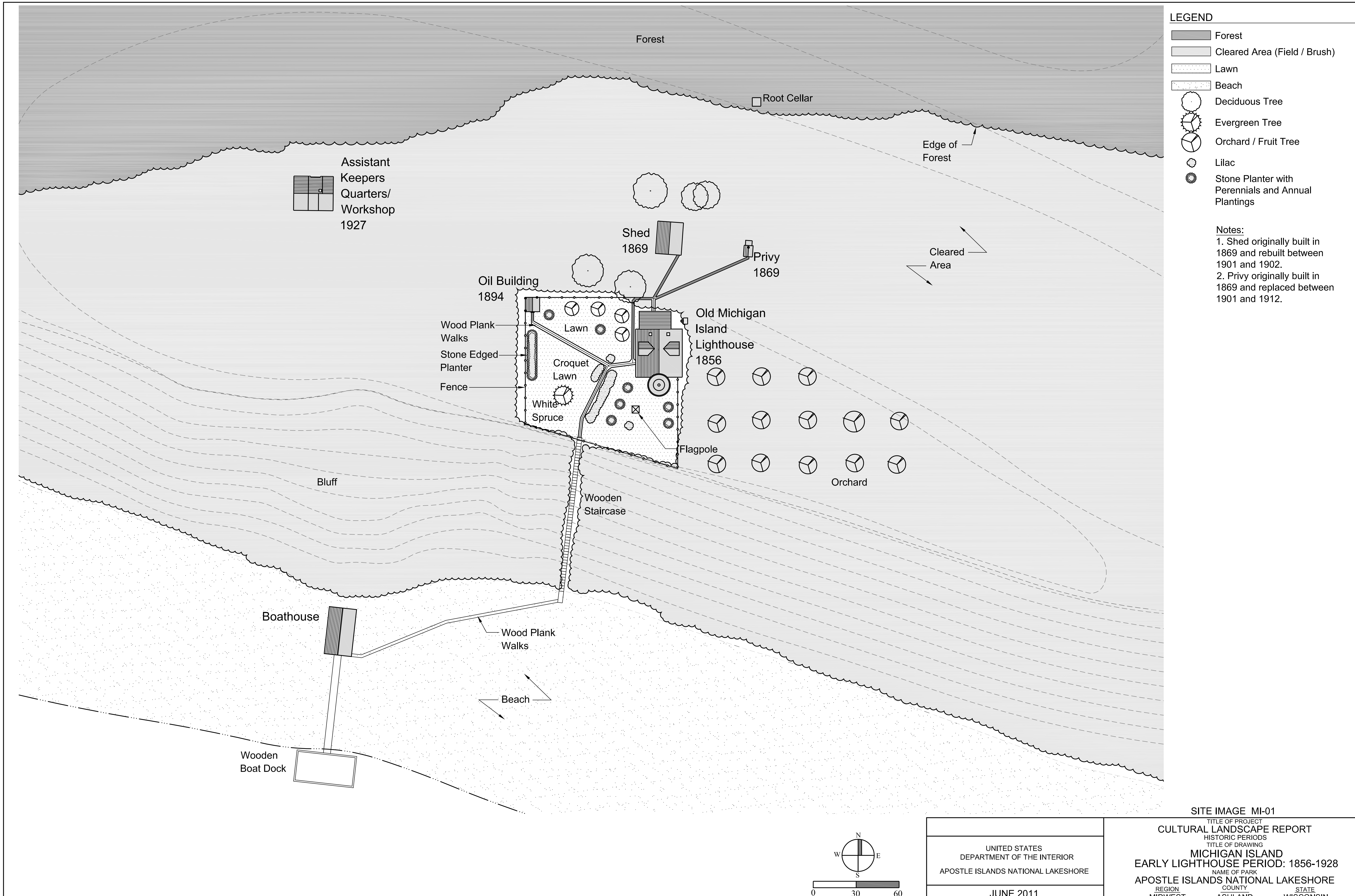
Lighthouse Keeper Ed Lane, who served from 1902 thru 1939, and his wife, Elizabeth, added many domestic plantings to the station. Among the landscape features added by the Lanes were a croquet lawn, located west of the Old Michigan Island Lighthouse, and numerous landscape plantings. The areas just outside of lawn remained cleared of forest vegetation and maintained as fields of grasses and wildflowers and agricultural planting was reduced.

Spatially, the Old Michigan Island Lighthouse was the central focus of the light station grounds with improvements radiating out from it. The keepers and assistant keepers lived and worked in the Lighthouse structure and fenced and maintained a small area around it. During this period the primary access to the light station was via a wooden staircase connecting the shoreline to the top of the bluff near the lighthouse. At the shoreline a dock, landing crib and wooden boathouse were built. The boat dock was a wood timber rectangular structure directly connected to a wood boathouse. Historic maps (Site Image MI-02) suggest that there was a pedestrian connection, possibly wood planks, connecting the staircase and the boathouse. Due to the harsh wintry weather, the dock and staircase had to be repaired or rebuilt frequently during this period. Records indicate that the dock was rebuilt three times, in 1890, 1897, and 1902.

In the 1880s wood plank walks were introduced to the site. A walk was built to connect the lighthouse to the Privy. In 1894 the brick Oil Building was built west of the lighthouse. Over the next few years the original domesticated or manicured area adjacent to the Old Michigan Island Lighthouse was expanded, fences were removed and replaced so that the Oil Building was within the fenced area. A walk was built leading from the lighthouse to the Oil Building after its addition to the site.

Toward the end of this period, in 1927, a 1½-story wood-framed Assistant Keepers Quarters and Workshop was built northwest of the Old Michigan Island Lighthouse and surrounding manicured area. The addition of this building was the first of several new structures to be built on the site.

[25] Ibid, page 127.
[26] Ibid, page 141.



Forest
Root Cellar
Edge of Forest
Assistant Keepers Quarters/ Workshop 1927
Shed 1869
Privy 1869
Cleared Area
Oil Building 1894
Old Michigan Island Lighthouse 1856
Wood Plank Walks
Stone Edged Planter
Fence
Lawn
Croquet Lawn
White Spruce
Flagpole
Bluff
Wooden Staircase
Orchard
Boathouse
Wood Plank Walks
Beach
Wooden Boat Dock
LEGEND
Forest
Cleared Area (Field / Brush)
Lawn
Beach
Deciduous Tree
Evergreen Tree
Orchard / Fruit Tree
Lilac
Stone Planter with Perennials and Annual Plantings
Notes:
1. Shed originally built in 1869 and rebuilt between 1901 and 1902.
2. Privy originally built in 1869 and replaced between 1901 and 1912.
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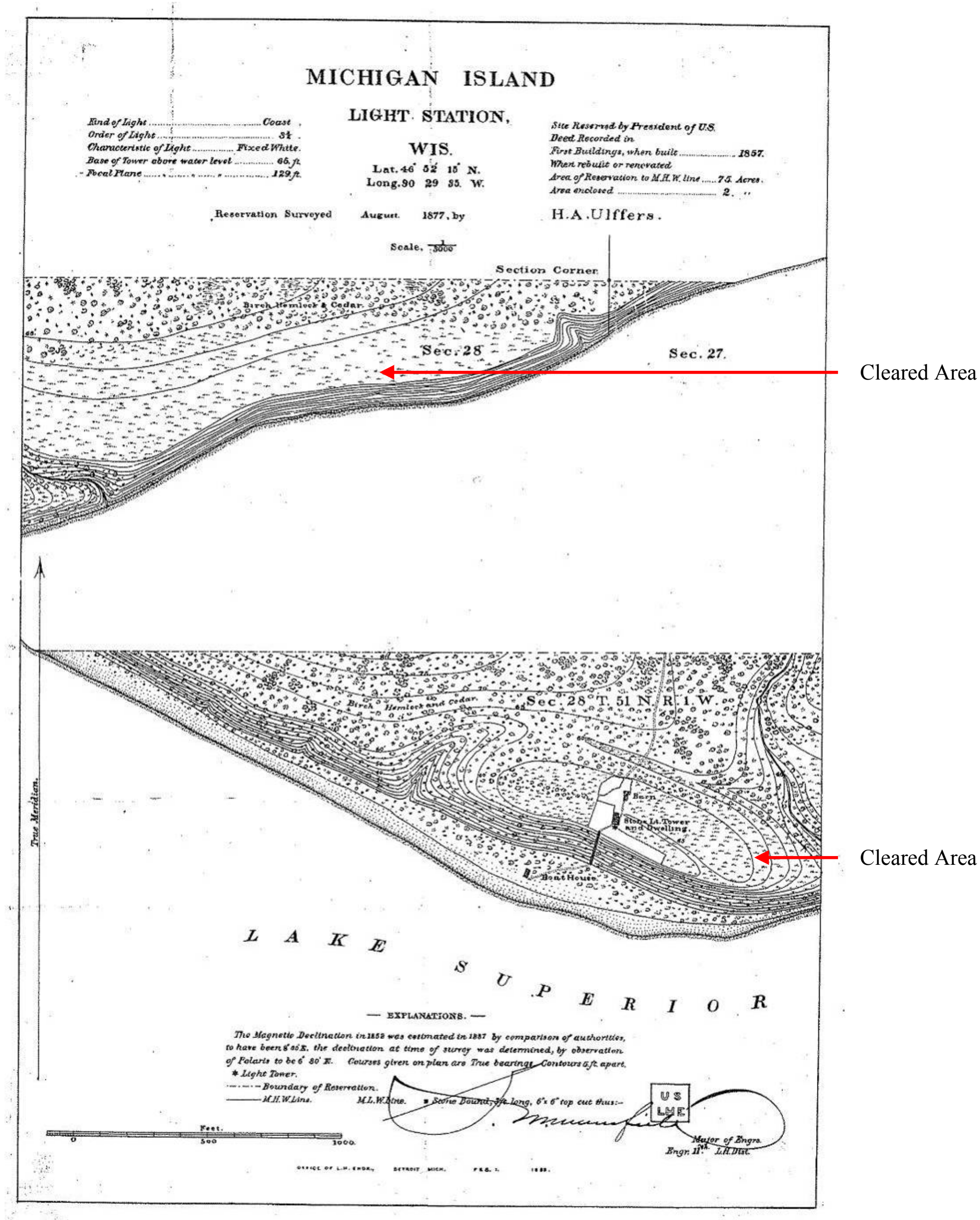
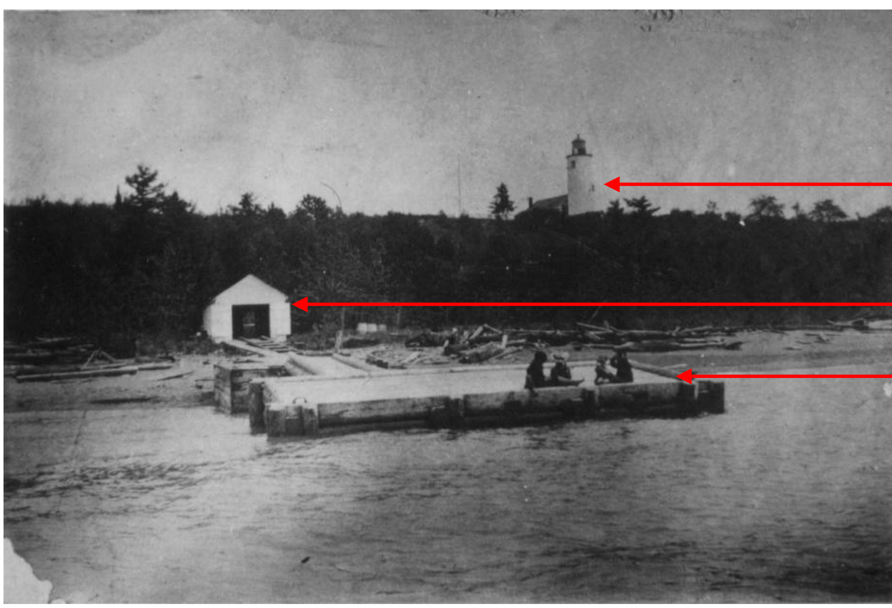
SITE IMAGE MI-01
UNITED STATES
DEPARTMENT OF THE INTERIOR
APOSTLE ISLANDS NATIONAL LAKESHORE
JUNE 2011
TITLE OF PROJECT
CULTURAL LANDSCAPE REPORT
HISTORIC PERIODS
TITLE OF DRAWING
MICHIGAN ISLAND
EARLY LIGHTHOUSE PERIOD: 1856-1928
NAME OF PARK
APOSTLE ISLANDS NATIONAL LAKESHORE
REGION
MIDWEST
COUNTY
ASHLAND
STATE
WISCONSIN

Pre-Lighthouse and Early Lighthouse Historic Survey and Photographs



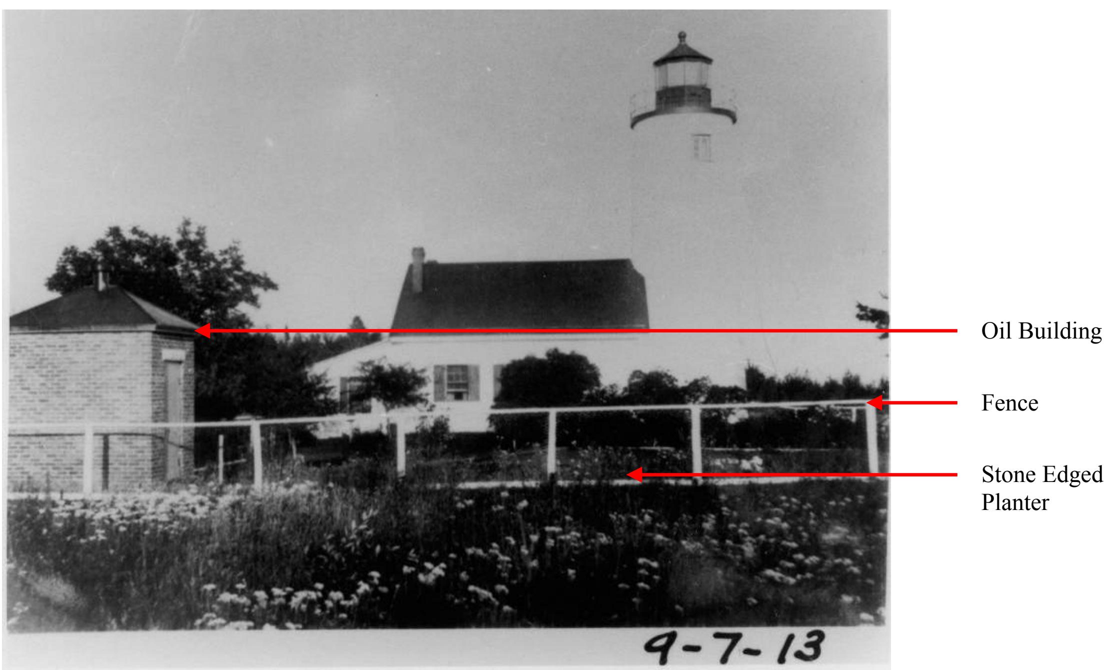
Site Image MI-02: Survey of Michigan Island Light Station showing the reservation boundary, c. 1887 (Source: NPS APIS Archives)

Site Image MI-03: View of Old Michigan Island Lighthouse from west, c. 1904 (Source: NPS APIS Archives)

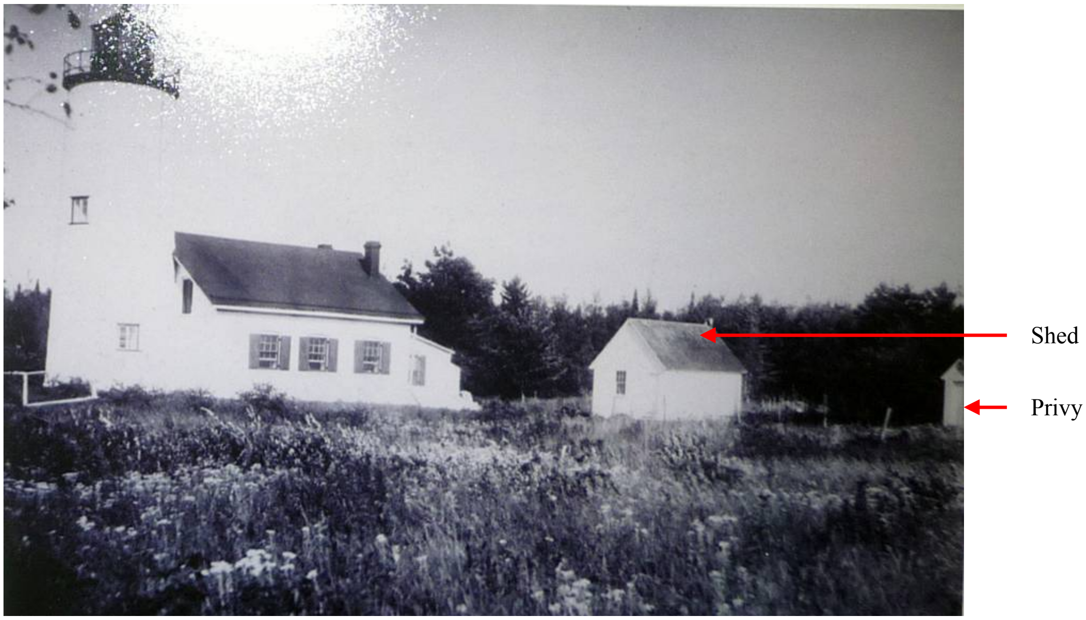


Site Image MI-04: View of Old Lighthouse from boat dock, c. 1904 (Source: NPS APIS Archives)

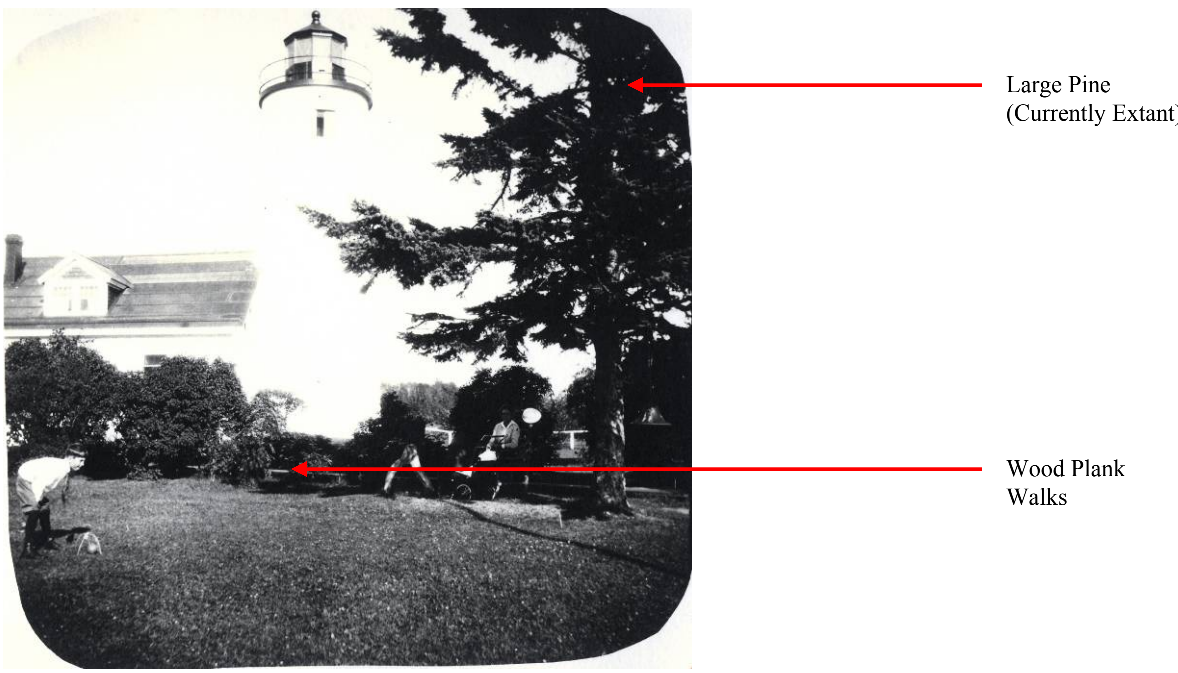
Site Image MI-05: View of wooden staircase to Old Michigan Island Lighthouse looking north, date unknown (Source: NPS APIS Archives)



Site Image MI-06: View of Old Michigan Island Lighthouse from west, c. 1913 (Source: NPS APIS Archives)

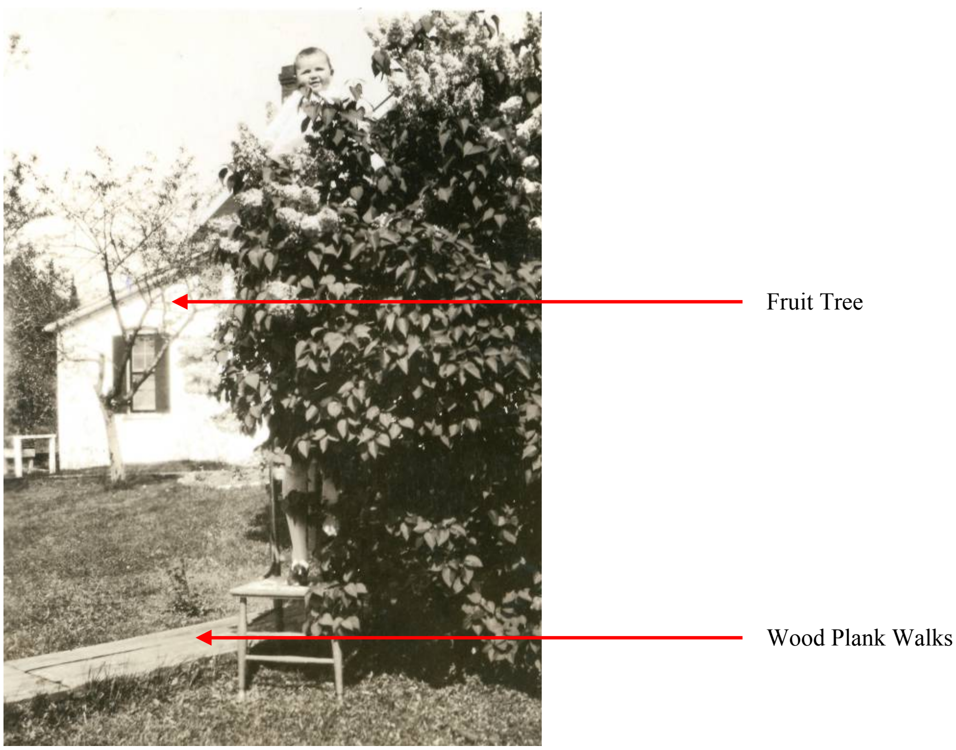


Site Image MI-07: View of Old Michigan Island Lighthouse from southeast – note meadow grasses, c. 1913 (Source: NPS APIS Archives)



Site Image MI-08: Croquet lawn east of Old Michigan Island Lighthouse, late 1910 - early 1920s (Source: NPS APIS Archives)

Site Image MI-09: Mrs. Lane in her garden near the Old Michigan Island Lighthouse, note peonies, date unknown (Source: NPS APIS Archives)



Site Image MI-10: Lilac west of Old Michigan Island Lighthouse. Original inscription on back of photo - "Find the baby. Gerrie Parker Lilac tree at one side of croquet ground which took one third of the yard. Wooden boardwalk," date unknown (Source: NPS APIS Archives)

Light Tower (1929–1938)

The Light Tower period was a time of substantial change for the cultural landscape of Michigan Island. New structures and improvements changed the composition of the light station core area from a loose agrarian arrangement to a more formally composed grouping of buildings and structures connected by a common 'lawn' area. The new arrangement of the cultural landscape was directly related to technological advances in navigational aid equipment and operations. The Old Michigan Island Lighthouse was supplanted as the central feature of the grounds by the addition of a new, taller steel light tower. Two new buildings; a Keepers Quarters and a Power House, were added to the grounds during this period, further defining the west side of the station. A new concrete tramway/staircase was added, moving the primary access to the light station further west, away from the Old Michigan Island Lighthouse.

The brick Power House was completed by the beginning of this period. The Power House provided electricity for the light station and eventually housed the engine for the tramway. In 1929, a steel light tower was erected west of the original lighthouse. At a height of 112', the Light Tower became the dominant feature of the island and was located centrally in the light station grounds. The new tower was almost twice the height of the old lighthouse. This provided a more visible aid to navigation as the light was higher. The height of the tower also reduced the need to clear vegetation in the coming years as the tower rose above much of the adjacent forest. The same year a brick, two-story Keepers Quarters was built on the west edge of the cleared area of the light station grounds. The manicured area of the light station, typically mown grasses, was expanded to include the large common area between all of the new buildings.

The inclined, concrete tramway leading from an elevated wood platform on the Power House down to a new dock was built by 1929. The tramway provided access from the shoreline, replacing the wooden steps to the Old Michigan Island Lighthouse and allowed more efficient transportation of goods and fuel. The tramway was built in two sections; an upper and lower. The upper section was steeper than the lower. Tram tracks were laid on the light station grounds, connecting all of the buildings, easing the movement of supplies and further defining the arrangement of the station.

1929 also saw the addition of an accompanying light on Gull Island, the small island approximately .5 mile off the northeast tip of Michigan Island.[27] The steel-framed tower was under the care of the Michigan Island keeper. Prior to the lighting of the Gull Island Tower, the 7 acre island was the site of many shipwrecks.

Lighthouse Keeper Ed Lane and his family continued to garden the station during this period. The domestic plantings expanded west with the new Keepers Quarters. The Lanes added plantings in small beds, usually with a white-washed stone edging; and foundation plantings along the Keepers Quarters. Roses predated a linear cedar hedge (still extant) in the southwest corner near the Keepers Quarters. The fence that previously bordered the manicured area west of the Old Michigan Island Lighthouse was removed as well as the 1894 brick Oil Building. Pine trees were transplanted in a line on the north side of the tram track in 1930, delineating the formal enclosure of the grounds on the north and further marking the manicured grounds from the surrounding forest.[28] The field east of the Old Lighthouse continued to be maintained as tall grasses and wildflowers by seasonal burning.[29] Trees on the embankment were allowed to grow taller than in the previous period due to the new 112' Light Tower (approximately 60' higher than the Old Michigan Island Lighthouse), however the trees continued to be maintained for visibility. Historic maps (Site Image MI-10) indicate the orchard planted by former Lighthouse Keeper Pendergast remained southeast of the Old Lighthouse.

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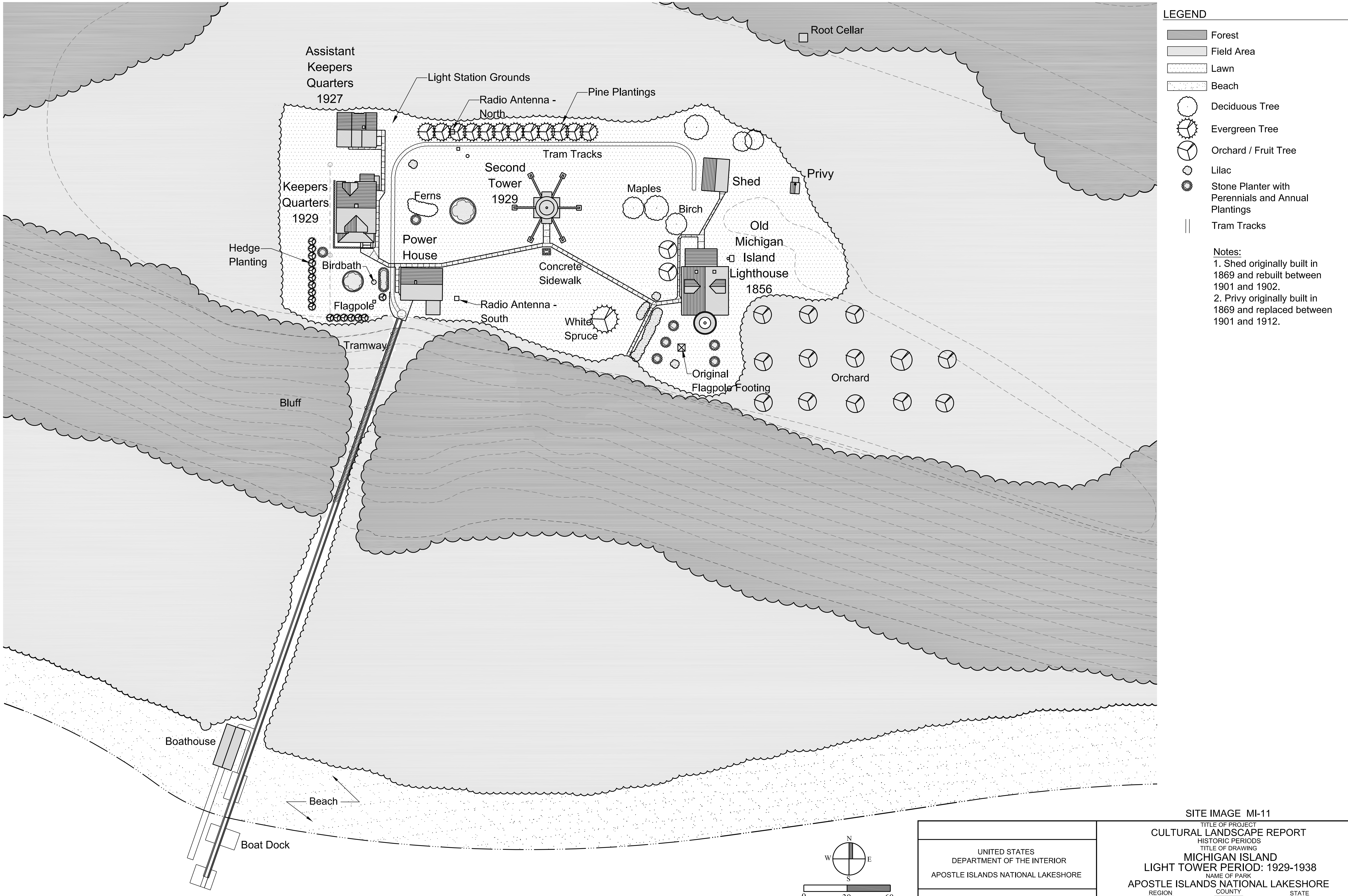
[27] See 1988 Gull Island Tower photo, Site Image MI-23.
[28] Michigan Island Keepers Log, page 31.
[29] Record of interview with Edna Lane, 1987.

After the completion of the improvements of 1929, which included the Light Tower, Keepers Quarters, Power House, tramway and tram tracks the landscape developed into a more manicured public grounds with mown grasses and extensive landscape plantings. The character of the landscape moved away from the utilitarian, agrarian feeling of the earlier landscape and toward a more public commons landscape type. This change closely followed the technology improvements of the Light Tower, circulation improvements on the grounds and the modernizing of the light keeper's quarters.



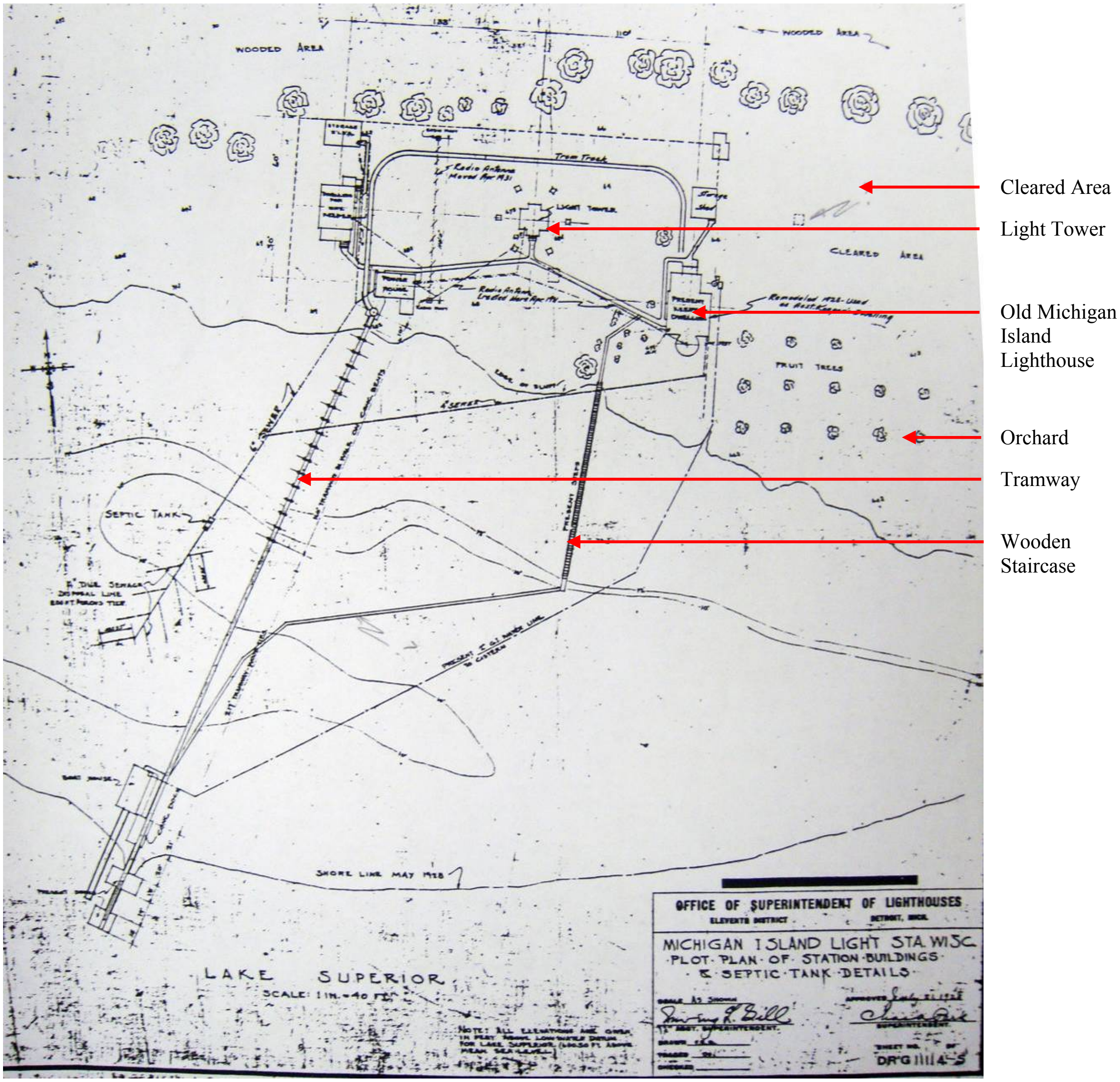
SITE IMAGE MI-11

UNITED STATES
DEPARTMENT OF THE INTERIOR
APOSTLE ISLANDS NATIONAL LAKESHORE

TITLE OF PROJECT
CULTURAL LANDSCAPE REPORT
HISTORIC PERIODS
TITLE OF DRAWING
MICHIGAN ISLAND
LIGHT TOWER PERIOD: 1929-1938
NAME OF PARK
APOSTLE ISLANDS NATIONAL LAKESHORE

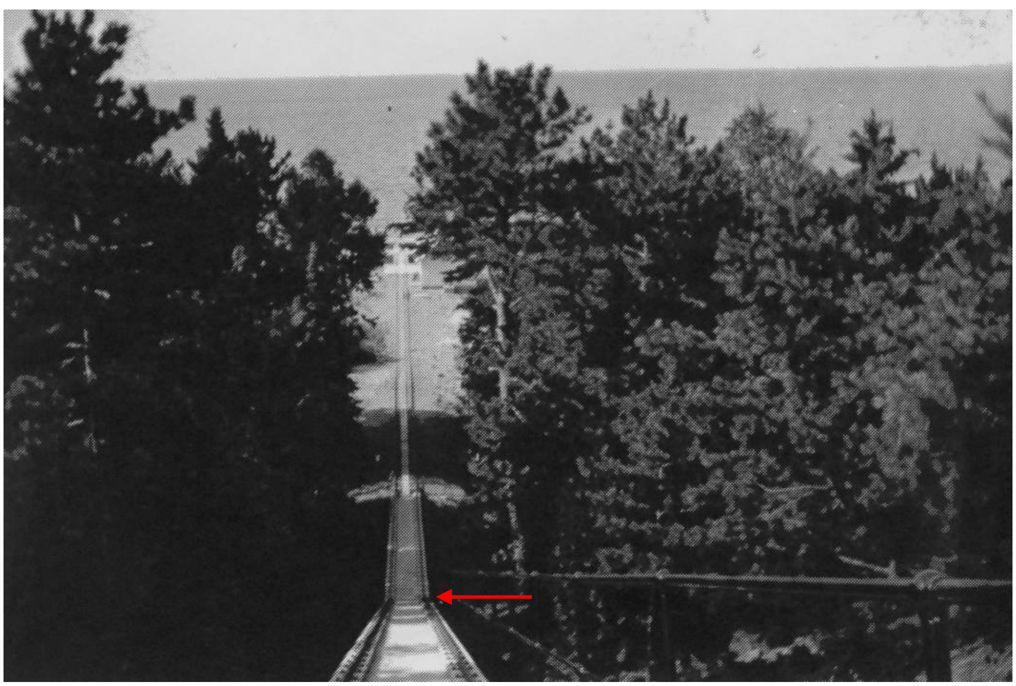
REGION	COUNTY	STATE
MIDWEST	ASHLAND	WISCONSIN

Light Tower Historic Plan and Photographs

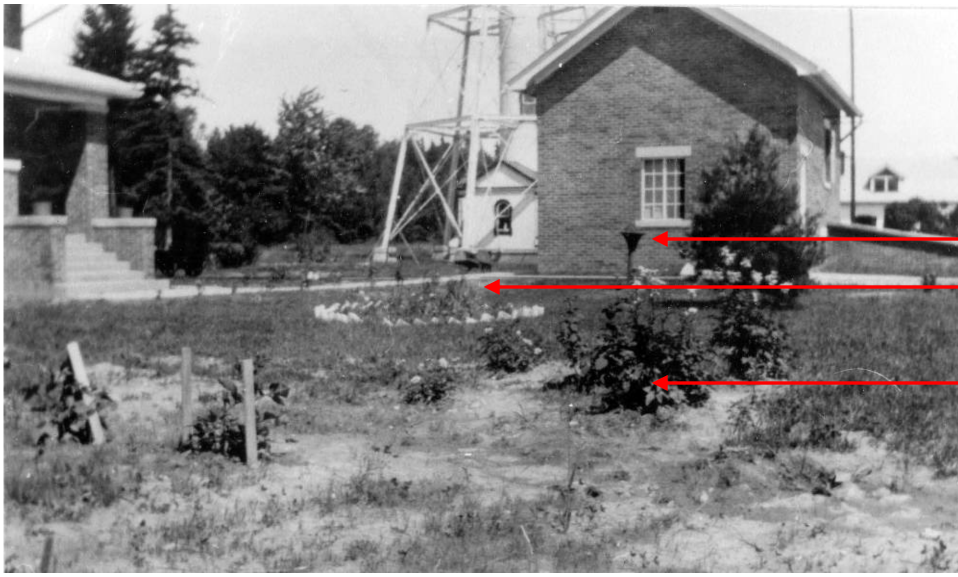


Site Image MI-12: Plan of the Michigan Island Light Station showing new buildings, structures and improvements – note orchard planting to lower right and distance of shoreline from bluff, c.1928–1931 (Source: NPS APIS Archives)

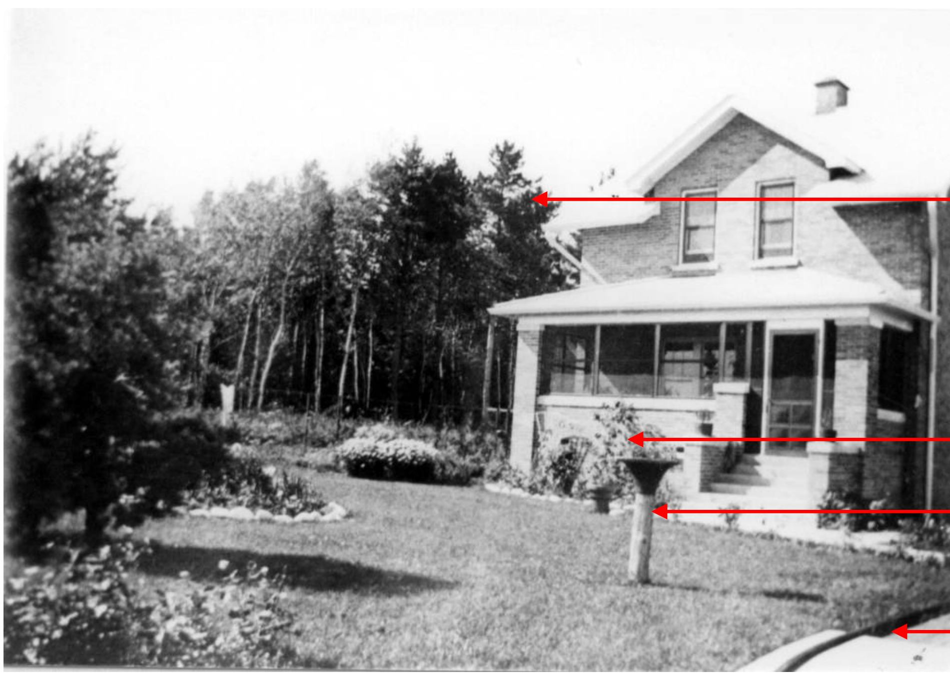
Site Image MI-13: View of upper portion of tramway – note extent of cleared area, c. 1930 (Source: NPS APIS Archives)



Site Image MI-14: Tramway and boat dock. Arrow indicates transition point between lower and upper portions of tramway, c. 1930 (Source: NPS APIS Archives)



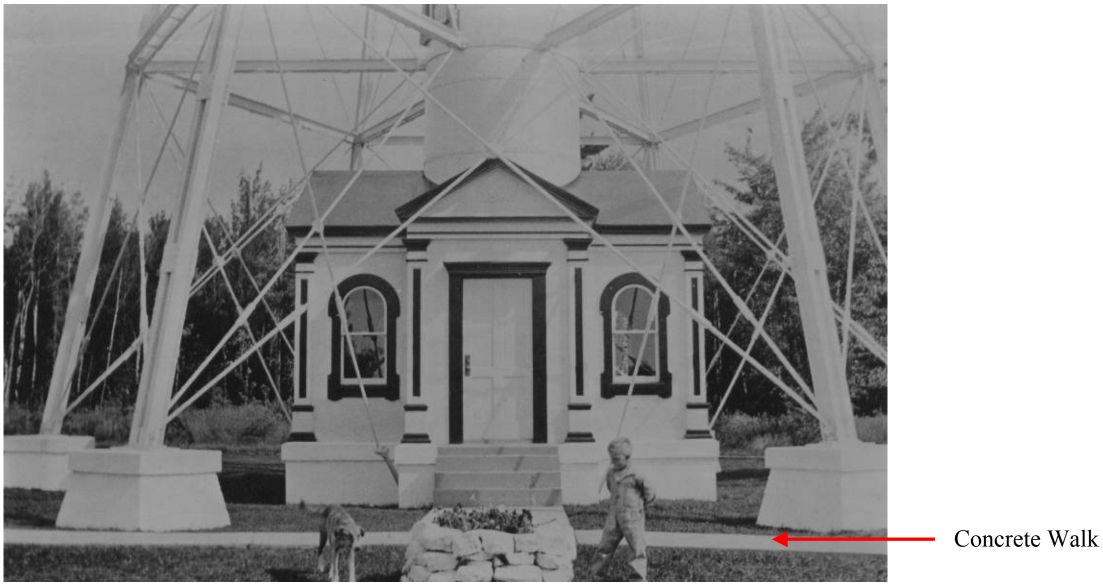
Site Image MI-15: View of Keepers Quarters, Light Tower; Power House; and Old Michigan Island Lighthouse; roses predated cedar hedge (still extant) in area south of the Keepers Quarters, c. 1930 (Source: NPS APIS Archives)



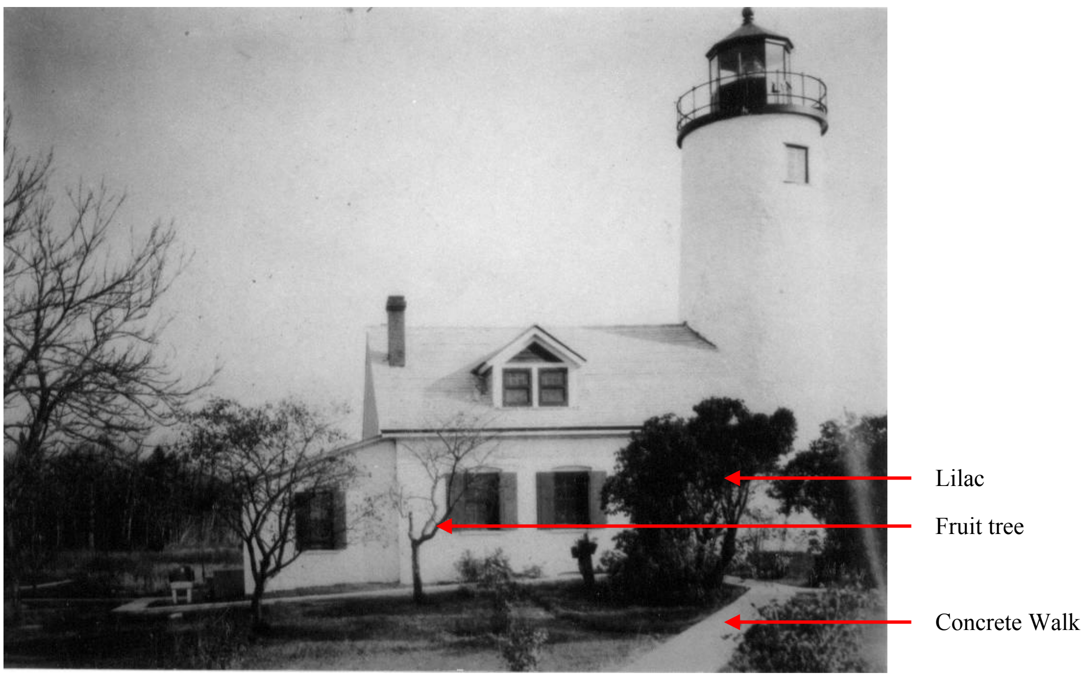
Site Image MI-16: Keepers Quarters with landscape plantings, c. 1930 (Source: NPS APIS Archives)

Site Image MI-17: Photo – View of Keepers Quarters and Assistant Keepers Quarters and Workshop with stone landscape planter, c. 1930 (Source: NPS APIS Archives)

Site Image MI-18: View of Keepers Quarters and Assistant Keepers Quarter and Workshop with landscape planters, c. 1930 (Source: NPS APIS Archives)



Site Image MI-19: View of Light Tower from south, note stone landscape planter, c.1930 (Source: NPS APIS Archives)



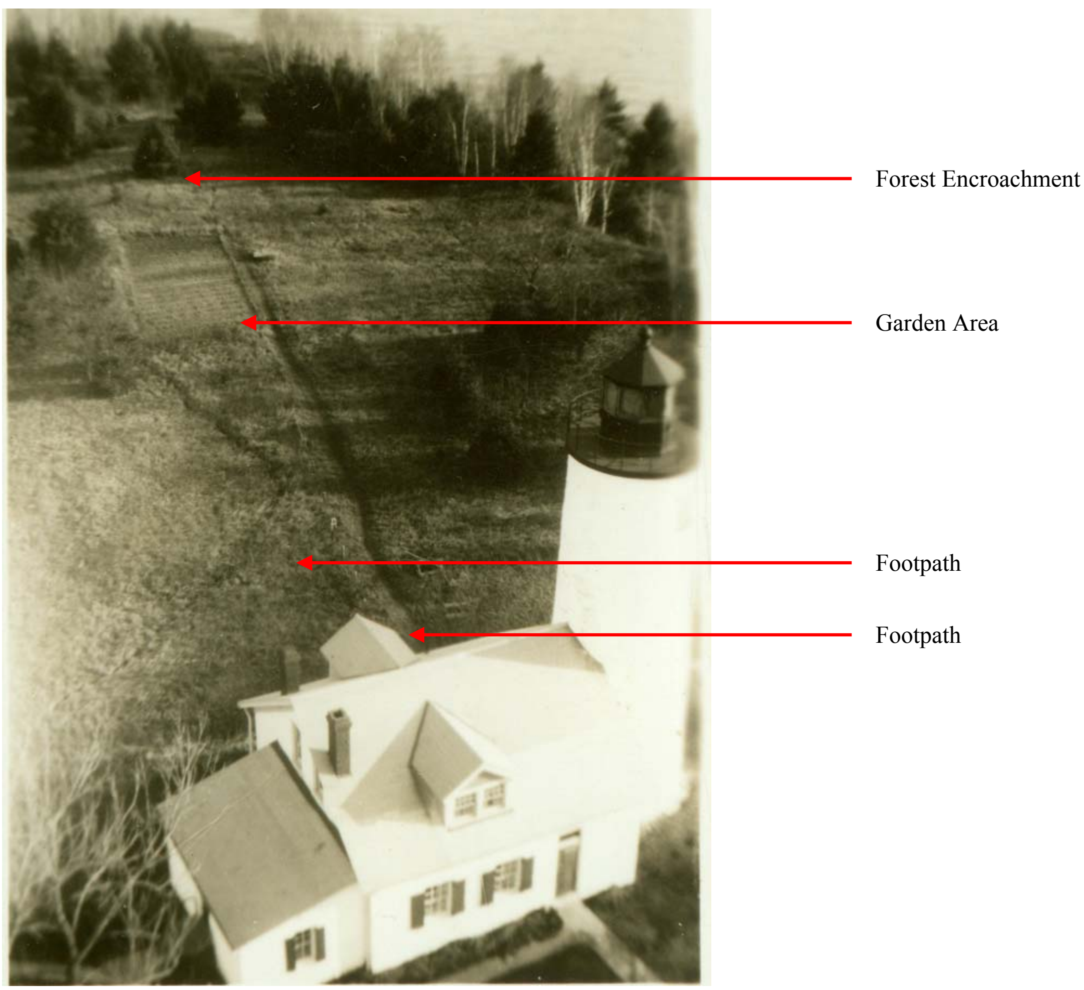
Site Image MI-20: View of Old Michigan Island Lighthouse with landscape plantings and concrete walks, c. 1930 (Source: NPS APIS Archives)

Site Image MI-21: Domestic planting beds and lilacs south of Old Michigan Island Lighthouse date unknown (Source: NPS APIS Archives)

Coast Guard and Automation (1939–1969)

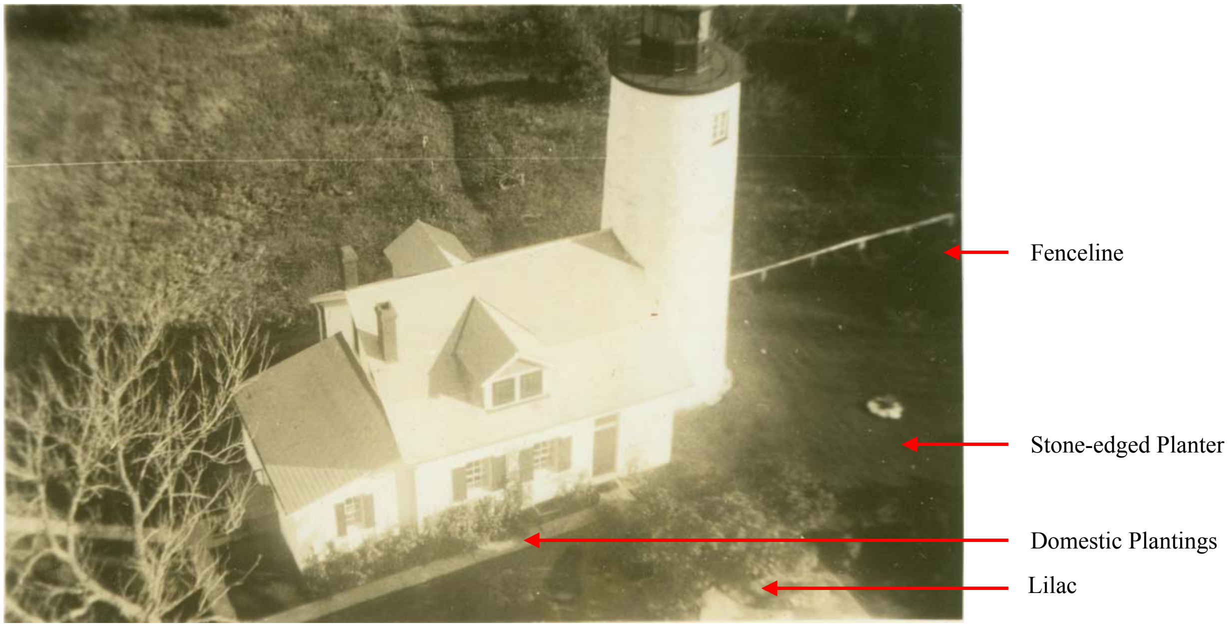
In 1939, the Bureau of Lighthouses was eliminated and the Coast Guard took over management of the light station. By 1943, the light station was automated and the keeper position on the island was eliminated.[30] This period resulted in limited additions to the light station grounds and landscape with only a few improvements added. A 1943 historic photo shows a garden existed east of the Old Michigan Island Lighthouse. This garden could have been present in earlier historic periods, although no documentation exists. The primary physical changes during this period were associated with the loss or diminishment of landscape features. After the departure of the light keeper, many of the domestic plantings installed by the lighthouse keepers, such as flower beds and fruit trees, no longer received annual maintenance and slowly fell into disrepair or were eliminated. Without regular maintenance or a need for them, fences also deteriorated or were removed. During this period the open, cleared area of the reservation was gradually reduced as the adjacent forest encroached into the reservation and light station grounds.

Coast Guard and Automation Photographs



Site Image MI-22: Cleared area with garden east of Old Michigan Island Lighthouse, 1943 (Source: NPS APIS Archives-Beals Collection)

[30] Busch, Jane C. "People and Places: A Human History of the Apostle Islands; Historic Resource Study of Apostle Islands National Lakeshore" Bayfield: Apostle Islands National Lakeshore. 2008. Page 147.



Site Image MI-23: Domestic planting beds and lilacs west of Old Michigan Island Lighthouse, 1943 (Source: NPS APIS Archives-Beals Collection)

Park Service (1970 to present)

In 1970, the Apostle Islands National Lakeshore was established. This is the beginning of the NPS period that continues to present day. This period opened the island to additional visitors and brought about changes in the landscape that primarily related to island access, recreation and visitor use.

The most significant changes were the 1987 construction of a new boat dock and the 1993 rehabilitation of the lower portion of the tramway and dock. This work reconnected the tramway directly to the boat dock. Other work in this period included the addition of visitor hiking trails, park signage, a pit toilet restroom, a solar panel and minor rehabilitation of the buildings and structures.

Park Service Photographs

Site Image MI-24: Stairs connecting to the tramway, replaced by current-day lower portion of the tramway in 1993, date unknown (Source: NPS APIS Archives)

Site Image MI-25: Gull Island Tower, c.1988 (Source: NPS APIS Archives)

ENVIRONMENTAL CONTEXT

Michigan Island is at the continental northwestern limits of the hemlock-white pine-northern hardwood forest and also contains elements of the boreal forest.[31] The maximum elevation above the lake is 93'.[32] The vegetation on the island has been disturbed by several types of human activities, including clearing associated with establishing and maintaining the light station. Additionally, a series of small farms, each around 100 acres, were established and eventually abandoned in the late 19th century.[33] The island was also extensively logged for timber in the late 19th and early 20th centuries. The majority of the island is now covered with a maturing second-growth northern hardwood forest dominated by white birch (*Betula papyrifera*), sugar and red maples (*Acer saccharum* and *Acer rubrum*), balsam fir (*Abies balsamea*), and white cedar (*Thuja occidentalis*). Michigan Island includes a bog/lagoon complex associated with the sandscape at the southwest end of the island.

As with the other islands within Apostle Islands National Lakeshore, wildlife on Michigan Island is not as diverse or abundant as that on the mainland.[34] Common mammal species include red squirrel (*Tamiasciurus vulgaris*), snowshoe hare (*Lepus americanus*), deer mouse (*Peromyscus maniculatus*), masked shrew (*Sorax cinereus*), and boreal redback vole (*Clethrionomys gapperi*). Bear (*Ursus americanus*), river otter (*Lutra canadensis*), and beaver (*Castor canadensis*) are also found on the island. A variety of migratory birds use the island for foraging, nesting, and as a stopover during migration, including the piping plover (*Charadrius melodus*), which is a federally and state endangered species. Bald eagles (*Haliaeetus leucocephalus*) nest on the island as they did in the early historic periods. The U.S. Fish and Wildlife Service has designated the Michigan Island sandspit at the southwest corner of the island as critical habitat for piping plover.

[31] National Park Service. 2009. Apostle Islands National Lakeshore Draft General Management Plan/Wilderness Management Plan/Environmental Impact Statement. Bayfield, WI.
[32] National Park Service. 2006. Apostle Islands National Lakeshore Website. Island Statistics. Last updated August 23, 2006. Available at http://www.nps.gov/apis/parkmgmt/upload/island%20statistics.PDF. Accessed December 7, 2009.
[33] Alanen, Arnold R. and William H. Tishler. "Farming the Lake Superior shore: agriculture and horticulture on the Apostle Islands, 1840–1940," Wisconsin Magazine of History. Volume:79/Issue:3 (1995–1996).
[34] National Park Service. 2009. Apostle Islands National Lakeshore Draft General Management Plan/Wilderness Management Plan/Environmental Impact Statement. Bayfield, WI.

EXISTING CONDITION ASSESSMENT AND LANDSCAPE ANALYSIS

The existing condition assessment and landscape analysis for the Michigan Island Light Station are presented in this section. The light station reservation and the three individual sites within it are documented as one entity through the landscape characteristics that together comprise its cultural landscape. The presentation of the existing condition assessment and analysis is organized by landscape characteristics: spatial organization, topography, views and vistas, and circulation/accessibility; and identifies those buildings, structures, small scale features and vegetation that contribute to the cultural landscape. An overview of the CLR methodology is presented in Volume I, Chapter 2: *Methodology*.

The landscape characteristics for the Michigan Island Light Station are as follows. Their associated character-defining features contribute to the overall integrity of location, design, materials, workmanship, setting, association, and feeling.

- Spatial Organization - is the arrangement of elements creating the ground, vertical and overhead planes that define and create space, including the arrangement of topography and buildings.
- Topography – is the three-dimensional configuration of the landscape surface characterized by features and orientation; including bluffs, cliffs, slopes and drainages.
- Views and Vistas – are features that create or allow a range of vision which can be natural or designed and controlled; these include views of the light stations from Lake Superior and views from the light towers and lighthouses.
- Circulation – are spaces, features, and materials that constitute systems of movement.
- Buildings - buildings that are either currently or were historically habitable are presented in the Historic Structure Report.
- Structures - are smaller nonhabitable buildings or significant features (now or historically) such as privies, tramways, and outbuildings.
- Small Scale Features – elements that provide detail and diversity combined with function and aesthetics; including paving; structural remnants; tram tracks; site walls; signs; and walls of building ruins.
- Vegetation – Indigenous or introduced trees, shrubs, vines, ground covers, and herbaceous materials; including lawns, and landscape garden areas.

The existing condition of the Michigan Island Light Station is presented first as a paragraph description. Annotated photographs support the condition assessment. The following criteria were used to evaluate condition:

- **GOOD –** The features of the landscape do not require intervention; only minor or routine maintenance is needed at this time.
- **FAIR –** Some deterioration, decline, or damage is noticeable; the feature may require immediate intervention; if intervention is deferred, the feature will require extensive attention in a few years.
- **POOR** – Deterioration, decline, or damage is serious; the feature is seriously deteriorated or damaged, or presents a hazardous condition; due to the level of deterioration, damage, or danger the feature requires extensive and immediate attention.

The landscape analysis, presented as narrative text, follows and provides an evaluation of the significance and integrity of each characteristic. The landscape analysis compares the site history with its existing condition to identify and evaluate those landscape characteristics that retain integrity and contribute to the significance of the light station.

The Michigan Island Light Station has integrity as it retains the majority of its character-defining features and buildings that depict its role in the development of navigational aids in the Apostle Islands. The most important features include the buildings, tramway, tram tracks and landscape as these defined the setting and lifestyle of the keepers that created many of the landscape features.

Spatial Organization

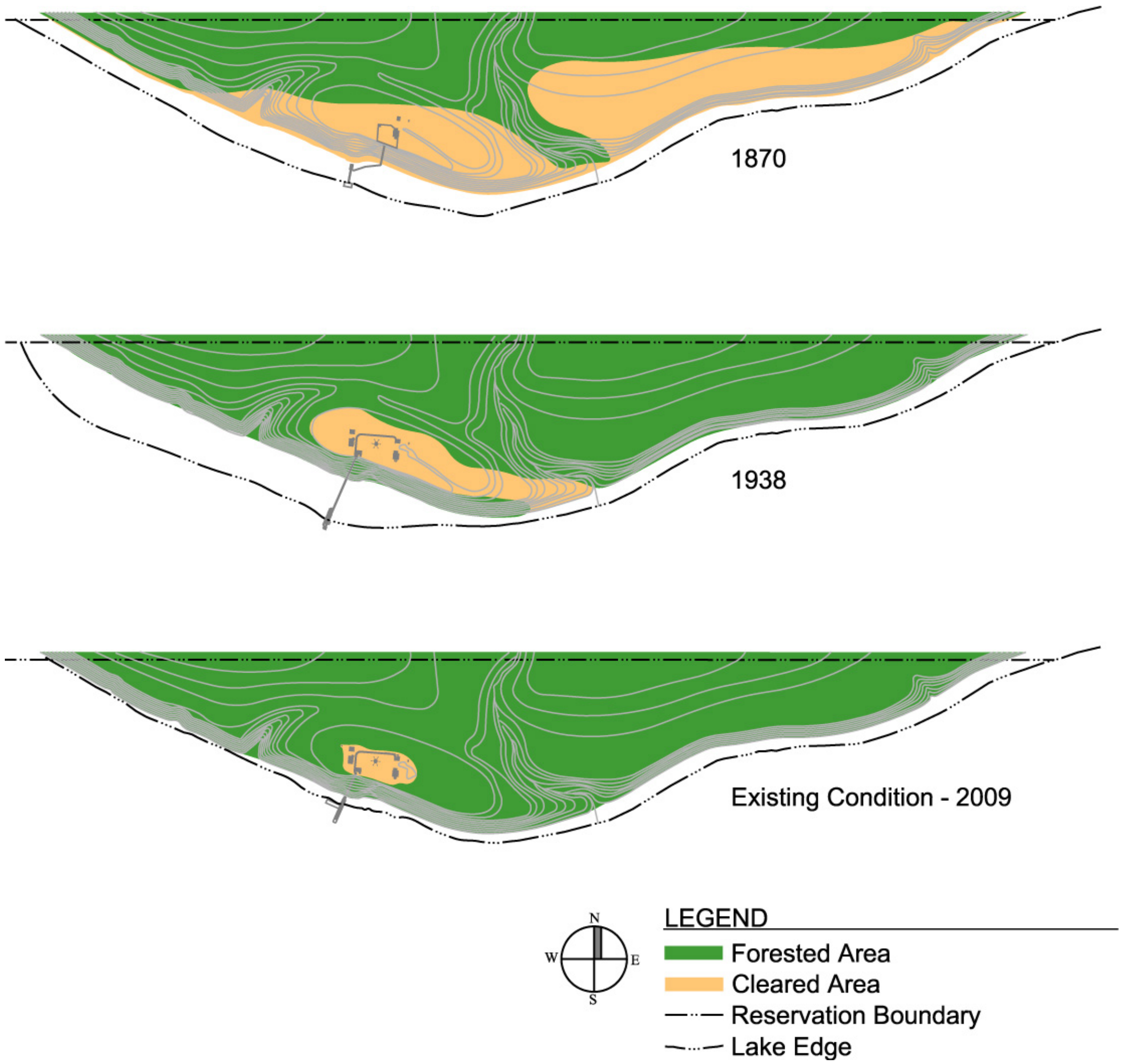
Spatial organization at the Michigan Island Light Station is of two distinct scales, the organization of the reservation and that of the light station grounds. While they are distinct they are also directly related. The cleared area of the reservation is also discussed under the vegetation section.

Existing Condition. The spatial organization of the light station reservation is simply defined by the relationship of the forest to the cleared area of the reservation and the edges created. Spatially this creates wide open areas that contrast with the heavily forested areas outside of the clearing. Outside of the core grounds area, no substantial cleared areas are extant.

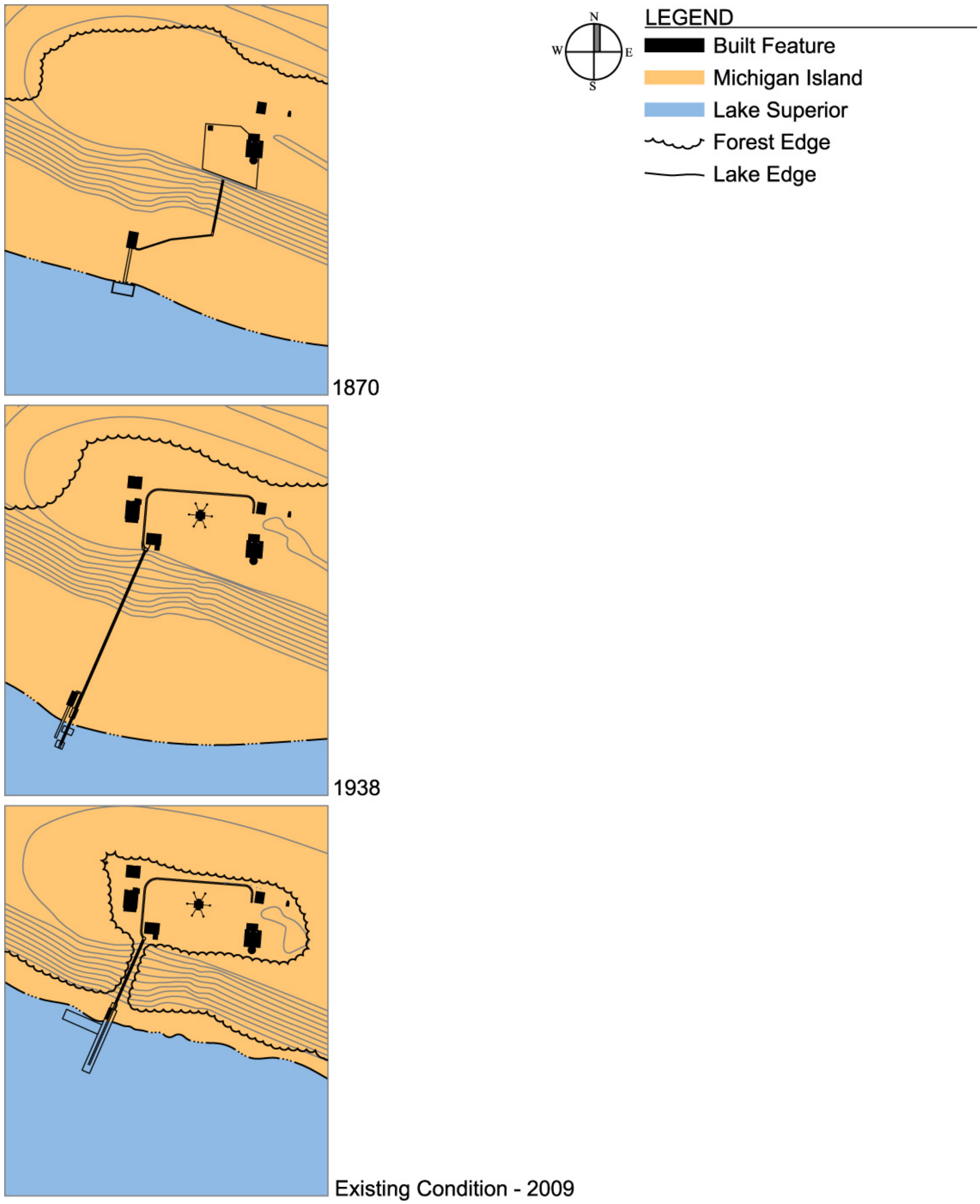
The light station grounds are arranged in a fairly formal, rectangular shape. The forest/encroaching vegetation creates an outer perimeter, the buildings and tram tracks form an inner perimeter, with the open lawn in the central portion of the site. Within the grounds the structures and tram tracks reinforce this outdoor common space. Centered in the grounds is the dominant element, the tall, steel Light Tower. The overall feeling is one of enclosure, on all four sides as the maintained landscape is surrounded by the encroaching forest. Overall the spatial organization of the light station, reservation and grounds, is in poor condition

Analysis. The spatial composition of the light station reservation has significantly changed from the island's early history as an aid to navigation. While the spatial organization of the light station's buildings, structures, and small scale features remains in place from the period of significance, the surrounding clearing has been greatly reduced due to forest encroachment (Site Image MI-26, MI -27). Once the island was no longer operated as a light station with a light keeper, the forest vegetation was not cleared as regularly as the height of the new tower reduced the need for extensive clearing that occurred during the early years of the light station. Spatial composition is an important contributing feature to the cultural landscape. The encroachment of the forest has diminished the integrity of this feature and the light station.

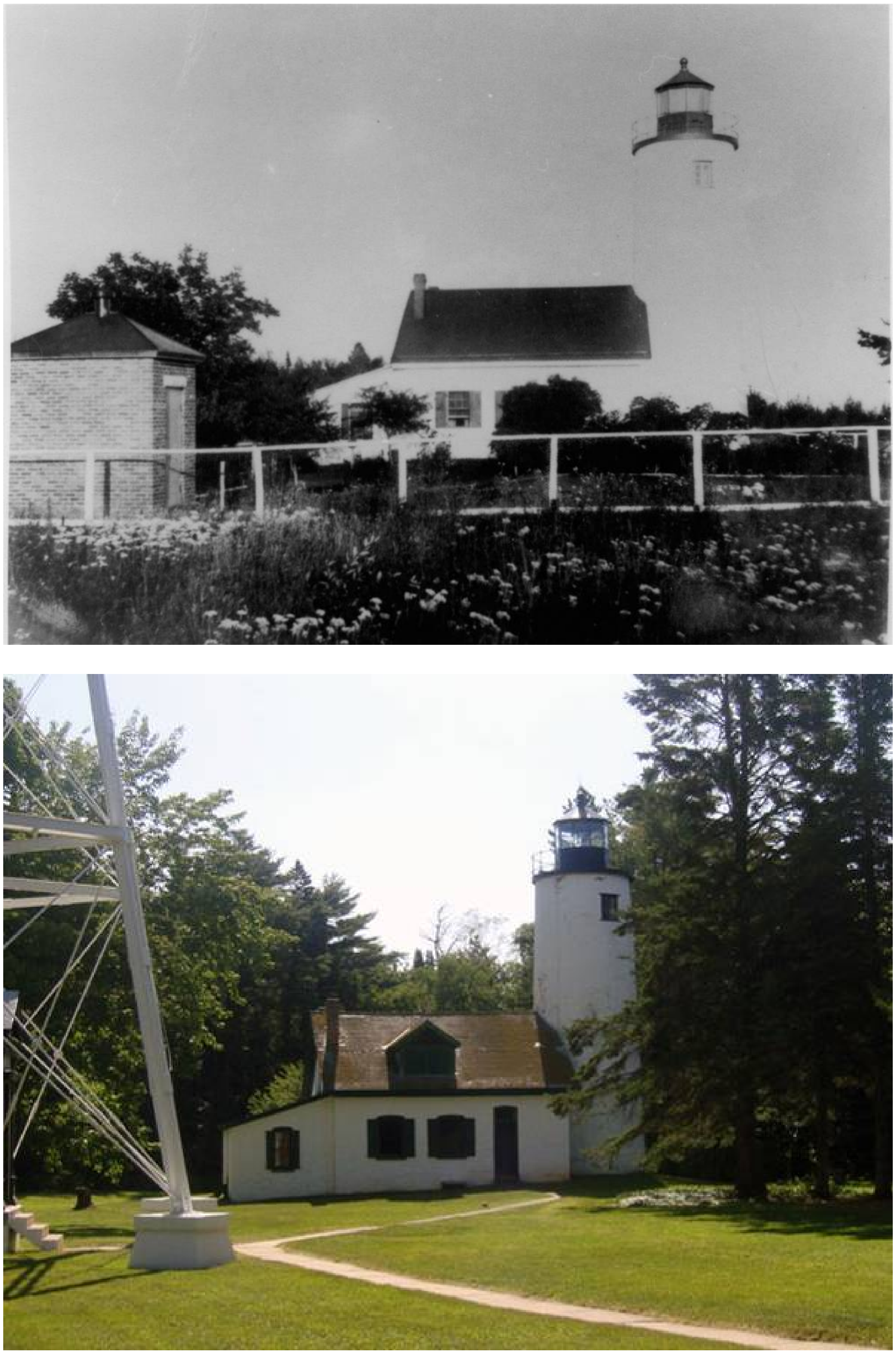
Spatial Organization Diagrams and Photographs



Site Image MI-26: Cleared area diagram (Source: MBD 2009)

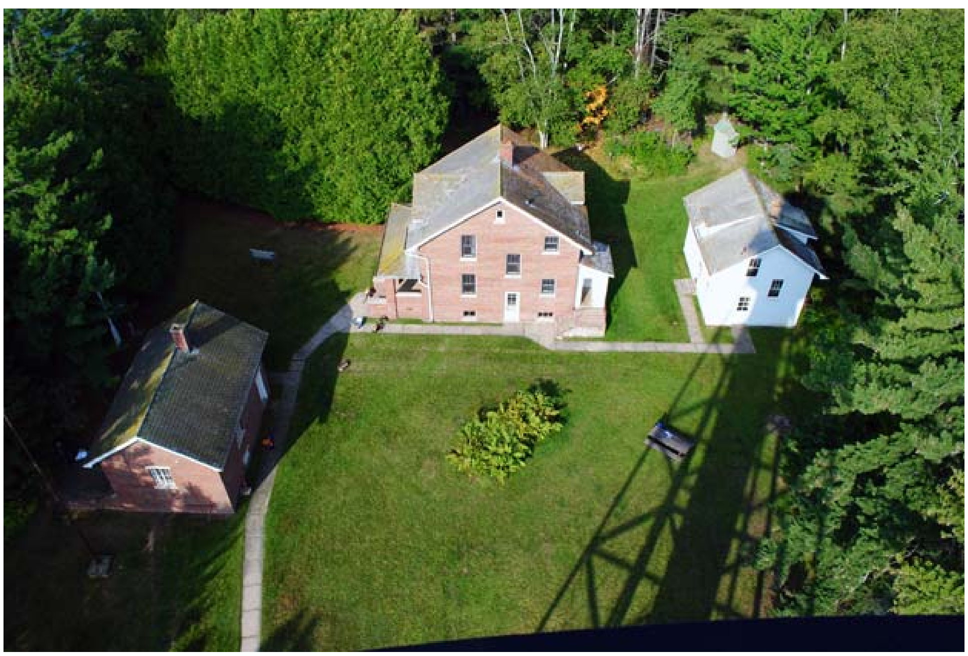


Site Image MI-27: Evolution of the spatial organization of the light station grounds (Source: MBD 2009)



Site Image MI-28: View of Old Michigan Island Lighthouse; top, c. 1913; below, 2009 (Source: MBD DSC00579.jpg)

Site Image MI-29: View of light station grounds from Light Tower, 2009 (Source: MBD DSC_0010.jpg)



Site Image MI-30: View of light station grounds from Light Tower, 2009 (Source: MBD DSC_0018.jpg)

Topography

Existing Condition. The light station grounds on Michigan Island are located on a bluff, rising approximately 60’ above Lake Superior. The overall island topography consists of a landscape of gently rolling, forested hills ending in steep banks that slope down to rocky or sandy beaches. The light station grounds are primarily flat with several small drainages leading from the interior of the island to the bluff edge and shoreline. The embankment slope is highly erodible but stable. The shoreline adjacent to the light station is primarily a narrow rocky cobble beach east of the boat dock with sand beaches to the west fluctuating in width. The topography of the light station and reservation is in good condition.

Analysis. The topography of the reservation generally remains as it has been since development of the light station with two exceptions.

First, the embankment has eroded and affected the area of the light station grounds primarily at the top of the slope. Because of concerns relating to erosion of the embankment slope, baselines were established in 1979 and monitored periodically until 1994. The average rate of erosion on the east side of the dock ranged from .3 to .6 meters per year.[35] The Michigan Island Light Station embankment is currently stable, but with a high erosion potential.

Secondly, historic drawings and photos indicate that the shoreline zone has become significantly narrower in width. Edna Lane Sauer, daughter of Lighthouse Keeper Lane, stated that, “There were only cobblestones east of the dock – all the way around the island except for a bit of red clay. Wonderful sand beaches from dock westward and north for a ways. So wide and clean.”[36] Whether the narrowing of the shoreline zone is due to natural forces, man-made developments (boat dock) or a combination is unknown.

The topography of the reservation and light station grounds retains its integrity and is a contributing feature.

Topography Photograph

Site Image MI-31: Bluff along lake edge, east of dock, 2009 (Source: MBD DSC00585.JPG)

[35] Van Stappen 1994 (Van Stappen, J. 1994. Bluff erosion monitoring, Michigan, Outer, and Raspberry Islands, Apostle Islands National Lakeshore, Bayfield, Wisconsin).
[36] Edna Lane Sauer, APIS 2682, Museum collection photo.

Views and Vistas

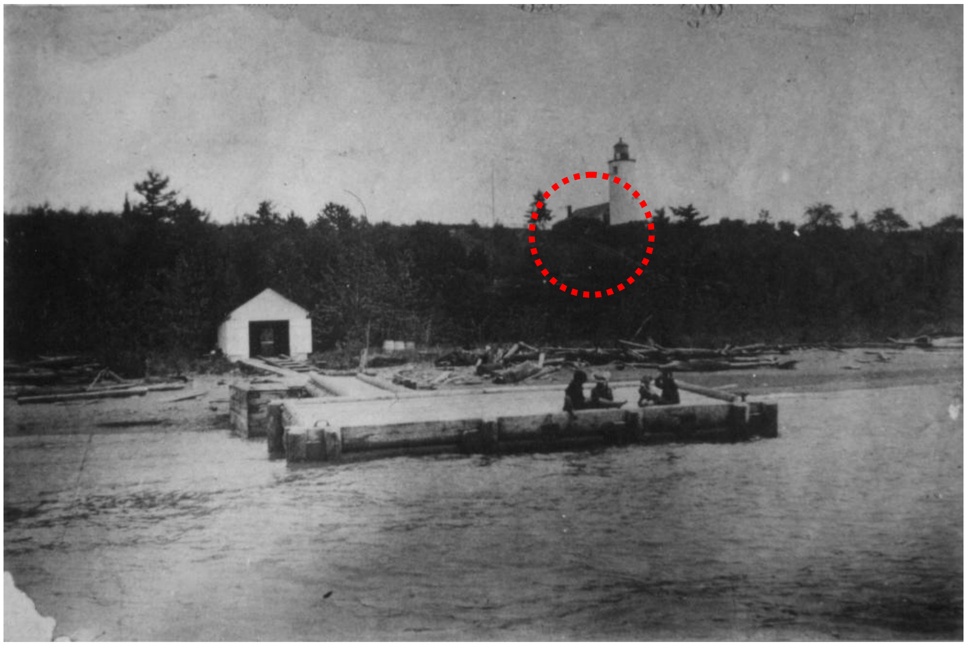
Existing Condition. Notable views to Michigan Island include those of the Light Tower and Old Michigan Island Lighthouse visible to passing ships and pleasure boats on Lake Superior. Notable views from the island include those to the south over Lake Superior from the Light Station grounds, and vistas from the top of the Light Tower and Old Michigan Island Lighthouse across the island and outward over the water. Selective clearing projects have been undertaken to open vistas to and from the light station. Views and vistas are generally in poor condition.

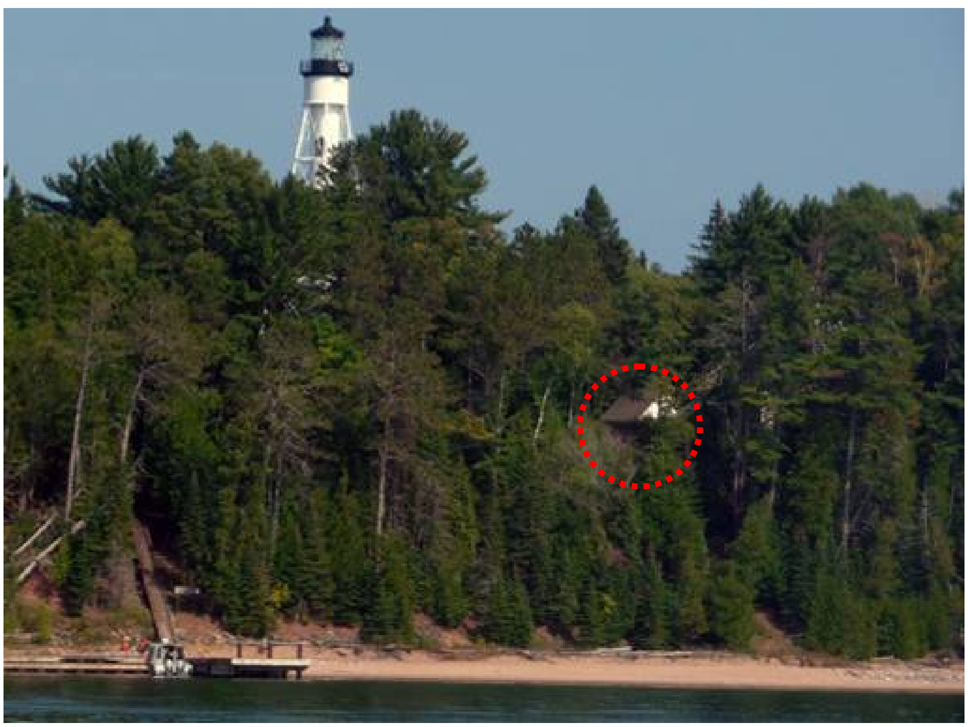
Analysis. The extent of views and vistas to and from the light station grounds has been reduced due to the encroachment of forest vegetation on the reservation. Views from Lake Superior to the Old Michigan Island Lighthouse and Light Tower are greatly obscured by vegetation. A review of historic photographs indicates that the lighthouse was clearly visible from the water. Today, the Old Michigan Island Lighthouse is only visible from Lake Superior where recent clearing activities have opened up narrow vistas. The Light Tower remains visible above the trees due to its height, reducing the navigational need for clearing of the forest. Views from the light station grounds and Old Michigan Island Lighthouse are also obscured due to encroaching and maturing vegetation. Views from the Light Tower over Lake Superior and the north portion of the Island remain intact due to the height of the tower.

Views and vistas are an important contributing feature to the cultural landscape of the Michigan Island Light Station. The loss of these diminishes the integrity of the light station.

Views and Vistas Photographs

Site Image MI-32: View from the Lighthouse to the boat dock below, top, c.1856–1928 (Source: NPS APIS Archives); below, c. 2009 (Source: MBD P1010701.JPG)





Site Image MI-33: View from water to Old Michigan Island Lighthouse (and Light Tower) showing growth of forest; top, c. 1904 (Source: NPS APIS Archives); below, c. 2009 (Source: MBD P1010811.jpg)

Site Image MI-34: View from Light Tower to south over Lake Superior, 2009 (Source: MBD DSC_0014.jpg)

Circulation/Accessibility

Existing Condition. Circulation on Michigan Island is focused on the boat dock and light station grounds. Access to the island is water based and the boat dock is the only formal boat landing on the island. The boat dock is used by NPS staff and visitors in small pleasure boats. The dock cannot be accessed by large day-cruise boats. The inclined, concrete tramway provides pedestrian circulation from the boat dock to the light station grounds and a method of transporting goods between the two. Concrete walks connect the Light Tower, Old Lighthouse, buildings and small scale features. A trail originates near the Keepers Quarters and leads west, through the forest across the reservation to a campsite, sand spit and lagoon on the west side of the island.

The boat dock, tramway and tram tracks are described in detail under the Structures section. The concrete walks are described under the small scale features section.

In general, circulation at the light station is in good condition. The condition of individual features is discussed within their respective sections.

Analysis. Circulation on Michigan Island has remained similar to the access and basic routes that were developed during the Light Tower period. Primary transit to the island was historically, and continues to be by boat, landing on the boat dock on the island's south side.

Originally, pedestrian circulation from the shore to the light station was along a wooden stairway leading to the Old Michigan Island Lighthouse. An existing concrete walk leads to the nonextant location of these stairs. During the Light Tower period a new point of access was established with the construction of a new boat dock, tramway and stairs which were built west of the original wooden staircase and boat dock. This substantial change brought new technology and a more efficient method of transporting goods up to the light station and fuel to the new Power House. The construction of the tramway reoriented the main pedestrian route to the new Keepers Quarters rather than the Old Michigan Island Lighthouse and significantly changed the circulation routes on the site. The tram tracks were also laid at this time and used for moving goods and fuel on the light station grounds.

Concrete walks were installed in both the Early Lighthouse period and Light Tower period, many of which remain today. Typical to the Apostle Islands light stations, the concrete walks were narrow in width; placed in straight lines connecting buildings and other site features. Concrete walks linked the Old Michigan Island Lighthouse with the Shed, wooden staircase and eventually the Privy and Oil Building. The concrete walks were preceded by wooden plank walks, laid on the ground surface. Later concrete walks were built to connect the Power House, Keepers Quarters, Assistant Keepers Quarters and Light Tower. In the 1990s a hiking trail was built leading from the light station westward to the southwest corner of the island.

Today, the historic circulation system, consisting of: the primary access at the boat dock; the inclined tramway; the tram tracks; and the concrete walks on the light station grounds contribute to the island's significance as a cultural landscape. The 1990s hiking trail does not detract from the cultural landscape.

Accessibility (ABAAS). Accessibility on the light station, including its buildings and structures, is limited due to physical barriers and a lack of ABAAS compliant improvements. Barriers to universal accessibility include 123 steps on the tramway connecting the boat dock to the light station, and steps leading into and through buildings and structures. The light station grounds present few barriers to accessibility as the terrain is generally flat. The buildings present individual accessibility barriers and are discussed in the HSR. The Park Service is currently developing a park-wide Accessibility Self Evaluation and Transition Plan separate from this project to address visitor accessibility requirements related to ABAAS and Section 504 of the Rehabilitation Act. At the time of this report the plan is in progress.

Buildings

The Michigan Island Light Station buildings include: the Old Michigan Island Lighthouse, Keepers Quarters, Assistant Keepers Quarters / Workshop, Power House, Shed and Privy No. 1. For information refer to the Historic Structure Report for Michigan Island.

Structures

The structures on Michigan Island provide a human scale to the island and convey important history and use of the light station. The structures include the boat dock, tramway, tram turntable and tram tracks. A physical description of each structure and its condition is presented first. An analysis of each structure follows and includes a determination of whether the structure is contributing or noncontributing.

Boat Dock

Existing Condition. The concrete boat dock extends from the shore in an 'L' shape to the south (140') and west (70') of the shore. The existing dock was constructed in 1987 and was modified in 1993. It is a steel sheet pile structure infilled with stone rubble and capped with a concrete deck. The top of the boat dock has tram rails set into the surface, which are connected to the inclined tramway. The boat dock is in good condition but has functionality issues related to water depth and sedimentation.

Analysis. The original boat dock was built about 50' to the east of the current boat dock and was connected to a wooden staircase leading up to the Old Lighthouse. Historic photographs indicate that there was a small Boathouse present on the shoreline during the Early Lighthouse period. The existing boat dock location has been in place since 1929, but the actual dock has been modified, repaired and rebuilt several times. The location of the existing boat dock is consistent with the locations of previous docks, specifically the 1929 dock. The materials and form of the dock are not consistent with the historic character. The boat dock has operational deficiencies due to the basic design of a solid L shaped structure that does not allow flows to pass underneath it. The current boat dock is considered a noncontributing, noncompatible feature due to the 'L' shaped form of the structure.

Boat dock planning work is currently under study by the NPS under separate but related projects, including the Great Lakes Restoration Initiative.

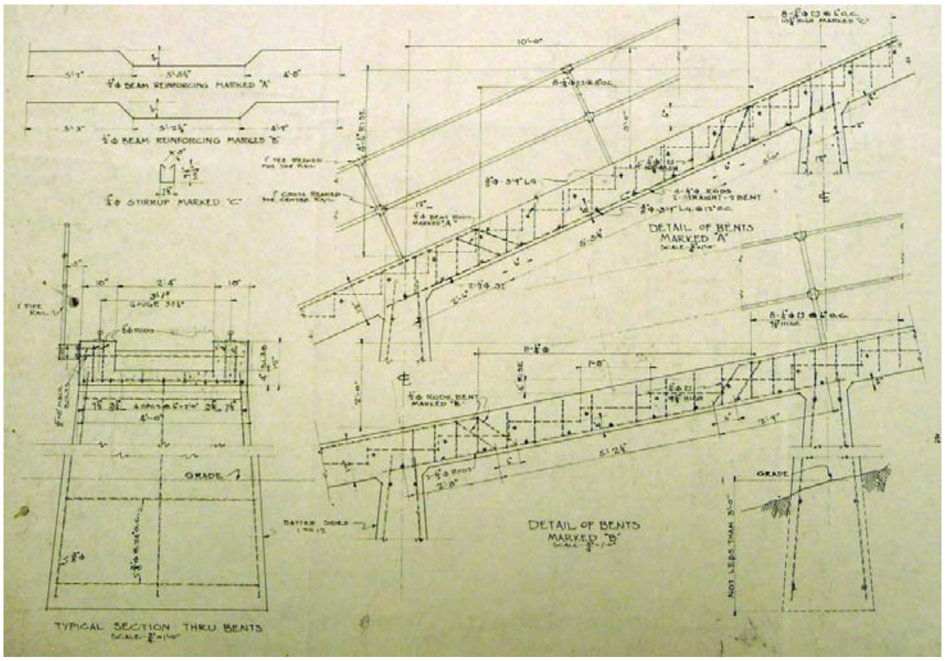
Tramway

Existing Condition. The inclined tramway is 158' long and connects the boat dock to the top of the bluff, rising approximately 60' above the shoreline. The tramway consists of: cast iron tram rails with formed concrete steps between the rails; and a steel pipe railing located on the west side of the structure. The tramway is built of cast-in-place, reinforced concrete and is supported by 15 concrete footings spaced evenly along its length. The footings are rectangular in shape and battered at 1/12 on all four sides, tapering to a wider base at, and below the ground. All exposed portions of the footings have a board form finish. The tramway structure is 4' wide with 25-pound rails spaced at 36" on center. The rails are secured to the concrete with flats and imbed bolts at approximately 24" on center. The steps are 28" wide and centered in the structure. The lower portion of the tramway has 20" treads and the upper portion has 14" treads. The 123 risers vary between 4½" and 6" high. The steel pipe railing (36" height) is secured to the outside vertical surface of the tramway structure with steel brackets and painted. The railing is 12" from the edge of the steps. The upper portion of the tramway structure (approximately 120') is constructed at a slope of approximately 40 degrees. The lower portion (approximately 34') is constructed at a lesser slope. The

lower portion was reconstructed in 1993, replacing a wooden platform and steps and connecting directly to the boat dock.

The tramway is in good condition and retains all of its original elements of the upper portion including: concrete footings and stairs, steel handrail, and cast iron tram rails.

Historic Drawing of Tramway, c. 1929



Site Image MI-35: Historic Drawing, 1928, of the Michigan Island Tramway (Source: APIS Archives)

Analysis. The tramway was built in 1928 and with the tram tracks was a major component in reshaping the light station grounds. The tramway and stairs replaced the wooden steps below the Original Lighthouse as the primary access to the light station moving it to the west, focused on the Power House and Keepers Quarters. This construction of this transportation system brought a new technology to the light station and allowed a much more efficient movement of goods and fuel up the bank and on the light station grounds. At this time, the water line that was previously in a separate location was rebuilt to run along the tramway, similar to Outer Island. The tramway and tram tracks changed the both the physical organization of the landscape and the way in which the light station operated.

The original lower 34-foot section was removed sometime following automation in 1943. It was reconstructed in 1993, and replaced an elevated, wooden landing platform and directly connecting the tramway to the boat dock (c. 1987). The tracks were extended onto the boat dock at this time. The 1993 reconstruction was done using the existing footings and compatible materials in a form similar to the original construction. The tramway presents several issues with regard to ABAAS and code compliance. The width of the steps, at 28”, falls short of the required 36” width; the railing is too far from the edge of the steps (currently 12”, should be directly adjacent to function as a handrail); and a handrail and guardrail are lacking on the east side of the structure. The riser to tread ratio of the upper portion of the tramway, at 40 degrees, exceeds ABAAS standards. The tramway is considered a contributing feature.

Tram Turntable

Existing Condition. At the top of the tramway is a manufactured steel turntable used to turn carts and connect them to the tram tracks that extend into the light station grounds. The turntable is 5' in diameter and is covered with a large cast iron plate stamped "KOPPEL CO PF 79, KOPPEL, PA." The turntable is currently locked in one position, nonfunctional, and in poor operating condition.

Analysis. The tram turntable was installed in 1929 as part of the tram system. The turntable is a contributing feature.

Tram Tracks

Existing Condition. The tram tracks lead from the Power House tramway turntable north past the Keepers Quarters, then turn to the east along the row of pine trees, before turning south and connecting to the Shed behind the Old Michigan Island Lighthouse. The tracks are cast iron 25-pound rails, spaced 36" on center matching the tramway and secured to timbers in a setting bed (gravel or cinders). The tracks as a system and are intact and remain in place, although portions of the rails have been damaged and bent and a great portion of the tracks have excessive soil and vegetation between the rails. The wooden timbers beneath the tracks are extant but are generally in poor condition. Overall the tram tracks are in fair to poor condition.

Analysis. The tram tracks were built in 1929 at the beginning of the Light Tower period as part of the tram system and were an integral part of the technological advances in equipment on the light station. Tram tracks are a feature common to Michigan, Devils, Outer, and Raspberry islands, making the transportation of goods within the station easier and more efficient. Spatially, the tracks assist in defining the northern edge of the light station grounds. Encroaching vegetation (grasses) and soil have gradually settled into the track area limiting drainage and accelerating the decay of the timbers beneath. The tram tracks are a contributing feature.

Original Wood Staircase

The original wood staircase is nonextant with no traces of it remaining. A concrete walk leads to the site of the former staircase.

Root Cellar

Existing Condition. The root cellar at the Michigan Island Light Station was located approximately 100' north of the Privy on the east side of the station. It is nonextant; however, there is evidence of its location in the form of a 10' x 14' rectangular depression in the ground where it once existed. The depression is bordered by four earth mounds, approximately 2' to 4' high.

Analysis. The date of the original construction of the root cellar is unknown. Since it is closer to the Old Michigan Island Lighthouse than the Keepers Quarters, it follows that the root cellar might have been constructed when the Old Michigan Island Lighthouse was the primary residence (1856–1929). If so, at that time, the root cellar would have been in a cleared area rather than the heavily forested area it is in today. The remaining landform where the root cellar once existed is a contributing feature to the cultural landscape.

Gull Island Tower

Existing Condition. The Gull Island Tower is a steel light located on Gull Island, northeast of Michigan Island. The island was not visited during the field work for the CLR, but the tower is fully operational and in good condition.[37]

Analysis. As the site of many of the archipelago's most notable shipwrecks, and as one of the most feared hazards in the vicinity, Gull Island and its surrounding shoals played a critical role in the region's maritime history. Gull Island wrecks included the 1865 stranding of the steamer Iron City, carrying goods intended for the final treaty payment at Grand Portage; the tragicomic 1899 grounding and fire which destroyed the packet steamer R.G. Stewart; the 1905 stranding of the Pittsburgh Steamship Company's flagship, the W.E. Corey; and numerous other incidents.[38]

The need for a light on Gull Island was a constant subject of agitation in the late 19th and early 20th centuries, and its construction in 1929, simultaneous to the erection of the new Michigan Island Tower, was part of a carefully planned two-part strategy to enhance the safety of vessels transiting the Apostles. Moreover, its intrinsic connection with the Michigan Island station is clear: entries in the Michigan Island keepers log show that maintenance of the Gull Island beacon was an integral, and frequent, part of that station's duties.[39] The Gull Island Tower is a contributing feature.

NPS Vault Toilet

Existing Condition. The NPS Vault Toilet is a wood-framed structure and vault located northeast of the Assistant Keepers Quarters. The Vault Toilet is not an accessible structure.

Analysis. The NPS Vault Toilet is a recent addition to the station and is a noncontributing feature. The location of the Privy does not detract from the spatial organization of the Michigan Island Light Station and, therefore, is a compatible feature.

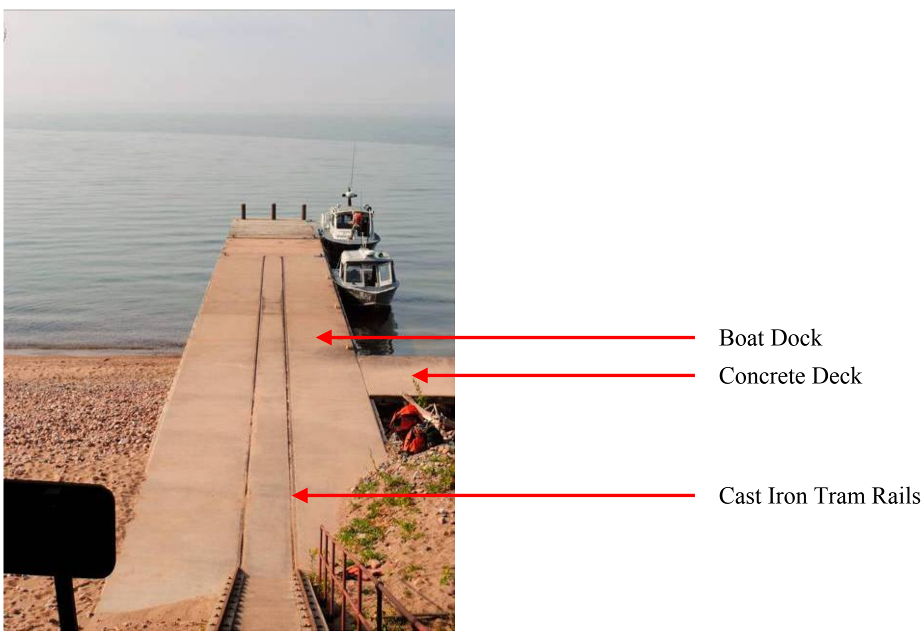
Table MI-1. Structures

Feature	Site Image #	Description	Condition	Contributing? /Rationale
Boat Dock (c. 1979)	MI-36, MI-37	see above	Good	Noncontributing – contemporary Noncompatible; see text
Tramway (c. 1928)	MI-36, MI-38, MI-39, MI-40, MI-41	see above	Good	Contributing; see text
Tram Turntable (c. 1928)	MI-42	see above	Good	Contributing; see text
Tram Tracks (c. 1929)	MI-43	see above	Fair to Poor	Contributing; See text
Root Cellar (1856–1929)	MI-44	see above	Poor	Contributing; see text
NPS Vault Toilet (1970–2009)	MI-45	NPS wood-framed Vault Toilet	Good	Noncontributing – contemporary; Compatible
Gull Island Tower	MI-46	see above	Good	Contributing; see text

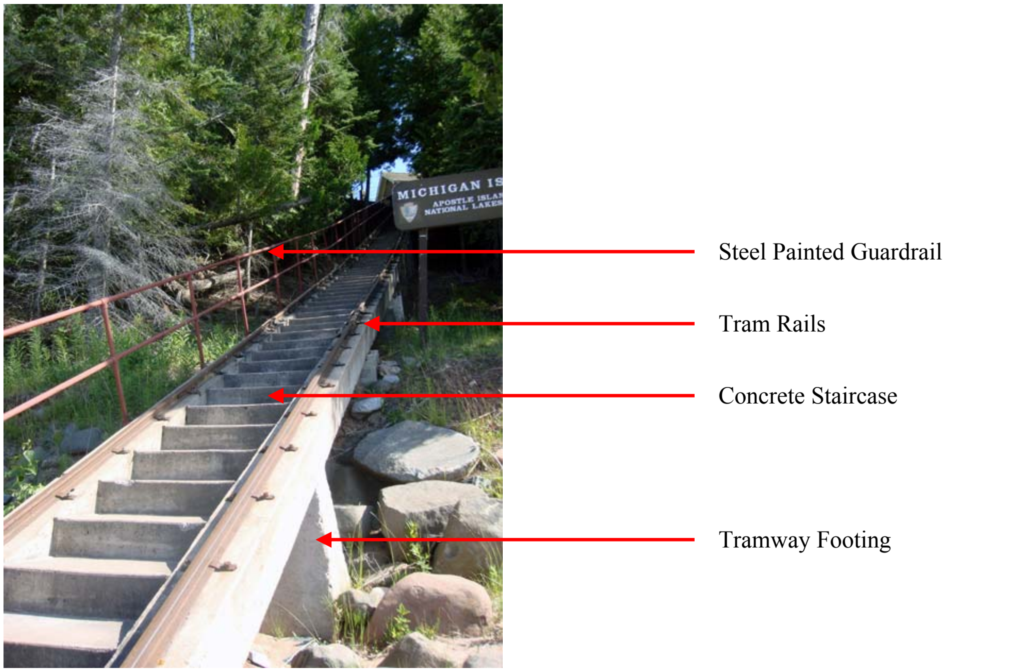
[37] APIS NPS staff.
[38] Susan Mackreth 2010.
[39] Ibid.

Site Structure Photographs

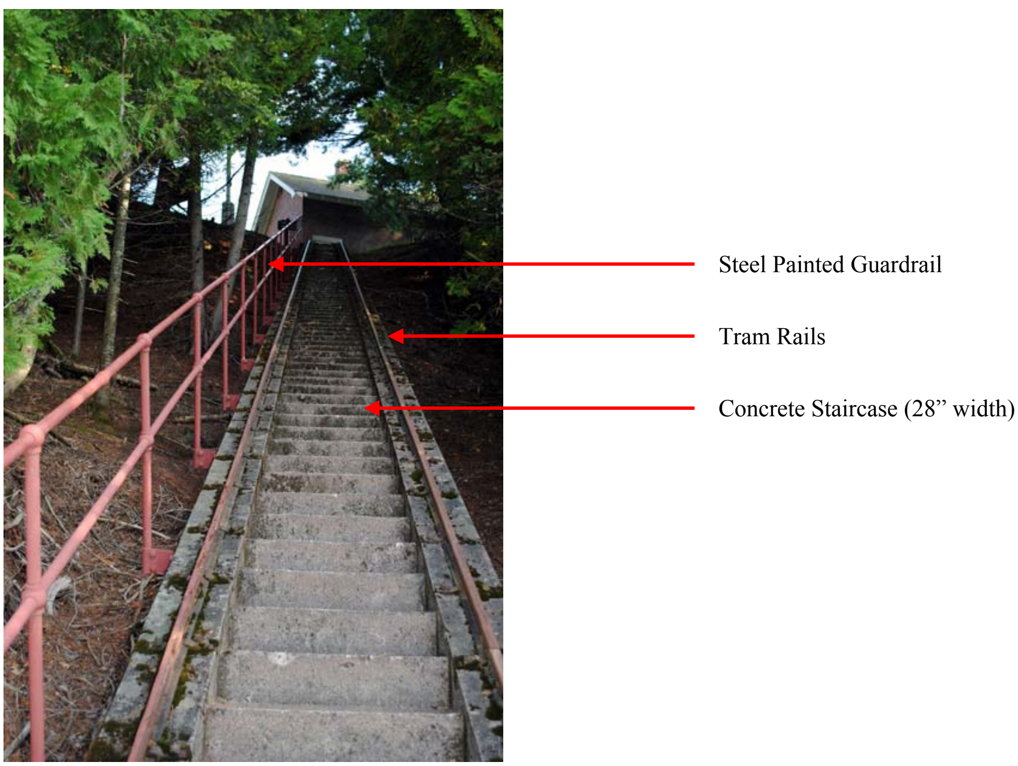
Site Image MI-36: Boat dock and tramway, 2009 (Source: MBD P1010680.jpg)



Site Image MI-37: Boat dock, 2009 (Source: MBD DSC_0036.jpg)



Site Image MI-38: Lower section of tramway, 2009 (Source: MBD DSC00574.JPG)

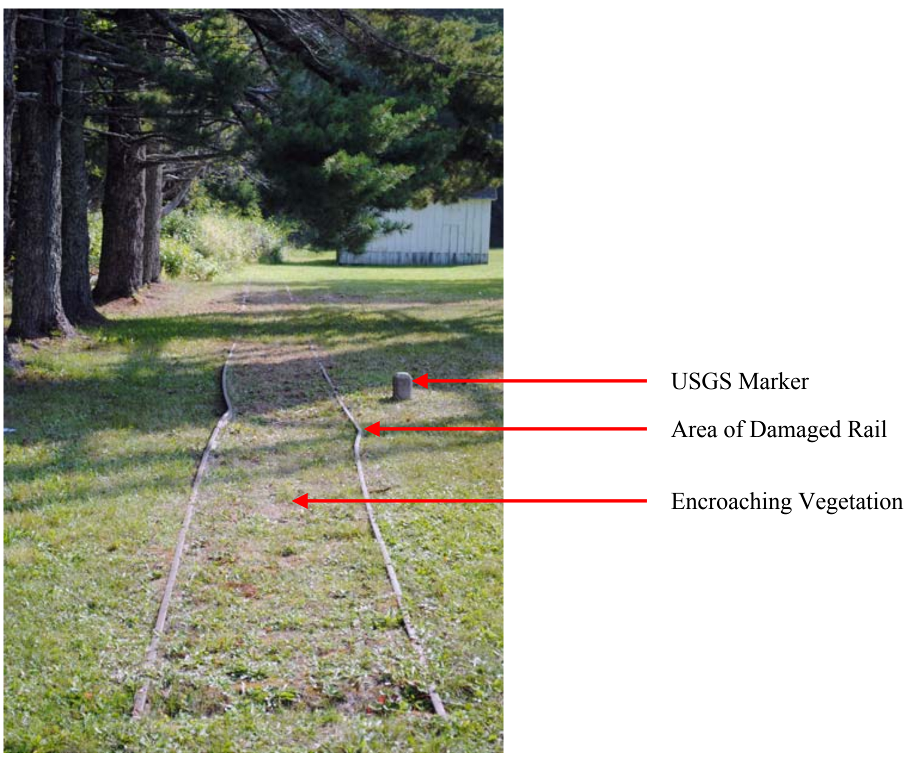


Site Image MI-39: Upper section of tramway, 2009 (Source: MBD DSC_0037.jpg)

Site Image MI-40: Upper section of tramway, tram tracks, and railing, 2009 (Source: MBD DSC_0037.jpg)

Site Image MI-41: Tramway, railing, and footings, 2009 (Source: MBD DSC_0037.jpg)

Site Image MI-42: Tram turntable, 2009 (Source: MBD DSC00599.JPG)



Site Image MI-43: Tram tracks, 2009 (Source: MBD DSC_0054.jpg)

Site Image MI-44: Root cellar depression 100' north of historic Privy, 2010 (Source: Rubin Stenseng, Michigan Island Light Station Summer 2010 Volunteer)

Site Image MI-45: NPS Vault toilet in northwest corner of light station grounds, 2009 (Source: MBD DSC_0106.jpg)

Site Image MI-46: Gull Island Tower, c. 2000 (Source: Picasa Web Albums)

Small Scale Features

The small scale features at the Michigan Island Light Station include concrete walks, radio antenna poles, a cistern, well basin, signs and other small site elements. The small scale features range in condition from poor to good. The following describes the contributing small scale features that are important to the light station's history of navigation. They are the features that convey the development of navigational technology and influenced the manner in which the station operated. At the Michigan Island Light Station these notable features include, concrete walks, radio antenna poles and flagpoles. Descriptions of the remaining individual features, many of which are contributing and their respective condition are included in Table MI-2.

Concrete Walks

Existing Condition. The concrete walks on the grounds were installed during the Early Light Tower period (1929–1938) many of them following the previous layout of wood planks as was common on the light stations. Typical to several of the Apostle Islands light stations, the walks appear to be constructed of precast units 3' × 4' × 4" thick with some smaller units also installed. The units have a fine aggregate finish and tooled edges. Historic photographs indicate that the concrete units may have been placed on top of the ground surface rather than excavated and placed. Other portions of the concrete walks appear to have been poured in place to infill odd shapes and address building edges. Overall the concrete walks are in good condition with only a few slabs requiring replacement due to excessive cracking.

Analysis. The concrete walks are important to the cultural landscape because their installation occurred during the period when the light station was at its most vibrant and they are closely related to the new technology and buildings that were developed at that same time. The walks are also important because of their production and installation as precast units was common to the other light stations. This construction character helps to depict the stories of each light station and more importantly how they are interrelated. The concrete walks are important contributing features.

The addition of concrete walks, radio antennae, and flagpoles relate to the evolution of the light station grounds and contribute to the significance of the cultural landscape. In addition to these features there are signs, a solar panel, and other site features that have been added to the site outside of the period of significance.

Radio Antenna Poles

Existing Condition. The radio antenna poles (north and south) are features that were installed between 1929 and 1931 along with the other technological advances (Light Tower, Power House, and tramway) related to improvements in navigational aid. An annotated 1928 drawing from the APIS archives indicates that one or both of the poles were moved from their original locations once if not twice. They are currently located just east of the Power House, and another directly north from the first, near the tram tracks. They are cast iron poles, with a height of approximately 40', and identical concrete bases, approximately 18" tall, with a 36"×36" width. Radio Antenna Pole – South is in good condition. Radio Antenna Pole – North is in fair condition, the foundation needs to be reset as the pole is leaning to the north.

Analysis. The radio antenna poles are important features because they relate to improvements in navigation technology during the period of significance and are an element common to many of the light stations in the Apostle Islands. The radio antenna poles are a contributing feature.

Flagpole

Existing Condition. The flagpole is at the top of the tramway, just south of the Keepers Quarters. The flagpole is constructed of a single wood pole, approximately 25' high mounted between two smaller base posts, with through bolt connections. The entire structure is painted white with a concrete footing. The flagpole was installed during the Light Tower period and is in good condition.

Originally another flagpole existed southwest of the Old Michigan Island Lighthouse. This pole is no longer extant except for a remnant concrete collar, approximately 18" square. Historic photographs indicate that the first flagpole had a metal pole painted white.

Analysis. The flagpoles are important features because they relate to the historic use, operation and management of the light station at a time when the stations were occupied. Flagpoles are element common to all of the light stations in the Apostle Islands. The flagpole and extant concrete base are contributing features.

Table MI-2. Small Scale Features

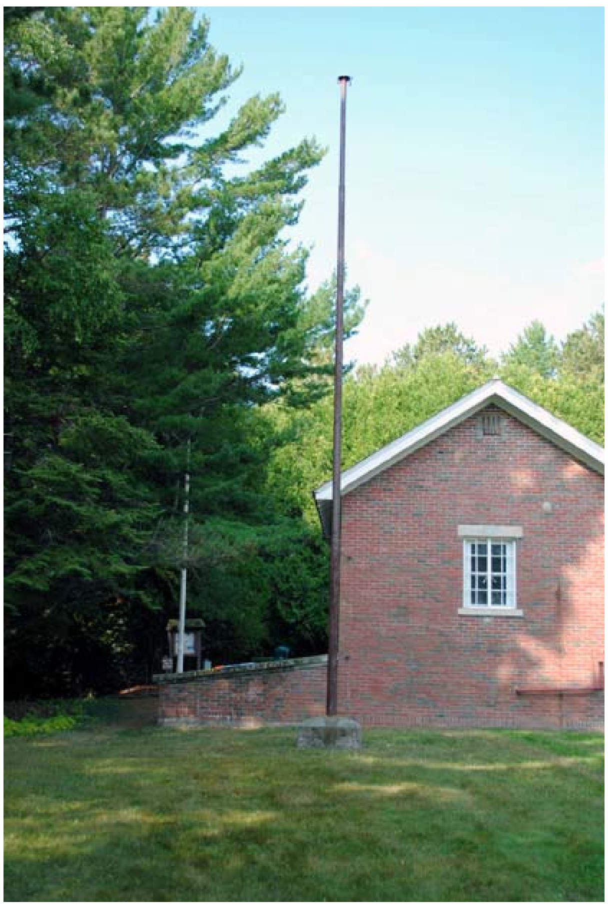
Feature	Site Image #	Description	Condition	Contributing? /Rationale
Concrete Walks (1881- 1938)	MI-47, MI 48	Concrete walks connecting site buildings and structures	Good	Contributing; See text
Radio Antenna Pole –South (c. 1928)	MI-49	Steel pole with concrete foundation adjacent to Power House	Good	Contributing; See text
Radio Antenna Pole –North (c. 1928, relocated 1931)	MI-50	Steel pole with concrete foundation north side of grounds – tipped over	Fair	Contributing; See text
Flagpole (1929–1938)	MI-51	Wooden, painted flagpole	Good	Contributing; See text
USGS Marker	MI-52	Concrete USGS marker	Good	Contributing; USGS Marker is from the period of significance.
Original Flagpole Footing	MI-53	Remnant stones and concrete footing of original flagpole south of Old Lighthouse.	Poor	Contributing; See text
Lighthouse Cistern and Well Basin (c. 1881)	MI-54	Cistern and Well Basin adjacent to Old Lighthouse	Fair	Contributing; Cistern is from the period of significance.
Steel Piling (unknown date)	MI-55	Buried steel piling on beach – possible location of former boat dock or boathouse	Poor	Contributing; Steel Piling is from the period of significance.
Park Sign (1970–2009)	MI-56	Wooden Michigan Island park sign	Good	Noncontributing – contemporary
Interpretive Sign (1970–2009)	MI-57	Wooden park sign with a brief history of Michigan Island	Fair	Noncontributing – contemporary
Trail Sign (1970–2009)	MI-58	Aluminum trail sign on wood post - showing trail location and distance	Good	Noncontributing – contemporary Compatible
Information Kiosk (1970–2009)	MI-59	Wood sign/kiosk	Good	Noncontributing – contemporary Compatible

Feature	Site Image #	Description	Condition	Contributing? /Rationale
Septic Tank (1970–2009)		Steel septic tank set in small clearing to southwest of Keepers Quarters	Good	Noncontributing – contemporary Compatible
Propane Tank (1970–2009)	MI-60	Steel propane tank set in small clearing to southwest of Keepers Quarters	Good	Noncontributing – contemporary Compatible
Fire Pit (1970–2009)	MI-61	Round steel fire pit	Good	Noncontributing – contemporary Noncompatible
Solar Panel (1970–2009)	MI-62	Mounted on steel pole with underground line to Power House	Good	Noncontributing – contemporary Noncompatible; Could be compatible with appropriate siting

Small Scale Feature Photographs

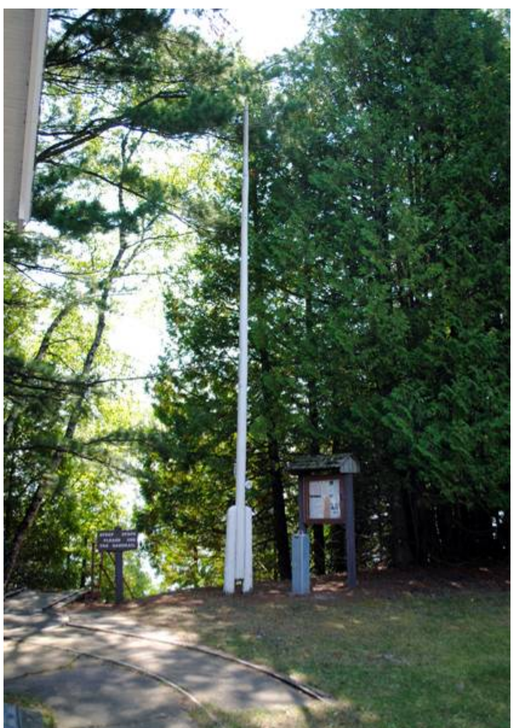
Site Image MI-47: Concrete walks – walk to left once led to former wooden staircase down bank, 2009 (Source: MBD P1010741.JPG)

Site Image MI-48: Broken section of concrete walk north of Power House, 2009 (Source: MBD DSC_0108.JPG)



Site Image MI-49: Radio antenna pole – south, 2009 (Source: MBD DSC_0050.jpg)

Site Image MI-50: Radio antenna pole – north (possibly relocated), 2009 (Source: MBD DSC_0052.jpg)



Site Image MI-51: Flagpole, 2009 (Source: MBD DSC_0088.jpg)

Site Image MI-52: USGS marker, 2009 (Source: MBD DSC_0053.jpg)

Site Image MI-53: Concrete footing – base for original flagpole, 2009 (Source: MBD P1010738.JPG)

Site Image MI-54: Lighthouse cistern (left) and well basin (right), 2009 (Source: MBD DSC_0060.jpg)

Site Image MI-55: Steel piling, 2009 (Source: MBD DSC_0084.jpg)

Site Image MI-56: Park sign, 2009 (Source: MBD DSC_0040.jpg)

Site Image MI-57: Interpretive sign, 2009 (Source: MBD DSC_0046.jpg)

Site Image MI-58: Trail signs, 2009 (Source: MBD DSC_0059.jpg)

Site Image MI-59: Information kiosk and donation box, 2009 (Source: MBD DSC_0089.jpg)

Site Image MI-60: Propane tanks, 2009 (Source: MBD P1010800.JPG)

Site Image MI-61: Fire pit, 2009 (Source: MBD P1010774.JPG)

Site Image MI-62: Solar panel, 2009 (Source: MBD P1010719.JPG)

Site Image MI-63: Broken concrete footing, 2009 (Source: MBD DSC_057.JPG).

Vegetation

Existing Condition. Vegetation at Michigan Island includes natural forested areas, cleared and maintained areas, agricultural plantings (e.g. fruit trees) and domestic plantings. The mixed northern hardwood forest dominates the landscape of the island and the reservation. The core of the light station grounds is maintained as mown lawn and is surrounded by forest vegetation which has encroached into the previously cleared areas.

Remnants of plants or gardens installed by lighthouse keepers and other personnel stationed on the island are still visible. The light station was known to have had extensive orchard and fruit tree plantings early in the period of significance. One apple tree remains from the former orchard southeast of the Old Michigan Island Lighthouse and several cherry trees volunteers. Domestic plantings include a formal row of pines along the north edge of the grounds, mature cedar hedge plantings near the Keepers Quarters and one prominent spruce planted southwest of the Old Michigan Island Lighthouse. Landscape plants found on the light station are both nonnative and domesticated native species including: Cherry (*Prunus* sp.), Apple (*Malus* sp.), White birch (*Betula papyrifera*), White pine (*Pinus strobus*), White spruce (*Picea glauca),* Sugar maple (*Acer saccharinum*), Cedar (*Thuja* sp.), Periwinkle (*Vinca minor*), Daylily (*Hemerocallus* sp.), and common ferns. A list of domestic plantings extant on the light station and nonextant material identified from historic photographs and documentation is included in Table MI-3.

Some domestic plantings, primarily Periwinkle (*Vinca minor*), have been introduced to the island and have encroached into the forest area. Periwinkle, considered an invasive plant species, was planted during the period of significance and is extant in a planting bed beneath the contributing spruce tree west of the Old Michigan Island Lighthouse. Periwinkle is also found in the forest adjacent to the grounds and has spread into the surrounding forest. Periwinkle (or blue myrtle) was also planted at adjacent homesteads on Michigan Island.[40]

Individual plantings in general are in fair to poor condition primarily due to their age. The overall planting pattern has been diminished with loss of many planting beds and individual plants. The plantings on the light station grounds are an important contributing feature because of their relationship to the light keepers and their families.

[40] " About a half mile north of the Michigan Island Light Station there was a small clearing and in it stood a very old wooden shanty. Dad always referred to it as Capt. Pasque's shanty. The ground there was carpeted with lovely thick Blue Myrtle and there were two lilac trees and many flowers. The shanty, thru the years, finally crumbled and the Blue Myrtle spread out of the clearing and under the birch trees." *Letter from Edna Lane Sauer to Marjorie and Elizabeth,* Nov. 14, 1985. Cultural Resource Files, People, Sauer.

Table MI-3. Historic Vegetation[41]

Trees		Shrubs		Perennials		Annuals	
Cherry (*Prunus sp.*)	X	Japanese roses (*Rosa sp.*)		Peonies (*Paeonia sp.*)		Pansies (*Viola sp.*)	
Apple (*Malus sp.*)	X	Cedar (*Thuja sp.*)	X	Daylily (*Hemerocallus sp.*)	X	Nasturtium (*Nasturtium sp.*)	
White birch (*Betula papyrifera*)		Lilac (*Syringa sp.*)		Coneflower (*Gaillardia sp.*)		Impatiens (*Impatiens sp.*)	
White pine (*Pinus strobus*)	X			Common ferns	X	California Poppy (*Eschscholzia californica*)	
Sugar maple (*Acer saccharinum*)	X			Iris (*Iris sp.*)		Sweet Pea (*Lathyrus sp.*)	
Crabapple[42] (*Malus sp.*)				Golden Glow (*Rudbeckia lacinata*)		Dahlias (*Dahlia sp.*)	
White spruce (*Picea glauca*)	X			Strawberries (*Rubus sp.*)[43]			

Note: "X" indicates species currently present at Michigan Island Light Station

Reservation Analysis. Historic drawings and photographs indicate that a significantly larger cleared area on the reservation existed than that which exists today. Since the Light Tower period (1929–1938), the cleared area of the light station has continued to decline from approximately 6.3 acres at the end of the period to approximately 1.3 acres in 2009. During the Early Lighthouse and Light Tower periods the light station grounds were maintained as lawn or other low vegetation. The field area to the east of the Old Lighthouse was maintained as an open field by seasonal burning. Today, a large portion of this open field has been filled by encroaching forest and the field vegetation type is missing from the landscape. The relationship between the extent of the cleared area and forest vegetation on the reservation has changed significantly since the period of significance. The cleared area of the light station is an important contributing feature. The extensive encroachment of forest vegetation diminishes the integrity of the cultural landscape.

Light Station Grounds Analysis. Michigan Island has a long history of landscape and garden planting installed by the lighthouse keepers and their families. This rich history helps to tell the story of the light keepers and their families. Lighthouse Keeper Roswell Pendergast, who served from 1869 to 1874, planted many orchard trees on the light station grounds and grew nursery stock plants on the island. Historic photographs indicate fruit trees were planted around the Old Michigan Island Lighthouse as well as domestic landscape plantings. Keeper Ed Lane and family continued this tradition of landscape plantings on the light station grounds from 1902 –1938. Some of these plantings remain in place today, such as the Daylily (*Hemerocallus* sp.) plantings on the west side of the house; the Cedar (*Thuja* sp.) hedge (now overgrown) planted at the west side of the Keepers Quarters; and the ferns east of the Keepers Quarters. The Lanes created many stone planters and used stone edging around planting beds on the light station grounds. While most of the planters have been removed, a circular depression exists today where a stone-edged planter once was between the Light Tower and the fern bed.

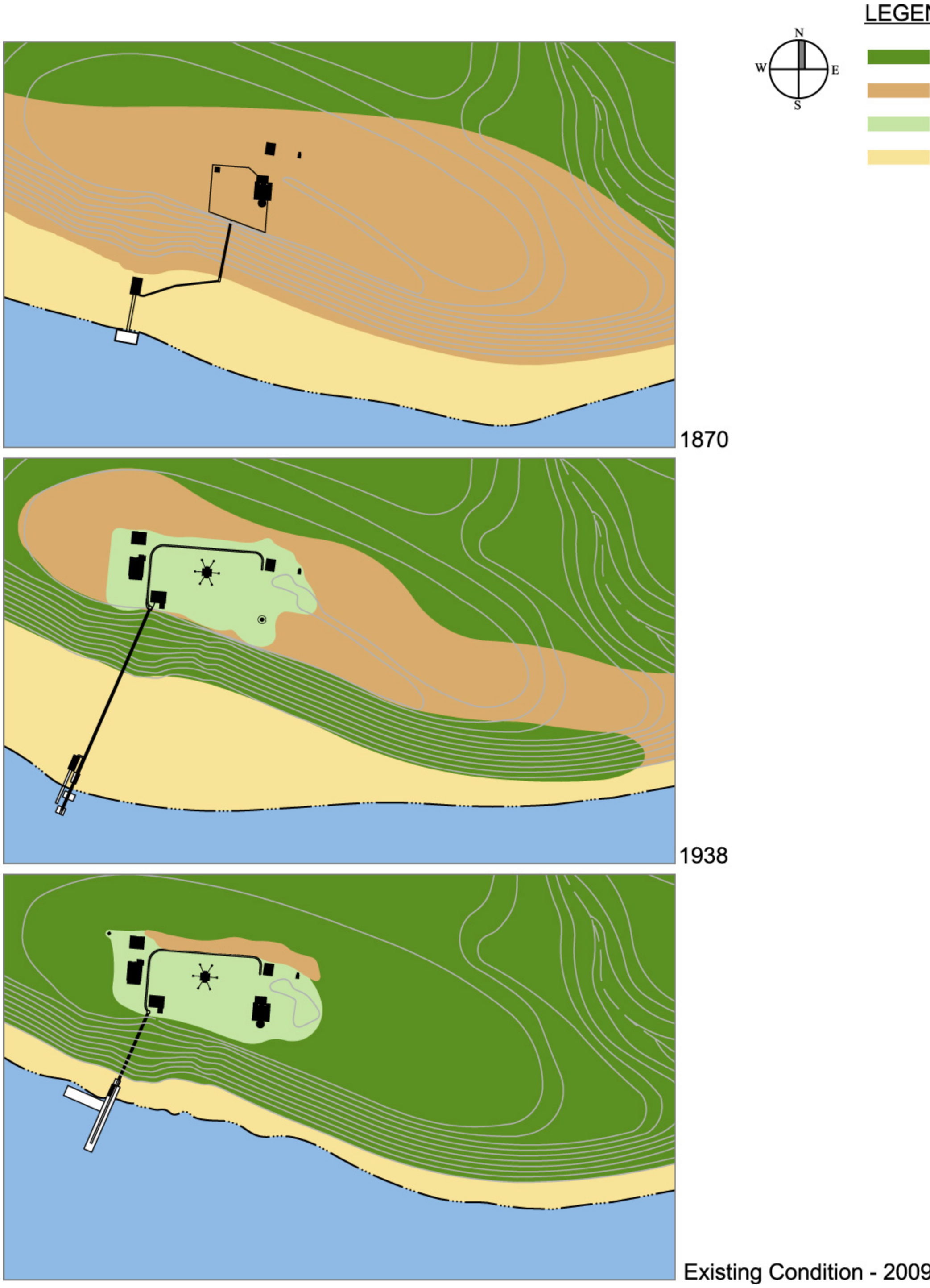
Vegetation features present on the site are described in table MI-4 and their condition is stated.

[41] "The walks were lined with lilac trees. The long trench on the west was for sweetpeas and California poppies. One to the north was Golden Glow while the east held Dahlias. A rockery near the east side contained nasturtiums while a tall cedar bark stood near the dwelling – yellow rose bush beside front entrance." *Letter from Edna Lane Sauer to Carole Graham,* March 10 1989. Cultural Resource Files, People, Sauer.
[42] Ed Lane Lighthouse Log
[43] Ibid

Table MI-4. Vegetation

Feature	Site Image #	Description	Condition	Contributing? /Rationale
Cleared Area	MI-64	Areas of forest vegetation cleared for reservation and light station	Poor	Contributing; present during the period of significance
Lawn Area	MI-65	Maintained lawn area of light station grounds – mown grass landscape	Good	Contributing; present during the period of significance
Pine Plantings (c. 1930)	MI-66	Line of planted pines (*Pinus strobus*) along northern edge	Fair – several pines have been removed – pines reaching end of lifespan	Contributing; planted by Lighthouse Keeper Ed Lane during the period of significance
Cedar Hedge (c. 1930)	MI-67	Planted hedge (*Thuja sp.*) at Keepers Quarters	Poor – plants are overgrown and reaching end of lifespan	Contributing; planted during the period of significance
Fern Planting Bed (1930s)	MI-68	Historic Fern bed east of the Keepers Quarters	Fair	Contributing ; planted during the period of significance
Circular Depression (1930s)	MI-69	Depression at site of large stone edged planter between Light Tower and fern bed.	Fair	Contributing; evidence of planter from period of significance
Orchard Planting (c. 1875)	MI-70	Remnant apple tree southeast of Old Lighthouse	Poor	Contributing; remnant of orchard present during the period of significance
Cherry Tree East of Old Lighthouse	MI-71	Cherry (*Prunus sp.*) tree at Old Lighthouse	Fair	Contributing; present during period of significance
Cherry Trees North of Privy	MI-72	Cherry (*Prunus sp.*) trees just beyond lawn clearing, north of the Privy	Fair	Contributing; present during the period of significance
Domestic Perennial Plantings	MI-73	Daylilies (*Hemerocallus sp.*) planted on west side of Keepers Quarters	Fair	Contributing; planted during the period of significance
Vegetation at Tramway	MI-74	Encroaching Forest Vegetation at Tramway	Fair	Noncontributing; has encroached following the period of significance
Invasive Domestic Plantings	MI-75, MI-76	Periwinkle (*Vinca sp.*) plantings in grounds	Fair	Contributing; planted during period of significance
Maple trees (2)	MI-77	Maple trees (*Acer saccharinum*) (2) and a stump east of Second Tower	Fair	Contributing; present during the period of significance
White spruce tree	MI-75, MI-78, MI-79	Spruce tree (*Picea glauca*) in a cluster of trees southwest of Old Lighthouse	Poor; badly damaged during 2010-2011 winter	Contributing; present during the period of significance
Cluster of trees between Power House and Old Lighthouse	MI-79	Several trees including pine and poplar	Fair	Noncontributing, noncompatible; not present during the period of significance

Vegetation Diagram and Photographs



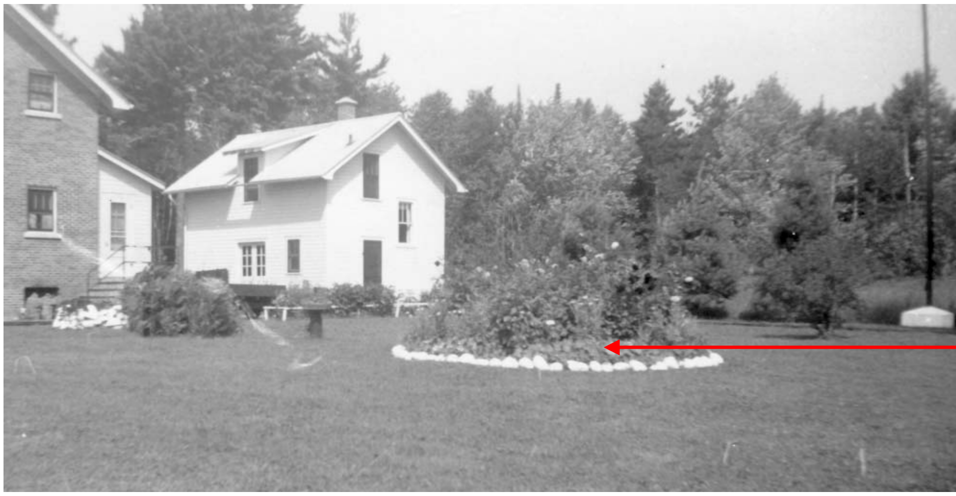
Site Image MI-64: Michigan Island vegetation diagram (Source: MBD 2009)

Site Image MI-65: Lawn area and domestic plantings, 2009 (Source: MBD DSC_0018.jpg)

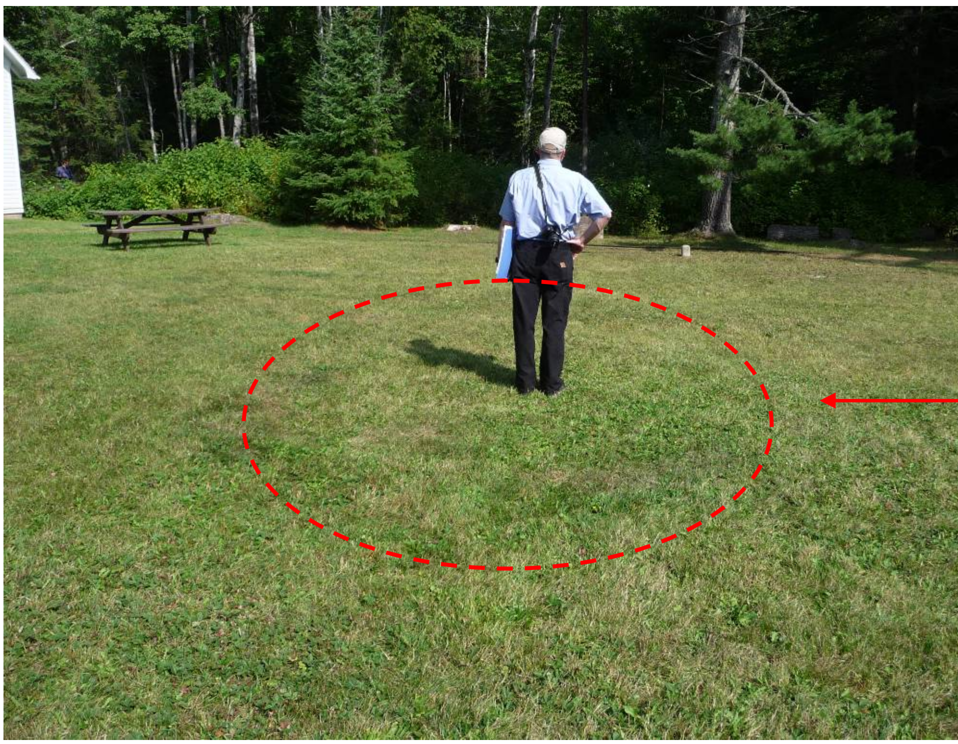
Site Image MI-66: Pines planted along tram track, 2009 (Source: MBD DSC00598.JPG)

Site Image MI-67: Cedar hedge plantings, 2011 (Source: MBD DSC00887.jpg)

Site Image MI-68: Historic fern bed east of Keepers Quarters, 2009 (Source: MBD P1010786.jpg)



Stone Edged Planter



Circular depression in
area of stone-edged planter

Site Image MI-69: Circular depression in area of stone edged planter; top, c. 1930; bottom, 2009; (Source: MBD P1010785.jpg)

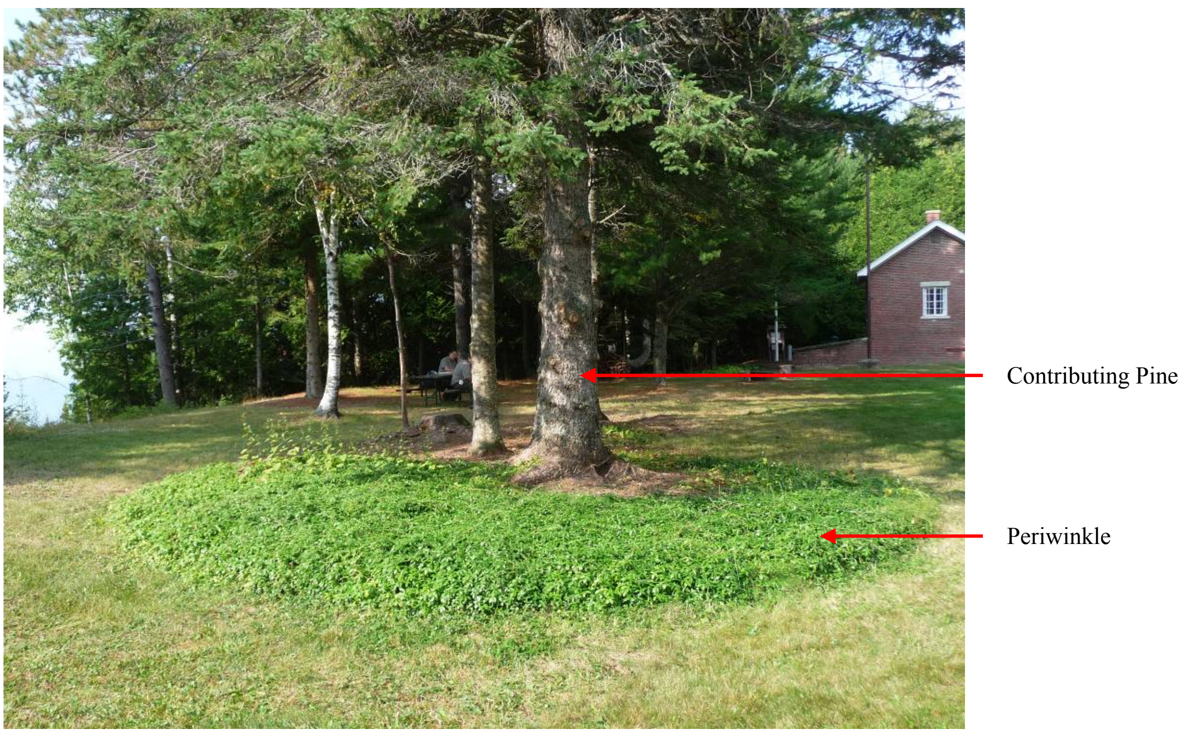
Site Image MI-70: Orchard planting; remnant apple tree southeast of Old Lighthouse, 2011 (Source: MBD DSC00886.jpg)

Site Image MI-71: Cherry tree, 2009 (Source: Susan Mackreth MI 2009 006.JPG)

Site Image MI-72: Cherry Trees north of Privy (note arrow), 2009 (Source: Susan Mackreth Cherry Trees a 2009.JPG)

Site Image MI-73: Daylilly plantings, 2011 (Source: MBD DSC00879.jpg)

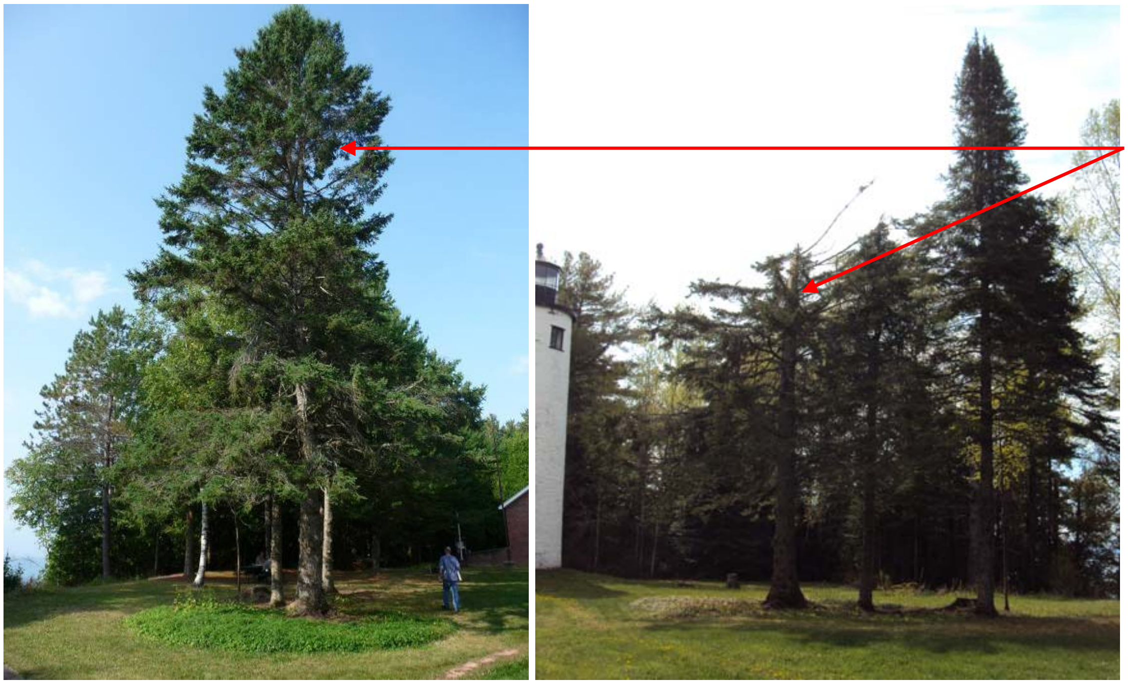
Site Image MI-74: Vegetation along tramway; left, c. 1930; right, 2009; (Source: MBD DSC0037.jpg)



Site Image MI-75: Periwinkle plantings at light station grounds, 2009 (Source: MBD P1010757.jpg)

Site Image MI-76: Invasive Periwinkle growing north of Old Lighthouse on edge of current woods, 2009 (Source: Susan Mackreth Cherry Trees a 2009.JPG)

Site Image MI-77: Maple trees east of Second Tower, 2009 (Source: MBD P1010754.JPG)

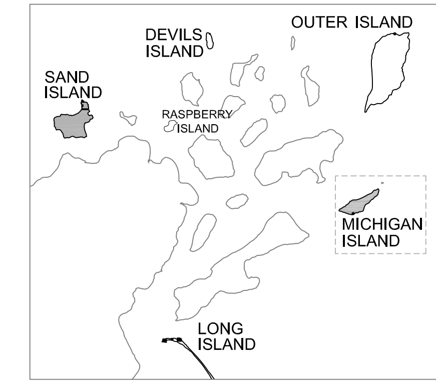


Contributing Spruce

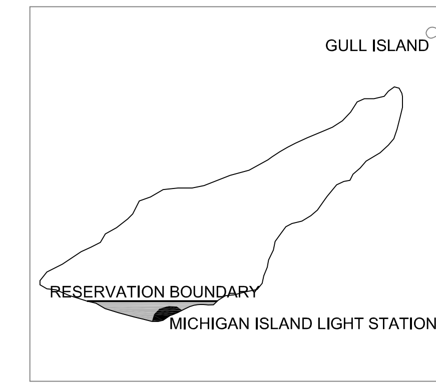
Site Image MI-78: White spruce tree west of Old Michigan Island Lighthouse before and after recent damage: left, 2009 (Source: MBD P1010758.JPG); right, 2011 (Source MBD DSC00882.JPG)

Contributing Spruce

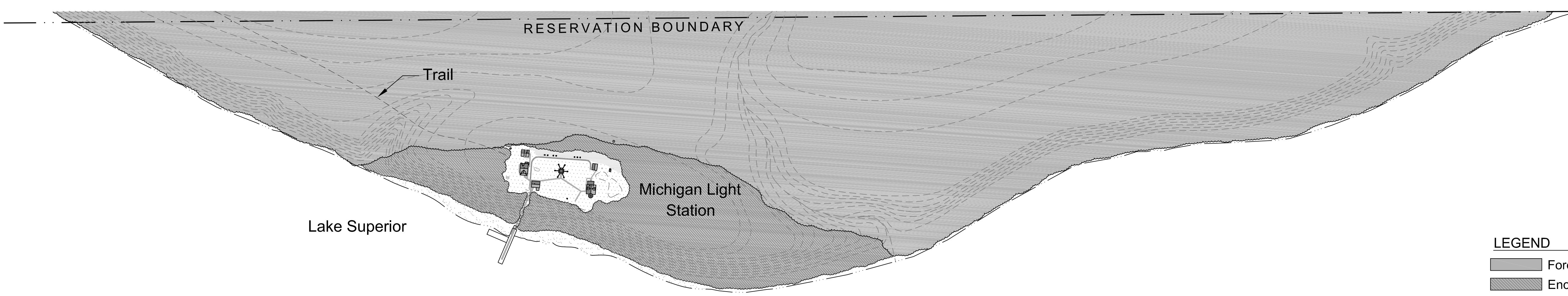
Site Image MI-79: Cluster of trees between Power House and Old Michigan Island Lighthouse (Noncontributing); spruce tree (Site Image MI-78) at right of image is contributing, 2009 (Source: MBD P1010766.JPG)



APIS KEY



MICHIGAN ISLAND

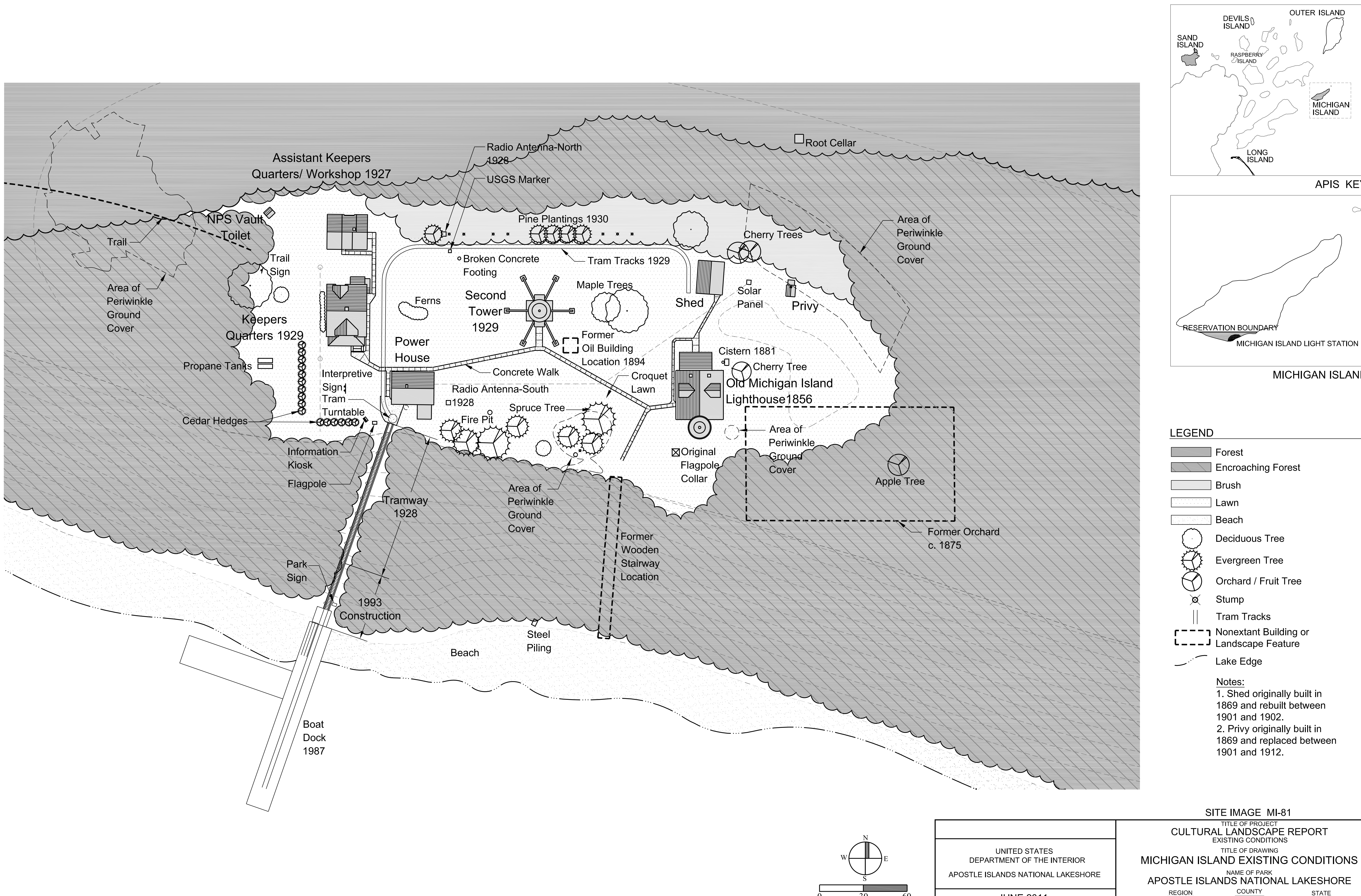


LEGEND

- Forest
- Encroaching Forest
- Brush
- Lawn
- Beach
- Reservation Boundary
- Lake Edge

SITE IMAGE MI-80

UNITED STATES DEPARTMENT OF THE INTERIOR APOSTLE ISLANDS NATIONAL LAKESHORE	TITLE OF PROJECT CULTURAL LANDSCAPE REPORT EXISTING CONDITIONS TITLE OF DRAWING MICHIGAN ISLAND - RESERVATION BOUNDARY NAME OF PARK APOSTLE ISLANDS NATIONAL LAKESHORE
JUNE 2011	REGION: MIDWEST; COUNTY: ASHLAND; STATE: WISCONSIN



SITE IMAGE MI-81

UNITED STATES
DEPARTMENT OF THE INTERIOR
APOSTLE ISLANDS NATIONAL LAKESHORE

JUNE 2011

TITLE OF PROJECT
CULTURAL LANDSCAPE REPORT
EXISTING CONDITIONS

TITLE OF DRAWING
MICHIGAN ISLAND EXISTING CONDITIONS

NAME OF PARK
APOSTLE ISLANDS NATIONAL LAKESHORE

REGION	COUNTY	STATE
MIDWEST	ASHLAND	WISCONSIN

MICHIGAN ISLAND CLR TREATMENT

Introduction

The treatment section of the CLR in conjunction with the HSR describes a strategy for the long-term management of the cultural landscape and historic structures of the Michigan Island Light Station. The strategy is based on the analysis of the cultural landscape's characteristics, the history and period of significance for the light station, the existing condition of the historic features, and contemporary use of the light station. A general management philosophy of rehabilitation has been identified as the most appropriate approach for the cultural landscape. Rehabilitation will allow for repairs, alterations, and additions that will be necessary for the compatible use of the light station, and will preserve the characteristics and features that convey the light station's historical, cultural and architectural values.[44] These actions will enable the park to preserve the contributing resources of the cultural landscape, while allowing for specific alterations to accommodate contemporary use and interpretation of its history.

TREATMENT GOALS

- Preserve extant contributing cultural resources
- Reestablish missing resources
- Reveal the cultural landscape by representing the important characteristics from the period of significance
- Improve understanding of the overall system of light stations in the Apostle Islands for both visitors and park staff by incorporating interpretation of landscape resources that have been repaired or reestablished
- Aid in preserving the natural resources of the light station reservation by monitoring and controlling invasive plant material, erosion of shoreline slopes and directing visitor use

TREATMENT TERMINOLOGY

The following terms are used frequently in the CLR for actions that address the cultural landscape and its features, and are defined below. A more detailed glossary is presented in the Glossary of Terms at the end of this volume.

Maintain. Maintain includes the standard maintenance practices (mowing, pruning, thinning of vegetation, painting and cleaning of small scale features) that are necessary to retain a feature or area as a contributing resource. Maintenance activities are usually not classified as repair, however minor repair such as replacement of posts or railings or segments of paving are included.

Plant. Plant or planting includes the planting or removal and replanting of landscape material and vegetation as part of maintenance activities, or the restoration of missing landscape planting features.

Reestablish. The measures necessary to depict a feature or area as it occurred historically. Reestablish may include replacement of missing features (such as replacement of a pattern of planting) or a missing quality (e.g., reestablishment of a view).

Relocate. Relocate includes the removal and resetting of features in new locations. This is usually associated with noncontributing features.

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[44] Landscape Lines.

Remove. The actions required to remove nonhistoric or noncontributing features. This is usually associated with noncompatible features in the landscape.

Repair. Repair includes the measures necessary to maintain features, components of features, and materials that require additional work. These may include repairing declining structures, small scale features (e.g., repair of a railing) or landscape plantings (e.g., repair mass planting by adding infill plantings). Features that are repaired shall match the original in design, color, texture, and where possible, material.

Restore. The measures necessary to depict a feature or area as it occurred historically. Restoration may include repair of a feature so that it appears as it did historically.

Retain. These are actions that are necessary to allow for a feature (contributing or noncontributing) to remain in place in its current configuration and condition.

Stabilize. Stabilize refers to immediate measures (more extensive than standard maintenance practices) that are needed to prevent deterioration, failure, or loss of features.

PREFERRED TREATMENT ALTERNATIVE

During the development of the CLR/HSR three treatment alternatives were produced and examined. The CLR/HSR contains only the Preferred Treatment Alternative. The additional treatment alternatives considered are presented in the Environmental Assessment.

Intent of Preferred Treatment Alternative

The Michigan Island Light Station is most significant to the Apostle Islands system of light stations because 1) it represents the development of navigational aids as the first light along the southern shipping route to Ashland and Bayfield; 2) its intertwined relationship with the Long Island Light Station; and 3) it illustrates a clear depiction of improvements in navigational and light station technology. The lives of the keepers and their families were impacted by the progression of new navigational technologies, made evident by the historic features of the cultural landscape. By preserving, rehabilitating, or reestablishing these features, the treatment approach of the CLR/HSR strives to clearly depict the story of the Michigan Island Light Station.

The intent of the preferred treatment is to rehabilitate the cultural landscape of the Michigan Island Light Station to portray the period of navigational history that the light station best represents within the system. The period of significance for the Michigan Island Light Station (1856 –1943) begins with the establishment of the Old Michigan Island Lighthouse, and ends with automation of the Light Tower. The extant contributing features best represent the Light Tower period (1929–1938) described in the Site Development section of this chapter. The treatment approach for the extant contributing features emphasizes this period when the light station was in its most vibrant state. Recommendations also include the restoration of landscape features lost since the period of significance.

Preferred Treatment Alternative (Site Image MI-85, Site Image MI-86, Site Image MI-87)

The treatment measures are intended to preserve and rehabilitate the cultural landscape features. This requires a variety of actions that may be accomplished by either a series of preservation steps implemented over time or as a one-time action paired with future maintenance. Emphasis should be placed on the

preservation and/or rehabilitation of the contributing features that most strongly define the character of the landscape as outlined above.

Specific treatment measures are depicted in a series of plan drawings and are accompanied by detailed narrative descriptions, organized by landscape characteristics and presented as follows.

SPATIAL ORGANIZATION/VIEWS AND VISTAS

Spatial organization and views and vistas are key features of the cultural landscape. Spatial organization is primarily defined by the relationship between the built structures and features and the cleared area of the light station. Views from the waters of Lake Superior to the light station are an important feature of the light stations. While the arrangement of built features has remained intact, the encroachment of forest vegetation has reduced the historic cleared area and obscured views of the light station. This loss of the cleared area and views has diminished the integrity of the cultural landscape.

Additional discussions regarding the means and methods of clearing forest vegetation from the light station and the removal of trees from the shoreline slopes are included in Volume I, Chapter 5: *Management Issues.*

Light Station Clearing

Clearing of forest vegetation is intended to reestablish the cleared area of light station to a condition that better represents the period of significance, specifically the Light Tower period (1929–1938). Specific actions related to clearing are presented in the vegetation section.

Clearing to reestablish a portion of the cleared area may be undertaken on an incremental approach addressing the most critical and beneficial areas first. Emphasis should be placed areas that most strongly define the character of the landscape listed below in order of priority:

- Clearing for fire protection (50 foot buffer) adjacent to existing buildings and structures;
- The nonextant orchard area immediately east of the Old Michigan Island Lighthouse;
- The area north of the tram tracks;
- The area west of the Keepers Quarters;
- Selective tree removal from areas along the shoreline bank that impact views from the water to the Old Michigan Island Lighthouse (see below).

Shoreline Bank-Selective Clearing

The intent of this treatment measure is to reestablish open views of the Light Tower, Original Michigan Island Lighthouse, and other structures to better represent their condition during the period of significance, specifically the Light Tower period (1929–1938).

Clearing work along the shoreline banks shall be done carefully and selectively, and care should be taken not to initiate erosion by overworking the slope. The clay and till banks at the Michigan Island Light Station are stable but have a high erosion potential. Experience has shown that erosion of the shoreline banks could result in the loss of portions of the lighthouse station landscape and possibly the loss of historic structures. Only through careful planning and management action will these banks be kept stable. This work may best be accomplished in an incremental manner with a sound erosion monitoring program in place and a plan for biostabilization of the banks. An area of approximately one-half acre has been

identified as the area where the selective removal of large trees by hinge-felling will be most beneficial for views of the light station.

An appropriate plan for long-term biostabilization must accompany any clearing and incorporate two key concepts. The first concept being the need for on-going operations and maintenance requirements. A properly biostabilized landform is not a static structure but is a dynamic system requiring close observation, regular maintenance, and periodic reevaluation. Secondly, a properly biostabilized landform is a harmonized, working plant community, evolving through vegetative succession, and filling environmental niches at the level of root, ground surface, understory, and canopy. Effective biostabilization will appear natural and not engineered and will require a community of plants which can establish themselves in a range of soil types, depths, aspects, grades, and moisture regimes. The development of a smoothed, homogenous and unnatural bank is to be avoided. The community of plants will utilize the natural slope contours and develop a mix of vigorous young growth, deep root systems, and more mature canopy elements to provide effective stabilization from a range of erosion threats including: surface drainage down and seepage onto the slope face; lake action at the slope toe; impacts from precipitation; wind throw; and loss of understory though over mature canopy and excessive shading.

Periodic maintenance will include the evaluation of the biostabilization effort, the thinning and hinge-felling of large trees, and the lowering (but not removal) of unstable or overcrowded elements.

CIRCULATION/ SITE ACCESSIBILITY/STRUCTURES

Overall, the site circulation patterns and features remain and are important elements of the cultural landscape. The circulation patterns significantly changed in 1928 with the construction of the tramway, tram tracks, and concrete walks and new buildings. The construction of the tramway provided a new primary access up to the light station and the concrete walks connected the Old Michigan Island Lighthouse to the new Keepers Quarters, Power House and Second Light Tower. The tram tracks provided a new route for transporting supplies from the tramway across the site. All of these improvements were installed to support the navigational and day-to-day operations of the light station and are extant. These features remain in much the same configuration as they were during the Light Tower period (1929–1938). The circulation features help to define the spatial arrangement of the site and are important to the integrity of the cultural landscape. The treatment measures focus on retaining the circulation patterns and rehabilitating or preserving the circulation features including the tramway, tram tracks and concrete walks. Detailed treatment recommendations are for the dock, tramway, and tram tracks are included in the Structures section.

Concrete Walks

Retain the pattern and configuration of concrete walks on the light station grounds. Repair of walks is presented under Small Scale Features.

Trails and Paths

Maintain the hiking trail leading from the light station to the campsite, sand spit and lagoon.

Accessibility (ABAAS)

An Accessibility Self Evaluation and Transition Plan (Plan) separate from the CLR/HSR is being developed to provide an overall plan for the six light stations in the Apostle Islands – Raspberry, Michigan, Outer, Devils, Long, and Sand islands. This work is intended to address the park as a whole and the accessibility requirements related to visitor services to be achieved at each individual light station. At the time of this report the plan is in progress. The CLR/HSR incorporates several standard recommendations into each of the light station's plans to prepare the light station grounds and buildings for the implementation of recommendations from the Transition Plan. Recommendations for the Michigan Island Light Station are:

- Provide an outdoor accessible route (minimum 36" width) to a new accessible NPS restroom (under a separate project). New paving material shall reflect existing in form, texture and craftsmanship.
- Provide an accessible ramp to the front door of Old Michigan Island Lighthouse (see HSR)
- Provide programmatic access to the Michigan Island story at the light station and APIS Visitor Center in Bayfield.

Outdoor accessible routes shall meet the requirements of the ABAAS for width (36" minimum), slopes (less than 4.75%), and include passing areas. These requirements are readily achievable on the light station grounds. Further discussion regarding the overall accessibility approach for the system of light stations is included in Volume I, Chapter 5: *Management Issues.*

STRUCTURES

There are several important structures within the light station. These features convey important details regarding the historical use and operation of the light station. Treatment recommendations are described in detail for major structures. In general the recommendations for these features are focused on the preservation and maintenance of existing contributing features.

Tramway

Repair the tramway to a working condition. This work includes:

- Minor repair of cast iron tramway rails. The rails should be reattached where plates are missing, loose, or lacking bolts.
- Minor repair of railing including painting and repair of attachments on the west side of concrete tramway.
- Maintain the concrete tramway abutments by insuring that adequate soil and rock protection remains at the base of each abutment.
- The tramway lacks a handrailing meeting ABAAS standards; however installing a handrail meeting these standards may impede the use of the tram carts on the tramway.
- Retain the tram turntable in its current location and condition. The turntable does not rotate.
- Recommendations for replacing the tramway hoist and other work in the Power House are included in the HSR.

Tram Tracks

Repair the tram tracks connecting the Power House to the Shed to a working condition. The work includes complete rail removal, repair and resetting on new timbers and setting bed (gravel or cinders). The majority of the milled lumber timbers require replacement as they are severely rotted. New material shall match

existing in wood type and dimension. Further investigation of materials, timber size and type and base course material type is needed. One area along the northern track requires a straightening of the rails or replacement with stockpiled rails. Several other areas will require the removal and replacement of concrete adjacent to the rails. The section of track between the Shed and Old Michigan Island Lighthouse has been removed and should be reestablished. Rails are stockpiled on site.

Boat Dock

The location of the boat dock should be retained. This general location has remained consistent since the construction of the tramway in 1929; however the materials and L-shape of the boat dock are not consistent with the historic character of previous docks and landings. The configuration of the dock has resulted in the buildup of sediments on the east side of the dock and erosion of the shoreline on the west side of the dock. The sediment build up has reduced the functionality of the dock. The boat dock should be altered to allow the flow of near-shore sediments under the dock structure, reducing the erosion and sediment deposition issues. The design and construction of durable boat docks in the harsh conditions of Lake Superior is extremely challenging and should be engineered and constructed carefully to insure the longevity of the dock and the protection of the adjacent beach and shoreline slope. Boat dock planning work is currently under study by the NPS under separate but related projects. Further discussion regarding the boat dock is included in Volume I, Chapter 1: Management Philosophy and Management Issues.

SMALL SCALE FEATURES

There are numerous small scale features on the light station. These features provide a human scale to the cultural landscape while conveying important details regarding the history and use of the light station. Treatment recommendations are described in detail for contributing small scale features, and noncontributing features are presented in Table MI-5. In general the recommendations for these features are focused on preservation and include:

- Retain all contributing small scale features.
- Retain noncontributing, compatible features including park and trail signs.
- Remove noncontributing, noncompatible features

Concrete Walks

Repair and maintain all concrete walks in the current, historic locations. Repair includes the removal and replacement of several severely cracked sections. Maintenance includes vegetation removal and minor leveling to eliminate trip hazards. Replacement of damaged sections shall be completed with precast units matching the various dimensions of the existing concrete slabs, poured and finished prior to installation. The finish of the replacement sections should be similar to the finish of the historic material including aggregate size and tooling but distinct in appearance.

Root Cellar

The nonextant root cellar is located north of the Shed. Protect the area of the root cellar from visitor use or damage. This area may warrant further archeological investigation.

Radio Antenna Poles

The radio antenna poles represent a technological advance on the light station and should be repaired and maintained as an important contributing feature. Maintain the southern pole near the Power House by painting the pole. The northern pole should be reset to an upright position and painted.

Flagpole

Maintain the flagpole in its current location by repainting.

Birdbath (Keepers Quarters)

Reestablish this missing feature to the landscape.

USGS Marker

Retain marker in place.

Original Flagpole Concrete Collar

Reset the concrete square in historic location

Broken Concrete Footing

Retain broken concrete, the piece is thought to be the collar for a nonexant bird house or elevated planter.

Old Michigan Island Lighthouse Cistern and Well Basin

Maintain cistern in place. Maintain the concrete well head basin adjacent to the cistern. Remove vegetation and soil, and add 12” of clean gravel.

Steel Piling on Beach

Retain in place.

Nonextant Wood Staircase

Maintain concrete walk that leads to former location of wood staircase.

Nonextant Oil Building

The brick Oil Building was removed at the time of the light tower construction. The location of this Oil Building marked the edge of the manicured and fenced area during the Early Light Tower period. As an interpretive feature the location of building corners could be marked with concrete squares to delineate the

location of the Oil Building during the Early Light Tower period. Alternatively, this building could be interpreted with other methods. Coordinate this work with interpretive planning undertaken for the Michigan Island Light Station.

Fencing

During the Early Lighthouse period a small area adjacent to the Old Michigan Island Lighthouse was fenced. Several locations and types of fencing have been documented from historic photographs. After the 1929 additions to the site the fencing was removed. This treatment measure includes marking the location of nonextant fencing with one foot-square concrete markers, flush to the ground, to provide an understanding of the evolution of the light station from the Early Light Tower period to the Light Tower period. Alternatively, this information could be provided by another interpretive technique. Coordinate this work with interpretive planning work undertaken by the Park Service.

Gull Island Light Tower

Maintain the Gull Island Light Tower in a working condition.

Park and Interpretive Signs

Measures related to park signage is not included in the CLR. Interpretive signage on the light station is addressed under the Park's *Long Range Interpretive Plan* and other studies. Additional discussion regarding interpretation is included in Volume I, Chapter 5: *Management Issues.*

The following table (Table MI-5) provides recommendations for small scale features identified as noncontributing.

Table MI-5. Small Scale Features (Noncontributing)

Feature	Compatible?	Status
Park Sign	Noncontributing Compatible	Not addressed in CLR
Interpretive Sign	Noncontributing Compatible	Not addressed in CLR
Trail Sign	Noncontributing Compatible	Retain trail signs
Information Kiosk	Noncontributing Compatible	Remove and replace with new signage
Septic Tank	Noncontributing Compatible	Retain septic tanks
Propane Tank	Noncontributing Compatible	Retain propane tanks
Fire Pit	Noncontributing Noncompatible	Relocate fire pit
Drainage System at Keepers Quarters	Noncontributing Compatible	Maintain drainage system, by cleaning and clearing, monitor erosion at outlet.

VEGETATION

Reservation Vegetation

Light Station Clearing (Meadow)

As previously presented under Spatial Organization the cleared area of the light station reservation and the light station grounds has been substantially reduced from the period of significance. Historic photographs and correspondence from this period indicate the cleared area outside of the immediate light station grounds was vegetated with grasses and wildflowers. This action includes the removal of forest vegetation (approximately 2 acres) that has encroached into the historic cleared area of the light station, and the establishment of meadow-like vegetation to reestablish the spatial qualities of the light station. The meadow may contain native grasses, forbs, wildflowers, ground covers and compatible nonnative species. Additional study will be needed to develop a method of revegetation and a list of species that will be suitable and noninvasive, as meadow species native to the island are limited. Further discussion on means and methods of clearing are discussed in Volume I, Chapter 5: Management Issues. Maintain newly cleared areas as meadow vegetation at a 12”-24” height by mowing or brushing twice per year.

The light station reservation and grounds should be monitored for the presence and growth of invasive plants. The most apparent invasive plant is Periwinkle (*Vinca minor*). This plant is thought to have been introduced as a domestic landscape plant on the light station. Existing patches of Periwinkle, in the forest should be removed, and areas of Periwinkle in the manicured area of the light station grounds should be monitored and maintained carefully. Do not introduce any potentially invasive plant material into the light station light station.

Station Vegetation

Historically, domestic landscape, garden and orchard plantings played a significant role in the cultural landscape of the Michigan Island Light Station. The lighthouse keepers and their families planted and maintained an extensive landscape on the light station. While some plantings remain, many of these features have been lost and under this treatment are recommended to be reestablished. The intent of this treatment is to rehabilitate the landscape by reestablishing missing features of the landscape and maintaining extant features to better depict the landscape during the period of significance, with an emphasis on the Light Tower period (1929–1938) when the landscape planting features were most intact.

Light Station Clearing (Lawn)

This treatment measure is a moderate expansion of the existing cleared lawn area of approximately 8,000 square feet. The work includes clearing of forest trees, shrubs and ground covers and establishing lawn grasses in the newly cleared area. Maintenance includes regular mowing of the lawn area to discourage forest encroachment.

Orchard Plantings

Reestablish the pattern of orchard planting previously established southeast of the Old Michigan Island Lighthouse by planting new fruit trees in the historical spacing and maintaining the lone remaining apple tree. This measure includes the clearing of the orchard area as described previously and pruning and maintaining the single extant apple tree found in the area. Consider horticultural methods to develop new plant material from the remaining apple tree and other cherry trees on the grounds.

Pine Plantings

The row of planted white pines *(Pinus strobus)* along the northern edge of the light station marks the northern edge of the light station grounds and separate the grounds from the adjacent forest. The uniformity of the row has been diminished over time and the trees are in various states of health and form. This measure includes maintaining the existing living trees (3) and removal of the two remaining existing pines. Complete the row by planting uniformly sized pines, matching the existing species. Remove and replant the existing living trees (3) in future projects as necessary. Historic documents indicate that the trees were originally transplanted from the adjacent forest. The intent of the treatment measure is to reestablish the line of pine trees as a significant linear landscape feature of the light station.

Cedar Hedge

To the south and west of the Keepers Quarters a cedar hedge was planted during the Light Tower period. The hedge defined the 'front yard' of the Keepers Quarters. The treatment measure includes thinning, pruning and shearing a test section of the hedge, and evaluating its condition after the work is complete. If evaluation deems work unacceptable, remove and replant hedge in kind.

Domestic Plantings

The light station grounds historically contained tree, shrub, perennial and annual plantings in the landscape and in a variety of landscape planters. The plantings were planted and maintained by the lighthouse keepers and their families. The treatment recommendations emphasize the Light Tower period as the extent and detail of the plantings peaked during this period under Lighthouse Keeper Ed Lane's tenure. The planters included white-washed, stone lined planting beds, raised stone planters, a raised 'birdbath' planter, raised 'stump' planters (objects placed on stumps and planted) and other decorative pots. Plant material has been identified through a review of letters and correspondence, and through the analysis of historic photographs. Plants used in landscape plantings include ornamental species and domesticated native forest species. Several tree and perennial species extant on the site are believed to remain from the period of significance.

Table MI-6 outlines a preliminary list of historic plant material to be used in reestablishing missing features of the landscape and Site Images MI-85, MI-86 and MI-87 show locations of plantings and features. Treatment measures related to plantings include:

- Reestablishing the stone planters and stone edges and their plantings in the landscape including planters at the Old Michigan Island Lighthouse, Keeper Quarters and Second Light Tower;
- Reestablish the small hanging planters and 'stump' planters at the Old Michigan Island Lighthouse and Keepers Quarters;
- Maintain the fern plantings east of the Keepers Quarters and reestablish the stone edge around them;
- Reestablish the lilac plantings along the walkway southwest of the Old Michigan Island Lighthouse;
- Remove and replant white spruce tree near the croquet lawn;
- Reestablish fruit tree plantings on the west side of the Old Michigan Island Lighthouse;
- Maintain the cherry tree on the east side of the lighthouse and the trees north of the Privy. Test the trees by coring and analysis to determine age and cultivar of tree.

Table MI-6. Domestic Plantings

Trees	Shrubs	Perennials	Annuals
Cherry (Prunus sp.)	Japanese roses (Rosa sp.)	Periwinkle (Vinca minor) (Invasive)	Pansies (Viola sp.)
Apple (Malus sp.)	Cedar (Thuja sp.)	Peonies (Paeonia sp.)	Nasturtium (Nasturtium sp.)
White birch (Betula papyrifera)	Lilac (Syringa sp.)	Daylily (Hemerocallus sp.)	Impatiens (Impatiens sp.)
White pine (Pinus strobus)		Coneflower (Gaillardia sp.)	California Poppy (*Eschscholzia californica*)
Sugar maple (Acer saccharinum)		Fern	Sweet Pea (*Lathyrus sp.*)
Crabapple[45] (*Malus sp.*)		Iris (Iris sp.)	Dahlias (*Dahlia sp.*)
White spruce (*Picea glauca*)		Foxglove (Digitalis sp.)	
		Golden Glow (*Rudbeckia lacinata*)	
		Strawberries (*Rubus sp.*)[46]	

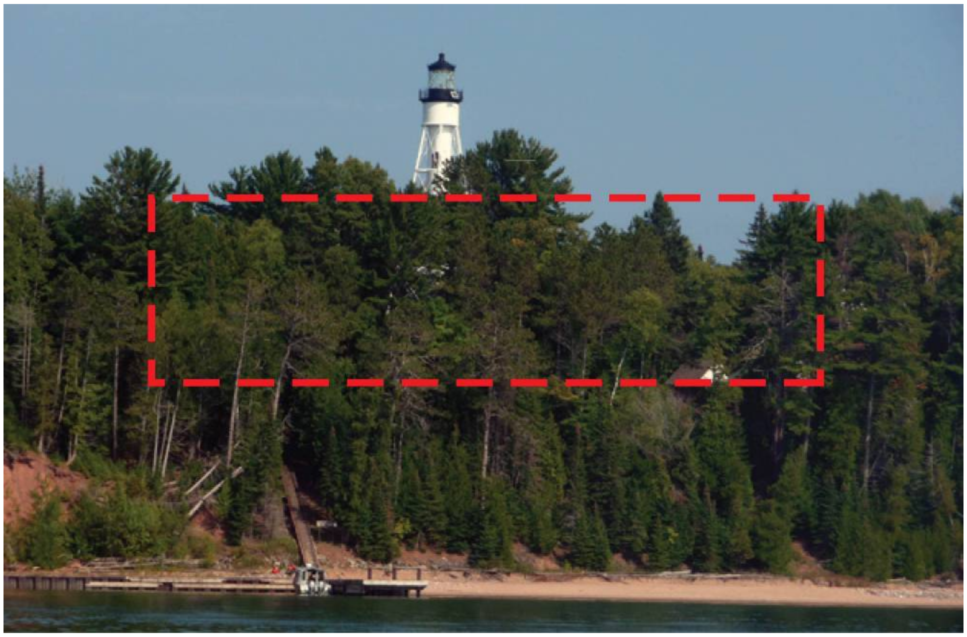
AREAS OF FURTHER INVESTIGATION

Archeological Investigations

Complete an archeological survey for all known resources in light station reservation using nondestructive investigations to document the extent of buried or nonvisible cultural resources that exist across the island. Consider using ground penetrating radar and other noninvasive measures to assist in locating resources. If a comprehensive survey for the entire Island is not possible, complete archeological investigations for proposed projects in advance of any other work on the project, including demolition. In compliance with the National Historic Preservation Act, and in consultation with the NPS Midwest Archeological Center, undertake archeological investigations for all projects, as appropriate to their scale, impacts, and extent of ground disturbance.

[45] Ed Lane Lighthouse Log
[46] Ibid

Areas of Further Investigation Photographs

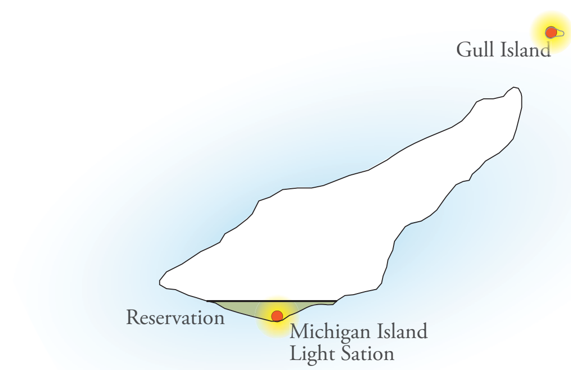


Site Image MI-82: Area of selective clearing for the restoration of views to the light station from Lake Superior, 2010 (Source: MBD P1010811_annotated.JPG)

Site Image MI-83: Historic condition of cleared area east of the Old Michigan Island Lighthouse, c. 1913; (Source: NPS APIS Archives)

Site Image MI-84: Mark the location of the nonextant oil building and fencing, 2010
(Source: MBD P1010698_annotated.JPG)

Michigan Island Reservation Preferred Treatment Alternative

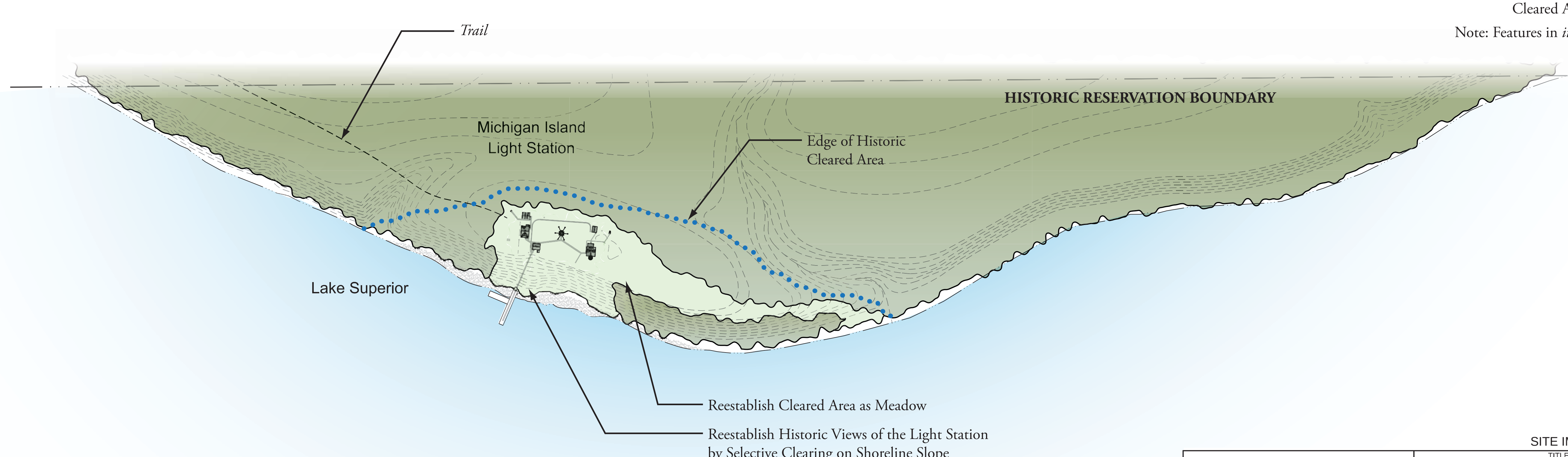


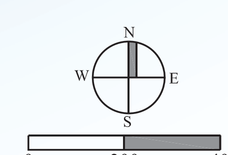
Michigan Island

Legend

- Cleared Area
- Forest
- Edge of Historic Cleared Area

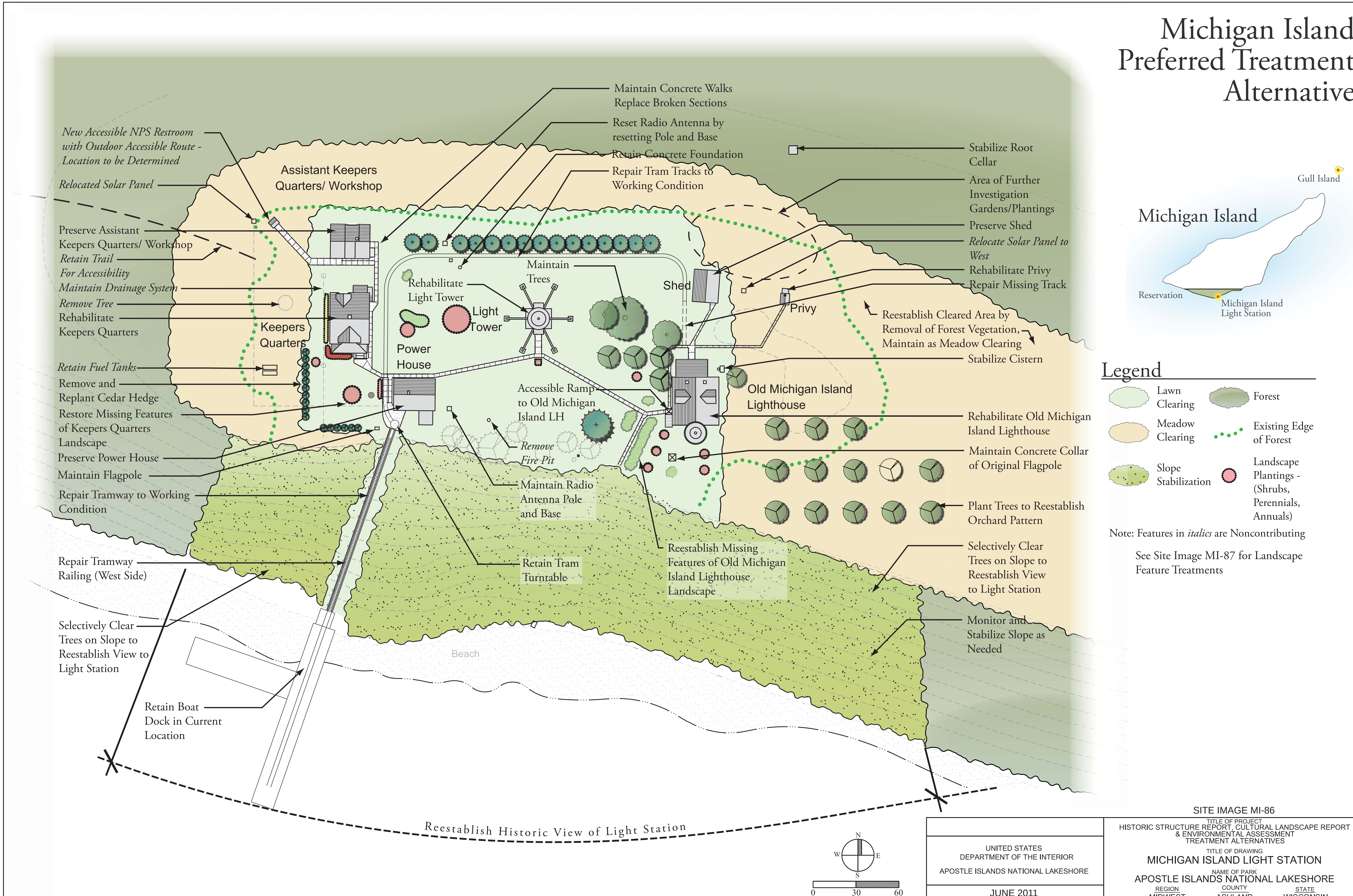
Note: Features in *italics* are Noncontributing





SITE IMAGE MI-85

UNITED STATES DEPARTMENT OF THE INTERIOR APOSTLE ISLANDS NATIONAL LAKESHORE	TITLE OF PROJECT HISTORIC STRUCTURE REPORT, CULTURAL LANDSCAPE REPORT & ENVIRONMENTAL ASSESSMENT TREATMENT ALTERNATIVES TITLE OF DRAWING MICHIGAN ISLAND - RESERVATION BOUNDARY NAME OF PARK APOSTLE ISLANDS NATIONAL LAKESHORE
JUNE 2011	REGION: MIDWEST · COUNTY: ASHLAND · STATE: WISCONSIN


Michigan Island
Preferred Treatment
Alternative
New Accessible NPS Restroom with Outdoor Accessible Route - Location to be Determined
Relocated Solar Panel
Preserve Assistant Keepers Quarters/ Workshop
Retain Trail For Accessibility
Maintain Drainage System
Remove Tree
Rehabilitate Keepers Quarters
Retain Fuel Tanks
Remove and Replant Cedar Hedge
Restore Missing Features of Keepers Quarters Landscape
Preserve Power House
Maintain Flagpole
Repair Tramway to Working Condition
Repair Tramway Railing (West Side)
Selectively Clear Trees on Slope to Reestablish View to Light Station
Retain Boat Dock in Current Location
Assistant Keepers Quarters/ Workshop
Keepers Quarters
Power House
Light Tower
Rehabilitate Light Tower
Maintain Trees
Shed
Privy
Old Michigan Island Lighthouse
Accessible Ramp to Old Michigan Island LH
Remove Fire Pit
Maintain Radio Antenna Pole and Base
Retain Tram Turntable
Reestablish Missing Features of Old Michigan Island Lighthouse Landscape
Beach
Maintain Concrete Walks Replace Broken Sections
Reset Radio Antenna by resetting Pole and Base
Retain Concrete Foundation
Repair Tram Tracks to Working Condition
Stabilize Root Cellar
Area of Further Investigation Gardens/Plantings
Preserve Shed
Relocate Solar Panel to West
Rehabilitate Privy
Repair Missing Track
Reestablish Cleared Area by Removal of Forest Vegetation, Maintain as Meadow Clearing
Stabilize Cistern
Rehabilitate Old Michigan Island Lighthouse
Maintain Concrete Collar of Original Flagpole
Plant Trees to Reestablish Orchard Pattern
Selectively Clear Trees on Slope to Reestablish View to Light Station
Monitor and Stabilize Slope as Needed
Reestablish Historic View of Light Station
Michigan Island
Gull Island
Reservation
Michigan Island Light Station
Legend
Lawn Clearing
Forest
Meadow Clearing
Existing Edge of Forest
Slope Stabilization
Landscape Plantings - (Shrubs, Perennials, Annuals)
Note: Features in italics are Noncontributing
See Site Image MI-87 for Landscape Feature Treatments
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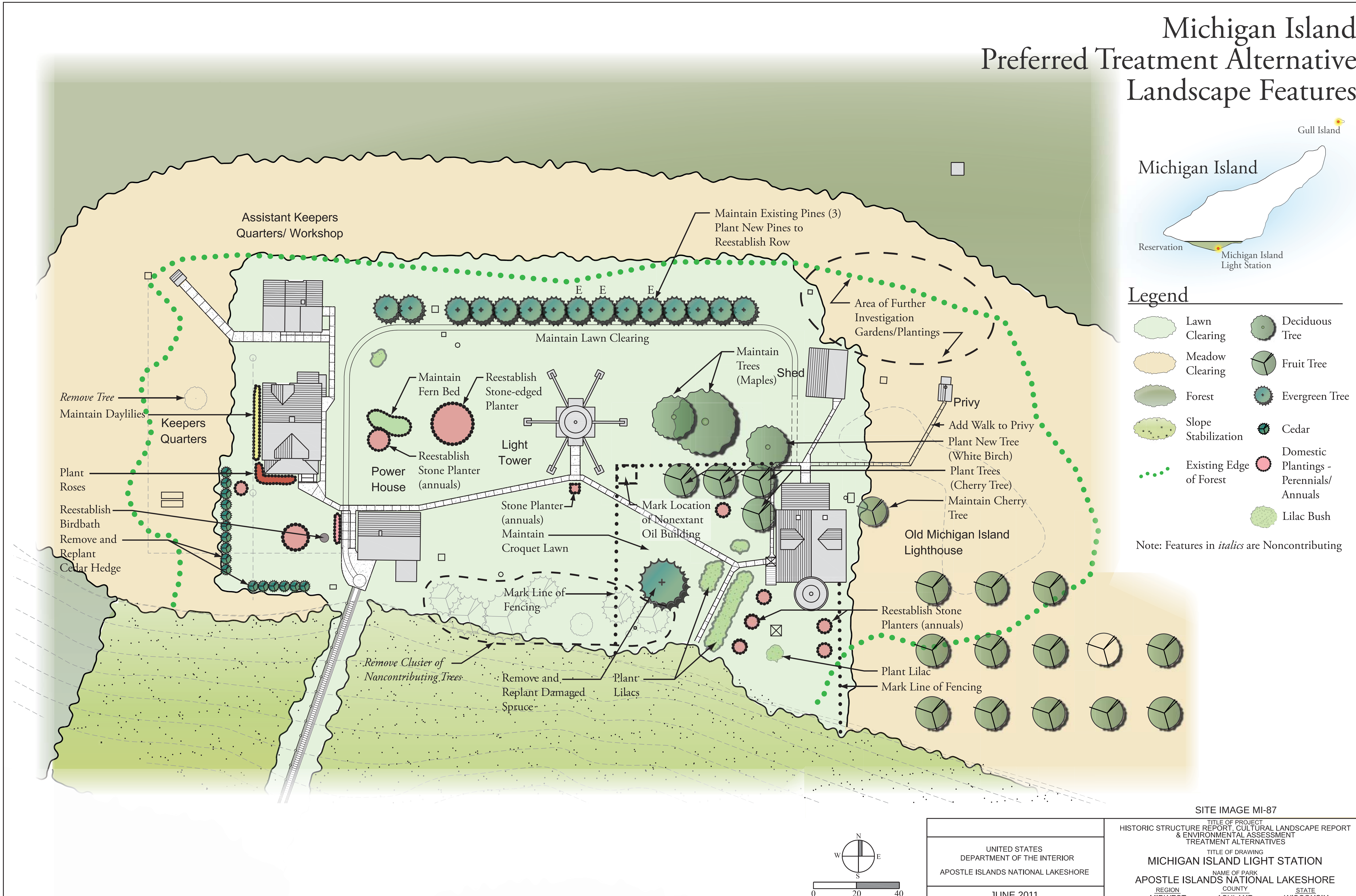
60
SITE IMAGE MI-86
UNITED STATES DEPARTMENT OF THE INTERIOR
APOSTLE ISLANDS NATIONAL LAKESHORE
JUNE 2011
TITLE OF PROJECT
HISTORIC STRUCTURE REPORT, CULTURAL LANDSCAPE REPORT & ENVIRONMENTAL ASSESSMENT TREATMENT ALTERNATIVES
TITLE OF DRAWING
MICHIGAN ISLAND LIGHT STATION
NAME OF PARK
APOSTLE ISLANDS NATIONAL LAKESHORE
REGION
MIDWEST
COUNTY
ASHLAND
STATE
WISCONSIN


Michigan Island
Preferred Treatment Alternative
Landscape Features
Gull Island
Michigan Island
Reservation
Michigan Island Light Station
Legend
Lawn Clearing
Meadow Clearing
Forest
Slope Stabilization
Existing Edge of Forest
Deciduous Tree
Fruit Tree
Evergreen Tree
Cedar
Domestic Plantings - Perennials/ Annuals
Lilac Bush
Note: Features in *italics* are Noncontributing
Assistant Keepers Quarters/ Workshop
Maintain Existing Pines (3)
Plant New Pines to Reestablish Row
E
E
E
Area of Further Investigation Gardens/Plantings
Maintain Lawn Clearing
Maintain Trees (Maples)
Shed
Privy
Add Walk to Privy
Plant New Tree (White Birch)
Plant Trees (Cherry Tree)
Maintain Cherry Tree
Old Michigan Island Lighthouse
Remove Tree
Maintain Daylilies
Keepers Quarters
Maintain Fern Bed
Reestablish Stone-edged Planter
Light Tower
Reestablish Stone Planter (annuals)
Power House
Plant Roses
Reestablish Birdbath
Remove and Replant Cedar Hedge
Stone Planter (annuals)
Maintain Croquet Lawn
Mark Location of Nonextant Oil Building
Mark Line of Fencing
Reestablish Stone Planters (annuals)
Remove Cluster of Noncontributing Trees
Remove and Replant Damaged Spruce
Plant Lilacs
Plant Lilac
Mark Line of Fencing
SITE IMAGE MI-87
N
W
E
S
0
20
40
UNITED STATES
DEPARTMENT OF THE INTERIOR
APOSTLE ISLANDS NATIONAL LAKESHORE
JUNE 2011
TITLE OF PROJECT
HISTORIC STRUCTURE REPORT, CULTURAL LANDSCAPE REPORT & ENVIRONMENTAL ASSESSMENT
TREATMENT ALTERNATIVES
TITLE OF DRAWING
MICHIGAN ISLAND LIGHT STATION
NAME OF PARK
APOSTLE ISLANDS NATIONAL LAKESHORE
REGION
MIDWEST
COUNTY
ASHLAND
STATE
WISCONSIN

CHAPTER 4: HISTORIC STRUCTURE REPORT

MICHIGAN ISLAND INTRODUCTION

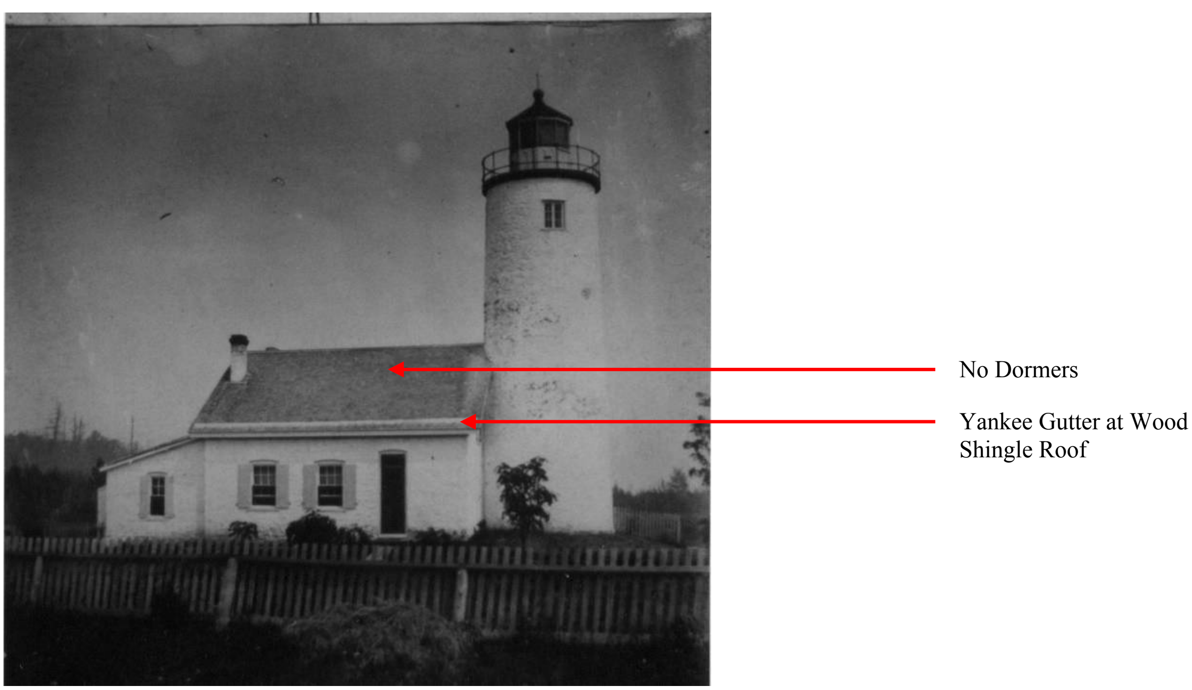
The following sections commence the HSR for Michigan Island. The disciplines of Architecture, Structural, Mechanical (HVAC and plumbing), Electrical and Environmental Engineering are addressed individually (refer to Volume I, Chapters 1 and 2 for more details on report organization and methodology). Michigan Island's extant buildings include:

- Old Michigan Island Lighthouse
- Keepers Quarters
- Second Tower
- Assistant Keepers Quarters and Workshop
- Power House
- Shed
- Privy

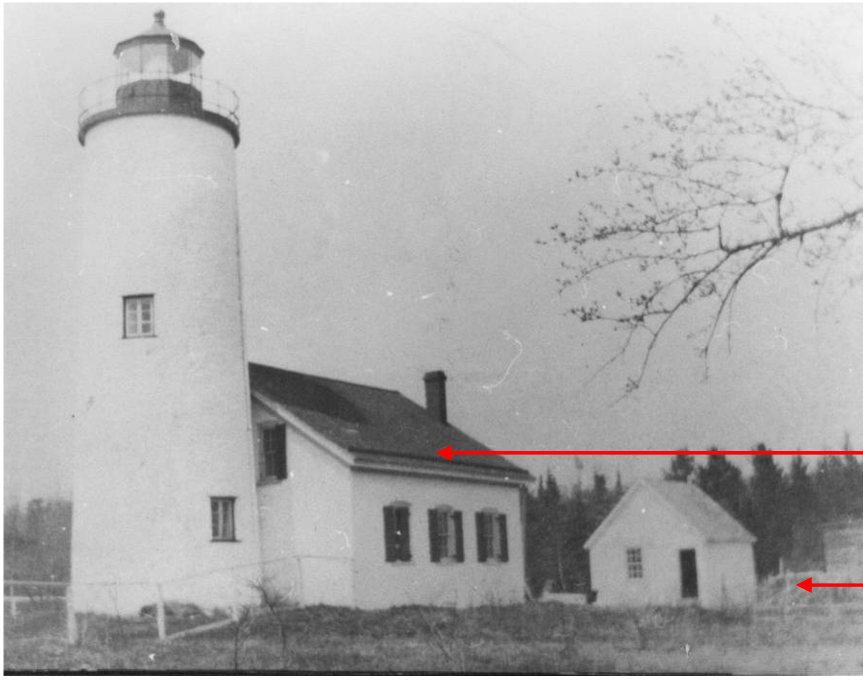
The original construction of each building is discussed, followed by its specific history/chronology of alterations (determined by studying historic photos, historic drawings, examining park records and archives and on-site investigations and observations by the Study Team).

The Physical Description section describes the current conditions, by discipline and by component, as observed on-site during the September 2009 site visit. Each component has been given a condition rating (as outlined in Volume I, Chapter 2: Methodology) in the Condition Assessment section. Treatment Recommendations are based on the preferred alternative of the May 2010 Value Analysis/CBA conducted at the park.

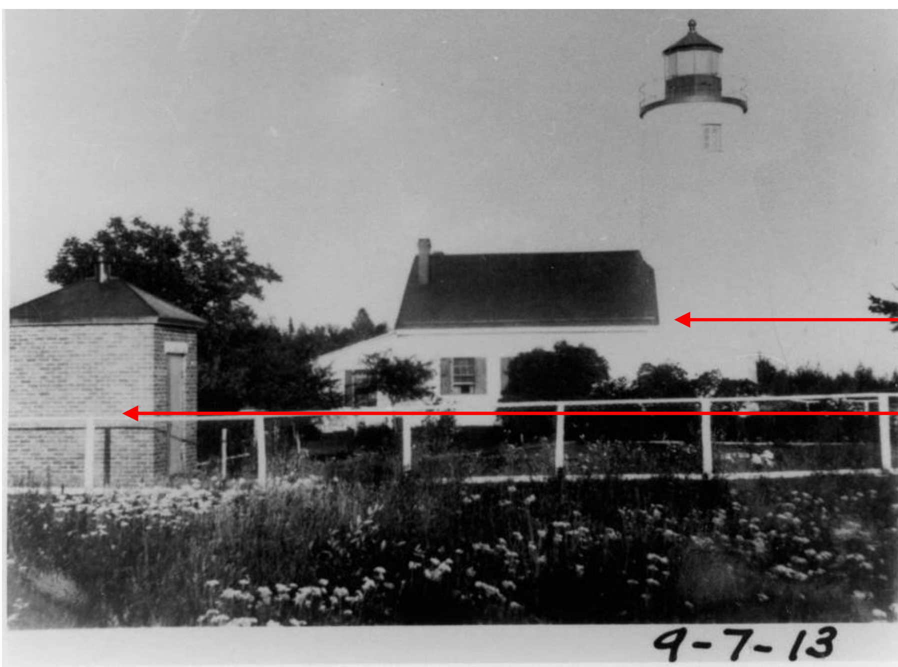
Historic Photographs



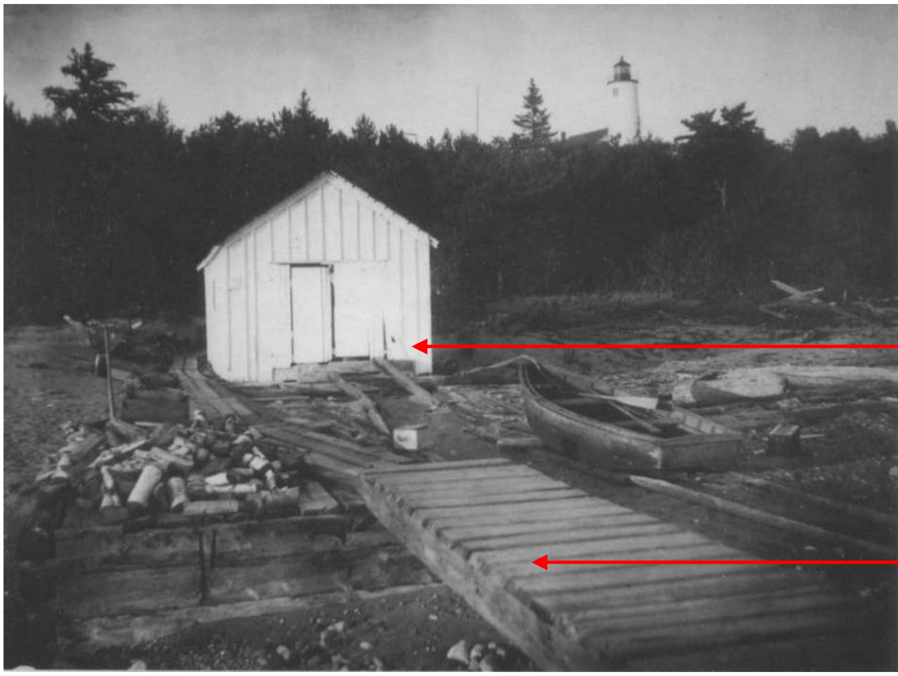
Historic Image MI-01: Old Lighthouse, 1904 (Source: NPS APIS Archives)



Historic Image MI-02: Old Lighthouse and Shed, c.1910 (Source: NPS APIS Archives)



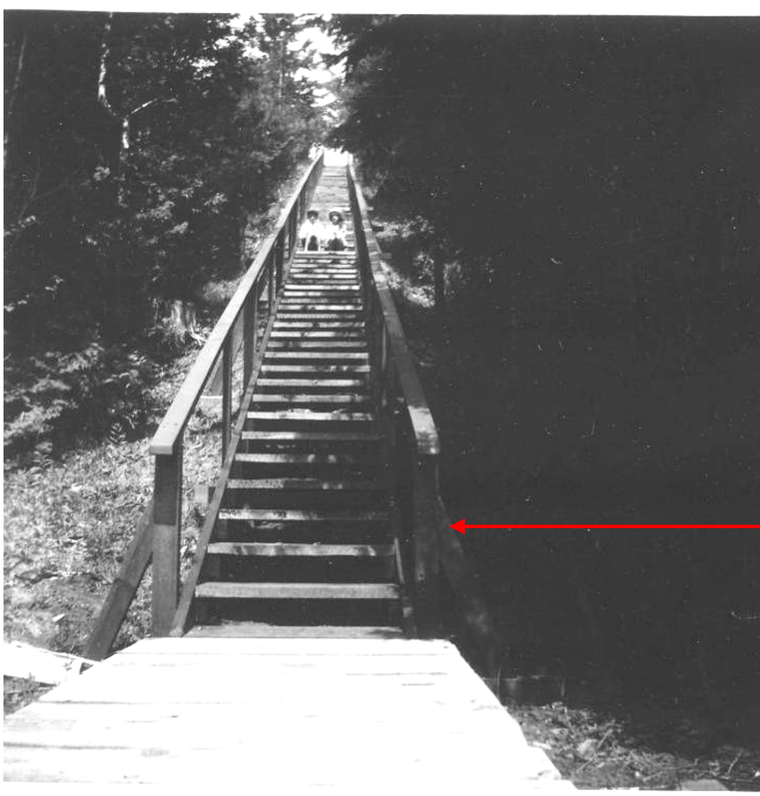
Historic Image MI-03: Old Lighthouse and Oil House, 1913 (Source: NPS APIS Archives)



Historic Image MI-04: Boathouse and dock with Lighthouse in background, 1913 (Source: NPS APIS Archives)

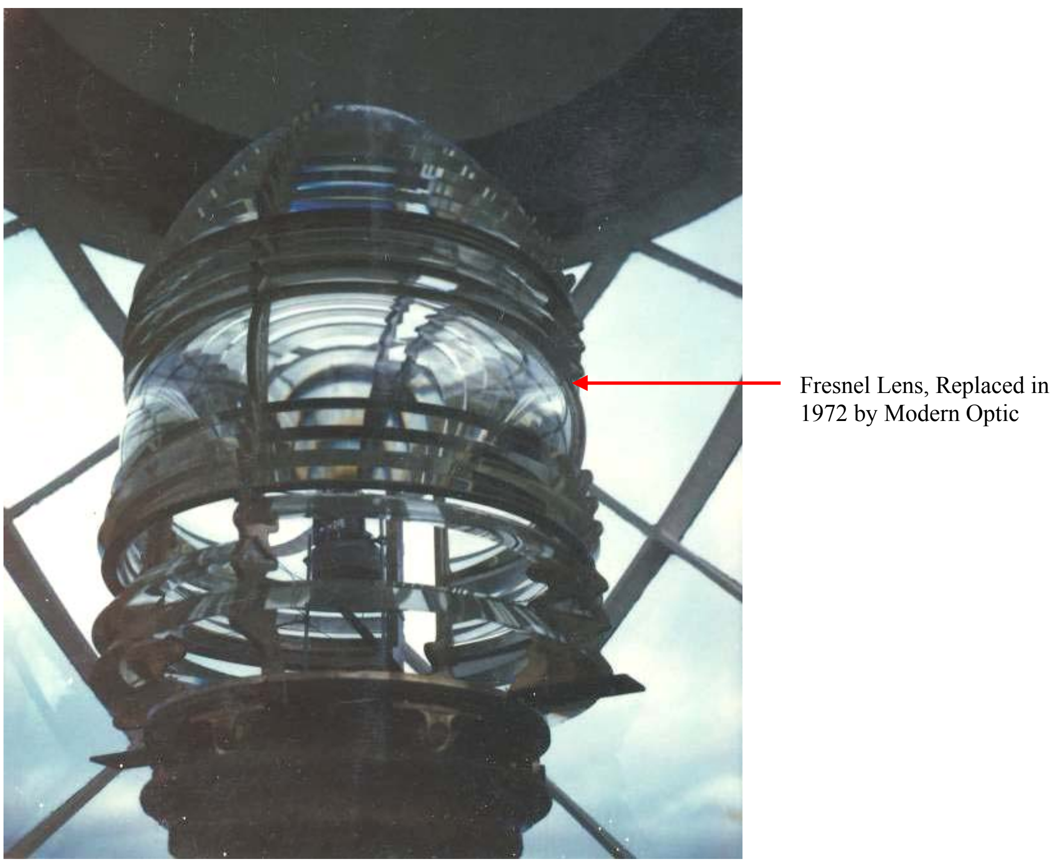
Historic Image MI-05: Old Michigan Island Lighthouse, 1929 (Source: NPS APIS Archives)

Historic Image MI-06: Second Tower Base with stone fire pit/planter, c.1930 (Source: NPS APIS Archives)

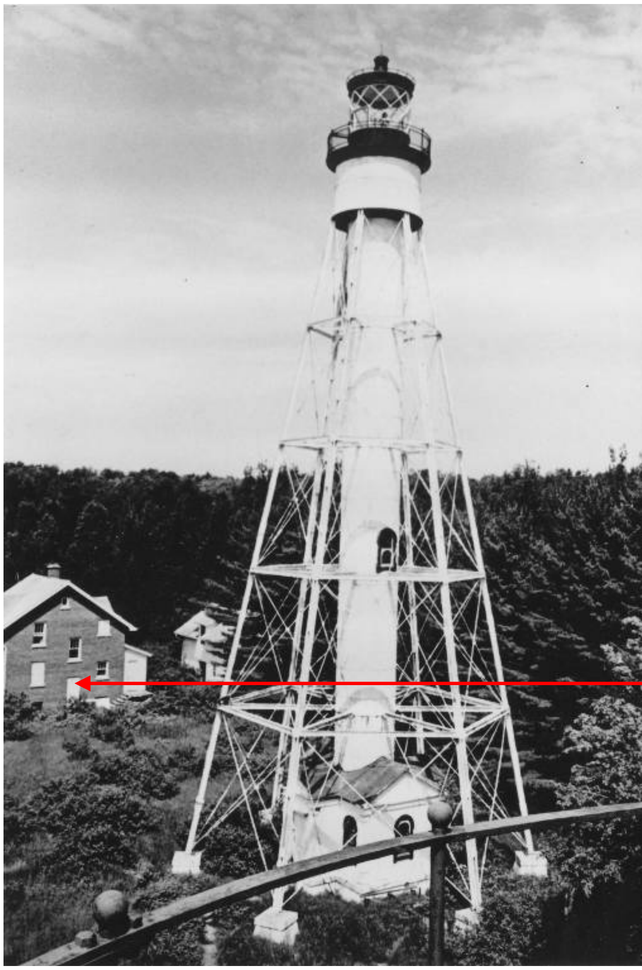


Historic Image MI-07: Wood stairs, unknown date (Source: NPS APIS Archives)

Historic Image MI-08: Keepers Quarters screened-in front porch, c.1939 (Source: NPS APIS Archives)



Historic Image MI-09: Second Tower Lantern and Lens, 1972 (Source: NPS APIS Archives)

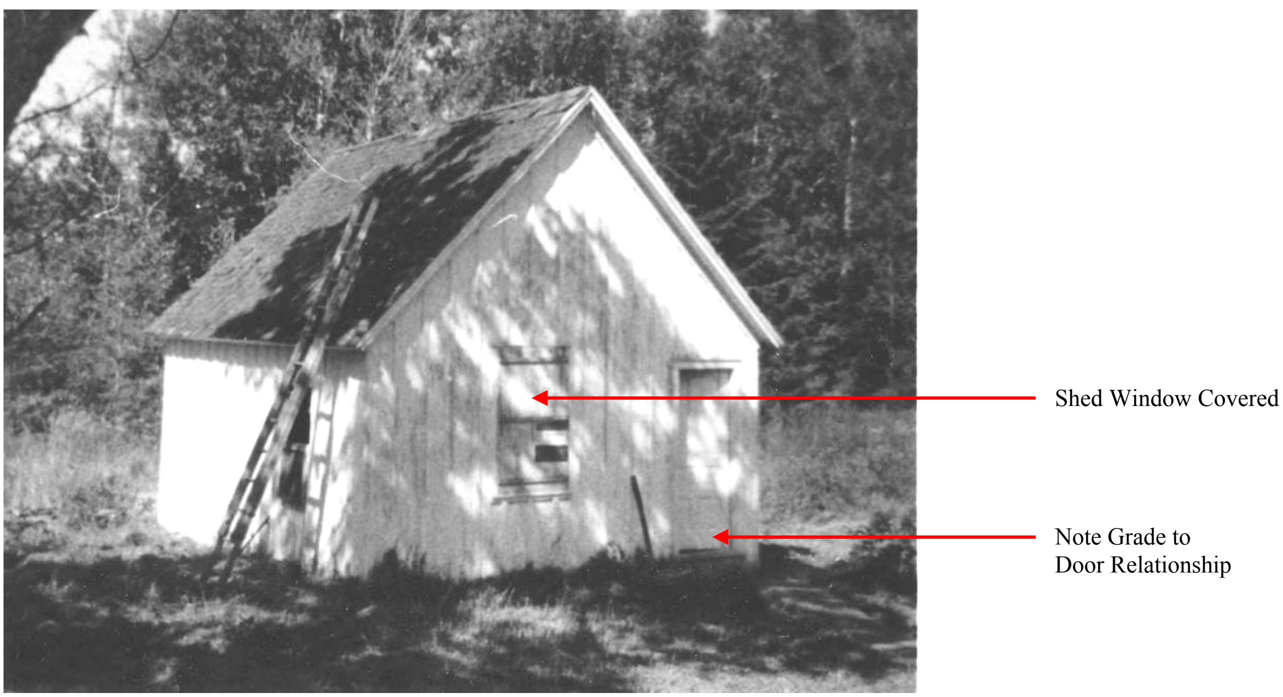


Keepers Quarters Windows Covered

Historic Image MI-10: Second Tower, 1974 (Source: NPS APIS Archives)

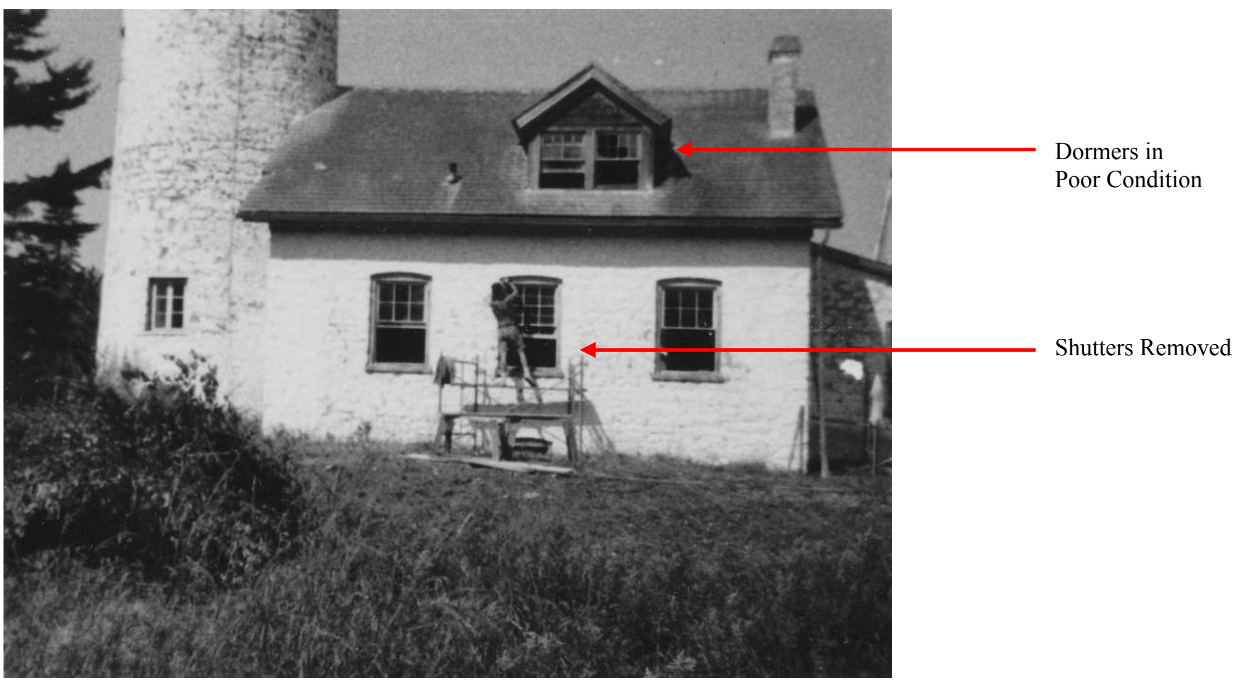
Historic Image MI-11: Keepers Quarters Living Room, 1975 (Source: NPS APIS Archives)

Historic Image MI-12: Keepers Quarters Dining Room, 1975 (Source: NPS APIS Archives)

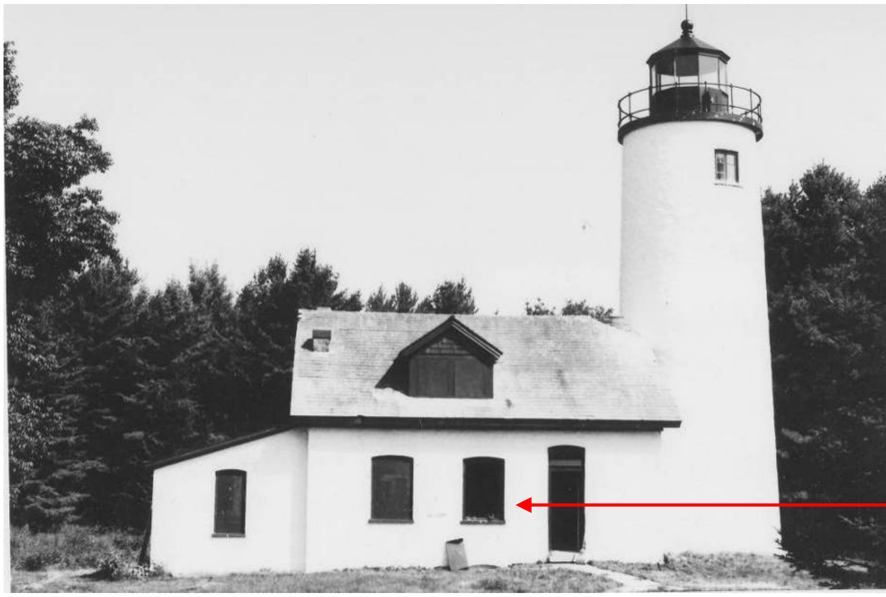


Historic Image MI-13: Shed, south elevation, 1975 (Source: NPS APIS Archives)

Historic Image MI-14: Tram Cart, 1975, possibly from Outer Island and not original to Michigan Island (Source: NPS APIS Archives)

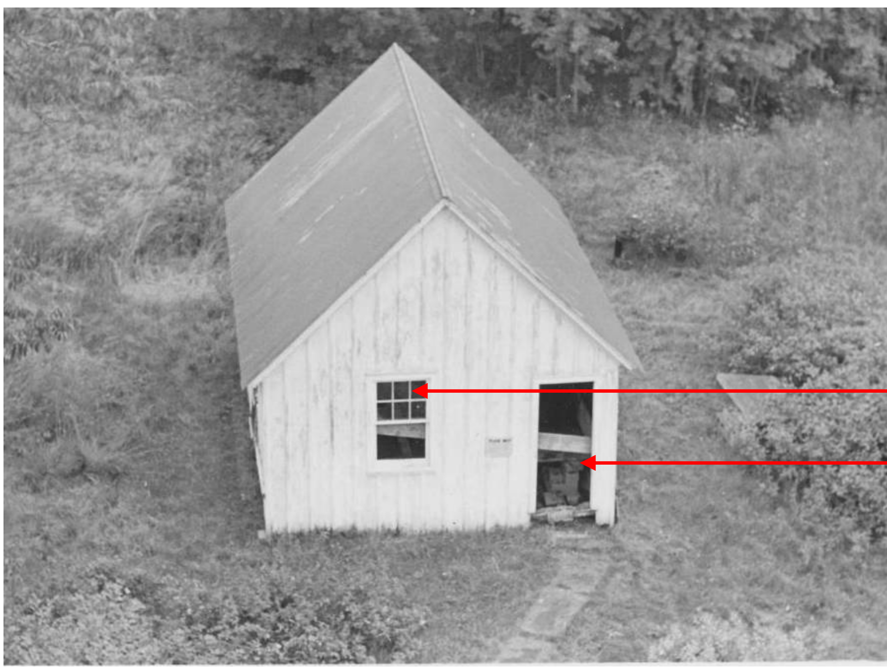


Historic Image MI-15: Old Michigan Island Lighthouse without shutters, 1975 (Source: NPS APIS Archives)



Shutters Reinstalled

Historic Image MI-16: Old Michigan Island Lighthouse with shutters, 1976 (Source: NPS APIS Archives)



Window Uncovered

Door Missing

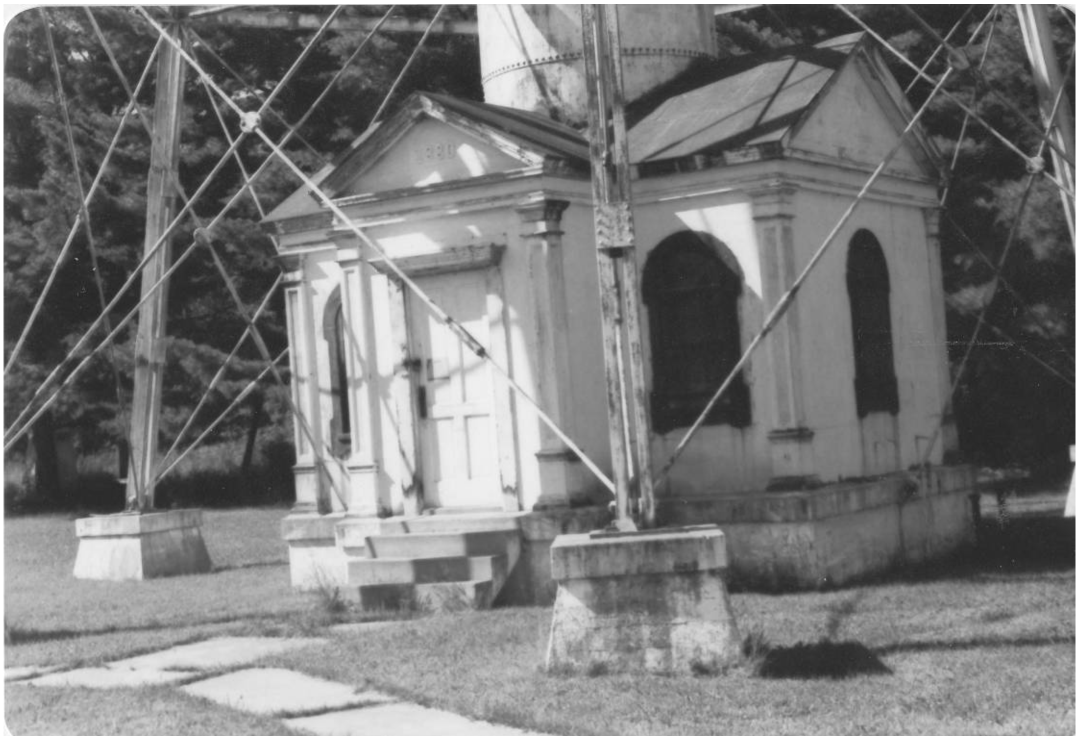
Historic Image MI-17: Aerial of the Shed, 1978 (Source: NPS APIS Archives)

Nonextant Platform and Stair to Beach from Tramway

Historic Image MI-18: Tramway to Power House from beach, 1978 (Source: NPS APIS Archives)

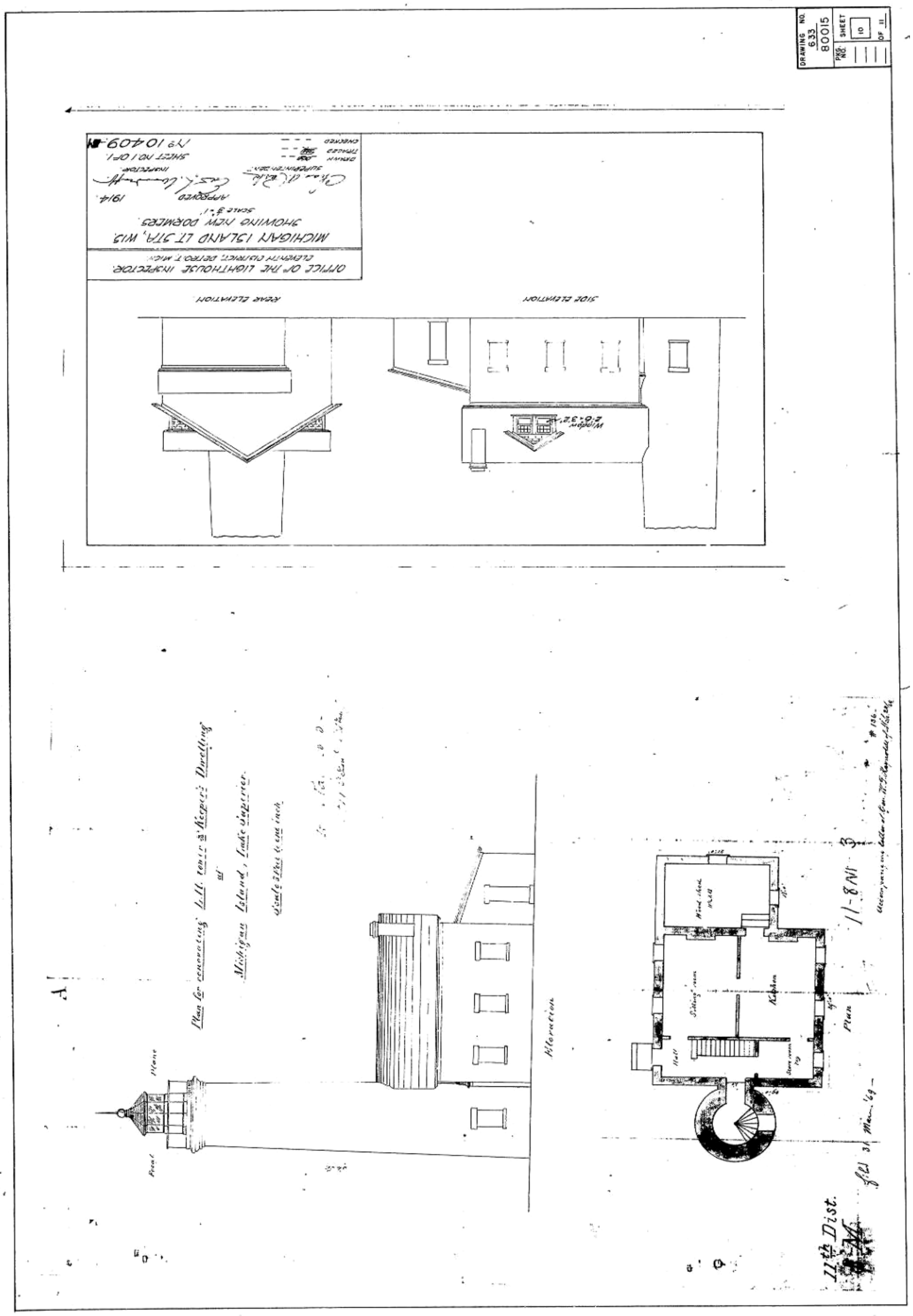
Nonextant Platform and Stair to Beach from Tramway

Historic Image MI-19: Tramway to Power House from beach, 1978 (Source: NPS APIS Archives)

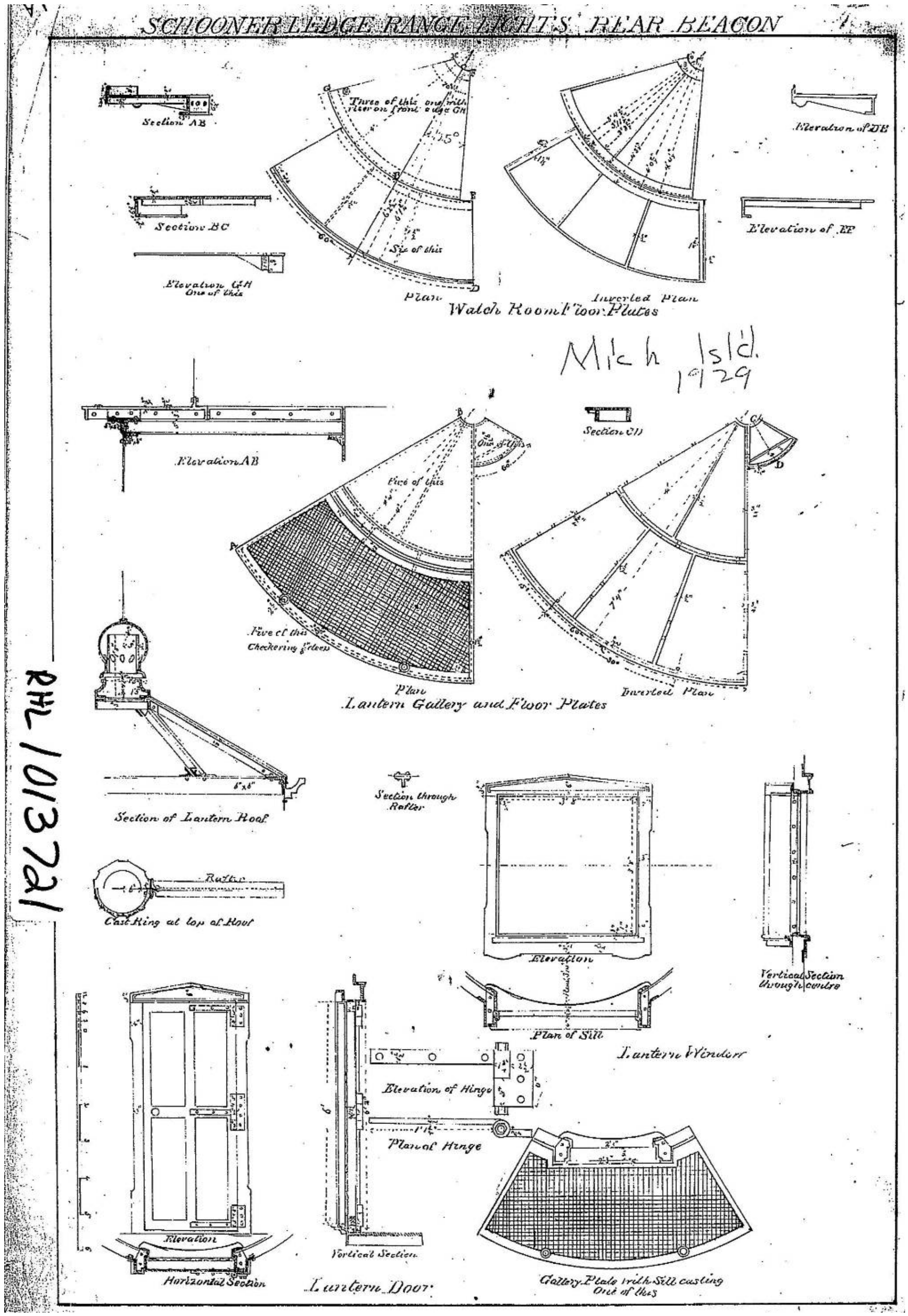


Historic Image MI-20: Second Tower Light Base, 1980 (Source: NPS APIS Archives)

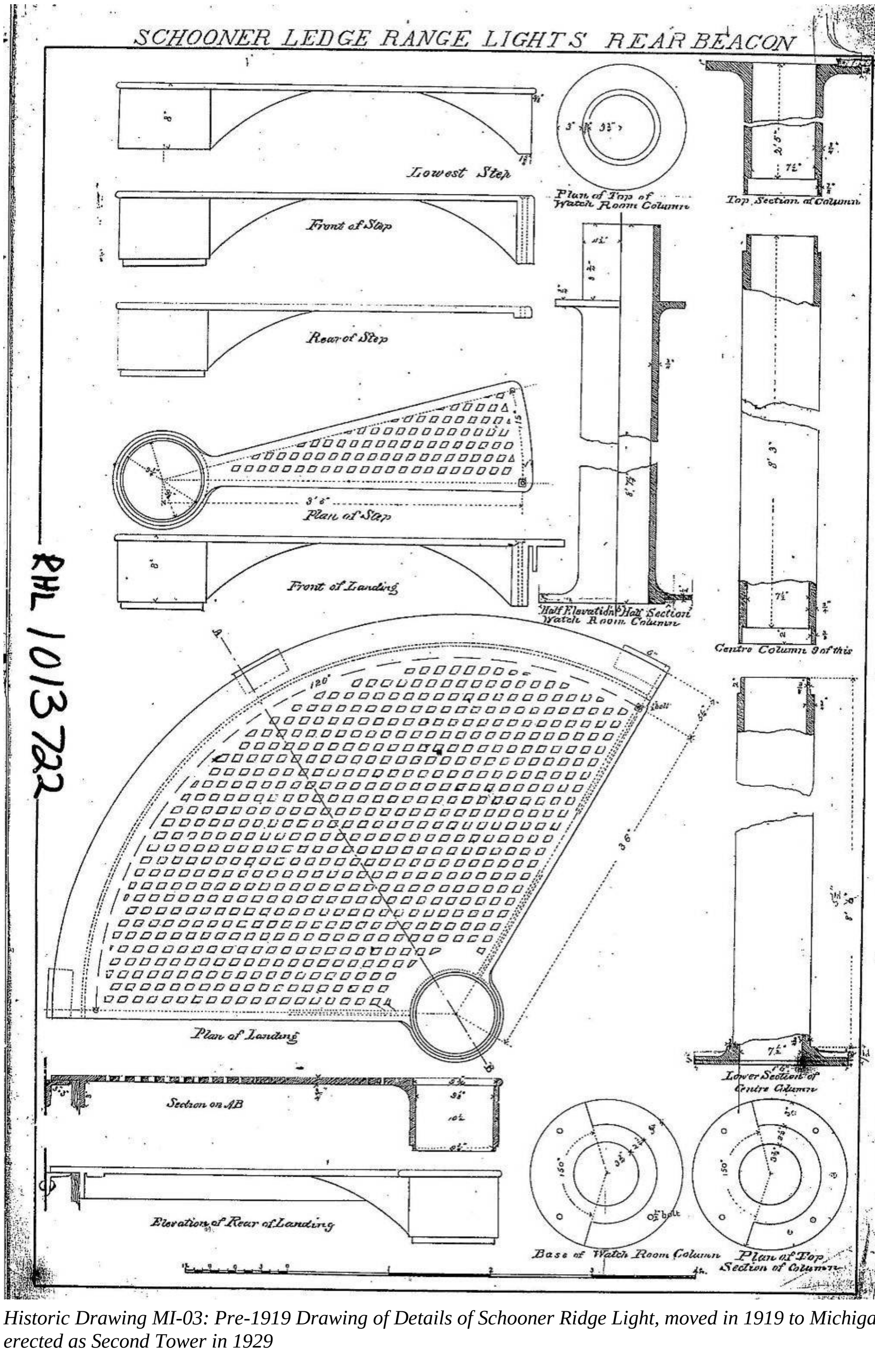
HISTORIC DRAWINGS



Historic Drawing MI-01: 1869 Plan of Old Michigan Lighthouse with 1914 dormers drawn in



Historic Drawing MI-02: Pre-1919 Drawing of Details of Schooner Ridge Light, moved in 1919 to Michigan Island and erected as Second Tower in 1929



Historic Drawing MI-03: Pre-1919 Drawing of Details of Schooner Ridge Light, moved in 1919 to Michigan Island and erected as Second Tower in 1929

SPECIFICATIONS:

FOR A CYLINDRICAL HELICAL BAR LANTERN FOR MICHIGAN ISLAND LIGHT STATION, WISC.

MATERIALS AND WORKMANSHIP.

The materials used in the construction of this work are to be first class in every particular. Bolt heads and nuts will be hexagonal unless otherwise specified, screw threads must be full, sharp, and clean, and the bolts are to be of sufficient length to give full bearing to the nuts. All castings must be free from imperfections affecting the strength or appearance of the finished work; they must be true to pattern, out of wind, and have smooth, clean surfaces, and well-rounded fillets. The machining and fitting must be neatly and accurately done, and the entire job must present a neat and well-finished appearance. The contractor must furnish the lantern complete in every detail and will be held responsible for the correct fitting of all the parts, and should any errors or omissions be discovered in the drawings as the work progresses, the contractor shall immediately notify the Commissioner of Lighthouses before proceeding with that part of the work.

CAST IRON.

The cast iron must be light gray, close-grained, and of such quality that test bars 1 inch square, cast in sand from the same heat as the regular castings, supported on knife-edges 12 inches apart, will not break under a concentrated load of less than 2,250 pounds, applied at the center.

STEEL.

The steel shall be of a quality and grade best suited to the purpose for which it is to be used, and shall conform to the latest revised specifications of the Association of American Steel Manufacturers for that grade of steel.

BRONZE.

The bronze shall be composed of 88 per cent copper, 10 per cent tin, and 2 per cent zinc. No scrap is to be used in making this bronze. The minimum physical properties required of a specimen 2 inches long between measuring points and one-half inch in diameter shall be as follows: Ultimate tensile strength, 30,000 pounds per square inch; elastic limit, 15,000 pounds per square inch; elongation, 15 per cent.

BRASS.

Where brass is called for it shall be a good quality of commercial brass suited to the purpose for which it is used.

SHEET IRON.

All sheet iron entering into this construction must be pure iron, guaranteed by the manufacturers to contain not less than 99.90 per cent pure iron.

TESTS.

All material for the metal work shall be tested in the presence of a representative of the Bureau of Lighthouses, and all expense of such tests borne by the contractor, or in lieu thereof the contractor shall furnish the lighthouse inspector a certified statement from the manufacturer or some reputable engineering laboratory, showing that the materials furnished conform to the foregoing specifications.

CURTAINS.

The curtains are to be of the best quality Irish linen of the width shown on the drawings. They must be neatly and strongly hemmed around all their edges, securely fastened to the rollers, and provided at their lower edges with a nickel-plated brass curtain rod, one-eighth by one-half inch, to which must be securely fastened two nickel-plated brass pulling rings each. The curtains must be so arranged that when in place the upper ones will overlap the lower, as shown on the drawings. The spring rollers mentioned above must be strong enough to take up easily the whole length of the curtain, which must roll evenly, neatly, and closely upon the rollers, and must not be over the diameter shown on the drawing when the length is taken up. The rollers must be of good quality sheet tin, free from all defects, and thoroughly japanned inside and out before attachments are secured. They are to be provided at one end with a simple journal and at the other with the best quality of spring-ratchet attachment, both of which are to be securely fastened concentric to the rollers. The rollers must also be perfectly straight and round and provided with a groove or slot along their length in which the curtains are to be secured.

86602—17

LANTERN GLASS.

The panes must be of the best quality of selected clear plate glass; their surfaces must be perfectly smooth and highly polished, free from distorted reflections, flaws, or cloudiness. The panes must be neatly and correctly cut to the dimensions shown on the drawings and bent as shown, and the edges must be straight and smooth. They must be thoroughly annealed after bending, and allowances must be made and the proper precautions taken before annealing in order that the panes lie of the proper shape, form, and curvature after the final cooling. The panes must be interchangeable, and must fit the sash without forcing and must completely fill the opening in the sash. The contractor for the lantern will be held responsible for the quality and correct fitting of the panes. Should any chipping of the panes be required to make them fit the sash, the chipped edges must be rubbed or ground until they are smooth and even. Should any of the panes show that they are not up to the requirements of the specifications, they will be rejected, and the faulty panes must be promptly replaced by others acceptable in every respect to the Government.

ERECTION AT THE SHOP.

The entire lantern shall be erected at the shop, including glass, curtains, railings, sheet-metal lining, etc. Sufficient bolts or other fastenings will be used in the erection to properly hold the various parts in their respective positions, and the parts must not be taken down until inspected by a representative of the Lighthouse Service. Each part of the metal work must be plainly marked with a steel die, in accordance with the erecting diagram. Where the work is painted, these numbers are to be duplicated in large figures painted on with white lead.

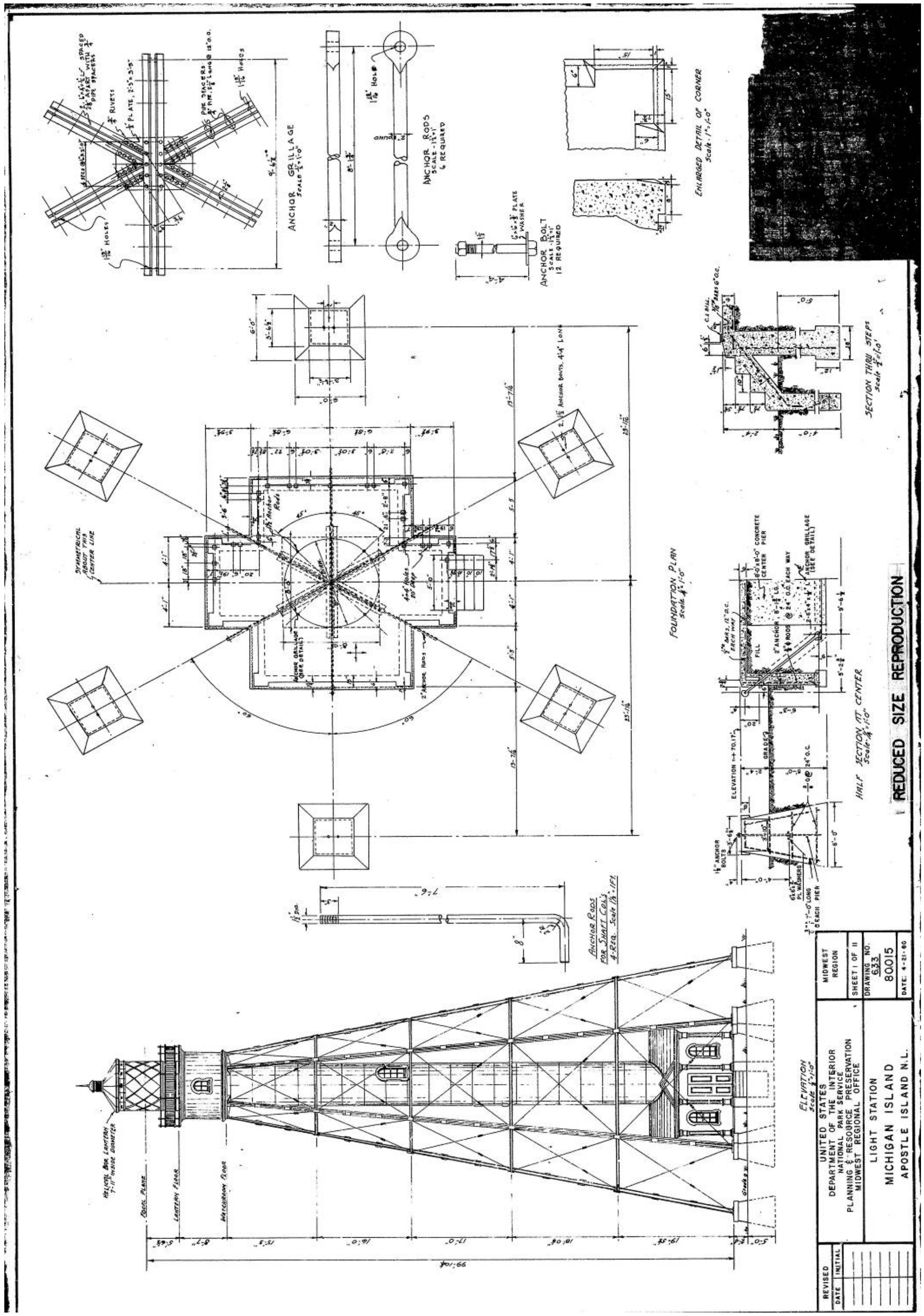
OILING AND PAINTING.

Only the iron and steel shall be painted at the shop. After the castings have been thoroughly cleaned of sand, rust, etc., and when the surfaces are perfectly dry, they are to receive one coat of linseed oil, applied hot. When this coat has thoroughly dried, it shall be followed by one coat of best quality red lead, ground in linseed oil. All other iron and steel shall receive one coat of best quality red lead, ground in linseed oil. All planed, turned, and finished iron and steel surfaces shall be given a coat of white lead and tallow.

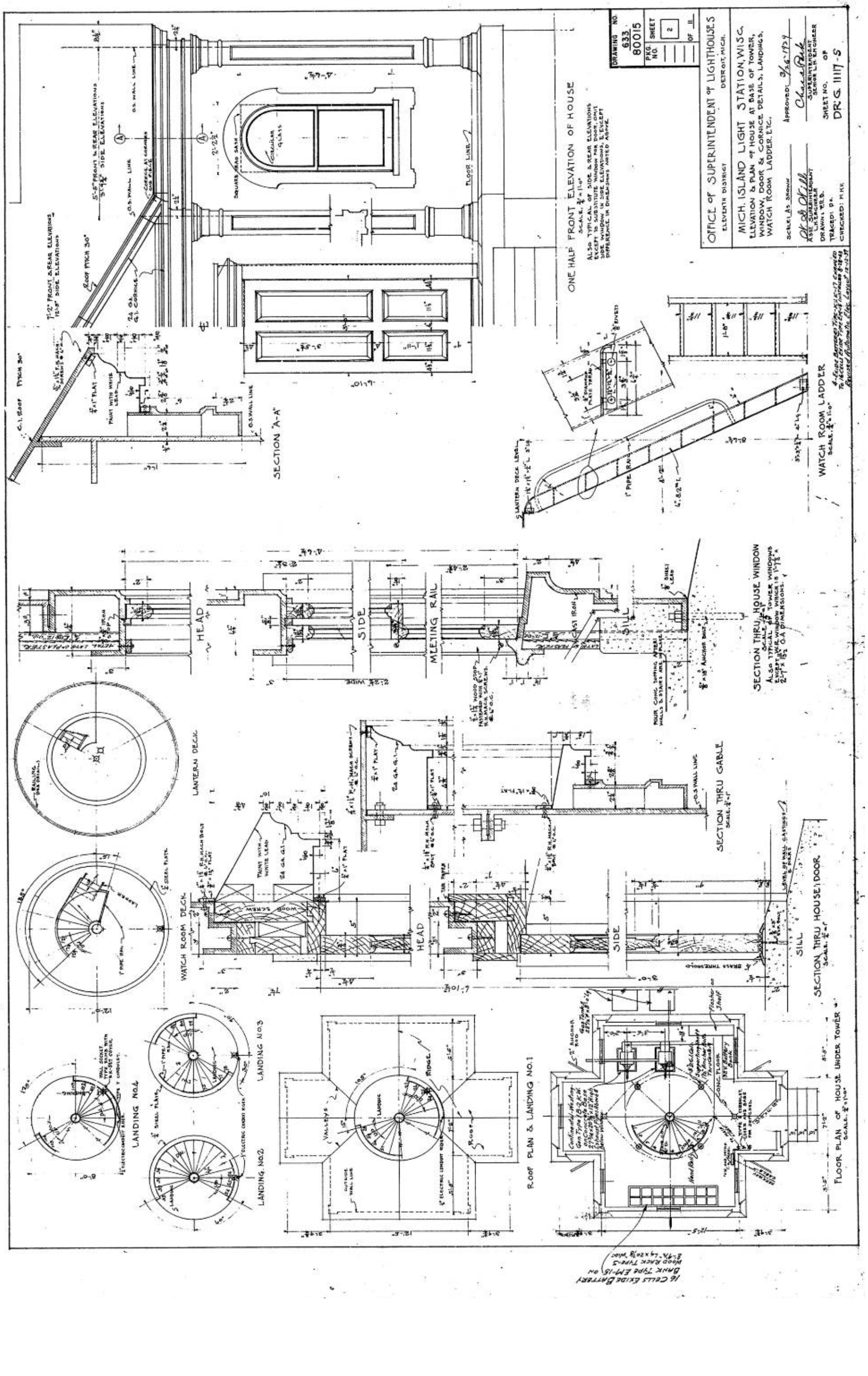
MISCELLANEOUS.

All portions of the metal work must be thoroughly inspected before painting, and the contractor must afford the Government inspector every assistance necessary to perform this inspection. All bolts, screws, etc., necessary for the complete erection of the lantern must be furnished, including an extra 5 per cent of the lining screws. The weights of all pieces and box numbers are to be entered on this sheet which is to be returned to the inspector. All pieces liable to damage in transportation must be securely crated or boxed, including bolts, screws, and other small parts.

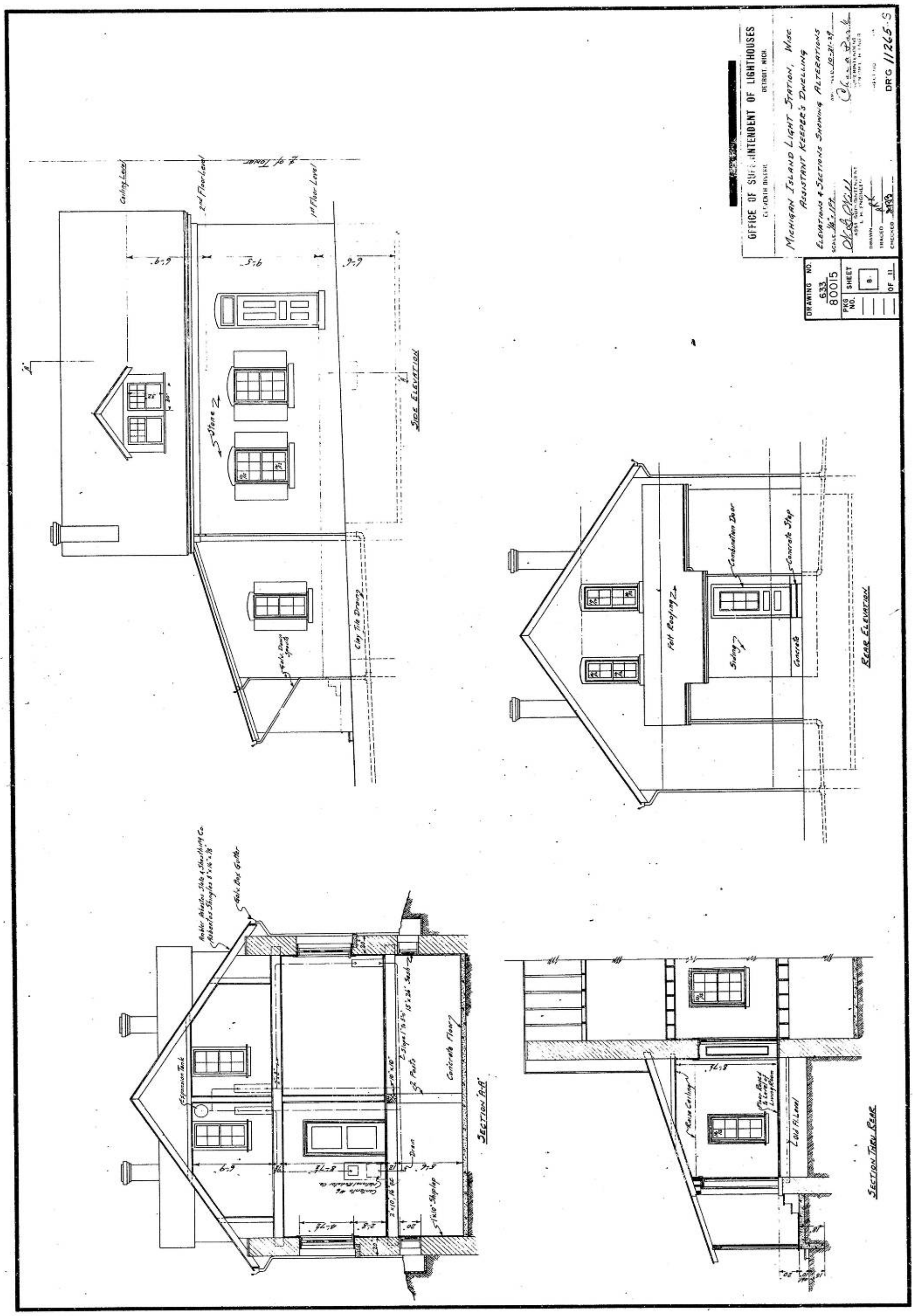
Historic Drawing MI-04: Pre-1929 Specifications for Second Tower Lantern



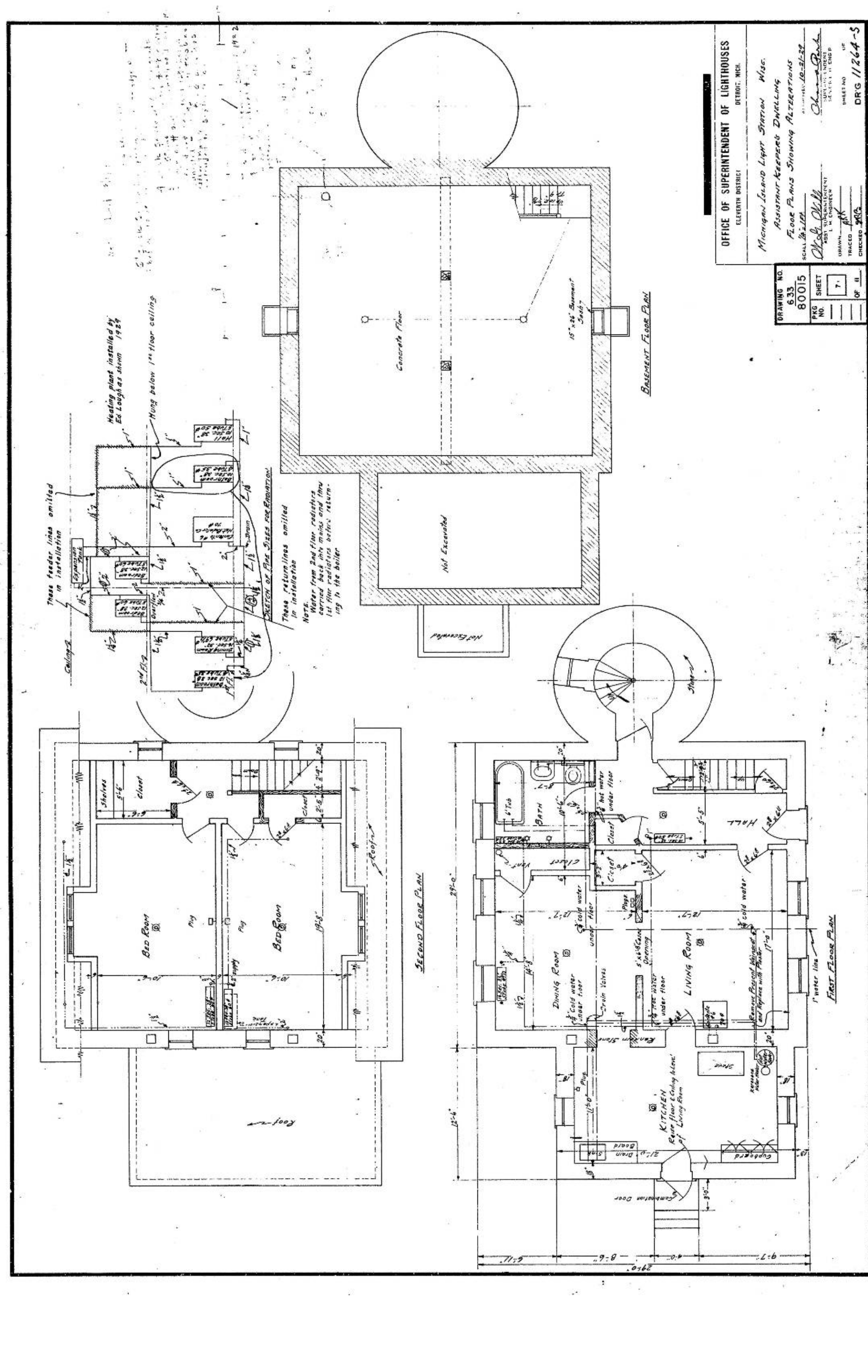
Historic Drawing MI-05: 1929 elevation, details, and plan of Second Tower



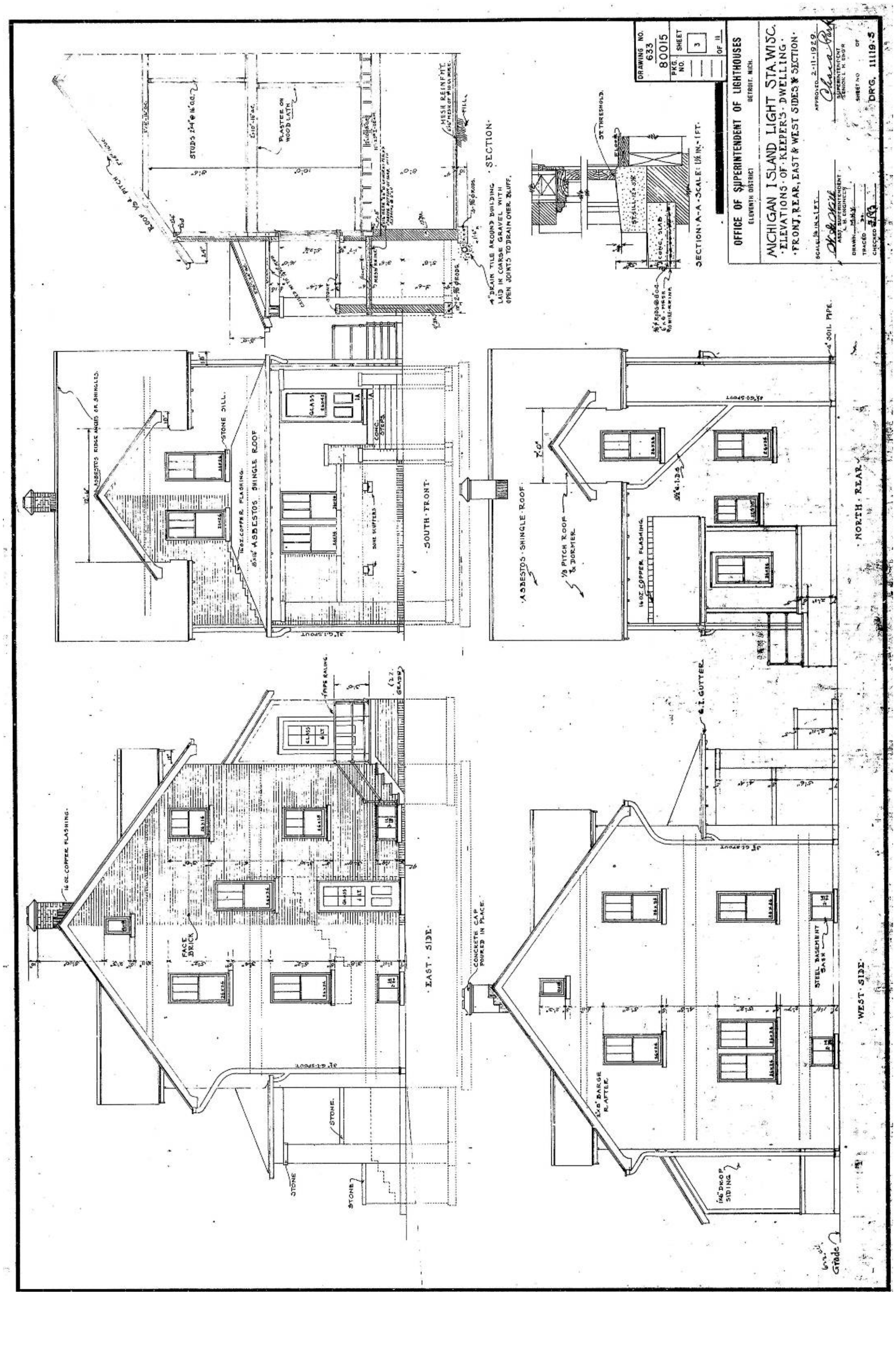
Historic Drawing MI-06: 1929 elevations, details, and plans of Tower Base



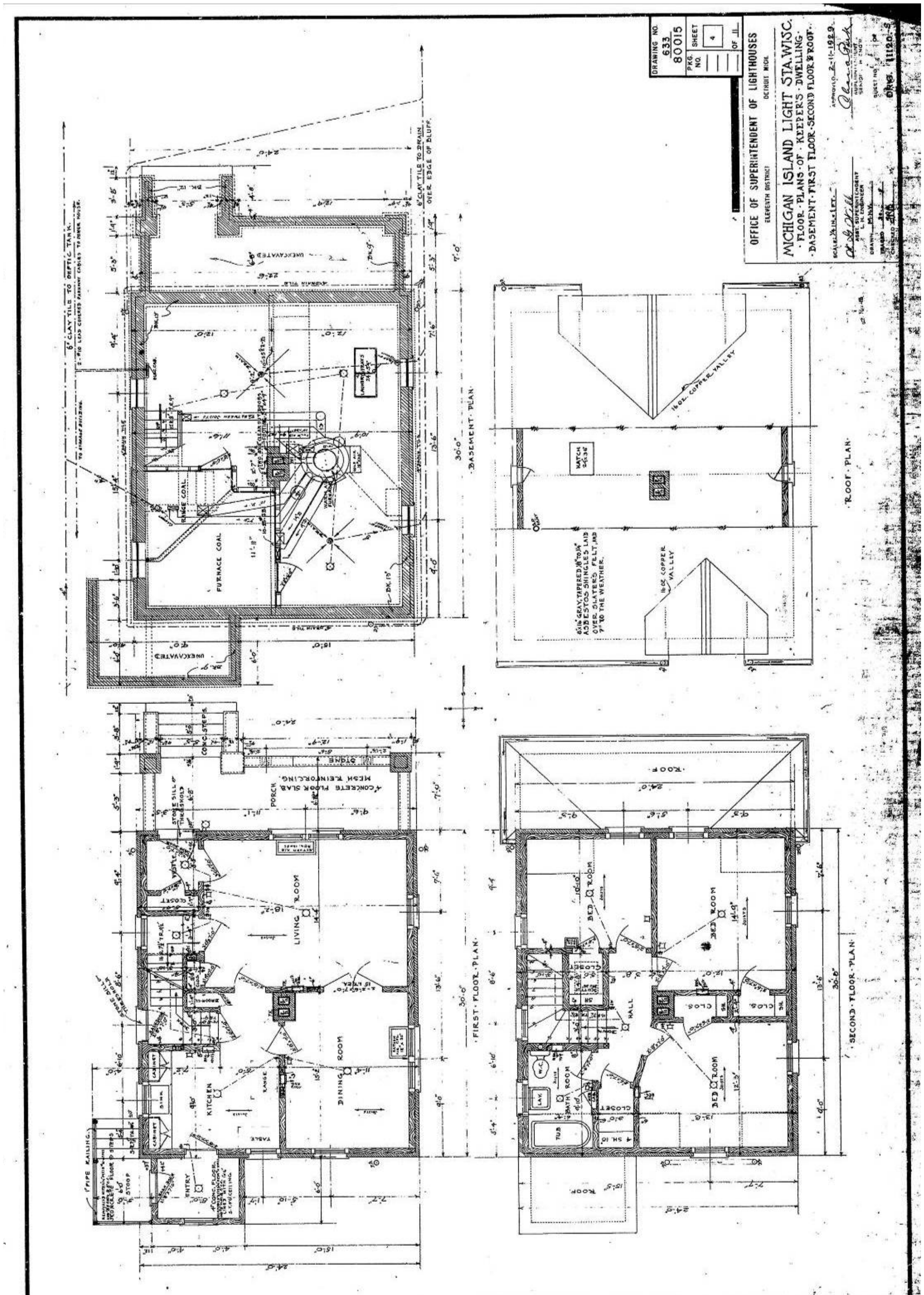
Historic Drawing MI-07: 1929 elevations of Old Michigan Island Lighthouse and proposed shed kitchen remodel



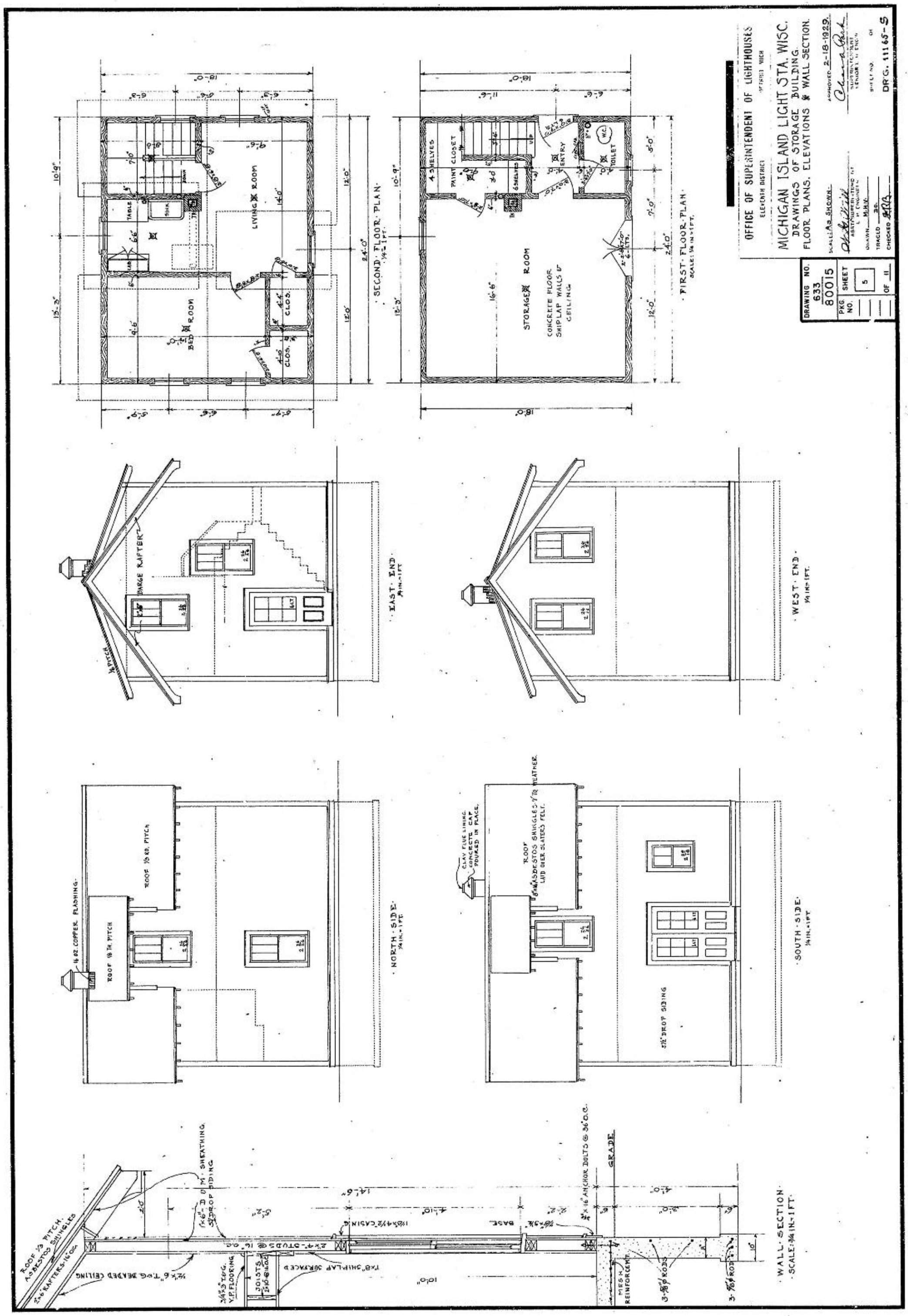
Historic Drawing MI-08: 1929 plans showing alterations to Old Michigan Island Lighthouse



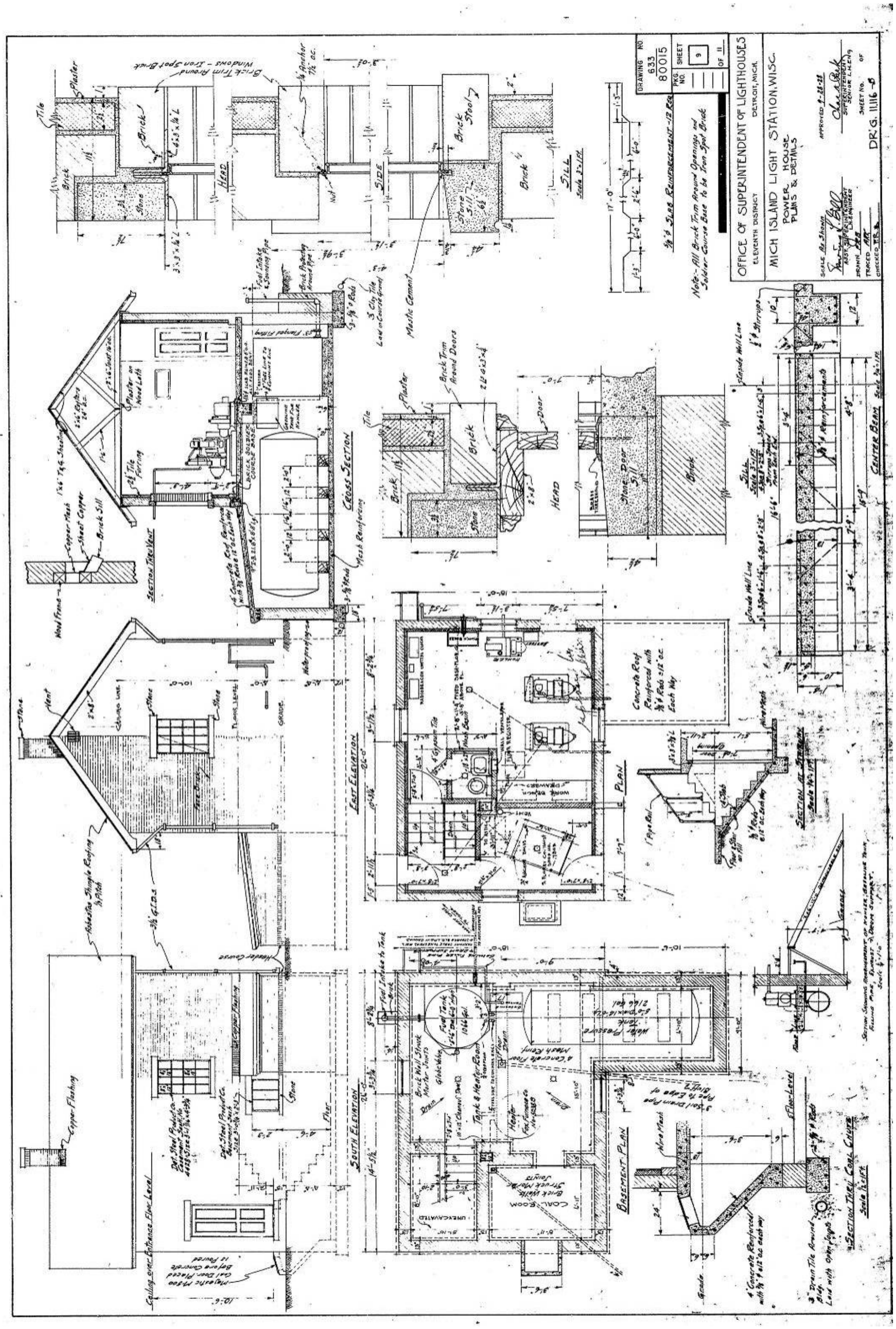
Historic Drawing MI-09: 1929 elevations of Keepers Quarters



Historic Drawing MI-10: 1929 plans of Keepers Quarters



Historic Drawing MI-11: 1929 elevations, details, and plans of Assistant Keepers Quarters

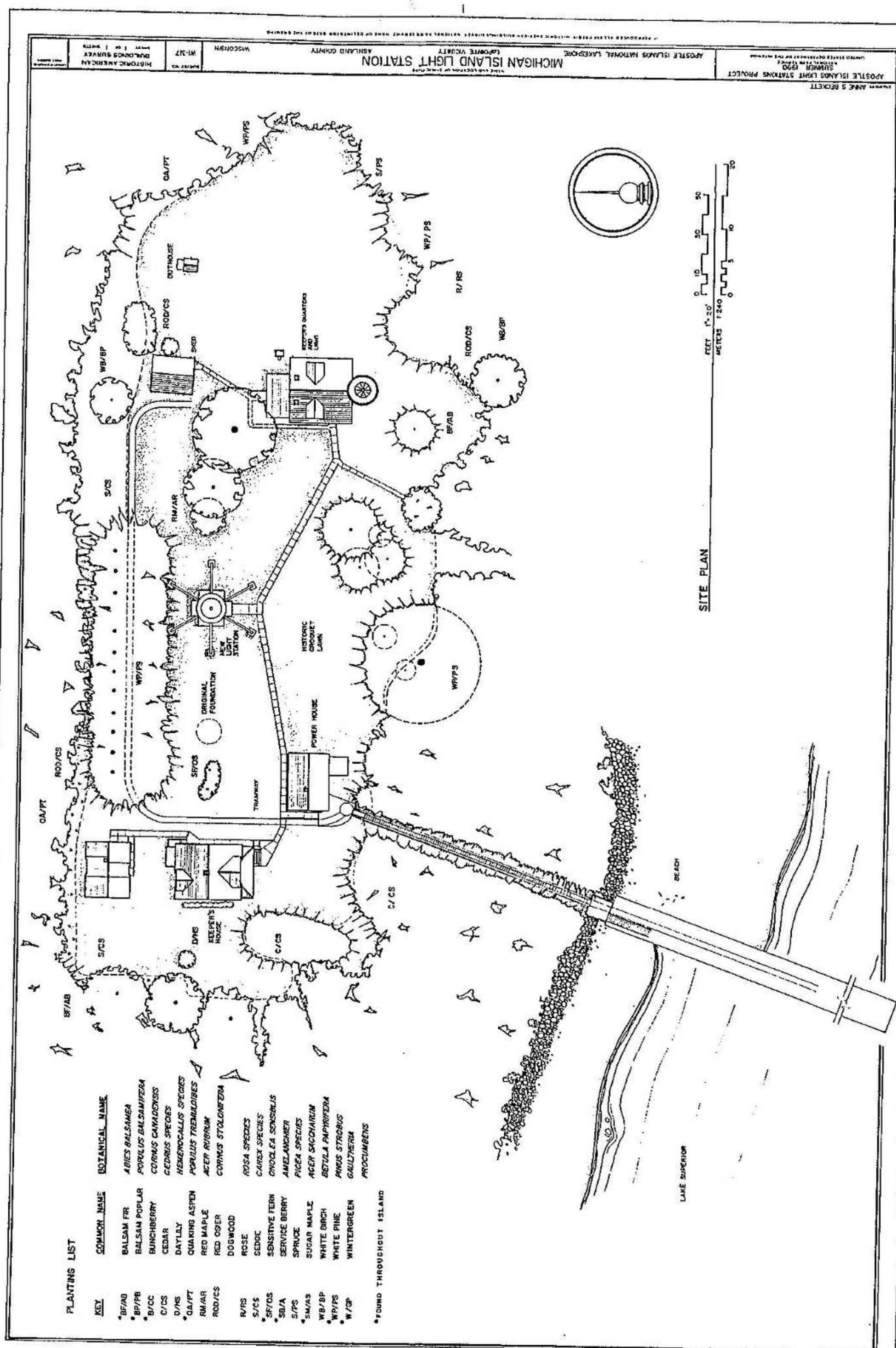


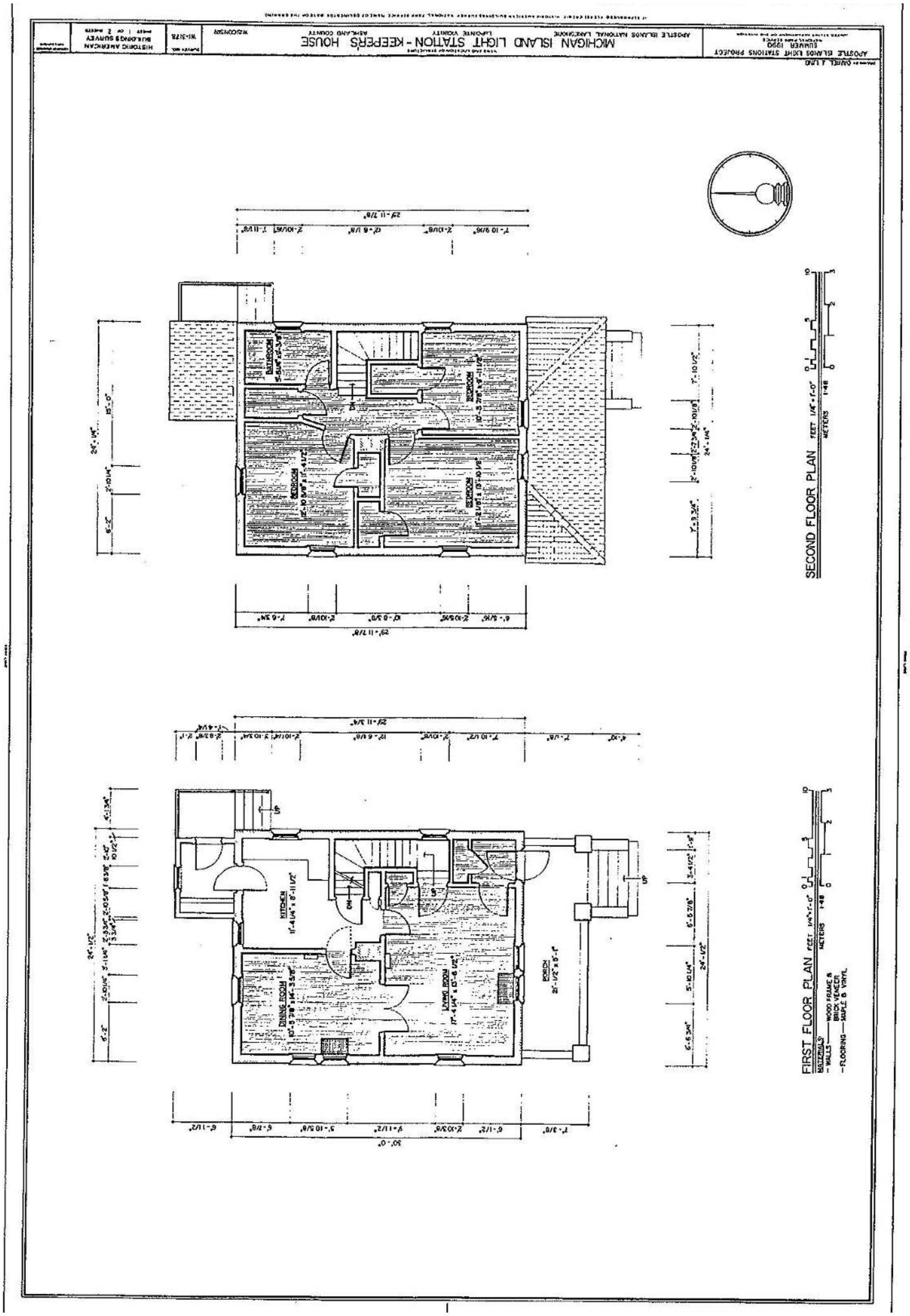
Historic Drawing MI-12: 1929 elevations, details, and plans of Power House

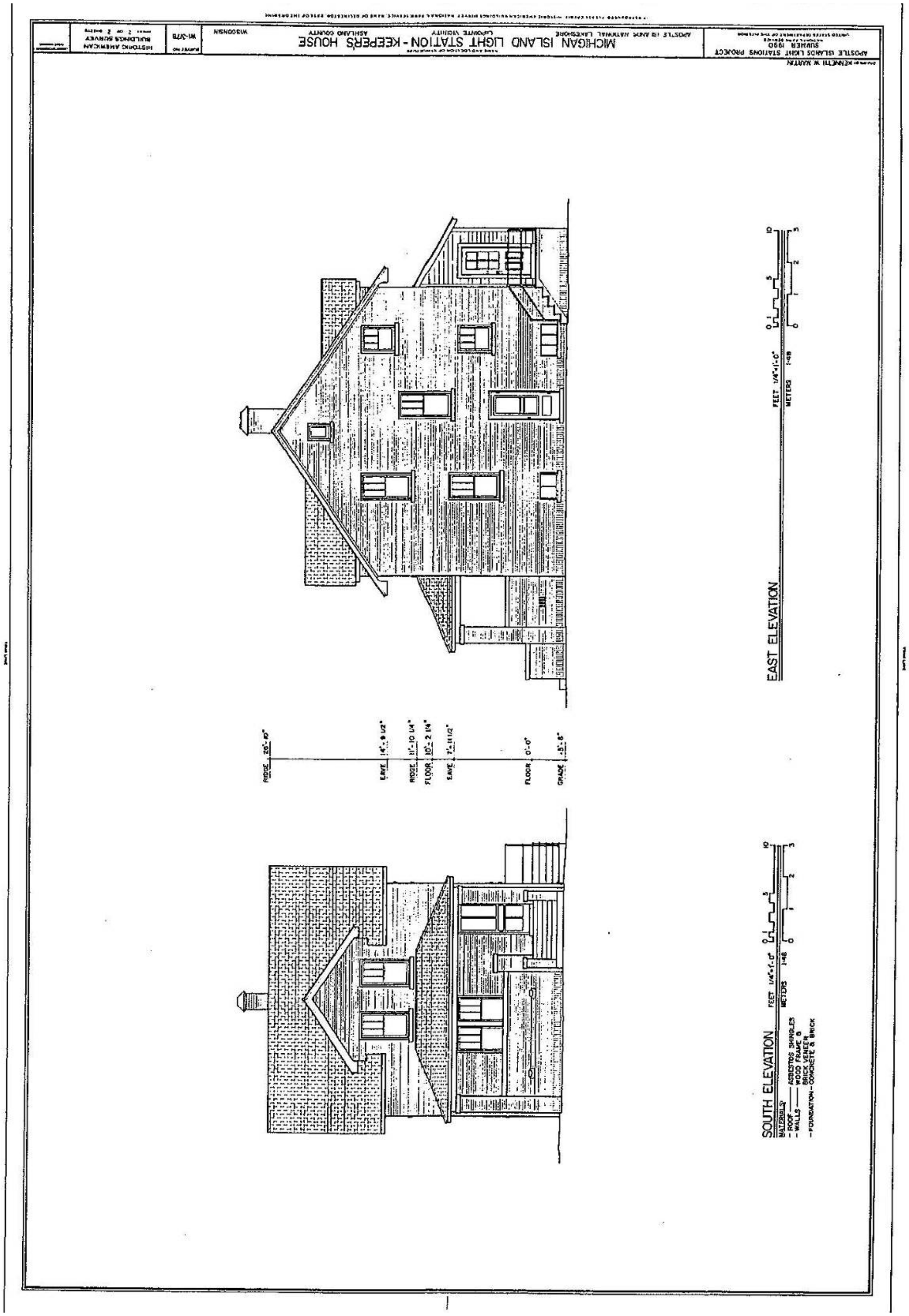
EXISTING CONDITION DRAWINGS

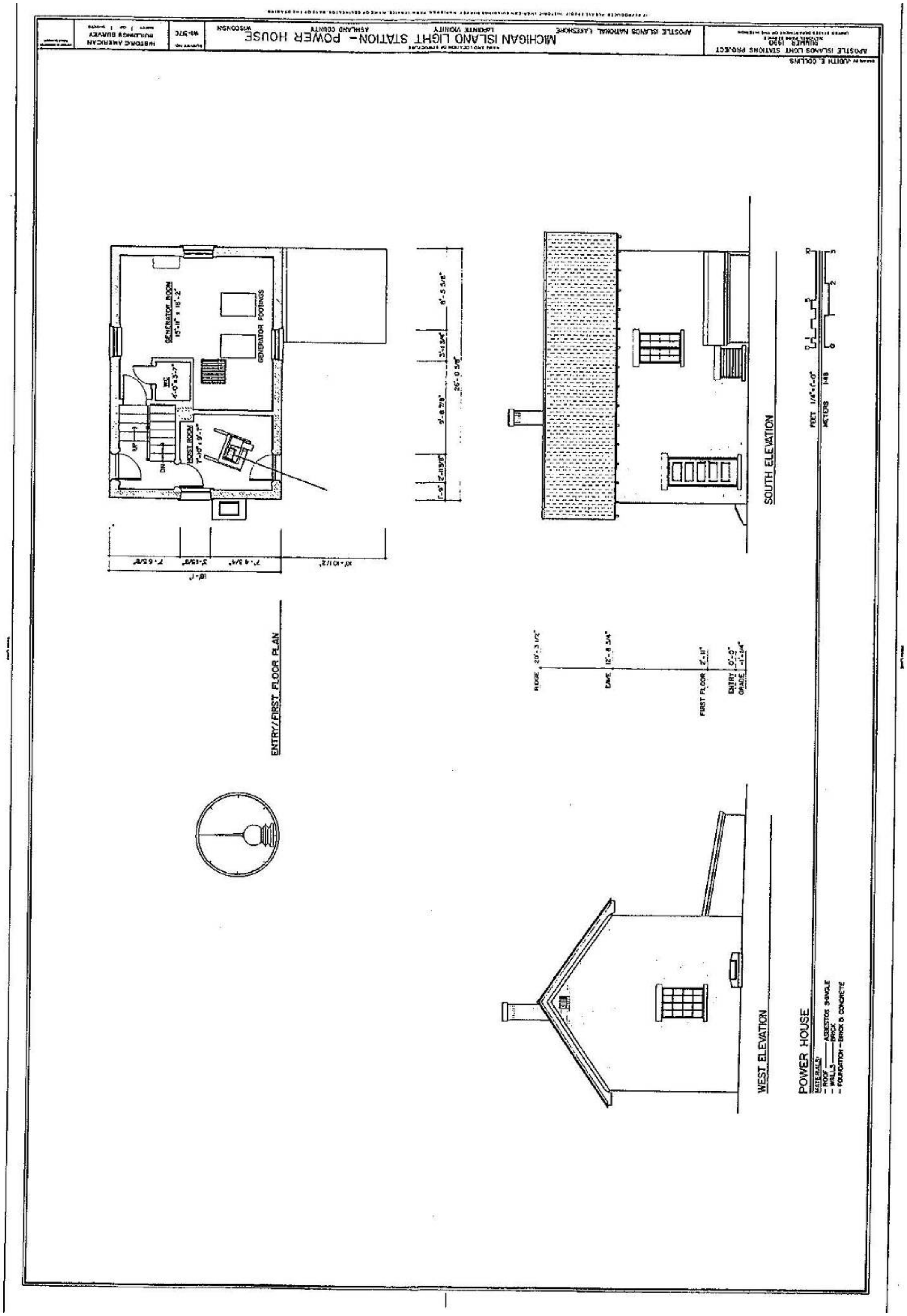
The primary and secondary buildings on Michigan Island were documented in the summer of 1990 by a team from the Historic American Buildings Survey (HABS). Since 1933, multiformat surveys in cooperation with government agencies have recorded the built environment in the United States. Measured drawings, large-format photographs and written histories have defined the survey technique for historic structures. The HABS collection currently contains detailed surveys on more than 38,600 historic structures. The following 10 drawings contain the measured drawings produced by the HABS survey from 1990.

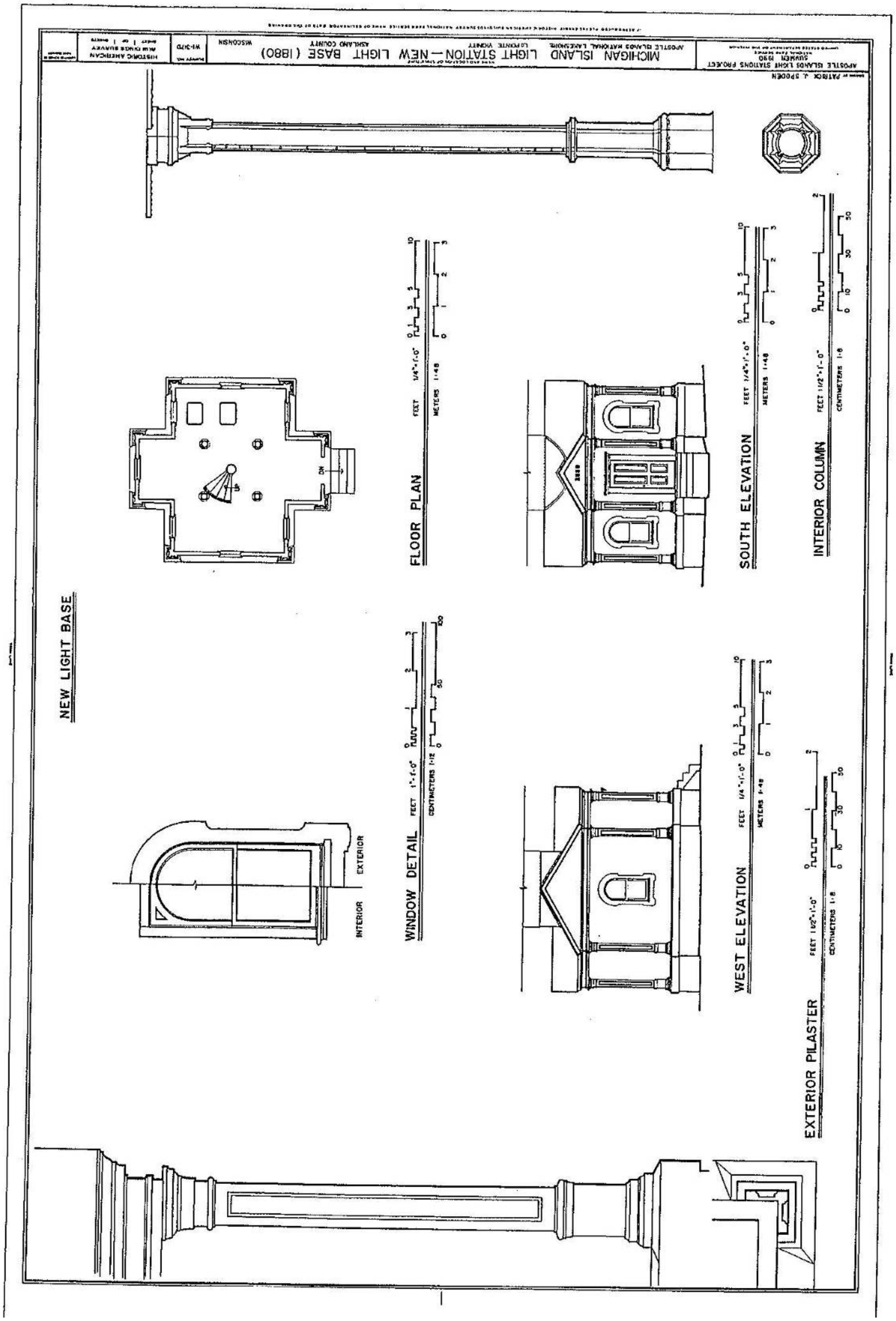
Typically, utilitarian buildings are not included in the HABS survey. In September of 2009, the architects and historic preservation specialists from Anderson Hallas Architects, PC surveyed the Shed and Privy on Michigan Island. These measured drawings have been included following the HABS drawings.


MICHIGAN ISLAND LIGHT STATION
APOSTLE ISLANDS NATIONAL LAKESHORE
ASHLAND COUNTY
WISCONSIN
SITE PLAN
PLANTING LIST
LAKE SUPERIOR
BEACH
KEEPER'S HOUSE
POWER HOUSE
ORIGINAL FOUNDATION
HISTORIC CROQUET LAWN
OUTHOUSE
SHED

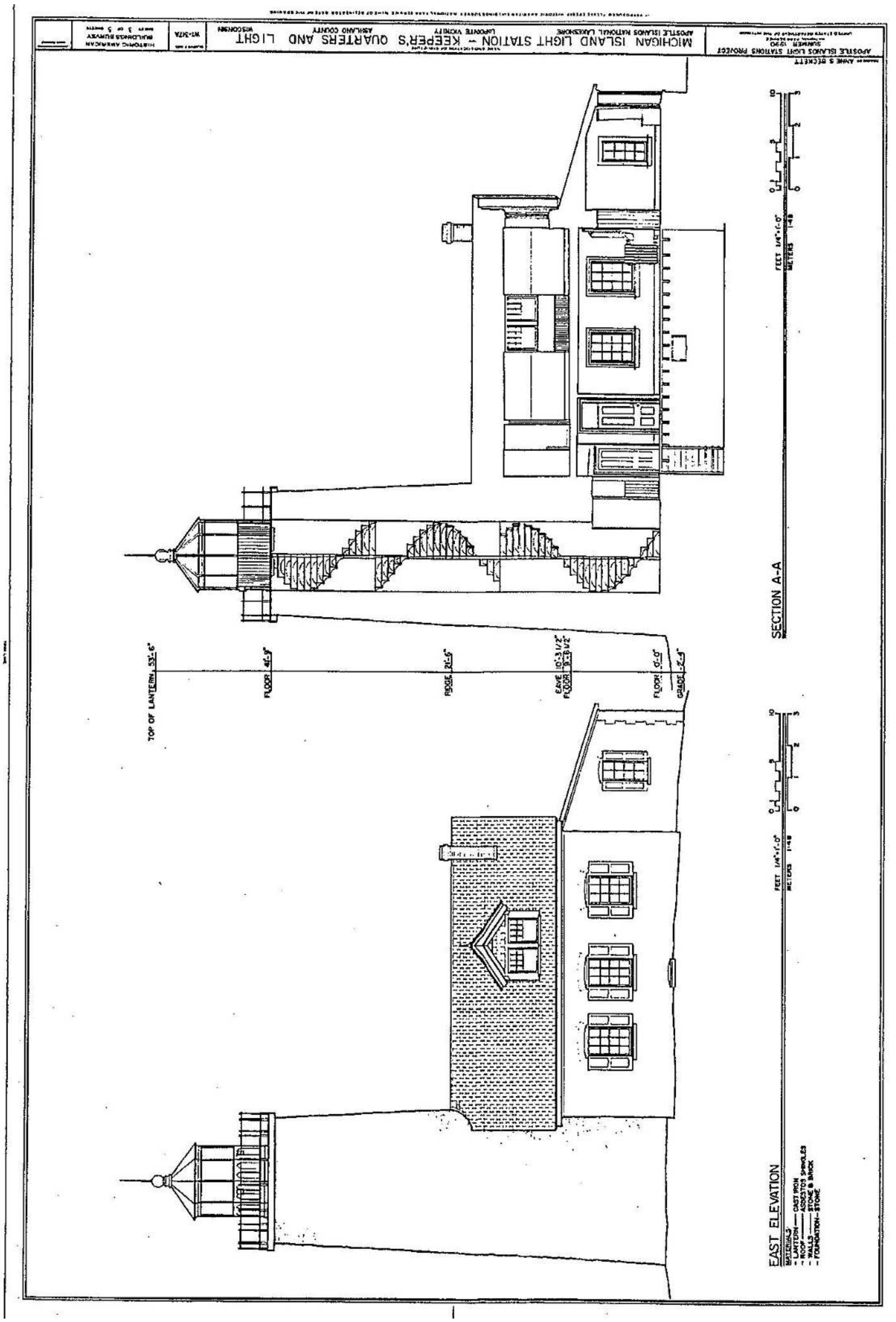

MICHIGAN ISLAND LIGHT STATION - KEEPER'S HOUSE
SECOND FLOOR PLAN
FIRST FLOOR PLAN

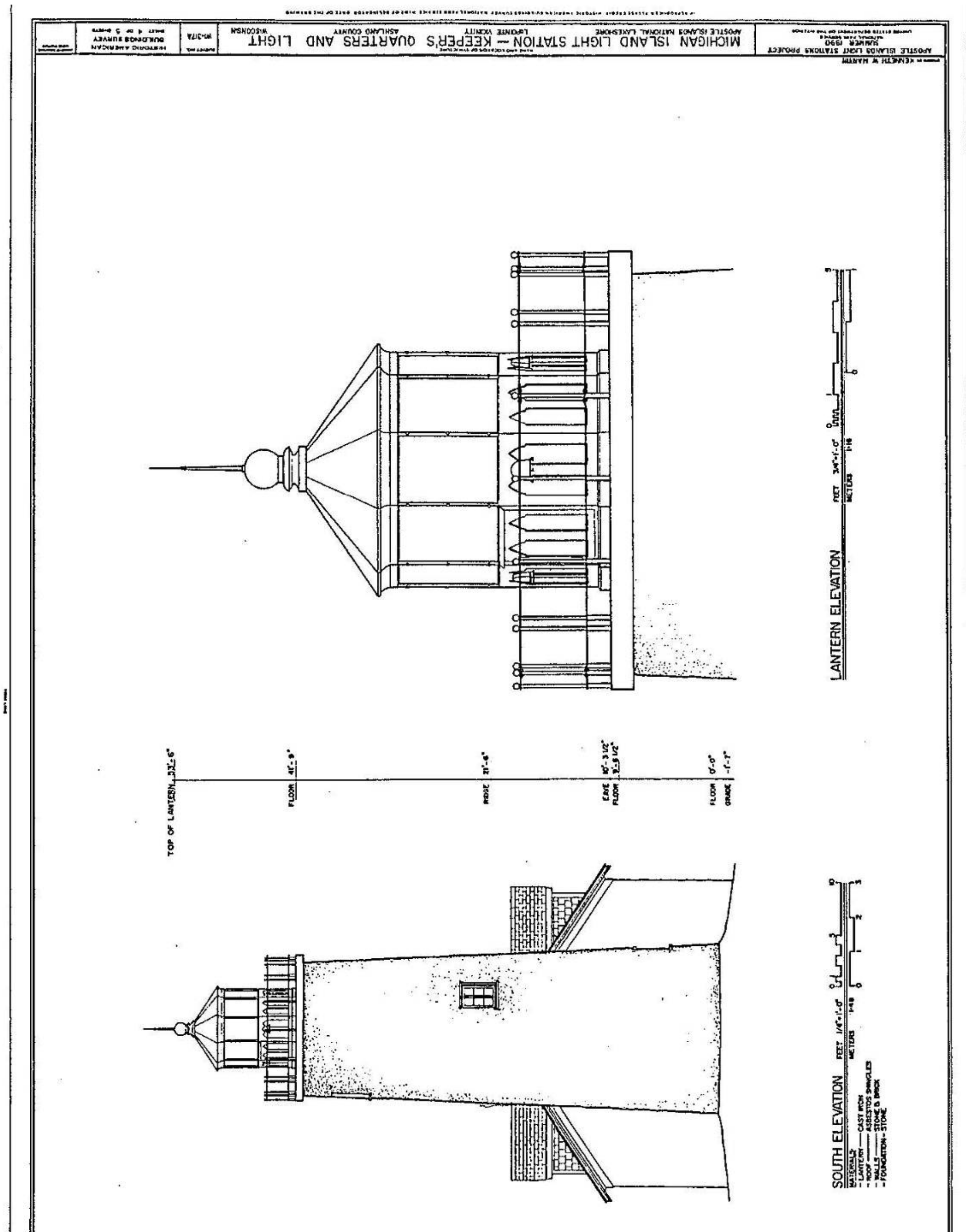

MICHIGAN ISLAND LIGHT STATION - KEEPER'S HOUSE
EAST ELEVATION
SOUTH ELEVATION

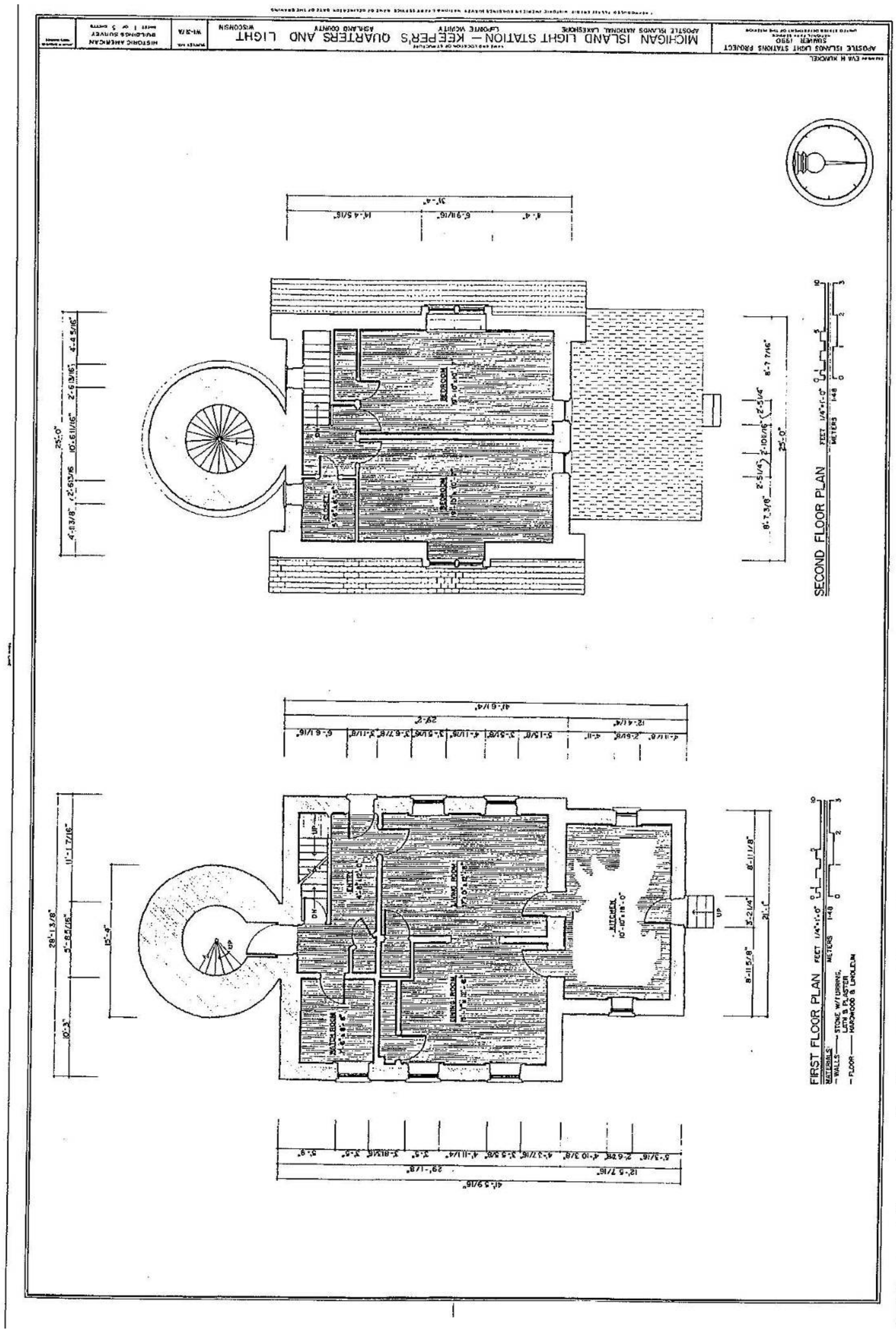

MICHIGAN ISLAND LIGHT STATION – POWER HOUSE
ENTRY/FIRST FLOOR PLAN
SOUTH ELEVATION
WEST ELEVATION
POWER HOUSE

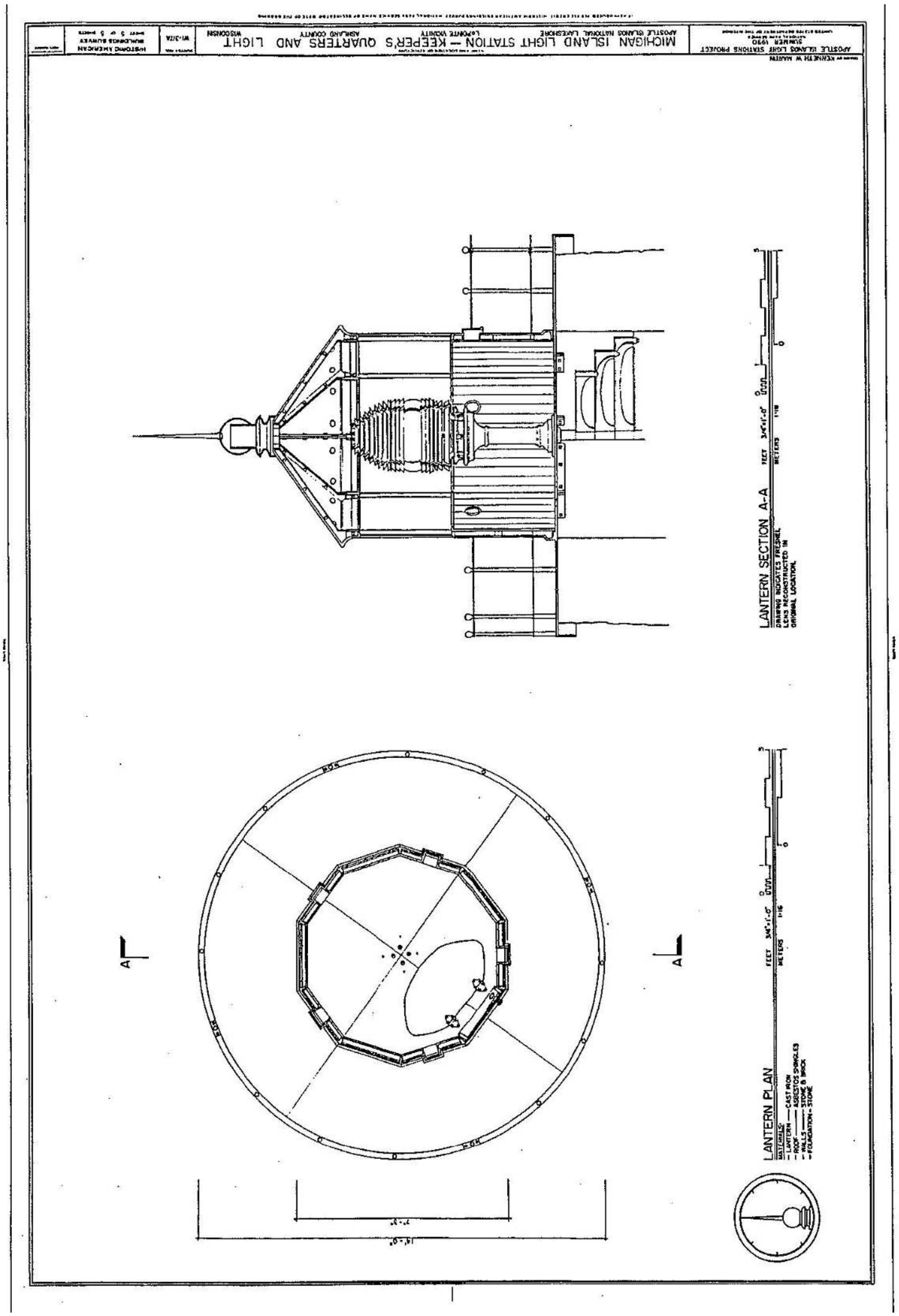


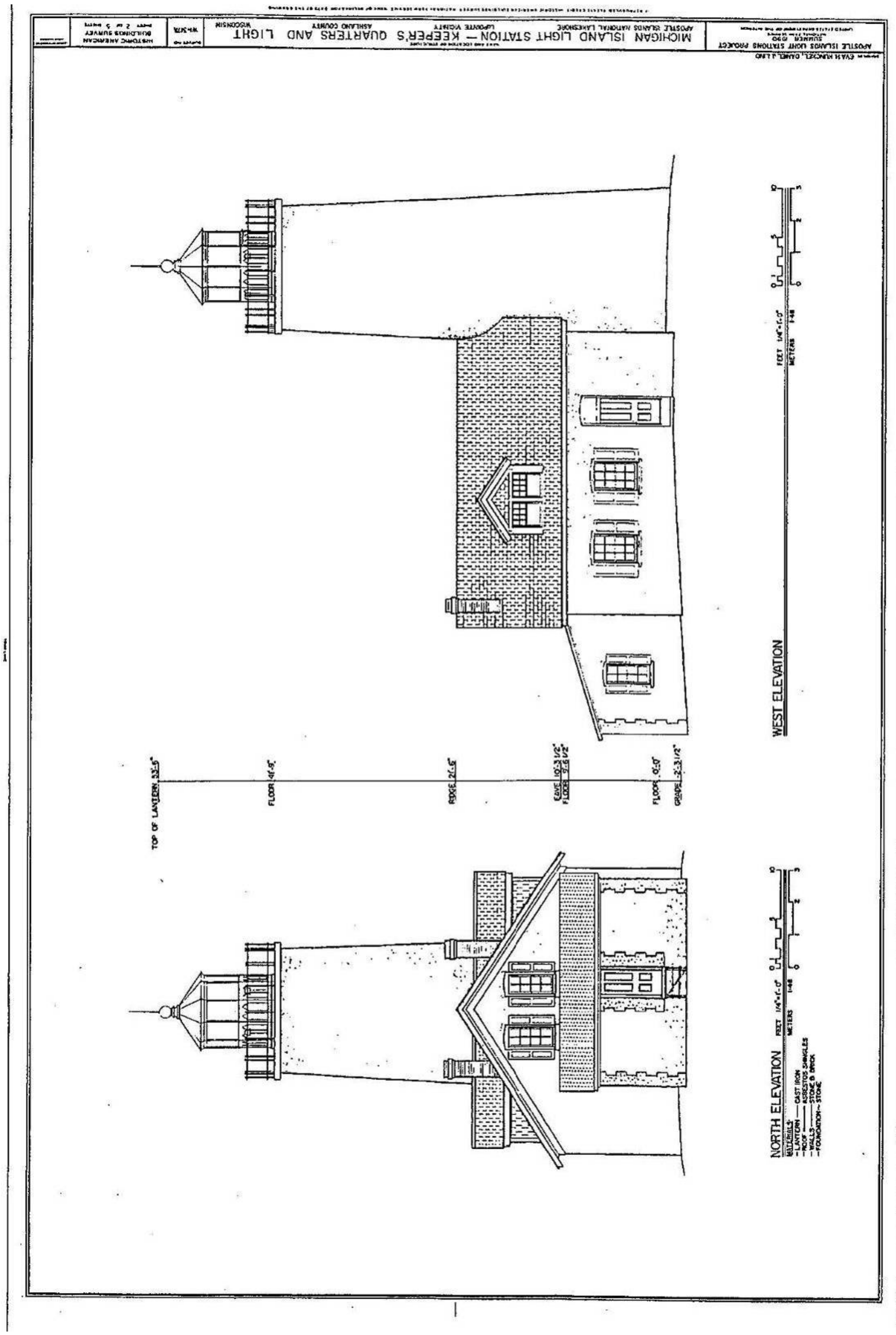
MICHIGAN ISLAND LIGHT STATION — NEW LIGHT BASE (1880)
NEW LIGHT BASE
FLOOR PLAN
WINDOW DETAIL
INTERIOR
EXTERIOR
SOUTH ELEVATION
WEST ELEVATION
INTERIOR COLUMN
EXTERIOR PILASTER

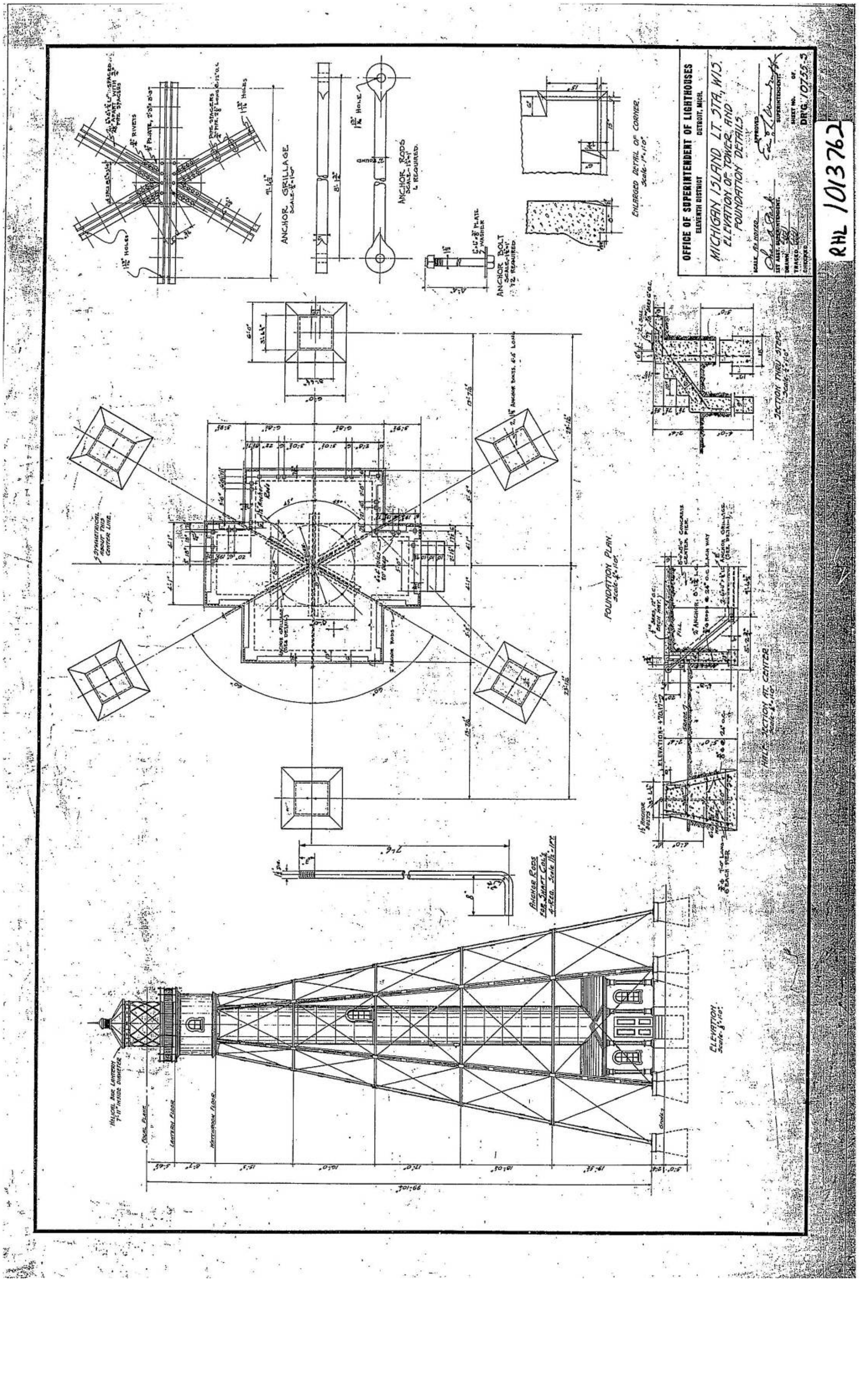

MICHIGAN ISLAND LIGHT STATION ~ KEEPER'S QUARTERS AND LIGHT
APOSTLE ISLANDS NATIONAL LAKESHORE
ASHLAND COUNTY
WISCONSIN
SECTION A-A
EAST ELEVATION
TOP OF LANTERN 53'-6"

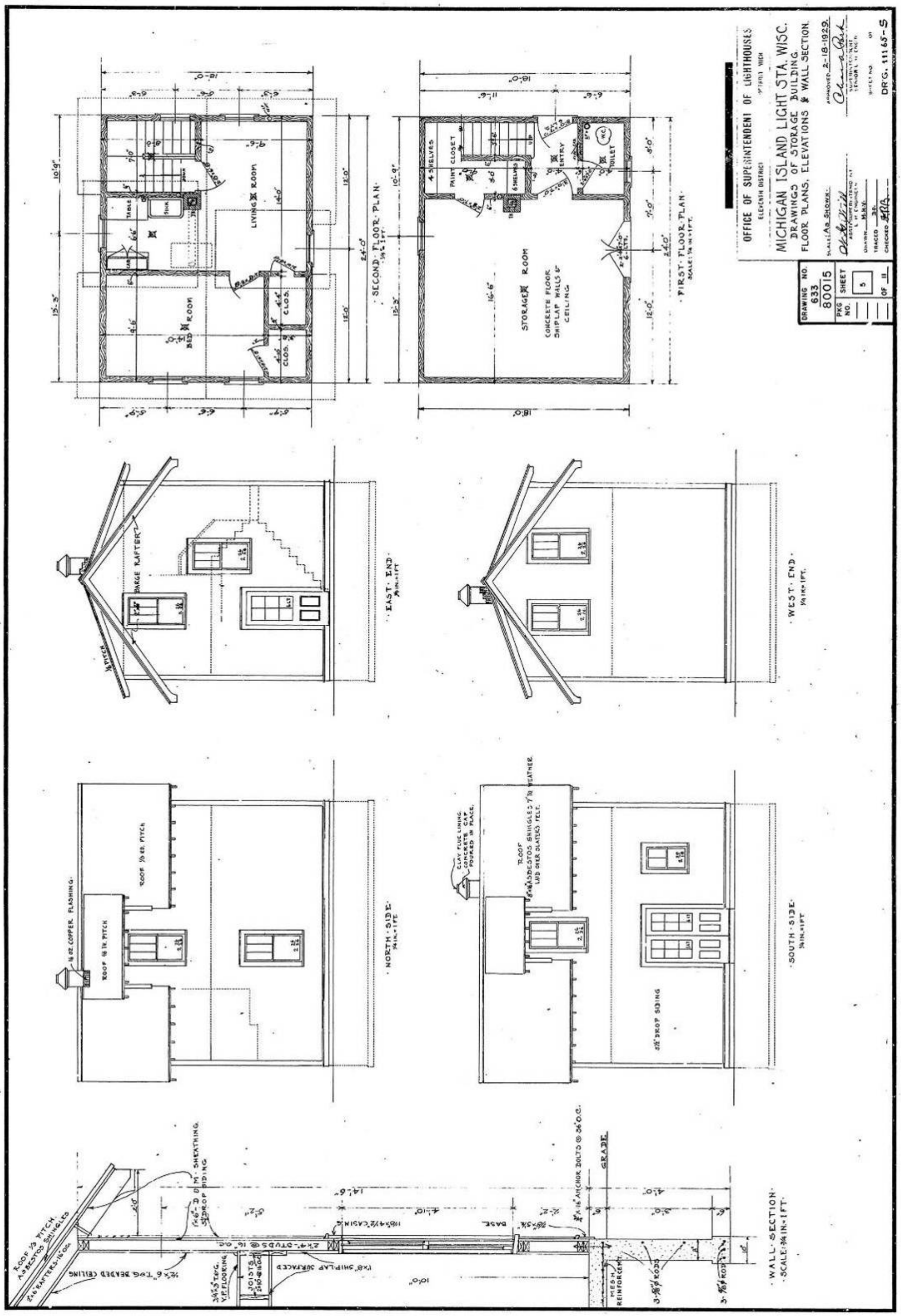

MICHIGAN ISLAND LIGHT STATION — KEEPER'S QUARTERS AND LIGHT
APOSTLE ISLANDS NATIONAL LAKESHORE
ASHLAND COUNTY
WISCONSIN
APOSTLE ISLANDS LIGHT STATIONS PROJECT
LANTERN ELEVATION
SOUTH ELEVATION
TOP OF LANTERN

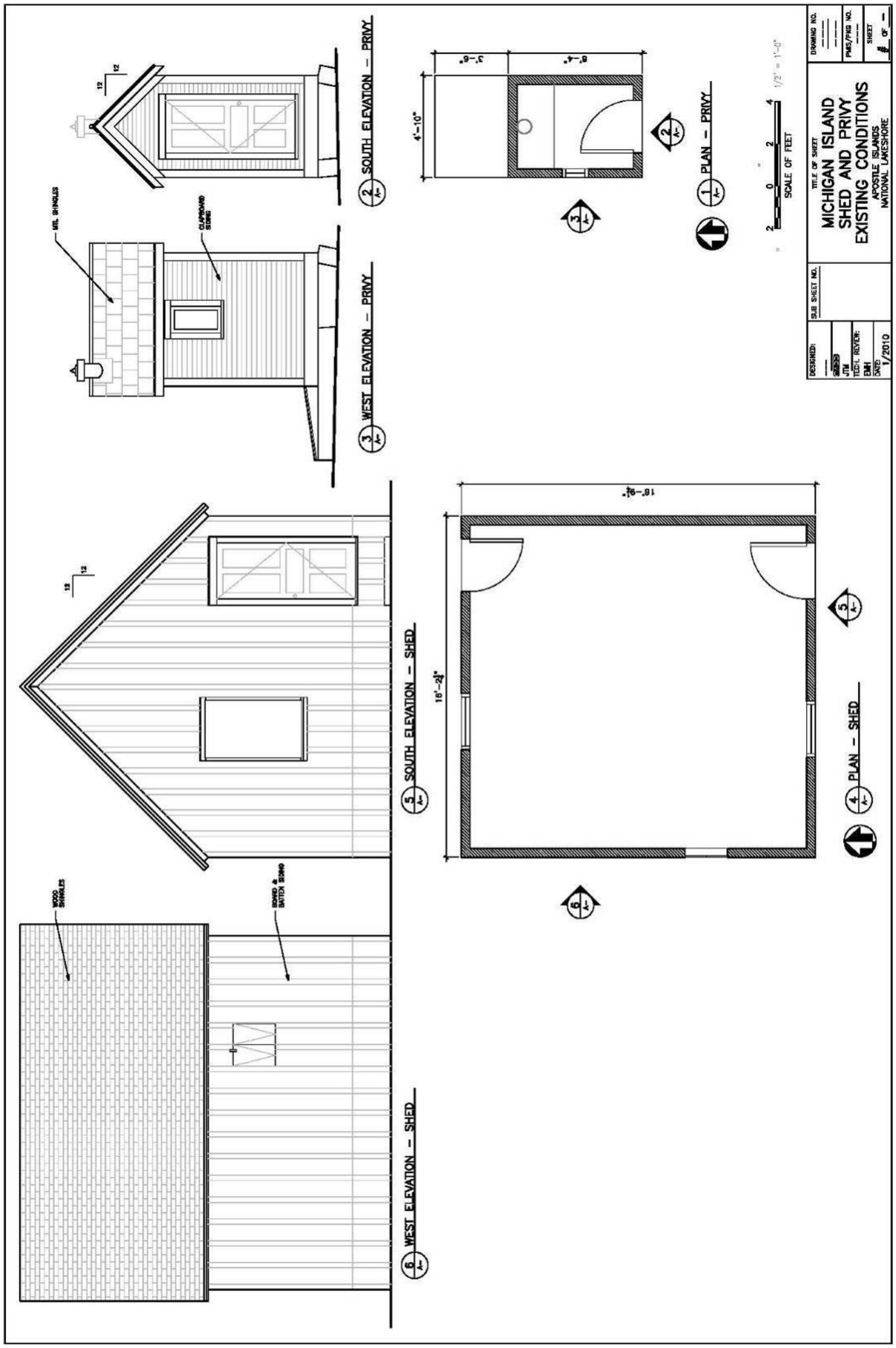

MICHIGAN ISLAND LIGHT STATION — KEEPER'S QUARTERS AND LIGHT
SECOND FLOOR PLAN
FIRST FLOOR PLAN
KITCHEN
LIVING ROOM
DINING ROOM
WATCH ROOM
BEDROOM
CLOSET


MICHIGAN ISLAND LIGHT STATION — KEEPER'S QUARTERS AND LIGHT
LANTERN SECTION A-A
LANTERN PLAN
A
A


MICHIGAN ISLAND LIGHT STATION — KEEPER'S QUARTERS AND LIGHT
APOSTLE ISLANDS NATIONAL LAKESHORE
ASHLAND COUNTY
WISCONSIN
APOSTLE ISLANDS LIGHT STATIONS PROJECT
HISTORIC AMERICAN BUILDINGS SURVEY
TOP OF LANTERN 53'-5"
FLOOR 41'-9"
RIDGE 21'-6"
EAVE 10'-3 1/2"
FLOOR 9'-6 1/2"
FLOOR 0'-0"
GRADE -2'-3 1/2"
WEST ELEVATION
NORTH ELEVATION
MATERIALS
LANTERN — CAST IRON
ROOF — ASBESTOS SHINGLES
WALLS — STONE & BRICK
FOUNDATION — STONE


OFFICE OF SUPERINTENDENT OF LIGHTHOUSES
ELEVENTH DISTRICT
DETROIT, MICH.
MICHIGAN ISLAND LT. STA. WIS.
ELEVATION OF TOWER AND
FOUNDATION DETAILS
RHL 1013762
FOUNDATION PLAN
ELEVATION
ANCHOR GRILLAGE
ANCHOR RODS
ANCHOR BOLT
ENLARGED DETAIL OF CORNER


OFFICE OF SUPERINTENDENT OF LIGHTHOUSES
ELEVENTH DISTRICT
MICHIGAN ISLAND LIGHT STA. WISC.
DRAWINGS OF STORAGE BUILDING
FLOOR PLANS, ELEVATIONS & WALL SECTION.
DRAWING NO. 633 80015
SECOND FLOOR PLAN
FIRST FLOOR PLAN
LIVING ROOM
BED ROOM
STORAGE ROOM
CONCRETE FLOOR SHIPLAP WALLS & CEILING
PAINT CLOSET
ENTRY
TOILET
EAST END
WEST END
NORTH SIDE
SOUTH SIDE
WALL SECTION
GRADE


MICHIGAN ISLAND
SHED AND PRIVY
EXISTING CONDITIONS
APOSTLE ISLANDS
NATIONAL LAKESHORE
SOUTH ELEVATION – PRIVY
WEST ELEVATION – PRIVY
PLAN – PRIVY
SOUTH ELEVATION – SHED
PLAN – SHED
WEST ELEVATION – SHED
SCALE OF FEET
4'-10"
1/2010

OLD MICHIGAN ISLAND LIGHTHOUSE

Chronology of Alterations and Use

Original Construction

The Old Michigan Island Lighthouse was constructed in 1856, at a cost of $12,000 (triple the original budget) and was put into service in June, 1857. Original plans for the building reflect the building much as it is today. Variations in the interior layout are fairly minor and probably represent builder preferences as well as later reconfigurations. Of note is the one-story, shed-roofed room at the north end of the quarters, called out as the "laundry" on the 1856 plans. Although there is some discussion in extant documentation about its enclosure, early photographs record this portion of the quarters as an enclosed structure. Physical evidence indicates that its most recent use was as the kitchen.

After operating only one year, the lighthouse was abandoned until the late 1860s when it was relit to support increased shipping traffic. During this period of neglect, the quarters and tower fell into disrepair and were the targets of scavengers. Reestablishing the Lighthouse required extensive rehabilitation that included new windows, doors and trim and repairs to interior finishes. Although it appears that sometime during the ensuing years, the tower's wood, circular staircase was replaced by cast iron, there is no further record of alteration until 1914, when dormers were added to the east and west elevations of the second floor.

In 1929, the light was decommissioned permanently when the new, Second Tower was erected and put into service. The quarters, however, shared in the site's transformation and experienced its second major rehabilitation as it became the home for the Assistant Keeper. The 1929 rehabilitation drawings show elevations for an extension of the kitchen's shed roof to provide shelter for the exterior kitchen stairs (unknown if it was built) as well as changes to the floor plan with the installation of an interior bath in the watch room (Historic Drawings MI-07 and 08).

A 1904, circa 1910, and a 1913 photo each show the Old Lighthouse without dormers and document the Shed and Privy (Historic Image MI-01, 02, and 03). A 1913 photo shows a board and batten boathouse and dock in the foreground with the tower and quarters in the background. The boathouse and dock no longer exist (Historic Image MI-04). A 1975 photo reveals the windows without shutters, suggesting they were being rehabilitated at this time or had been removed (Historic Image MI-15). A 1976 photo shows the shutters back on and in-use, as the house currently looks to most visitors. The shutters are most likely in-kind replacements (Historic Image MI-16).

Significant Alterations / Current Condition

Significant alterations to the Old Michigan Island Lighthouse consist of: the work that occurred in the late 1860s after it had been abandoned for a number of years (described in the 1869 Letter from W.F. Raynolds, Lighthouse Engineer, to Rear Admiral W. B. Shubrick); in 1914 when the dormers on the east and west elevations were installed (construction drawings from the APIS Archives); and in 1929 when the Second Tower and Keepers Quarters were completed. The 1929 alterations included a modernization of the kitchen appliances and new cabinetry, the installation of new base trim (the same used in the Keepers Quarters) and the addition of linoleum flooring and possibly carpet flooring. These alterations were made for the building's new residents, the assistant keeper, and his family.

The majority of the mechanical systems were installed during the 1929 remodel with additional work to the sewer and septic system completed in 1932.

Electrical wiring and equipment was retrofitted into the building in 1929 when the building was remodeled. Code compliance would have been regulated by the National Electrical Code of 1928. The National Electrical Code has changed over the years, and although the provisions of the NEC of 1928 were followed, most system requirements have changed significantly since then.

Between 1998 and 2009, the Historic Structure Preservation Team of the Park Service rehabilitated the Old Michigan Island Lighthouse by trying to mitigated the bat infestation (unfortunately, bats are still inhabiting the structure), repairing deteriorated sections of the roof and soffits, installing caps on the chimneys, adding basement ventilation louvers, and reparging and painting the exterior masonry tower section.

The Old Michigan Island Lighthouse is in stable condition. There are areas in the second floor ceiling finish that are deteriorated or missing and the attic is visible. Some of this damage is due to the bat infestation that is still a problem. The moisture levels in the first floor framing were measured above 30% and this will lead to deterioration of the wood.

Summary of Documented Work on the Building

Date	Work Described	Source of Information
Annual Report of 1869	"The light here, discontinued and abandoned since 1858, was put in operation again on the 15th of September last. The repairs required amounted to but little less than rebuilding it."	"1869 Annual Report of the Lighthouse Board," Michigan Island Light in annual reports 1850–1920
c.1869 (stated in March)	New "summer kitchen" added to Quarters	1869 Letter of Alterations
c.1869 (stated in March)	New "wood-shed" added to Quarters	1869 Letter of Alterations
c.1869 (stated in March)	New doors and windows	1869 Letter of Alterations
c.1869 (stated in March)	Privy built	1869 Letter of Alterations
c.1869 (stated in March)	Roof fitted with projecting eaves and new shingles	1869 Letter of Alterations
c.1869 (stated in March)	New wooden sash for tower windows	1869 Letter of Alterations
c.1869 (stated in March)	Wooden Tower stair repaired	1869 Letter of Alterations
c.1869 (stated in March)	New lantern installed with 14-foot-diameter cast iron deckplate	1869 Letter of Alterations
1881	Sidewalks laid from the Lighthouse to the Privy	1881 District Engineer Letter
1914	Dormers added to east and west elevations	1914 Michigan Island Elevations
1927, April 18	"Repaired walls with plaster in Assistant's room and hallway."	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1927, June 24	"Repaired Tower window frame, and put in three panes of glass. All was broken when window was torn from Tower [due to storm]"	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1927, August 25	"Varnished Tower stairway, and repaired walk at back of house."	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1928, May 1	"Painted in Lantern. Whitewashed dwelling; painted window blinds, doorstep; and varnished linoleum in hallway."	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1929	Second Tower and Keepers Quarters completed, Old Quarters altered for Assistant Keeper with new asbestos shingle roofing, new gutters and raising of the Kitchen shed's floor and ceiling	Floor Plan Alterations, c.1929
1929	New kerosene water heater installed in the kitchen to supply hot water to the bath and kitchen	Floor Plan Alterations, c.1929
1930, Sept 4	"Putting asbestos covering on pipes in Assistant's dwelling [Old Lighthouse Quarters]…"	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1932, August	Aug 18: "Worked in Assistant Keeper's dwelling putting in sewer and finished job this evening."	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1933, May 8	"Replaced four frames of glass in First Assistant's dwelling."	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1933, Oct 24	"Snow broke eaves on Assistant's house. Repaired same."	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1974	Shutters installed on Old Lighthouse	APIS/NPS Business Office File D3423
1975	Stabilization of Old Lighthouse	APIS/NPS Business Office File D3423
1976	Repair drainage at Old Lighthouse	APIS/NPS Business Office File D3423
1976, August 12	Whitewashed Lighthouse	From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 1
1979	Repoint and paint exterior wall of the Old Lighthouse	APIS/NPS Business Office File D3423

Date	Work Described	Source of Information
1981, August 12	"The roofing is continuing to move right along." (Sue Osman with Chris Vetta)	From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 3
1984, August 22	Fan in basement of Quarters installed	From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 6
1985, June 14	Mention of "'Dickson Meter' humidity observation system" (Terry Blomberg, VIP)	From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 7
1988, June 27	:..4 archeologists arrived. They are digging to find if the water (moisture) mitigation team will do any damage to the archeological history of the 1857 Lighthouse." (Hazel Keller, VIP)	From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 12
1988–1989	Moisture mitigation	From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 14
1991, July 1	Basement has 4" of standing water	From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 18
1994, September 1-2	Asbestos crew removes asbestos in basement of Keepers Quarters and Old Quarters	From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 22
1998, July to 1999, August	Exterior of quarters and tower painted and rehabilitated; interior cleaned and all equipment and material removed	HSPT Reports, 2009 and From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," pages 24-25

Notable Actions with Unknown Dates

Date Range	Work Described
1856-1869	Six windows with 12 lites each, 8" by 10" dimension, stone headers and sills, installed in Lighthouse
1856-1869	6' by 3' door with stone header and threshold, installed in Lighthouse
1856-1869	Sewer installed
1856-1869	Lightning rod of ½" copper, extended 4' above the lantern and 4' into the ground
1998–2009	Mitigated bat infestation
1998–2009	Repaired deteriorated sections of roof and soffits
1998–2009	Capped chimneys
1998–2009	Added basement ventilation louvers

General Physical Description

The Old Michigan Island Lighthouse is a one-and-a-half story masonry building with a gable roof, two gable dormers on either side of the ridge and two brick chimneys at the north end on either side of the ridge, and a single story shed roof at the north end with the light tower on the south end, closest to the lake. There are three rooms on the first floor and two rooms on the second floor.

Physical Description – Architecture

Architecture – Roof

The existing roofing consists of asbestos shingles, 9" wide × 7" exposure, and metal, possibly galvanized, flashing c. 1929. The 1929 alteration drawings specify asbestos shingles by Ambler Asbestos Slate and Sheathing Company. These drawings also call for "felt roofing" at the north Shed (possibly due to the shallower roof pitch), however, it appears that the same asbestos shingles were installed throughout. There is a curved trim piece at the ridge of the main gable and dormers. There is also a step flashing at the

chimneys and metal flashing at the valleys of the dormers. There is no flashing visible at the dormer wall/roof juncture, but it could be concealed beneath wall shingles (MI-OLH-06).

The original roofing was likely wood shingle due to the use of open-spaced sheathing (now filled in with blocking) and as visible in photos as early as circa 1900.

The eave wood trim consists of raked soffit extending ±1'2" at the main roof, ±8" at the dormers and shed roof, with a 1x fascia and frieze board, all painted. Records from the park indicate soffit repair work within the past 11 years. Two paint samples were taken at the frieze boards – one from the main gable roof and the other from the kitchen shed roof. The main gable roof trim has six layers of paint, the oldest having separated from the wood substrate, while the shed roof trim has only two layers of latex paint, like the shutters. Rehabilitation of the trim may have occurred around the time of the installation of the shutters in 1974.

Architecture – Gutters and Downspouts

No gutter and downspout system currently exists, however historic photos circa 1904, 1910 and after the dormer construction of 1914, indicate a Yankee gutter at least on the west facing roof (Historic Images MI-01, MI-02, and MI-05). The Yankee gutter slopes to dump into the east side cistern. The 1929 alteration drawings called for a new galvanized box gutter and downspout system to drain into a clay pipe underdrain. An undated color photo shows a gutter and downspout, so it is assumed the gutter system was installed, although it is unknown if the underdrain was installed.

Architecture – Chimneys

There are two original brick chimneys flanking either side of the ridge of the main gable. The east chimney may have had a parge coating applied at the time as it is a whitish color versus the clear red brick coloration of the west chimney. There are bricks located in the west second floor bedroom near the west chimney that suggest recent masonry work. A cap of galvanized sheet metal and what appears to be one of the composite replacement roof shingles have been installed at both chimneys (MI-OLH-06).

Architecture – Exterior Walls

The original exterior walls are rubble stone with a white-washed parge coat finish. The north one-story shed has brick "quoins" at corners, north door, and east window openings (not at west window). In 1998, the exterior of the tower was repainted with Liquitex previous paint layers, which were not stripped. Additionally, an alternate test patch of coating (stain) was documented and applied by the park staff and appears to be holding up better than the Liquitex paint. The walls in general have peeling paint and staining at the base, which is partly due to no control of the roof drainage. The interior humidity may also be contributing to masonry damage at the Lighthouse Tower.

Architecture – Dormers

There are two wood-framed gable dormers at the second floor level projecting from the roof plane - one facing west, the other facing east. The dormers' exterior walls on the north and south appear to be asbestos shingles. The shingles above the windows are wood that appear to be a contemporary treatment. The dormers are not original, but are historic as they were added to the house in 1914 (MI-OLH-06, 07, 08, and 09).

Architecture – Windows

Six-Over-Six Lites, Double Hung. These windows are located on the first floor of the Lighthouse quarters (excluding the kitchen). This window type appears to have a replaced sash with reused original panes (where available). The profile of the muntins is very simple – shallow bevel with no detail. There is no evidence of original hardware. The windows have wood shutters at the exterior (two panels each), 3” wood sills, and segmented brick arch headers. (A paint sample was taken of the wood shutters and the results indicate that the shutters are not original as both layers of paint are latex.) The 1x exterior trim is painted green, while the interior trim is painted white. The interior trim matches the original, decorative interior door trim. Wood sills are 1” wood with simple 1x5 skirts. There is roller shade hanger hardware at most of the windows and some roller shades located in the window seat on the second floor. The typical dimension of these double hung windows is 2’10” × 4’6”.

Four-Over-Four Lites, Double Hung. These windows are located on the first floor, in the kitchen, and on the second floor in the north and south walls. This type of window appears to have a replaced sash with reused original panes (where available). The profile of the muntins is very simple – shallow bevel with no detail. There is no evidence of original hardware. The windows have wood shutters at the exterior (two panels each), 3” wood sills, and segmented brick arch headers. The 1x exterior trim is painted green, while the interior trim is painted white. Wood sills are 1” wood with simple 1x5 skirts. There is roller shade hanger hardware at most of the windows and some roller shades located in the window seat on the second floor. The typical dimension for these double hung windows is 2’0” × 4’6”.

Eight-Over-One Lites, Double Hung (Paired). These windows are located on the second floor in the 1914 addition dormers. The muntins have a shaped profile. Operation is controlled by sash cord and pulleys. One window has the original thumb-turn latch at the meeting rail. The windows have plywood panels covering the exterior, painted green. They also have 1x exterior trim painted green, while the interior trim is painted white. The interior trim is 1x. Interior sills are 1” with 1x5 skirts. There is roller shade hanger hardware at most of the windows and some roller shades located in the window seat on the second floor. The typical dimension of a pair is 2’6” × 3’0” (MI-OLH-29 and 31).

Two Leaf, Three-Lite Casements. These windows are located in the Lighthouse Tower and have metal frames with wood sash. This window type appears to have replacement sash with reused original panes (where available). The sash has a simple beveled profile at the muntins. The interior trim and frame is painted. The typical dimension for a pair is 2’2” by 3’0”. (A paint sample from the window was taken and reveals multiple layers of whitewash, like the tower walls) (MI-OLH-34).

Architecture – Exterior Doors

Main Entry Door. This door is a four panel wood door with a two-lite transom. Both are deeply recessed into the exterior wall set at the plane of the interior of the wall. The masonry opening is arched. Hardware is comprised of the original knob with integral key on a mortised plate at the interior face, separate dead bolt keyed on the exterior/ thumb turn at the interior face, and three hinges. The exterior trim of the door and transom are 1x wood and the interior trim is decorative (an ogee profile with beaded edge, 5½” wide). The door and transom are painted green on the exterior and white on the interior. There is evidence of a possible screen door (notches and hardware holes), which is seen in a historic photo circa 1914. The cast concrete sill is sloped toward the exterior and the 1x threshold is beveled wood. The door is 2’8” × 6’9” × 1¾” (MI-OLH-12).

Kitchen Entry Door. This door is a four-panel wood door deeply recessed into the exterior wall. The upper panels are original glass. Hardware is comprised of the original knob with integral key on a mortised plate at the interior face, separate dead bolt that is keyed on the exterior/ thumb turn at the interior face, and three hinges. The exterior mortised plate is decorative with raised “BLW” initials. There is a padlock on the door. The exterior trim is 1x wood with a decorative, shaped, 1x stop at the door face. The exterior trim is

green while the exterior frame, door, and interior door and trim is white. The interior trim is ¾” by 4½”. The sill is 4x full width and depth and the threshold is 1x wood (beveled). There are three wood steps up to the door (MI-OLH-13).

Architecture – Exterior Trim
Refer to roof section.

Architecture – Tower Walk, Railing, Roof, and Finial
The walkway is 3” to 3½” wide plate metal. The top rail of the railing is ⅝” × 1¾” bar stock at 34” above the walk. The bottom rail is ⅜” × 2¼” bar stock at 9½” above the walk. The metal posts are 1¼” in diameter with ball finials. The entire assembly is painted black. The roof structure is constructed of segmented cast iron sections, with fascia and a simple ball finial. The finial has air vents which, in combination with the wall openings, provide ventilation at the lantern (MI-OLH-38 and 42).

Architecture – Tower Lantern
The lantern has a 10-sided base of 3’7” high plate metal. Each segment has recessed panels in a Gothic arch configuration. The typical segment is 2’4” wide and is secured by a 1⅜” × 1” triangular stop that is screwed into the 1” × 2” triangular metal framing member at the interior. The interior finish is 1” × 4½” tongue and groove wood, oriented vertically, and painted. The glazing continues 3’3” up to the base of the roof and is modern, “Viracon Tempered 16 CFR 1201 11 SGCC 1404 ¼” U Ansi Z97.1 1984.” The floor of the lantern is cast iron. There are a series of drilled holes of unknown origin. However, they likely currently facilitate the ventilation. There are five openings for the original intake vents but none of the cap controls at the interior are extant (MI-OLH-37).

Architecture – Interior Doors
Four-Panel Door (Typical Interior Door). This door type is four panel, wood, painted, and original (or early) to the building. The trim is also original and is the same as the base trim used in the main rooms. The base trim is ⅞” × 5” with a 2¾” ogee profiled trim piece overlaid ½” beyond the edge of the base trim. The trim is painted. Hardware is comprised of a metal knob with mortised lockset, and typically includes two hinges. The typical dimensions for this door are 2’-8” × 6’-7” × 1¼”. The door to the basement is 2’4” × 6’4” × 1¼” and the second floor bedroom doors are 2’3” × 6’4” × 1¼”. The opening to the first to second floor stairs is 2’3” × 6’4” above step, and it has the original trim.

Five-Panel Door. These doors are five-panel wood doors with raised panels. The painted trim is also original and is the same as the base trim. It is built-up ¾” × 4¼” with rounded edges and the overlay at the outside edge is an L-shaped trim piece (1” × 1⅛” × ±¼”). Both sides of each door have mortise plates and each door has two ball hinges. The opening between the living room and the dining room has trim that matches this type of door. The entry closet’s door dimensions are 2’0” × 6’7” × 1¼”. The watch room/bath door is 2’6” × 6’7” × 1¼”. The second floor closet doors are 2’0” × 6’4” × 1¼”.

Metal Door between Light Tower and Quarters. This plate metal door is original to the building and was at one time painted white. The door is reinforced by ½” × 1½” bar frame which is riveted to the door. It has a thumb press/lever lift set in a metal angle frame. The door also has two heavy pin hinges. The door is 3’0” × 7’0” × ±⅛”.

Hatch in the Lantern Floor. This is a metal plate floor hatch original to the Lighthouse Tower. There is a hinged metal catch and two heavy brass hinges. The hatch is 2’0” × 4’0” × ¼” (MI-OLH-40).

Access Door to Walkway. This original door is plate metal with recessed panels in a Gothic arch configuration. The door is painted, has a handle operated with a throw bolt, and has two heavy duty hinges. The door is 2'0" × 2'10" × ½" (MI-OLH-41).

Architecture – Wall Finishes

The typical wall finish in this building is the original plaster over lath, except for the basement which has unpainted masonry walls. The wall finishes for the kitchen, entry to the tower, and the tower itself have plaster over masonry. The entry to the tower has wood board wainscot painted white. The interior recessed doorways in the kitchen have wood bead board framing the entire opening. A paint sample from the tower wall shows that, like the tower windows, the walls have multiple whitewash layers.

A plaster sample from the kitchen indicates that the plaster is a mixture of gypsum and sand, as opposed to lime and sand. The sand is relatively fine and the plaster is very soft.

A plaster sample from the watch room/bath is similar to the plaster mixture from the kitchen with an added very thin skim coat.

A mortar sample from the Lighthouse Tower indicates the mortar was composed of natural cement and sand. The plaster is a tan color, moderately hard, with very fine sand.

A plaster sample from the entry closet plaster is almost identical to the watch room/bath plaster.

Architecture – Ceiling Finishes

The typical ceiling finish for this building is the original plaster over lath. The kitchen's plaster over lath ceiling finish may have been added after the building was constructed. The finished ceiling was dropped and would have been added when this room's function was changed to a year-round kitchen (MI-OLH-21 and 22). The basement has no ceiling finish as the floor framing for the first floor is exposed. The tower's ceiling finish is the underside of its metal ten-sided roof with its center vent and has several historic manufacturer's markings visible (MI-OLH-39).

Architecture – Interior Trim

There are three primary types of trim in this building. The most elaborate type is in the entry, dining room, watch room/bath, and the second floor bedrooms. The base trim is ⅞" × 8¼" with a 2¾" ogee profile at top. The base shoe is rectangular. The door and six-over-six window casings feature the same 2¾" ogee profile molding atop a simple rectangular casing. This trim is original to the building (MI-OLH-17).

The second type of trim is a less-elaborate, painted, 8" base with an Ogee profile at the top and a simple quarter-round base-shoe. This trim is in the living room and the kitchen. This trim is most likely not original to the building, but historic as it is the same as the trim in the Keepers Quarters and therefore dates to 1929 (MI-OLH-19).

The third type of trim is the simplest as it is a painted board with base-shoe. The living room closet has this type of trim and it is 8" high. The second floor hall also has this style, but the trim is 4½" high. This type of trim is not historic. The Lighthouse Tower has remnants of a base trim around the floor and along the stairs. These trim remnants may be coated with coal tar, as seen at the Outer Island Tower and mentioned in the "Floor" section below.

A paint sample of the tower trim reveals multiple layers of black paint over multiple layers of whitewash. There are no definitive test results regarding the use of coal tar at this location.

A paint sample from the living room trim revealed 18 layers of paint, all in various shades of white, gray, and green. A paint sample of the newer trim in the living room only revealed one paint layer.

Architecture – Floor

The visible floors in this building are varnished 2¼" wood flooring, most likely installed at the time of the bath addition in 1929. The original wood floor, however, is constructed of 5½" wide planks, painted gray. This flooring is seen under the second floor window seat in the west bedroom (MI-OLH-30). There is a linoleum square extant in the kitchen and adhesive residue from linoleum or carpeting in the living room and dining room. The living room, dining room, and entry have carpet nail holes in the base-shoes. The basement floor is poured concrete with a gutter composed of rubble and wood boards lining the edges. The tower floor is also poured concrete with remnants of a black, thick-paint substance (possibly coal tar, see Outer Island Tower, Interior Trim for more details) painted on the floor and as a base trim.

Architecture – Stairs

Exterior North (Kitchen) Stairs. These stairs are painted wood with four open risers, 8½" high for bottom three risers and 6" high for top riser. The treads are 11¼" wide and 2'11¾" long. There is no handrail. It is unknown if these stairs are original to the building or historic.

First Floor to Basement Stairs. These stairs are painted wood with ten, 8" high risers and 12" wide treads that are 2'-8½" long. The nosing protrusion is 1¼" and there is no handrail. The landing from the first floor door to the first tread is 2'2" long and 2'8½" wide. These stairs are original to the building (MI-OLH-15).

First Floor to Second Floor Stairs. These are painted wood stairs with thirteen 8" high risers and 10¼" wide treads that are 2'10" long. The nosing protrusion is 1". There is a partial handrail located on the second floor with a middle horizontal rail but no spindles. This railing is 2'6" tall and 2'1½" long with the top rail dimensions of 2½" (wide) × 4" (tall) and the middle rail dimensions of 1" × 2". The distance from the floor to the top of the middle rail is 1'2". The landing from the first floor to the start of the stairs is 2'3" wide and 3'2½" long. These stairs are original to the building (MI-OLH-27).

Tower Stairs. These stairs are cast iron. There are 24 treads to the first landing (½ circle), 18 treads to the second landing (⅝ circle), and 15 treads to the lantern level. The risers are 8" high. The tread width goes from 1⅛" to 11½" and the tread length is 3'3½". The center pole has a 4" diameter. There are no handrails. These stairs are original to the Lighthouse Tower (MI-OLH-33 and 36).

Architecture – Casework

Entry and Closet. The entry has a painted wood board with hooks. The closet has a wood shelf and rod and a painted hook rack, likely c. 1929 when the closet was shown on the plans.

Living Room Closet. This closet has three existing wood shelves, all painted, likely c. 1929 when the closet was shown on the plans.

Kitchen. The kitchen has a large wood cabinet with a two-door cabinet, two drawers, and a garbage chute on the lower portion and two two-door cabinets on the upper portion. The cabinet was once attached to the north wall but no longer is. Its doors are made of bead board. The cabinet is painted white. The knobs on the doors are brass push button catch knobs, (possibly "Handy Catch" by Keil, New York) and the cabinet has butterfly hinges (each door has two) (MI-OLH-24). It may have been c. 1929 when this room became the kitchen.

Dining Room and Closet. The dining room has a painted wood board between the windows. The closet has a painted wood board, likely c. 1929, and a 9½” wide × 6½” deep unpainted wood shaft in the northeast corner, which is modern.

Lighthouse Tower. The Tower has two wood vertical panel doors, painted white, connected by a hollow passage inside the wall to another smaller opening below. This would have been used for the clock mechanism that would have rotated the lens, but there is no evidence it was ever installed (MI-OLH-35). The Fresnel lens that was installed in 1869 and removed in 1972 has no bull’s eye and was described in historic records as “fixed white,” which suggests there was no need to have a rotation mechanism.[47] There is also a wood cabinet with two doors, painted white, made of vertical board, with the stamp, “Danger, Alcohol Storage, Do Not Light.” These are likely original.

Second Floor Hall Closet. The hall closet has a 3” stained wood hook board, likely c. 1929 when this closet is shown on the plans as an alteration.

Second Floor West Bedroom and Closet. This bedroom has two 2” painted wood boards, likely c. 1929 when this closet is shown on the plans as an alteration.

Second Floor East Bedroom. This bedroom has one 2” painted wood board, likely c. 1929 when this closet is shown on the plans as an alteration.

Architecture – Accessibility
The building is currently not accessible. The west door opening (main entry) is 2’7¾” clear with a grade to finished floor elevation change of 1’0” and consists of one step. The north door opening (kitchen entry) is 2’7” clear with a grade to finish floor elevation change of 2’7¾” and consists of four steps. Within the building, the first floor elevation is consistent to the kitchen due to the 1928–1929 remodel. The opening between the living and dining rooms allows accessibility. It appears that the bathroom door is not wide enough for accessibility. The basement, upper level and tower are not accessible.

Physical Description – Structural

Structural – Foundation
The perimeter foundation system consists of stone masonry. The interior foundations are covered by a concrete slab-on-grade in the basement and the lighthouse and could not be observed.

Structural – Floor Framing
Where accessible, the first floor framing of the main building was measured to be full-sawn (FS) 2x10 joists spaced at about 16’. The joists span approximately 12½’ and are sheathed with solid wood subflooring. The joists are supported on the perimeter foundation walls and FS 10x10 beams. The 10x10 beams span approximately 6’, 9’, and 11’. The beams are supported on the perimeter foundation walls and on two 8” diameter timber columns that bear on 2x wood plates placed directly on the concrete floor slab.

Where accessible, the second floor framing was measured to be FS 2x8 joists spaced at about 16’. The joists span approximately 12½’ and are sheathed with solid wood subflooring. The joists are supported on wood-framed partition walls that are primarily framed with FS 2x4 studs and the exterior masonry walls.

[47] S. Mackreth, 2011.

The original stepped down floor framing of the kitchen could not be measured at the only access point in the basement, but appeared to be FS joists spaced at about 16'. The joists span approximately 11'. The joists are supported on the perimeter foundation and are sheathed with one layer of 1x solid wood subflooring and one layer of 1x solid wood flooring. The original stepped down floor is over-framed with 2x wood joists spaced at about 16" that may have been added in 1929. The joists bear directly on the original floor and appear to be sheathed with solid wood subflooring.

The floor of the lighthouse lantern is constructed of cast iron plates that are bolted together. The plates are supported on the masonry walls of the tower. The floor is accessed via a spiral cast iron stair from the first floor of the main building.

Structural – Roof Framing

The roof framing of the main building was measured to be FS 2x6 rafters spaced at about 16". The rafters span approximately 11'. The rafters are supported on the exterior masonry walls, second floor interior partition walls and FS 8x6 beams approximately midway between the ridge and eaves. The rafters are sheathed with spaced solid wood underlayment. The spaces between the solid wood underlayment have been filled with wood blocking. This was probably done in the past when new roofing was installed.

The roof framing of the Kitchen was measured to be FS 3x5 rafters spaced at about 25". The rafters span approximately 11'. The rafters are supported on the exterior masonry walls and the masonry wall between the main building and the kitchen. The rafters are sheathed with solid wood underlayment.

The roof of the lighthouse lantern is constructed of cast iron panels that are bolted together. The panels are supported on the walls of the lantern.

Structural – Ceiling Framing

The ceiling framing of the second floor was measured to be FS 2x4 joists spaced at about 16". The joists span approximately 16'. The ceiling joists are supported on the roof rafters and the interior partition wall.

The ceiling framing of the kitchen was measured to be FS 2x4 joists spaced at about 20". The joists span approximately 11'. The joists are supported on the exterior masonry walls and the masonry wall between the main building and the kitchen.

Structural – Wall Framing

The exterior walls of the tower, main building and kitchen are constructed of stone masonry. The kitchen walls are accented with brick masonry. The original interior walls are framed with FS 2x4 studs. Interior walls added during renovations are framed with 2x4 studs.

The walls of the lighthouse lantern are cast iron panels that are bolted together. The panels bear directly on the floor of the lantern.

Structural – Lateral System

Lateral stability for the building is provided by the exterior masonry walls.

Structural – Load Requirements
The required floor load capacity of the watch room and Lighthouse quarters is 40 pounds per square foot (psf), the required lantern floor load capacity is 50 psf. The required ceiling live load capacity is 10 psf (no storage is allowed).

Physical Description – Mechanical

Mechanical – Plumbing Systems
A galvanized steel domestic water supply pipe from a surface water system enters the building at the basement level with distribution piping in the basement and crawlspace to the bath and kitchen above. The water system in the building is no longer active. The 1929 remodel provided a kerosene water heater in the kitchen to supply hot water to the bath and kitchen sink. The water heater is no longer in place. However, galvanized steel piping stubs remain through the floor of the kitchen. An abandoned cistern is located to the northeast of the building. The 5’ × 8’ × 8’ cistern was installed in 1881. According to the log entries, the keeper would frequently pump water into the cistern. The cistern has been filled with old asbestos shingles.

The building waste lines are cast iron and connect to a 4” cast iron sewer main that exits the building below grade at the southeast corner of the basement. This 4” line connects to a 6” clay sewer pipe that runs to the west and into a septic tank and leach field located to the southwest of the Power House that serves the entire building complex. The septic tank capacity is approximately 500 gallons.

The plumbing fixtures that remain include a pedestal sink in the kitchen and an enameled cast iron bath tub in the bath. Galvanized steel hot and cold water piping is still in place to the bath tub with shutoff valves in the piping risers. The bath tub faucet is also in place, but the handles have been removed (MI-OLH-46). Galvanized steel hot and cold water piping extends up the wall behind the kitchen sink. The piping has been disconnected from the sink and the faucet for the sink has been removed. The wall mounted bathroom lavatory and tank type toilet have been removed.

Mechanical – HVAC
The original heating for the building completed in 1856 would likely have been coal burning stoves. All that remains from this era are two brick chimney stacks at the north end of the main house and three circular vent stack openings in the north wall of the first and second floor. The heating system installed in 1929 consists of a cast-iron coal burning Contento No. 6W boiler manufactured by the National Radiator Corporation and located in the living room with galvanized steel piping to cast iron hot water radiators in the dining room, bath, entry hall, and upstairs bedrooms. The system operated as a hot water convection circulation system with a thermal expansion tank located on the second floor (MI-OLH-28). Radiators have been removed in the bath and entry hall. A majority of the heating water distribution piping is still in place. The 6” flue vent from the boiler extends into the west chimney stack. The heating system is no longer active.

Basement ventilation consists of a 15” × 26” louver on the west side of the building. There are no other ventilation systems in the main building. The Lighthouse Tower ventilation consists of passive vents at the top of the tower.

Mechanical – Fire Suppression
There is no fire suppression system in the building.

Physical Description – Electrical

Electrical – System Configuration
Power to the building originally came from the power plant building via underground cable. The underground cable has been abandoned and is no longer observable. At present, there is no alternating current power to the building. Service entrance to the building was via a four circuit fuse box located in the basement. There is no main building disconnecting means.

Electrical – Wiring Devices
Wiring devices have largely been removed. Those that remain including receptacles and toggle switches are typical of the late 1920's era. In general, wiring devices are mounted in outlet boxes in walls. Receptacles are of the two prong type and do not include a ground connection. Wiring devices for alternating current are no longer connected to a source of power and are no longer utilized.

Electrical – Conductor Insulation
Branch circuit wiring is of the armored cable construction Type "BX" which is a classification of flexible steel armored outer tube with individual copper conductors insulated with rubber and covered with a cotton braided sheath. Type BX cable was primarily used from the late 1920s until present. In this case, the BX cable does not have a separate grounding conductor. The BX cable is run concealed in walls and ceilings and is run on the surface, where exposed in the basement. Many receptacles have been removed. Remaining receptacles are of the two wire ungrounded type. Most outlet boxes have bare wires exposed. Existing conductors for alternating current are no longer connected to a source of power and are no longer utilized.

Electrical – Overcurrent Protection
Overcurrent protection was originally by screw-in fuse elements. The fuses have been removed.

Electrical – Lighting Systems
Lighting systems inside of the building were originally incandescent lamp type. Most lighting fixtures have been removed. Lighting fixtures that remain are typical of the late 1920s era and consist of various surface mounted types, including drums, and ornamental types. Lighting fixtures originally supplied b alternating current are no longer connected to a source of power and are no longer utilized

Electrical – Telecommunications
None in building.

Electrical – Fire Alarm System
None in building.

Electrical – Lightning Protection
Lightning protection consists of brass air terminals and brass or copper down-cables that appear to be terminated on buried ground rods. Air terminals are located at the peak of the roof, on the peak of each dormer, on each chimney, and at the top of the tower.

Physical Description – Hazardous Materials

Landmark Environmental collected 12 bulk samples from a total of 12 different types of suspected Asbestos Containing Materials (ACMs) at Michigan Island. Of the 12 suspect ACMs that were sampled and analyzed, a total of 2 samples collected from 2 suspect ACMs resulted in concentrations of greater than 1% (positive for asbestos).

Hazardous Materials – Asbestos

Asbestos is confirmed to be present at the following homogeneous materials/areas:

1. Heater Component Adhesive,
2. Roofing materials on the structure and in the abandoned cistern.

The following suspected ACMs were not sampled due to inaccessibility or park limitations regarding potential for damage to structures. Asbestos is assumed to be present at the following locations:

1. Wall and Ceiling Plaster,
2. Wall and Ceiling Interiors (Gray granular plaster was observed in exposed wall interiors between wood slats. This suspect ACM is similar in appearance to confirmed ACM identified in the Keepers Quarters),
3. Ceiling Insulation (Black matting or felt paper observed above ceilings, this suspect ACM may also be present in wall interiors),
4. Adhesives (Multiple varieties of miscellaneous adhesives were seen on heater components, under remnant flooring applications, and around windows),
5. Thermal System Insulation (TSI) (Was not observed and asbestos is commonly present in insulation on water pipes, metal ducting for heating systems, behind floor registers, steam piping, etc.),
6. Roofing Materials (Roofing felt, tar, and shingles were observed that may contain asbestos),
7. Subflooring (Suspect ACMs in flooring applications were not observed and asbestos is commonly present in vapor barrier felts and tar-papers used in subflooring applications),
8. Brick and Block Filler (The exterior of the structure is stone and has the potential to have a block filler or grout that is potentially asbestos containing),
9. Caulk (Caulking was observed around window and door penetrations, which can also include gasket applications between the window assembly and the structure), and,
10. Asbestos-cement (Piping, wall-board, wall interior panels, roof flashing and roofing applications can be constructed of asbestos-cement. This type of application was not observed at the structure but may be present).

The confirmed ACM was observed to be in fair condition, and the assumed ACM was observed to be in fair condition, except isolated areas of plaster that were in poor condition.

Hazardous Materials – Lead Containing Paint

The Lead Containing Paint (LCP) inspection included a visual inspection of the structure. A previous inspection and testing for LCP was conducted using an x-ray florescence (XRF) detector coupled with bulk paint sampling and laboratory analysis. The XRF inspection was conducted by NPS staff in 1993. The findings of this study are incorporated into this report by reference.

Detectable lead in paint was confirmed for the following testing combinations:

1. Window Sashes - Wood substrate with beige paint,
2. Window Trim - Wood substrate with beige paint,
3. Doors - Wood and metal doors of various colors, and,
4. Door Trim - Wood and metal doors of various colors.

Detectable lead in paint is assumed to be present at the following locations:

1. Interior Painted Surfaces (Based on testing in the kitchen, bathroom, living room, den, and upstairs bedroom LCP is assumed to be present on painted surfaces throughout the structure except in the basement which, based on the NPS testing, was determined to be a non-LCP white-wash),
2. Exterior Painted Surfaces (Exterior surfaces were stone with white paint except at windows which had wood shutters with a dark green paint), and,
3. Tower Surfaces (The tower appeared to be stone construction with white paint as the exterior layer).

Based on the estimated dates of construction of the various structures and the available testing data LCP is assumed to be present throughout the structure. The confirmed LCP was observed to be in poor condition and the assumed LCP was observed to be in poor condition.

Loose/flaking LCP is identified on the exterior walls of the structure. Paint chip debris is noted on localized areas of surface soils surrounding the tower but was not readily observable around the Old Lighthouse Keepers Quarters.

Hazardous Materials – Lead Dust

Surface wipe-sampling for lead dust analysis was not conducted in the Old Michigan Island Lighthouse because lead dust was assumed to be present in concentrations above applicable standards due to the poor condition of the confirmed and assumed LCP.

Hazardous Materials – Lead in Soils

Historical paint maintenance activities such as manual scraping, power-washing, sanding, abrasive blasting or the general poor and peeling condition of exterior LCP may have created the potential to impact the surrounding soil. Areas of the surface soils adjacent to the structure were observed to have LCP debris and additional areas may exhibit LCP debris or lead-contaminated soils, but are not observable due to vegetative cover surrounding the structure. Preliminary lead-in-soil sampling was performed to assess whether these near-structure soils contain lead concentrations above applicable soil standards.

One four-aliquot soil sample was collected from ground-surface soils at the roof (drip-line), approximately 3' from the foundation wall. One sample aliquot was collected from each side of the structure and these aliquots are composited together for analysis.

1. Analysis of the composite drip-line soil sample resulted in 163.6 milligrams of lead per kilogram of soil (mg/kg).

Hazardous Materials – Mold

Inspections of the structure were performed to identify the readily ascertainable visual extent of mold growth. Moisture testing in building materials was not performed nor was sampling of building materials performed for microbial analysis.

Mold was visually identified at the following locations:

1. Throughout the structure
   a. A musty odor was noted throughout the structure.

Guano was observed throughout the structure. The guano was more concentrated on the stairs and second floor room.

Character-Defining Features

Mass/Form. A conical masonry tower attached to a one-and-a-half story gable structure with a gable dormer and brick chimney on each side of the roof slope and a one story shed roof appendage on the opposite end.

Layout of Space. The tower is connected to the quarters; the upper floor has two separate bedrooms accessed from the hall and stair. The 1928–1929 renovations changed the original layout by creating new openings between rooms – creating more of an open plan between the living and dining rooms.

Exterior Materials. Whitewashed masonry with brick accents, wood trim and dormers painted dark green and asbestos roofing shingles.

Openings. Wood windows typically six over six or four over four (eight over eight at the dormers only) with casement style shutters all painted dark green at the house portion of the structure; Wood casement style three lite windows painted black at the tower portion of the structure.

Interior Materials. Painted plaster at walls and ceilings, painted wood trim and tongue and groove wood floors.

General Condition Assessment

In general, the Old Michigan Island Lighthouse is in fair condition on the exterior and in poor condition on the interior. Most of the ceiling and wall finishes are in the process of deteriorating. The original plaster and lath has not held up well with the moisture issues that have been developing in the building. The bats inhabiting the attic also have caused damage. The attached Lighthouse Tower is in good condition.

Structurally, the Old Michigan Island Lighthouse is in good condition with the exception of the basement. This level needs to be dried out to reduce the moisture content of the first floor framing. The high moisture content of the framing could promote decay of wood.

Mechanically, the majority of the systems in the building are in poor condition with portions of the system missing or in disrepair.

Electrically, the equipment and systems within the building are in poor to deteriorated condition. Equipment in the basement is severely corroded. Wiring systems in the building are well beyond their useful life and do not meet current codes. In general, the electrical systems for this building are not salvageable. All wiring, boxes, fixtures, receptacles, and lightning protection are nonfunctional and unusable.

The following section is a discipline-by-discipline, component-by-component condition assessment of the building. Refer to Volume I, Chapter 2: Methodology for definitions of the condition ratings.

Condition Assessment – Architecture

Architecture – Roof
<u>*Condition:*</u> *Poor*
The roof is overall in poor condition. The shingles have substantial moss build-up at the shaded north roof areas. There are also yellow algae throughout. Several shingles are missing at the west-facing slope near the ridge. There has been recent repair work within the last few years due to loose and/or missing shingles.

Architecture – Chimneys
<u>*Condition:*</u> *Good*
The chimneys are in good condition. Newer repointing work appears to have been performed on the west chimney but the upper course of the east chimney needs repointing. There are two types of brick at the west chimney, which may be due to recent repair work.

Architecture – Exterior Walls
<u>*Condition:*</u> *Fair*
The condition of the exterior walls is fair due to the roof not having a gutter and downspout system, resulting in the drainage contributing to the deterioration of the exterior walls. This is especially evident at the base of the walls and at the splash area of the stoop at the north door. The parging is coming loose at the tower's upper northwest quadrant.

Architecture – Dormers
<u>*Condition:*</u> *Fair*
Overall, the dormers are in fair condition. The wood wall shingles are cupping badly while the asbestos wall shingles are performing well. The north side of the east dormer has moss growth and there is newer white caulking also at the east dormer. There is a hornet's nest at the eave of the west dormer.

Architecture – Windows
<u>*Condition:*</u> *Fair*
Six-Over-Six Lites, Double Hung. The sash and frame of these windows are in fair condition due to fair wood and paint finish condition. They generally do not operate (upper sash is nailed shut at exterior). The glazing is also in fair condition as it is gapped in some areas.

Four-Over-Four Lites, Double Hung. The sash and frame of these windows are in fair condition due to fair wood and paint finish condition. They generally do not operate (upper sash is nailed shut at exterior). The glazing is also in fair condition as it is gapped in some areas.

Eight-Over-One Lites, Double Hung (Paired). The sash and frame of these windows are in fair condition due to fair wood and paint finish condition. They generally do not operate (upper sash is nailed shut at exterior). The glazing is also in fair condition as it is gapped in some areas.

Two Leaf, Three-Lite Casements. These windows are in fair condition as their throw bolt hardware is missing, the metal frames are rusted at the interior, and the interior trim paint is badly alligatored. All glazing is in fair condition as it is gapped in some areas.

Architecture – Exterior Doors
<u>*Condition:*</u> *Fair*
Main Entry Door. This door is in good condition with the exception of the hardware. The knob is loose and the deadbolt sluggish. The skeleton key is missing and the hinges are rusted. Also, the paint is peeling on the interior face of the door.

Kitchen Entry Door. The door is in fair condition with peeling paint, rusted hardware and knobs, and the door barely latches. There is a divot out of the front face of the sill, a crack in the glass pane, and the wood steps have no railing, are steep (8½"x 11"), and are rotting.

Architecture – Exterior Trim
<u>*Condition:*</u> *Good*
The trim appears to be in good condition with areas of peeling paint, including one area on the soffit at the east elevation.

Architecture – Tower Walk, Railing, Roof, and Finial
<u>*Condition:*</u> *Fair*
The Lighthouse Tower walk, railing, roof, and finial are in fair condition. The walkway paint is peeling and the underlying metal is rusted. The caulk is missing at the horizontal walk joints, but the caulk at the base of the wall and deck has held up well. The ball of the finial has a previous crack and there is one ±⅜" diameter rusted through hole at the northeast quadrant.

Architecture – Tower Lantern
<u>*Condition:*</u> *Good*
The lantern is in good condition.

Architecture – Interior Doors
<u>*Condition:*</u> *Fair*
Four Panel Door (Typical Interior Door). These doors are generally in fair condition as they have peeling paint and most of the knobs are missing.

Five Panel Door. This type of door is generally in fair condition with missing knobs. The entry closet door has scraped the floor.

Metal Door between Light Tower and Quarters. This door is in fair condition as it is badly rusted and most of the white paint has disappeared. It is still operable.

Hatch in the Lantern Floor. The metal hatch is in good condition; however the operability is in poor condition due to safety concerns of the risk of dislodging the hook.

Access Door to Walkway. This metal door is in good condition, however the operability is poor.

Architecture – Wall Finishes
<u>*Condition*</u>*:* *Poor*
In general, the wall finishes are in poor condition. The plaster and lath have high instances of moisture infiltration seen by peeling paint, cracks and deflection in the plaster, plaster falling off the lath and masonry and separation at joints with other walls and ceiling. The bat inhabitation of the attic also has caused further damage to the second floor wall finishes. The wood board wainscot in the entry to the tower is in fair condition as the paint is peeling and there are gouges in the wood. The bead board finish in the kitchen's recessed doorways is in fair condition as the west doorway has peeling paint while the east doorway is in good condition. The tower's plaster is in fair condition as there are rust stains from the stairs and some peeling paint and flaking plaster. The basement's masonry walls are in good condition but there is efflorescence on the lower ±1'0" of stone. Condensation within the building due to poor ventilation is contributing to the overall poor condition.

Architecture – Ceiling Finishes
<u>*Condition:*</u> *Poor*
The plaster over lath ceiling finishes are in poor condition due to moisture issues. Most of the rooms have missing sections of plaster. The plaster is cracked and its paint is peeling. In the areas of missing plaster on the second floor, holes in the lath and deterioration of lath has left the attic visible (MI-OLH-28). Bats living in the attic have furthered the process of deterioration. The tower's ceiling is in fair condition due to paint deterioration and rust.

Architecture – Interior Trim
<u>*Condition:*</u> *Fair*
The three types of base trim are generally in fair condition in this building. The most elaborate trim is in fair condition except for the trim in the dining room as there are segments missing. The less elaborate trim is also in fair condition as the kitchen's base-shoe is warped, especially on the east wall near a water stain. The simplest trim (wood board) is also in fair condition.

Architecture – Floor
<u>*Condition:*</u> *Fair*
The wood floors are generally in fair condition as there are water and adhesive stains, fading, wear, warping, and some board separation. The linoleum in the kitchen is in poor condition. The closet wood floors tend to be in good condition due to their relatively less exposure to wear then the more public rooms. The original wood flooring seen inside the second floor west bedroom's window seat appears to be in fair condition. The concrete floor in the basement and the Lighthouse Tower are both in fair condition with typical stains and wear associated with more industrial spaces. The tower's black paint has all but disappeared.

Architecture – Stairs
<u>*Condition:*</u> *Fair to Good*
Exterior North (Kitchen) Stairs. These exterior stairs are in fair condition as the wood stairs are starting to rot in places and the paint is peeling. This is most likely due to the roof draining onto these stairs. There is no handrail.

First Floor to Basement Stairs. These stairs are in fair condition as they are heavily worn, especially in the centers, and do not have a handrail.

First Floor to Second Floor Stairs. These stairs are in fair condition as the stair walls have badly peeling paint and a handrail needs to be added to the rest of the stairs.

Tower Stairs. These stairs are in good condition but lack handrails.

Architecture – Casework
<u>*Condition:*</u> *Fair to Good*
In general, the casework is in fair condition with some missing elements and some visible mold growth. The kitchen cabinet is in fair condition as the knobs and shelving are in good condition while the paint is faded and stained and the hinges are rusted. Every drawer and door is operational. The three wood cabinets in the tower are in good condition. The passage for the clockwork mechanism's weight chains is clear and the oil storage cabinet is in good condition.

Architecture – Accessibility
<u>*Condition:*</u> *Poor*
This building is not accessible.

Condition Assessment – Structural

Structural – Foundation
<u>*Condition:*</u> *Good*
The perimeter foundation walls are in good condition. The interior and exterior foundations are covered by a concrete slab-on-grade and could not be observed, thus their condition is unknown. No obvious signs of distress or damage were observed.

Structural – Floor Framing
<u>*Condition:*</u> *Fair*
The first floor framing in the main building is in fair condition. Floor joists that are located above the windows and the floor joists at the stairway are not properly supported on lintels or headers (MI-OLH-43 and 44). The moisture levels in the framing were above 30% and this is causing deterioration of the wood. The basement windows have been replaced with louvers to increase the ventilation but this does not appear to be enough. Further investigation is needed. The original stepped floor framing and the newer floor framing of the kitchen could not be observed, thus their condition is unknown. No obvious signs of distress or damage were observed. Most of the second floor framing could not be observed, thus its condition is unknown. No obvious signs of distress or damage were observed. The floor of the lantern is in good condition.

Structural – Roof Framing
<u>*Condition*</u>*:* *Good*
The wood roof framing is in good condition. The roof of the lantern could not be observed, thus its condition is unknown. The joints between the roof panels had been sealed (MI-OLH-45). This suggests structural movement that needs further investigation.

Structural – Ceiling Framing
<u>*Condition:*</u> *Good*
The ceiling framing of the second floor and kitchen is in good condition.

Structural – Wall Framing
<u>*Condition:*</u> *Good*
The exterior walls are in good condition.

Structural – Lateral System
<u>*Condition:*</u> *Good*
Lateral stability of the building is good.

Structural – Load Requirements
<u>*Condition:*</u> *Good*
The roof, ceiling, first and second floor framing have adequate capacity to support the required loads.

Condition Assessment – Mechanical

Mechanical – Plumbing Systems
Condition: *Fair to Poor*
There are portions of the domestic water distribution piping remaining in the basement and crawlspace. The kerosene water heater, originally located in the kitchen, has been removed. The remaining galvanized steel piping is in poor condition. The abandoned cistern outside the building is filled with sediment and vegetation.

The cast iron waste lines within the building are in fair condition. The condition of the buried 6" clay sewer pipe that runs to the west and into the septic tank could not be determined.

The wall mounted bathroom lavatory and toilet have been removed. The remaining kitchen pedestal sink and enameled cast iron bath tub are in fair to poor condition and have been disconnected from the plumbing systems.

Mechanical – HVAC
Condition: *Fair*
Although not functional, the "Contento" boiler located in the first floor living room is in fair condition. The cast iron radiators, associated piping, and the thermal expansion tank on the second floor are intact and in fair condition. The radiators in the first floor bath and entry hall have been removed.

The basement ventilation louver is in fair condition. However, this does not provide adequate ventilation for the space. The passive air vents at the top of the tower are in poor condition and do not provide adequate ventilation to prevent condensation.

Mechanical – Fire Suppression
Condition: *N/A*

Condition Assessment – Electrical

Electrical – System Configuration
Condition: *Poor*
At present, there is no power to the building. The original underground power feeder to the building has been abandoned and is no longer observable. Electrical equipment and conduits located in the basement are badly corroded. Lighting and receptacle boxes in the rooms of the structure are in very poor condition.

Electrical – Wiring Devices
Condition: *Poor*
Wiring Devices that remain, including receptacles and toggle switches are in poor condition.

Electrical – Conductor Insulation
Condition: *Poor*
Type BX branch circuit cable is in poor condition. At 70 years old, insulation is suspect and potentially very fragile. Existing cables are two wire only and do not contain a separate ground wire. The integrity of remaining connections is suspect.

Many receptacles have been removed. Remaining receptacles are of the two wire ungrounded type and are

no longer usable. Most outlet boxes have bare wires exposed.

Electrical – Overcurrent Protection
Condition: *Poor*
Fuses are missing and the fuse box and connections are badly corroded.

Electrical – Lighting Systems
Condition: *Poor*
Most fixtures have been removed. Those remaining are not serviceable and do not meet current code.

Electrical – Telecommunications and Fire Alarm System
Condition: *N/A*

Electrical – Lightning Protection
Condition: *Fair to Poor*
Lightning protection systems are intact, however over time, connections deteriorate and components corrode. The integrity of the system cannot be assured.

Condition Assessment – Hazardous Materials

Refer to "Physical Description – Hazardous Materials" for detailed descriptions of locations and conditions of hazardous materials.

Ultimate Treatment and Use

This building operated as a lighthouse and primary residence from 1856 to 1857 and from the late 1860s to 1929 when the Second Tower became operational and the Keepers Quarters was completed. The building was renovated and modernized in 1929 for continued use as a residence for the Assistant Keeper.

The building is currently used as guided visitor access with no remaining furnishings or Fresnel lens in the tower.

The recommended treatment of this structure is rehabilitation for visitor use (interpretation). However, the exterior will be 'restored' to a period of significance matching site rehabilitation objectives (refer to the CLR) for Michigan Island Light Station.

Requirements for Treatment

Compliance requirements for treatment currently include laws, regulations, and standards as outlined by the Park Service and listed in Volume I, Administrative Data section of this report.

The recommended treatments are tailored to the preferred alternative as the outcome of the Value Analysis/CBA for the project. As individual buildings are rehabilitated, specific alternatives will present themselves during design and construction. The following section is a discipline-by-discipline, component-by-component description of the treatments proposed for the rehabilitation of the building. Refer to Volume I, Chapter 2: Methodology for the priority rating definitions.

Treatment Recommendations – Architecture

Architecture – Roof
Priority: *Severe*
Remove the existing asbestos shingle roof and replace with a composite shingle roof of 9" wide × 7" high exposure to match the dimensions of the roofing of the 1929 era. Verify/provide proper underlayment and flashings at all eaves, rakes, valleys and intersections. Scrape, sand, and repaint the wood trim at the eave, soffit, fascia, and frieze using the paint analysis to guide the color selection.

Architecture – Gutters and Downspouts
Priority: *Moderate*
Provide and install a new galvanized box gutter and downspout system to slope and drain away from the foundation. Study discharging to the east in keeping with the previous cistern location.

Architecture – Chimneys
Priority: *Low*
Repoint the upper portion of the east chimney. Perform material testing of mortar to determine a match of mortar composition and color. Perform tooling of mortar joints to match original.

Architecture – Exterior Walls
Priority: *Moderate*
Remove all loose parging. Examine substrate below and perform moisture readings prior to repair work. Coordinate exterior repair work with increased ventilation at the interior and controlling roof drainage.

Repair damage at the exterior rubble and masonry walls and repoint. Recoat with a suitable masonry coating to allow moisture permeability.

Architecture – Dormers
<u>Priority:</u> Moderate
The dormers shall remain, however they are planned to be concealed from the interior. Remove and replace in kind the cupping wood shingles above the windows. Verify proper valley flashing is installed at the time of the reroofing. Scrape, sand, and repaint.

Architecture – Windows
<u>Priority:</u> Moderate
Remove all window sash. Remove the glazing compound and salvage all glass. Scrape, sand, and repaint the sash, frame, and shutters using the paint analysis to guide the color selection. Reinstall the salvaged glass and reglaze each pane. Replace missing hardware in kind. Verify proper operation of each sash and shutter. Investigate secure means for enhancing the basement window openings for seasonal ventilation.

Architecture – Exterior Doors
<u>Priority:</u> Severe
Coordinate with the accessibility work and investigate retrofitting the existing west exterior door and masonry opening/wood frame to enlarge and provide a 32" clear opening. Scrape, sand, and repaint. Provide new lever-style hardware, hinges, and locking mechanisms to match the existing finish.

Repair the kitchen door and sill. Replace the cracked pane of glass. Reglaze all lites of the door. Epoxy stabilize divot at sill. Provide new hardware to match original finish.

Architecture – Exterior Trim
<u>Priority:</u> N/A
Refer to roof section.

Architecture – Tower Walk, Railing, Roof, and Finial
<u>Priority:</u> Moderate and Severe (Railing)
Remove peeling paint. Patch and clean areas of rust. Repair the crack and hole at the finial. Verify all ventilation components are operational. Scrape, sand, and repaint. Investigate alternatives to discretely upgrade the existing railing to become a code compliant guard rail.

Architecture – Tower Lantern
<u>Priority:</u> Low
Provide five new brass intake vent cap controls. Continue to monitor sealant at roof panels.

Architecture – Interior Doors
<u>Priority:</u> Moderate
Scrape, sand, and repaint all interior doors. Replace missing hardware in kind. Verify/provide proper operation at all doors. Add a security gate at the base of the tower stair. Add a custom closer/hold open at the lantern hatch and walkway access door.

Architecture – Wall Finishes
<u>Priority:</u> *Severe*
Repair damaged plaster and replace in kind. Patch previous penetrations of piping and conduit where removed. Repaint using the paint analysis to guide the color selection.

Architecture – Ceiling Finishes
<u>Priority:</u> *Severe*
Repair damaged plaster and replace in kind. Patch previous penetrations of piping and conduit where removed. Repaint using the paint analysis to guide the color selection. Preserve and protect historic markings at interior of lantern.

Architecture – Interior Trim
<u>Priority:</u> *Moderate*
Remove the 1929 era base and casing as applicable. Replace in kind with the earlier profiles and trim. Repair as needed due to adjacent plaster repair work. Scrape, sand, and repaint using the paint analysis to guide the color selection.

Architecture – Floor
<u>Priority:</u> *Low*
Remove linoleum at kitchen and curate. Sand and revarnish the 2¼" boards c. 1929 flooring throughout the building.

Architecture – Stairs
<u>Priority:</u> *Severe*
Provide new exterior stair and hand/guard rails at the kitchen exit to meet code. Add code compliant handrails to the basement stairs (wood), and tower (metal). Provide portions of handrail to the first floor. Infill areas on the second floor stair where the handrail is missing. Sand, prepare and paint first and second floor stairway.

Architecture – Casework
<u>Priority:</u> *Low*
Scrape, sand, and repaint using the paint analysis to guide the color selection.

Architecture – Accessibility
<u>Priority:</u> *Severe*
The existing west door wood frame shall be enlarged approximately ¼" to allow for a 32" clear opening at the door. Remove the existing step by providing a freestanding 1:20" max slope ramp to this door to accommodate the approximate 1'0" of elevation change. The accessible route would include the entire first floor with possible modifications to widen door openings. Add exhibits on the first floor to make the second floor and tower programmatically accessible.

Treatment Recommendations – Structural

Structural – Foundation
<u>Priority:</u> *Low*
No recommendations at this time.

Structural – Floor Framing
<u>*Priority:*</u> *Severe; Low*
The first floor framing of the main building is in serious danger of decay. The moisture levels in the wood should be reduced below 15%. The basement should be dried out and ventilation should be added below the kitchen floor. Further investigation is needed at the center beam of the first floor framing. Investigate new openings for ventilation at the kitchen framing.

The first floor joists located above windows and the floor joists at the stairway should be properly supported on lintels or headers.

Structural – Roof Framing
<u>*Priority:*</u> *Unknown*
Rust-jacking is causing the roof panels of the lantern to separate. Further investigation is required to determine the extent of the corrosion to the cast iron panels and/or the fasteners. Sealants and coatings should be used to protect the cast iron from further deterioration. The extent of the damage should be checked at least annually and corrective action taken if the damage continues.

Structural – Ceiling Framing
<u>*Priority:*</u> *Low*
No recommendations at this time.

Structural – Wall Framing
<u>*Priority:*</u> *Low*
No recommendations at this time.

Structural – Lateral System
<u>*Priority:*</u> *Low*
No recommendations at this time.

Treatment Recommendations – Mechanical

Mechanical – Plumbing Systems
<u>*Priority:*</u> *Low*
The existing plumbing fixtures and plumbing piping are no longer functional. It is recommended that the plumbing fixtures and piping be removed and curated. The clay sewer pipe serving the building should be capped below grade.

Mechanical – HVAC
<u>*Priority:*</u> *Severe (Ventilation); Low (Heating)*
The humidity levels inside the structure need to be reduced to prevent further damage to the building. The addition of mechanical and passive ventilation is highly recommended.

The existing heating system consisting of a cast iron boiler, piping, and radiators are no longer functional, however they can remain for interpretive reasons.

Mechanical – Fire Suppression
Priority: *N/A*

Treatment Recommendations – Electrical

Electrical – System Configuration
Priority: *Severe*
The existing electrical systems are old, nonfunctional and non-code compliant. It is recommended that the existing electrical systems be removed. This recommendation is consistent with the recommended use of the building. A new, code compliant electrical distribution system for PV power for new ventilation equipment should be installed.

Electrical – Wiring Devices
Priority: *Moderate*
It is recommended that new wiring devices for PV systems be installed where required. Wiring devices shall be in accordance with the National Electrical Code, NPS and Federal Standards and Regulations.

Electrical – Conductor Insulation
Priority: *Moderate*
It is recommended that new conductor insulation be consistent with wiring methods for proposed PV systems. Conductor insulation shall be in accordance with the National Electrical Code, NPS and Federal Standards and Regulations.

Electrical – Overcurrent Protection
Priority: *Moderate*
It is recommended that overcurrent protection for new PV system wiring be in accordance with the National Electrical Code, NPS and Federal Standards and Regulations.

Electrical – Lighting Systems
Priority: *Moderate*
Existing lighting fixtures are nonfunctional and do not meet present codes. It is recommended that all remaining lighting fixtures be removed.

Electrical – Telecommunications and Fire Alarm System
Priority: *N/A*

Electrical – Lightning Protection
Priority: *Severe*
Existing lightning protection is old and its effectiveness has not been established. It is recommended that the existing lightning protection system be removed prior to roof replacement. It is recommended that a new LPI-175 compliant lightning protection system be installed after roof replacement.

Treatment Recommendations – Hazardous Materials

Hazardous Materials – Asbestos
Priority: *Moderate*
Recommend sampling suspect asbestos containing material, including wall and ceiling plasters, wall and ceiling interiors, ceiling insulation, adhesives, TSI, roofing materials, subflooring, brick and block filler, caulking, gaskets at boiler chambers and asbestos cement. Recommend removal and replacement of asbestos roofing.

Hazardous Materials – Lead-Containing Paint and Lead Dusts
Priority: *Moderate*
Recommend stabilization or abatement of Lead-Containing Paint. Wipe sampling for lead dust is not recommended.

Hazardous Materials – Lead In Soils
Priority: *Moderate*
Recommend further soils characterization to confirm applicable regulatory requirements.

Hazardous Materials – Mold/Biological
Priority: *Moderate*
Recommend bat guano abatement and water intrusion/mold mitigation.

Hazardous Materials – Petroleum Hydrocarbons
Priority: *Low*
No recommendations at this time.

Alternatives for Treatment

The following are several considerations of alternatives for the proposed treatments:

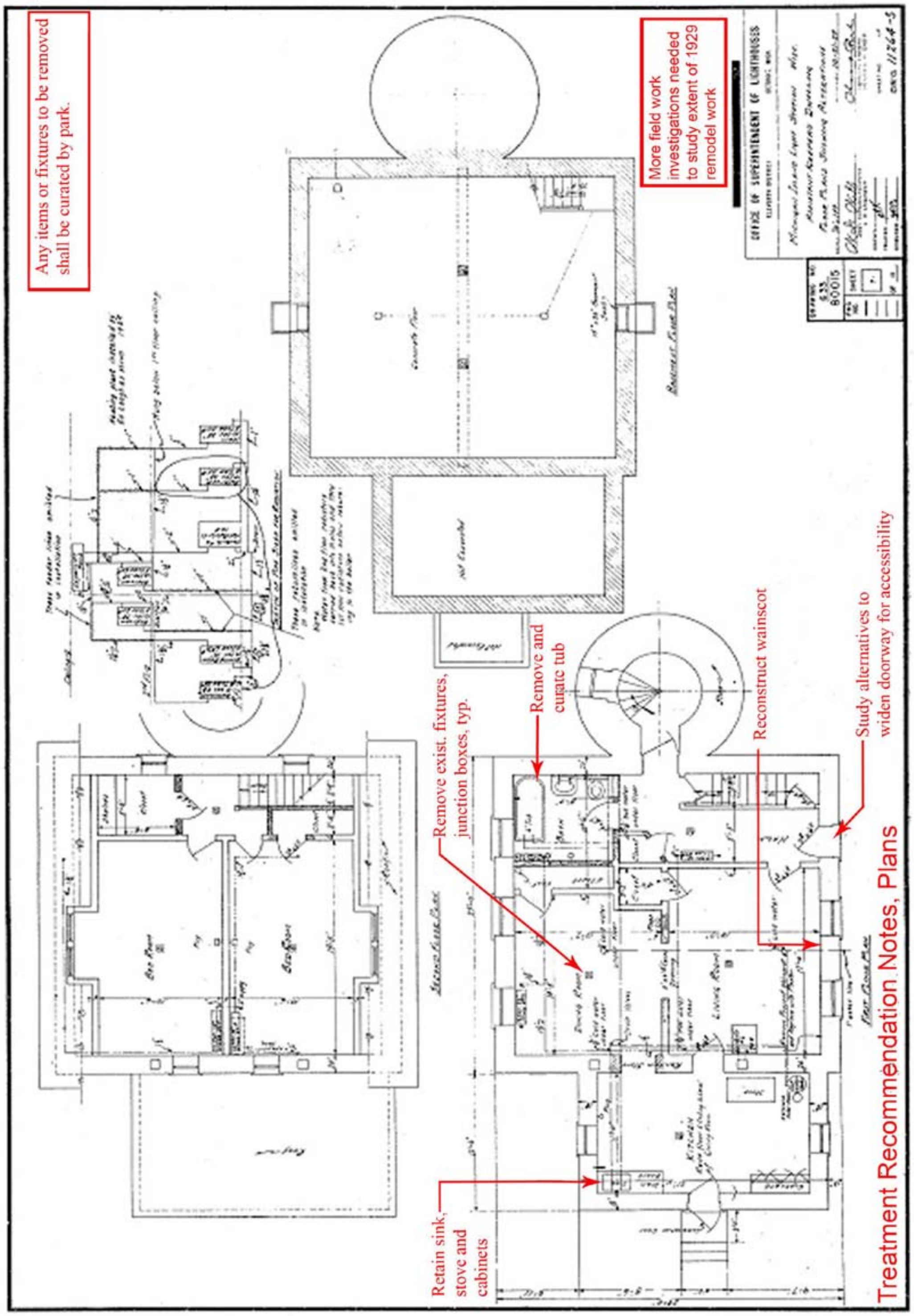
1. If it is decided to allow public access to the catwalk, careful study will be needed for introducing a code compliant guard rail at the Lighthouse walk that will not be visually disruptive to the historic character nor be a long term maintenance burden for park staff.
2. The current recommendations for the exterior of the building are reflective of the 1929 timeframe including a replacement for the asbestos shingles and adding a gutter system. Other alternatives could consider different materials if an earlier timeframe was agreed upon.
3. At this time, the park has opted to retain the 1929 alterations. Discussion did occur regarding removal of the 1929 alterations; however this was dismissed in order to retain the historic fabric. Several items may be retained by the staff for curation/interpretation including linoleum tile and the bath tub.
4. An alternative would be to restore this building to an earlier time period.
5. The alternative of removing the dormers was discussed by the team and dismissed due to the concern of removal of existing historic fabric as it is within the stated period of significance and due to the need for natural light within.

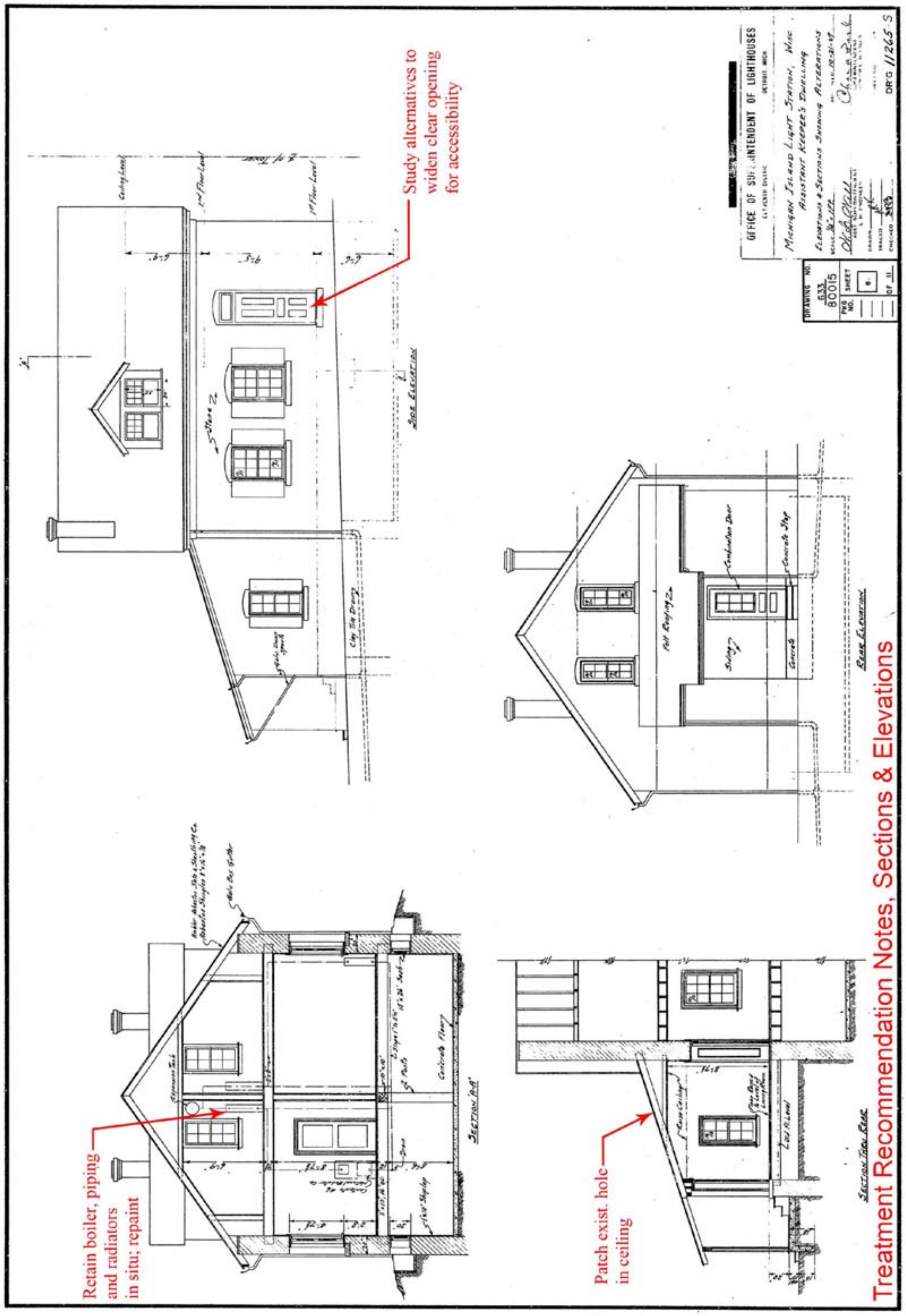
Assessment of Effects for Recommended Treatments

The following table includes an analysis of the major treatment recommendations which affect Section 106 Compliance:

Recommended Treatment	Potential Effects	Mitigating Measures	Beneficial Effects
1. Visitor access into the former Lighthouse	Change in use: Upgrades for code safety and ABAAS will be required which will alter the historic fabric.	Integrate the upgrades to minimize damage to historic fabric and visual disruption.	- Improves safety for visitors and staff - Allows visitors to experience the Lighthouse first hand
2. Additional Hazardous Testing and Mitigation	Mitigation of hazardous material may require removal of historic materials.	Any mitigation will need to be evaluated for benefit and implemented sensitively to minimize damage to the resource.	- Improves safety for visitors and staff - Removes hazards from the cultural resource
3. Adding a security gate at the base of the light tower	Installation of security gate will be a modern element.	Design a gate that will be as unobtrusive as possible.	- Allows NPS better security over the resource - Improves safety for visitors
4. Adding a code compliant guardrail at the light tower	Visually disruptive to the historic integrity of the Lighthouse.	Design a guardrail to be as 'invisible' as possible as viewed from the ground.	- Improves safety for visitors and staff
5. Accessibility Upgrades	Altering the front entry (ramp) and door frame (width).	Study all of the alternatives.	- Allows universal access to the cultural resource
6. Removal of existing and replacement of roofing materials	Removes the existing material which dates to the period of significance.	The roofing material is asbestos and is at the end of its life. The new material will aim to match the existing in dimension and exposure.	- Removal mitigates a current HazMat management issue -A new roof will reduce maintenance for the next 20-30 years -A new roof will protect the resource

Old Michigan Island Lighthouse Treatment Recommendation Notes




Study alternatives to widen clear opening for accessibility
Retain boiler, piping and radiators in situ; repaint
Patch exist. hole in ceiling
Treatment Recommendation Notes, Sections & Elevations
OFFICE OF SUPERINTENDENT OF LIGHTHOUSES
SIDE ELEVATION
REAR ELEVATION

Old Michigan Island Lighthouse Photographs, 2009

MI-OLH-01: Aerial, 2009 (Source: AH DSC00604)

MI-OLH-02: West elevation, 2009 (Source: AH DSC00672)

MI-OLH-03: North elevation, 2009 (Source: AH DSC00673)

MI-OLH-04: East elevation, 2009 (Source: AH DSC00675)

MI-OLH-05: South elevation, 2009 (Source: AH DSC00677)

MI-OLH-06: Dormers, roof, and chimneys from the Tower, looking north (Source: AH IMGP2761)

MI-OLH-07: East dormer, trim, chimney, and shutters (Source: AH IMGP2764)

MI-OLH-08: East dormer siding, windows, and roof (Source: AH IMGP2766)

MI-OLH-09: East dormer siding and exterior trim (Source: AH IMGP2767)

MI-OLH-10: West dormer siding, chimney, windows, and exterior trim (Source: AH IMGP2768)

MI-OLH-11: West dormer siding, roof, trim, and Tower integration (Source: AH IMGP2851)

MI-OLH-12: West entry door (primary) (Source: AH 102_9512)

MI-OLH-13: North entry door (kitchen entrance) (Source: AH 102_9511)

MI-OLH-14: Basement window 1 (Source: AH CIMG3442)

MI-OLH-15: Basement stair (Source: AH IMGP2818)

MI-OLH-16: Living room south elevation (Source: AH CIMG3288)

MI-OLH-17: Entry, south wall door, and base trim, detail (Source: AH CIMG3320)

MI-OLH-18: Living room north elevation (Source: AH CIMG3292)

MI-OLH-19: Kitchen east elevation (Source: AH CIMG3324)

MI-OLH-20: Kitchen southwest elevation (Source: AH CIMG3328)

MI-OLH-21: Kitchen southeast door ceiling (Source: AH CIMG3326)

MI-OLH-22: Kitchen southeast door ceiling detail (Source: AH CIMG3327)

MI-OLH-23: Kitchen floor and c. 1920 base trim (Source: AH CIMG3333)

MI-OLH-24: Kitchen built-in cabinet on north wall (Source: AH CIMG3335)

MI-OLH-25: Dining room east elevation (Source: AH CIMG3345)

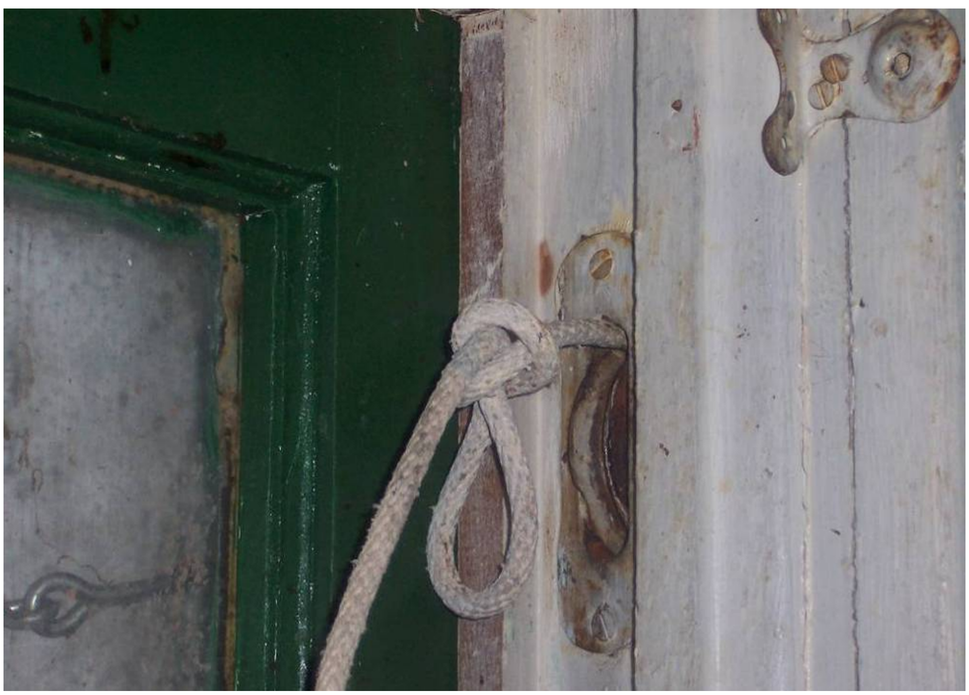

MI-OLH-26: Watch room/bath east elevation (Source: AH CIMG3368)


MI-OLH-27: First floor to second floor stairs, east view (Source: AH IMGP2806)

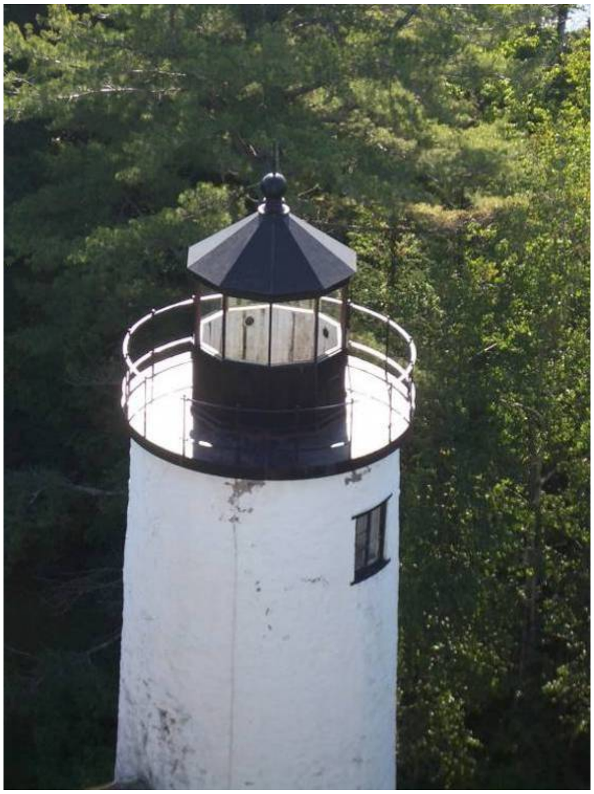
MI-OLH-28: West bedroom north elevation and thermal expansion tank (Source: AH CIMG3457)

MI-OLH-29: West bedroom west elevation (Source: AH CIMG3461)

MI-OLH-30: West bedroom window seat, view of wall, trim, and floor beneath (Source: AH CIMG3470)



MI-OLH-31: East bedroom dormer window detail (Source: AH 102_9545)



MI-OLH-32: Aerial of Tower, 2009 (Source: AH IMGP2781-A)

MI-OLH-33: Tower south elevation and door (Source: AH CIMG3390)

MI-OLH-34: Tower window 1 (Source: AH 102_9527)

MI-OLH-35: Tower cabinet, open, door is stamped "Danger, Alcohol Storage, Do Not Light" (Source: AH CIMG3407)

MI-OLH-36: Tower stairs (Source: AH IMGP2822)

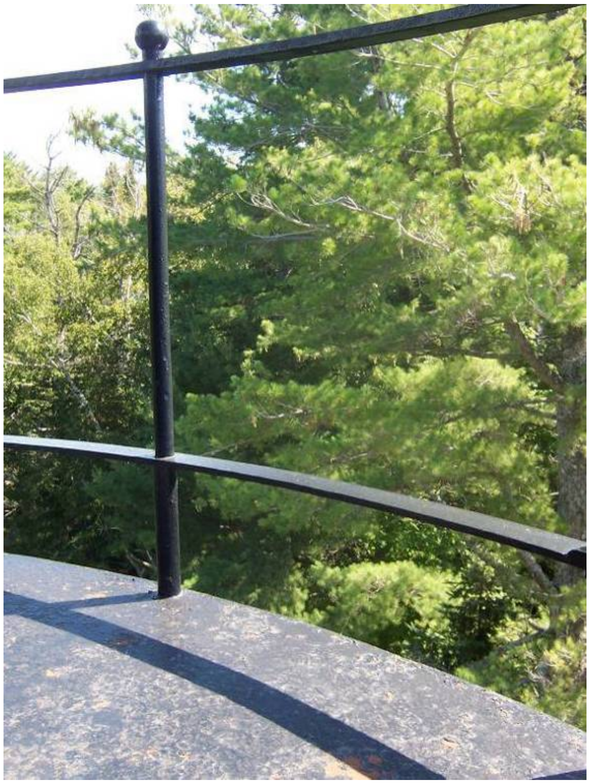
MI-OLH-37: Lantern southwest elevation (Source: AH 100_9656)

MI-OLH-38: Lantern roof (Source: AH IMGP2760)

MI-OLH-39: Lantern ceiling (Source: AH 100_9655)

MI-OLH-40: Lantern floor and hatch (Source: AH 100_9654)

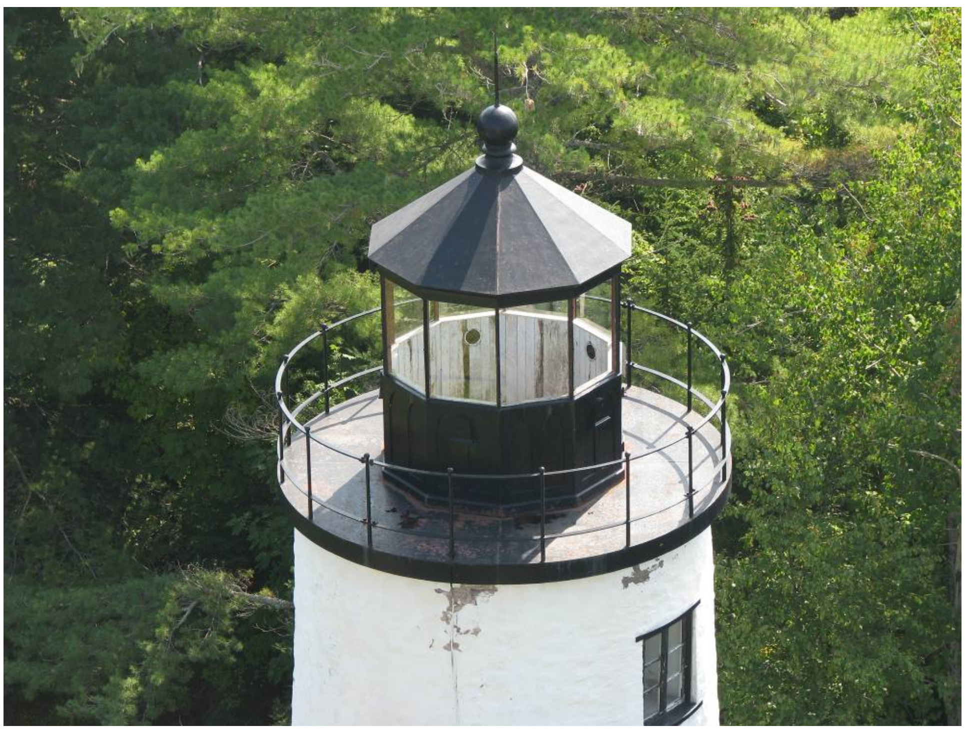
MI-OLH-41: Lantern door to walkway (Source: AH 100_9650)



MI-OLH-42: Lantern walkway railing (Source: AH 100_9647)

MI-OLH-43: Joist header above basement window (Source: Martin/Martin)

MI-OLH-44: Joists at stair (Source: Martin/Martin)



MI-OLH-45: Sealed joints in roof (Source: Martin/Martin)

MI-OLH-46: Cast iron bathtub in watch room/bath (Source: RMH)

MI-OLH-47: "Contento" Boiler in living room (Source: RMH)

SECOND TOWER

Chronology of Alterations and Use

Original Construction

The Michigan Island Second Tower was constructed in 1880 as a rear range light for Schooner's Ledge south of Philadelphia on the Delaware River. In 1916, the river's course was changed due to dredging and the light was disassembled and shipped to Michigan Island between 1918 and 1919. The light was reassembled and erected near the Old Michigan Island Lighthouse in 1929, after many years of it remaining in pieces on the beach. The Light Base, an eclectic mix of neo-classical form and Italianate detail, was delivered with the tower. The tower and its base were put into service on October 29, 1929. The radio beacon, also installed in 1929, began operating November 3. The tower's Fresnel lens was a third-and-a-half order with a focal plane 160' above Lake Superior, making this tower the tallest in the Apostle Islands. In 1972, the Coast Guard replaced the lens with a modern optic. The glass was removed sometime the following year, after it was noted that the new light reflected back into the lantern room. In 1994, the Park Service replaced the glass in an effort to slow the rusting in the lantern. The Fresnel lens is currently on display at the Visitors Center in Bayfield, Wisconsin.[48]

The base of the Second Tower was photographed circa 1930 with a stone circular fire pit or planter in front of the entry (Historic Image MI-06). The tower and base appear in better condition in 1974 then they do in a 1980 photograph. This is most likely due to the fact that the 1974 photo was taken only two years after seasonal habitation ceased, while the later photo reflects the damage and weathering that occurs when the Light Station is not being maintained consistently (Historic Image MI-10).

The historic 1929 drawings call for repairs to the tower that include cast iron steps, watch room and tower base cornices, and interior handrail brackets. It is unknown what the extents of these repairs were (Historic Drawing MI-02, 03, 05, and 06). There is also a construction specification document from the original construction of the tower that mentions the curtains, which, "must be of the best quality Irish linen of the width shown on the drawings" (Historic Drawing MI-04). There is no mention of curtains in the tower when it was functioning on Michigan Island, but they may have existed and served as sun protection for the lens.

Significant Alterations / Current Condition

Significant alterations to the Second Tower consist of the move and reconstruction of the tower and base from Pennsylvania to the Michigan Island, the replacement of the Fresnel lens with a modern optic and removal and reinstallation of the Lantern glass. In 2006, the Historic Structure Preservation Team of the Park Service contracted the painting of the exterior of the tower. In May of 2009, an LED-powered beacon was installed in the tower.

No alternating current electrical service or utilization equipment exists within the Second Tower. There is evidence of an old direct current generator and battery system for the Lighthouse, but none of this equipment remains.

The Second Tower and its base are in good condition.

[48] List of Classified Structures, National Park Service, 2009.

Summary of Documented Work on the Building

Date	Work Described	Source of Information
1918–1919	Light tower moved from Pennsylvania to Michigan Island	LCS, 2009
1928, May 28	Survey crew comes to Island: surveys for Gull Island Light, foundation for Second Tower and height for Second Tower, and new tramway. Leaves June 10, 1928	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1929	Reused tower and base and new radio beacon erected and operational	LCS, 2009
1933, November 28	"Finished installing winter Light and, weather permitting, Mechanic O.H. Joyner will leave for town."	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1936, August 10	"Replaced rotten sash in tower window."	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1943	Light automated, keeper leaves island	J. Busch, 2008
1972	Fresnel lens replaced by a solar-powered, acrylic aero-beacon	LCS, 2009
1973	Second Tower's brass mullions and lantern glass removed by the Coast Guard	APIS/NPS Business Office File D3423
1977	Emergency stabilization of Second Tower	APIS/NPS Business Office File D3423
1983, June 8	"Swallows nesting in stairwell; evidence of bird eggs, and could hear peeping of asbabies." (Dan and Marilyn Lehman)	From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 4
1984, August 30	Coast Guard installs new lens	From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 5
1991, August 6	Coast Guard inspection, District Commandeer "not very happy with the rust and general condition." (Pat Dekker/Case Dekker)	From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 18
1992, June 28	Coast Guard removed 4 of 6 solar charged batteries as it was found that 2 batteries were sufficient	From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 19
1994	The Park Service reinstalls lantern glass. Brass mullions refabricated using originals as templates, originals now in the park's museum collection. August 16: Coast Guard replaced solar panel and installed a thin cable through the air vent from the panel to the battery box- removed existing, thicker cable.	LCS, 2009; APIS/NPS Business Office File D3423; "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 22
1996	Interior sand blasted and repainted, lead paint removed; astragals painted white although the original astragals had been painted black – paint soon flaked off	APIS/NPS Business Office File D3423 and S. Mackreth, 2009
1999, June 22	"…[repairing] the fractured concrete sidewalk slabs leading to the steps of the 'New Tower'…" (Gene Wilkins, VIP)	From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 24
2006	Exterior of tower and base repainted, lead paint removed.	HSPT Reports, 2009
2009, May	LED-powered beacon installed in the tower	NPS Records, 2009

General Physical Description

The tower has a wrought iron or steel skeletal framework, a wrought iron or steel cylindrical body with an interior, circular stair, and a cylindrical lantern (further testing is required to determine material). At the base of the tower is a small, neoclassical cast iron building. The base building is cross-gabled with Greek Revival (wide gable trim on all gable pediments, and simplified Doric pilasters at all corners), and

Italianate (arched, hooded windows) detailing. The plan is symmetrical with a narrow north-south unit intersecting a wider east-west unit. The south façade features the entrance door centered in the north-south unit which projects approximately 5' from the east-west unit. Flanking the entrance door in the north wall of the east-west unit are two arch-top windows centered in their respective walls. The north elevation is similarly detailed, except a single arch-top window replaces the entrance door. On the east and west elevations, a single arch-top window is centered in the east and west walls of the wider unit. The east-west unit project about 6' from the north-south unit. The circular metal stairway is located in the center of the building and has 139 risers. The tower base once was used to store batteries for the automated light and still contains cradles for the storage tanks. It currently houses a small exhibit with historic photographs, an area map, and the book, "Instructions to Light-Keepers," (a reprinted version of the 1902 pamphlet given to the Light Keepers), for visitors to peruse (MI-ST-12).

Physical Description – Architecture

Architecture – Roof
The tower roof is cast iron segments with a vent ball finial at the center. There are three screens at the finial vent that have been torn out. The roof of the tower base consists of painted cast iron panels as called out on the original drawings. The cornice of the base is 24-gauge galvanized iron, painted (MI-ST-22).

Architecture – Walls and Wall Finishes
The walls of the tower base, watch room, and center cylinder are wrought iron panels riveted together, painted white (except for the black trim). The lantern walls are cast iron. The walls are original to the structure. The tower base has plaster on lath over furring attached to the cast iron exterior walls. The plaster wall finish is also original to the building.

A paint sample from the exterior of the tower base reveals a stark white paint as the oldest, a glossy clear coat of varnish, and then the current glossy white coat of paint (applied in 2006).

A paint sample from the interior of the tower base reveals three layers of latex paint, which is consistent with the most recent paint project in 1996.

Architecture – Windows
The windows for the Second Tower are arched top, one-over-one, double-hung windows. The window sash are wood, painted white on the interior and exterior. The trim, frame, and sills are cast iron, riveted into place and painted black. Each window has an arched hood trim of metal on the exterior, accented in black. This style of shroud is consistent with Italianate architecture. The glazing in most of the sash is Plexiglas (or a similar product) and the hardware appears to be replacement lifts and sash locks. The pulleys are extant for the lower windows but not visible at the upper tower windows. There is a hole through the cast structures evidencing that pulleys used to exist on these windows as well. The frame and trim are original but the sash ages are unknown (MI-ST-11).

Architecture – Doors
Entry to Tower Base. This door is wood, raised, four-panel and is original to the tower base. The door has no knob and two hinges. The exterior trim is wood, painted black and is ⅞" × 6⅜". Crown molding at the exterior forms the door header and is shaped sheet metal. The interior trim is ⅞" × 4". The dimensions for the door are 3'0" × 6'10" × 1¾" (MI-ST-09 and 10).

Lantern Door. This original door is plate steel with a single lite. The door has screwed attachments and the handle operates the top and bottom throw bolts simultaneously. The door is 2’7” × 5’4” × 4¼” (MI-ST-20).

Architecture – Exterior Trim
The exterior trim is original and is galvanized iron as per the 1929 reconstruction drawings. The base/foundation is board-formed, painted concrete. The exposed overhang of the concrete floor also serves as a water table type of trim detail. The paint contrast scheme of the column/pilaster detailing has varied through the years as evidenced in the historic photos of 1930, 1974 and to current day.

Architecture – Walk and Railing
The perimeter walk at the Lantern level is 2’11½” wide diamond plate cast iron. The top metal rail is ½” × 2” bar stock at 3’0½” above the walk. The intermediate rail is ½” × 2” bar stock and is 1’11½” above the walk. The intermediate rail and the bottom rail are evenly spaced below the top rail and above the walk. Metal pickets are ½” diameter at 4” on center. Metal posts are 1¾” diameter at 3’9” on center with ball finials. All metal is painted and original to the structure. There is a newer painted steel angle frame installed on the south side to support solar panels (MI-ST-23).

Architecture – Lantern
The lantern has plate cast iron to 3’5” A.F.F., with screwed connections. The glazing is 6’0” high with a lattice (⅝” × 3¾”) of painted welded steel with exterior brass stops bolted into the lattice on the exterior at 2’0½” on center. The glazing is stamped “CGB Safety LAN 2973 16 CFR 1201 I,II” and is installed with silicone sealant. The glazing is new and is held in place with ⅞” wide heavy brass stops bolted to the lattice frame at 7” on center. Brass handles are integral to the stops for ease of installation (MI-ST- 24 and 25). A ±6’0” diameter shallow, cone-shaped sheet metal reflector (with a ±16” diameter hole at the center) is suspended ±18” below the roof. The entire assembly is painted. The brass astragals were refabricated in 1994 using the originals as templates. The originals are in the park museum. Reportedly, shortly after the lens removal in 1972–1973, the glass was removed. The tower was open to the elements from 1973 to 1994 (MI-ST-18 and 19).

There are also nine painted cast iron screened exhaust vents (±8” diameter) at the hood above the lantern. These vents have operable fins and pulleys but operating cords or chains are not extant. The vents are companions of the nine painted cast iron intake vents at the lantern level. The intake vents are controlled by 6½” brass caps that open as they are turned. Six of the brass intake caps have been painted, two are missing and one is functional (MI-ST-21). There is a painted cast iron coved cornice at the lantern hood and below the walk. There is a painted, cast iron railing at the lantern roof.

Architecture – Ceiling Finish
The ceiling of the lantern is the underside of the roof - cast iron panels bolted together, painted white (MI-ST-21). The tower base’s ceiling finish is plaster and lath over furring attached to the cast iron panels. Both ceiling finishes are original to the Second Tower.

Architecture – Interior Trim
None.

Architecture – Floor
The tower base has a concrete floor, painted gray, which is original to the building.

Architecture – Stairs
This spiral staircase is cast iron and painted red. The perforated pie-shaped treads are 2” wide at the center column and 11” wide at the outside edge. Each tread is welded to hollow steel sections which slip over the central pipe column. The narrow end of each tread is strengthened with curved steel plate brackets welded to the treads and to the hollow section. At the outside back ends of each tread two additional curved brackets are welded at right angles to vertical pipe sections and to the undersides of each tread. These form the stringer and riser segments. Treads were assembled by stacking each onto the central column and bolting through the edge pipe sections. The diameter of the stairs is approximately 7’0” and the rise is 8”. The metal pipe handrail (painted red) is 3’0” above the nosing and has a 1⅜” diameter. The brackets supporting the railing are located about 3’6” on center (MI-ST-13, 14, and 16). The ship’s ladder at the top of the stairs has a 1⅜” diameter handrail. The ladder has eight steel treads. The steel stringers say, “Bethlehem,” and the guardrail is 3’0” from the finished floor. The ladder is painted (MI-ST-17). Both stairs and ships ladder are original to the tower.

The entry stairs into the tower base have five risers, varying in height from 10” to 2” and the treads are 10” deep and 4’ wide. These stairs are concrete with painted stringers.

Architecture – Accessibility
The building is currently not accessible due to the 3’0” wide door and the 2’7” elevation change from grade to the finished floor (MI-ST-08).

Physical Description – Structural

Structural – Foundation
The foundation system consists of concrete pad footings under each leg of the tower bracing and the center cylinder. The perimeter foundations of the tower base are concrete stem walls on continuous concrete footings.

Structural – Floor Framing
The floor of the tower base is a concrete slab-on-grade.

The floors of the tower watch room and lantern are constructed of cast iron plates that are bolted together. The plates are supported on the center cylinder of the tower and the exterior braces. The watch room and lantern are accessed via a spiral cast iron stair in the center cylinder.

Structural – Roof Framing
The roof of the tower base is metal panels that are bolted together. The panels are supported on the exterior walls of the tower base.

The roof of the lantern is constructed of cast iron panels that are bolted together. The panels are supported on the walls of the lantern.

Structural – Wall Framing
The walls of the center cylinder, tower base and watch room are wrought iron or steel panels that are riveted together. The walls of the watch room are supported on the watch room floor. The walls of the tower base are supported on the perimeter foundations. The walls of the center cylinder are supported on four columns in the tower base that bear directly on the slab-on-grade and center concrete footing.

The walls of the lantern are cast iron panels that are bolted together. The panels bear directly on the floor of the lantern.

Structural – Lateral System
Lateral stability for the tower is provided by a tapered hexagonal wrought iron or steel framework that is riveted together. The framework consists of six legs that are interconnected with horizontal braces at four levels between the footings and the watch room. Additional horizontal braces extend from the legs to the center cylinder at each level. The framework is stiffened with metal x-bracing rods between adjacent legs and between each leg, the center footing and the center cylinder.

Structural – Load Requirements
The required floor load capacity of the watch room is 40 psf, the required lantern floor load capacity is 100 psf and the required roof snow load capacity is 32 psf.

Physical Description – Mechanical

Mechanical – Plumbing Systems
None in the Tower.

Mechanical – HVAC
None in the Tower.

Mechanical – Fire Suppression
None in the Tower.

Mechanical – Other
The only mechanical components in the Second Tower are the passive air vents at the top of the Tower.

Physical Description – Electrical

Electrical – System Configuration
The only electrical equipment in the Second Tower is the Coast Guard's Light Beacon system. This consists of 3 to 12 volt direct current (dc) batteries that feed power to an LED powered beacon. The system employs a photovoltaic array, approximately 14" by 20" to charge the battery system.

Electrical – Wiring Devices
None in the Tower.

Electrical – Conductor Insulation
None in the Tower.

Electrical – Overcurrent Protection
None in the Tower.

Electrical – Lighting Systems
None in the Tower.

Electrical – Telecommunications
None in the Tower.

Electrical – Fire Alarm System
None in the Tower.

Electrical – Lightning Protection
Lightning protection consists of brass air terminals and brass or copper down-cables. Each leg of the Tower is bonded to the ground via a copper or brass grounding strap.

Physical Description – Hazardous Materials

Landmark Environmental collected 12 bulk samples from a total of 12 different types of suspected Asbestos Containing Materials (ACMs) at Michigan Island. Of the 12 suspect ACMs that were sampled and analyzed, a total of 2 samples collected from 2 suspect ACMs resulted in concentrations of greater than 1% (positive for asbestos).

Hazardous Materials – Asbestos
The following suspected ACMs were not sampled due to inaccessibility or park limitations regarding potential for damage to structures. Asbestos is assumed to be present at the following locations:

1. Adhesives (Multiple varieties of miscellaneous adhesives were seen on stairs and around windows).

Materials within the Second Tower were observed to be in good condition.

Hazardous Materials – Lead Containing Paint
Detectable lead is assumed to be present at the following locations:

1. Exterior Painted Surfaces.

The park has reported that the LCP was removed from the interior of the Second Tower in 1996 and the exterior in 2006. Testing was not conducted to confirm the extent or completeness of removal.

Paint chip debris was noted on localized areas of surface soils surrounding the Second Tower. Paint chips were seen in areas up to 10’ from the structure where there was little vegetative ground cover.

Hazardous Materials – Lead Dust
Surface wipe-sampling for lead dust analysis was not conducted in the Second Tower because it is an uninhabited structure.

Hazardous Materials – Lead in Soils
Historical paint maintenance activities such as manual scraping, power-washing, sanding, abrasive blasting or the general poor and peeling condition of exterior LCP may have created the potential to impact the surrounding soil. Areas of the surface soils adjacent to the structure were observed to have LCP debris and additional areas may exhibit LCP debris or lead-contaminated soils, but are not observable due to vegetative cover surrounding the structure. Preliminary lead-in-soil sampling was performed to assess whether these near-structure soils contain lead concentrations above applicable soil standards.

One four aliquot soil sample was collected from the ground surface soils at the roof (drip-line) approximately 3' from the foundation wall. A second four aliquot soil composite sample was collected from the ground surface soils at low lying areas outside the drip-line.

1. Analysis of the composite drip-line soil sample resulted in 8,289 milligrams of lead per kilogram of soil (mg/kg).
2. Analysis of the composite low lying areas outside the drip-line resulted in 7,053 milligrams of lead per kilogram of soil (mg/kg).

Hazardous Materials – Mold
Inspections of the structure were performed to identify the readily ascertainable visual extent of mold growth. Moisture testing in building materials was not performed nor was sampling of building materials performed for microbial analysis. Mold was not visually identified.

Character-Defining Features

Mass/Form. Conical steel tower with exterior bracing and a lantern set off with a decorative cornice all set on a Neoclassical style one-story, symmetrical base.

Exterior Materials. Cast and wrought iron and steel with concrete elements, all painted white with black trim.

Openings. Arched double hung windows (one-over-one) at both the tower base and the tower. Italianate hoods at the windows' exteriors.

Interior Materials. Exposed cast and wrought iron walls and other structural elements and concrete floors and plaster walls all painted.

General Condition Assessment

In general the Michigan Island Second Tower is in good condition. The spiral metal stairs, the cast and wrought iron walls and railing, the metal ships ladder, the metal lantern members, and the metal door all are in good condition. The tower base is an unusual cast iron structure that provides an area for storage or other uses that the other cylindrical light towers do not offer.

Structurally, the Second Tower is in good condition with the exception of the cracked column bases in the tower base.

Mechanically, there are no systems in the tower except for the passive vents located in the lantern level.

Electrically, no alternating current electrical service or utilization equipment exists within the Second Tower.

The following section is a discipline-by-discipline, component-by-component condition assessment of the building. Refer to Volume I, Chapter 2: Methodology for definitions of the condition ratings.

Condition Assessment – Architecture

Architecture – Roof
<u>*Condition:*</u> *Good*
The roof of the Second Tower and its base are both in good condition.

Architecture – Walls and Wall Finishes
<u>*Condition:*</u> *Good*
The exterior and interior cast and wrought iron walls are in good condition. The plaster finish in the tower base is also in good condition with the exception of the south wall which has cracking and peeling paint at the ceiling and wall intersection. According to the park staff, this is suspected to be from condensation.

Architecture – Windows
<u>*Condition:*</u> *Fair*
The window trim and frame (cast parts) are in good condition with minor rusting at joints and connections. The wood sash are in good condition but are no longer operable. The Plexiglas product is inconsistent with

the historic character of the windows. Moreover, the sash may be retrofits based on the evidence of the pins at joints and the router marks.

Architecture – Doors
Condition: *Fair*
Entry to Building and Tower. This door is in fair condition as the bottom rail is loose and the base of the exterior trim is rotted and weathered. The hardware for the door is in poor condition as the knob is missing.

Lantern Door. The door is in good condition.

Architecture – Exterior Trim
Condition: *Good*
All of the trim has been painted recently and is in good condition.

Architecture – Walk and Railing
Condition: *Good*
The walk and railing are in good condition.

Architecture – Lantern
Condition: *Good*
The paint is in good condition but the glazing has a few cracks at the corners. The silicone is also in good condition. Two of the brass intake caps are missing, six of the caps are painted shut, and all chains and cords are missing for the exhaust vent system. Overall, the lantern is in good condition.

Architecture – Ceiling Finish
Condition: *Good*
The underside of the roof in the Tower is in good condition but it does have minor rust. The Tower base's plaster ceiling is in good condition with the exception of the peeling and cracking paint in the southwest corner.

Architecture – Interior Trim
Condition: *Good*
The plaster and cast iron base surround in the Tower base is in good condition.

Architecture – Floor/Foundation
Condition: *Good*
The concrete floor is in good condition with minor chipped and cracked paint and a possible water stain at the south end of the Tower base.

Architecture – Stairs
Condition: *Good*
The spiral staircase and the steel ladder are both in good condition. The entry stair to the Tower base is in good condition.

Architecture – Accessibility
<u>*Condition:*</u> *Poor*
This building is not accessible.

Condition Assessment – Structural

Structural – Foundation
<u>*Condition:*</u> *Good*
The foundations are in good condition.

Structural – Floor Framing
<u>*Condition:*</u> *Good*
The floors of the tower base, lantern, and watch room are in good condition.

Structural – Roof Framing
<u>*Condition:*</u> *Good*
The roof of the tower base and lantern are in good condition.

Structural – Wall Framing
<u>*Condition:*</u> *Good*
The walls of the center cylinder, tower base, watch room, and lantern are in good condition with the exception of the cast iron column bases in the tower base. Two of the column bases are cracked and further investigation is needed (MI-ST-26 and 27).

Structural – Lateral System
<u>*Condition:*</u> *Good*
Lateral stability of the Tower is good.

Structural – Load Requirements
<u>*Condition:*</u> *Good*
The roof and floor framing have adequate capacity to support the required loads.

Condition Assessment – Mechanical

Mechanical – Plumbing Systems, HVAC, and Fire Suppression
<u>*Condition:*</u> *N/A*

Mechanical – Other
<u>*Condition:*</u> *Fair*
The passive air vents at the top of the tower are in fair condition, but they do not provide adequate ventilation to prevent condensation.

Condition Assessment – Electrical

Electrical – System Configuration
<u>*Condition:*</u> *Good*
The Coast Guard's Light Beacon system is in good condition.

Electrical – Wiring Devices, Conductor Insulation, Overcurrent Protection, Lighting Systems, Telecommunications, and Fire Alarm System
<u>*Condition:*</u> *N/A*

Electrical – Lightning Protection
<u>*Condition:*</u> *Fair*
Lightning protection system appears to be intact. However, over time, connections deteriorate and components corrode. The integrity of the system cannot be assured.

On one leg of the Second Tower, a cable appears to have been cut, and left extending out away from the tower. This cable might be a down-cable for the lightning protection grounding system. Alternatively, the observed cable might have been part of an old antenna system that has been abandoned. The exact purpose and nature of this cable is unknown.

Condition Assessment – Hazardous Materials

Refer to "Physical Description – Hazardous Materials" for detailed descriptions of locations and conditions of hazardous materials.

Ultimate Treatment and Use

This building has been operated as a light tower continuously from 1929 through the present. A fully automated light was installed in 1943.[49]

The Tower is currently used as guided visitor access with artifacts on the main level for visitors to review. The proposed use for the building will remain as is with guided access at the main level and to the tower.

Rehabilitation is the recommended treatment for the building.

Requirements for Treatment

Compliance requirements for treatment currently include laws, regulations, and standards as outlined by the Park Service and listed in Volume I, Administrative Data section of this report.

The recommended treatments are tailored to the preferred alternative as the outcome of the Value Analysis/CBA for the project. As individual buildings are rehabilitated, specific alternatives will present themselves during design and construction. The following section is a discipline-by-discipline, component-by-component description of the treatments proposed for the rehabilitation of the building. Refer to Volume I, Chapter 2: Methodology for the priority rating definitions.

Treatment Recommendations – Architecture

Architecture – Roof
Priority: *Low*
Monitor and verify/provide sealant at all roof panel joints.

Architecture – Walls and Wall Finishes
Priority: *Moderate*
Repair damaged plaster and repaint using the paint analysis to guide the color selection. Coordinate with enhanced ventilation work. Monitor and verify/provide sealant at all exterior joints.

Architecture – Windows
Priority: *Moderate*
Replace Plexiglas with glass at sash. Verify/provide operability to all sash to facilitate ventilation. Repair cast components that have minor rust and repaint. Investigate replacing one lower sash of a north window with a secure louver to enhance ventilation.

Architecture – Doors
Priority: *Moderate*
Repair damaged entry door bottom rail and base of trim with epoxy stabilization. Scrape, sand, and repaint. Replace the missing knob with finish to match original.

[49] S. Mackreth, 2011.

Architecture – Exterior Trim
<u>Priority:</u> *Low*
No recommendations at this time.

Architecture – Walk and Railing
<u>Priority:</u> *Low*
No recommendations at this time.

Architecture – Lantern
<u>Priority:</u> *Moderate*
Provide two new brass intake vent cap controls and repair six which are painted shut. Verify operation of all ventilation components. Repair select areas with cracks at glazing.

Architecture – Ceiling Finish
<u>Priority:</u> *Moderate*
Repair damaged plaster and repaint using the paint analysis to guide the color selection. Coordinate with enhanced ventilation work.

Architecture – Interior Trim
<u>Priority:</u> *Low*
No recommendations at this time.

Architecture – Floor/Foundation
<u>Priority:</u> *Low*
No recommendations at this time.

Architecture – Stairs
<u>Priority:</u> *Low*
No recommendations at this time.

Architecture – Accessibility
<u>Priority:</u> *Low*
Provide program access through interpretive wayside exhibits.

Treatment Recommendations – Structural

Structural – Foundation
<u>Priority:</u> *Low*
No recommendations at this time.

Structural – Floor Framing
<u>Priority:</u> *Low*
No recommendations at this time.

Structural – Roof Framing
<u>Priority:</u> *Low*
No recommendations at this time.

Structural – Wall Framing
<u>Priority:</u> *Unknown*
The two cracked column bases should be investigated further to determine if the cracks are structurally significant.

Structural – Lateral System
<u>Priority:</u> *Low*
No recommendations at this time.

Treatment Recommendations – Mechanical

Mechanical – Plumbing Systems and Fire Suppression
<u>Priority:</u> *N/A*

Mechanical – HVAC
<u>Priority:</u> *Moderate*
The existing passive air vents at the top of the tower do not provide sufficient ventilation to prevent condensation inside the tower. Additional passive ventilation is recommended.

Treatment Recommendations – Electrical

Electrical – System Configuration
<u>Priority:</u> *Low*
No recommendations at this time.

Electrical – Wiring Devices, Conductor Insulation, Overcurrent Protection, Lighting Systems, Telecommunications, and Fire Alarm System
<u>Priority:</u> *N/A*

Electrical – Lightning Protection
<u>Priority:</u> *Moderate*
Existing lightning protection is old and its effectiveness has not been established. It is recommended that a LPI (Lightning Protection Institute) certified inspector perform an inspection of the lightning system and provide findings and recommendations in accordance with LPI-175.

Treatment Recommendations – Hazardous Materials

Hazardous Materials – Asbestos
<u>Priority:</u> *Low*
Recommend sampling of suspect asbestos containing materials, including adhesives.

Hazardous Materials – Lead-Containing Paint and Lead Dusts
Priority: *Low*
No recommendation at this time.

Hazardous Materials – Lead In Soils
Priority: *Moderate*
Recommend further soils characterization to confirm applicable regulatory requirements.

Hazardous Materials – Mold/Biological
Priority: *Low*
No recommendation at this time.

Hazardous Materials – Petroleum Hydrocarbons
Priority: *Low*
No recommendation at this time.

Alternatives for Treatment

The following are several considerations of alternatives for the proposed treatments:

1. Consider retaining existing Plexiglas.
2. Allowing self-guided tours at the base was discussed and dismissed due to difficulty in closing off access up the stair.

Assessment of Effects for Recommended Treatments

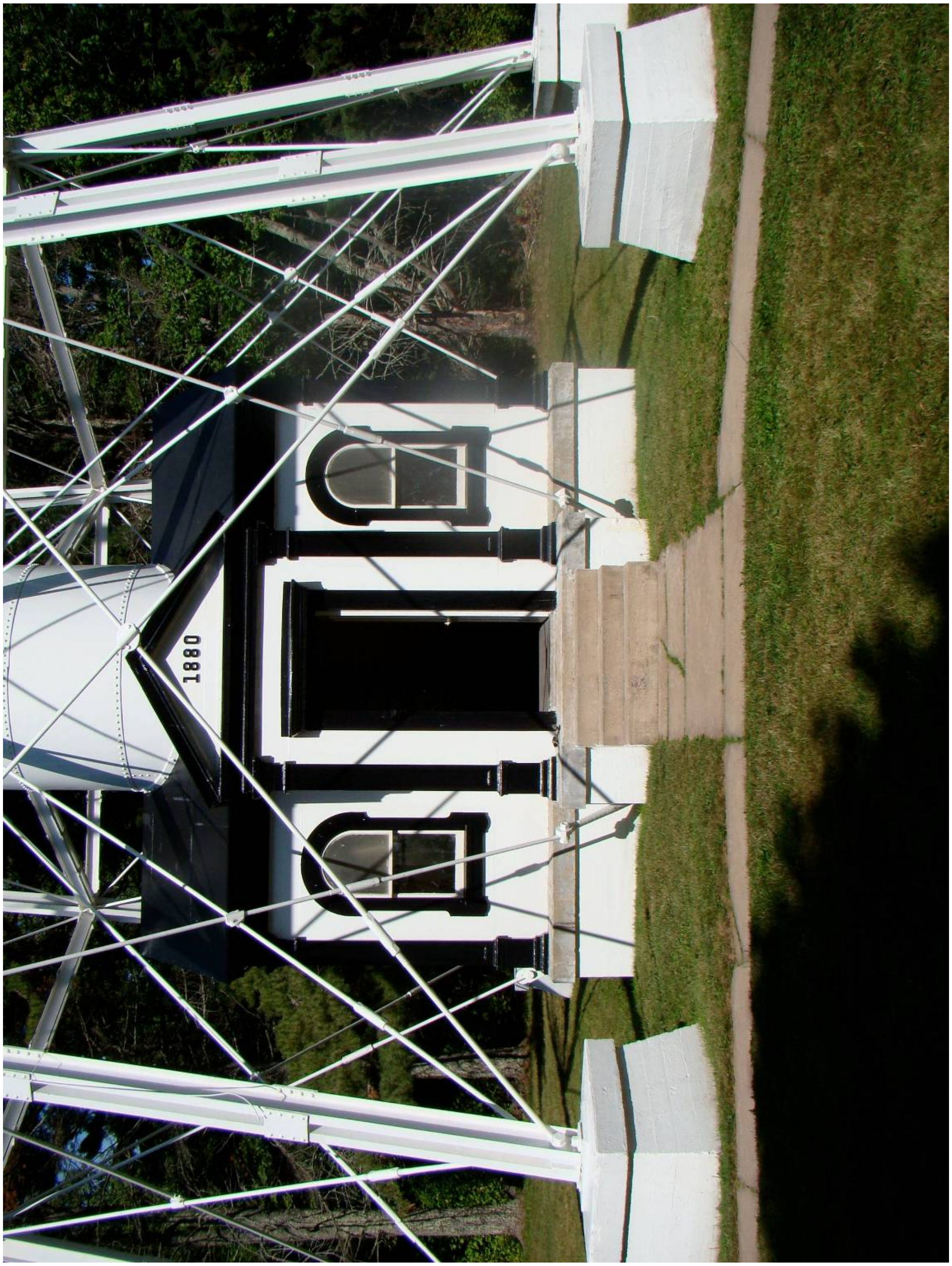
The following table includes an analysis of the major treatment recommendations which affect Section 106 Compliance:

Recommended Treatment	Potential Effects	Mitigating Measures	Beneficial Effects
1. Additional Hazardous Testing and Mitigation	Mitigation of hazardous material may require removal of historic materials.	Any mitigation will need to be evaluated for benefit and implemented sensitively to minimize damage to the resource.	- Improves safety for visitors and staff - Removes hazards from the cultural resource
2. Add new ventilation elements (i.e. replace sash with secure louvers)	Removal of character defining feature (sash) and replacing with a modern material	Verify operation and efficiency of existing ventilation elements prior to introduction of new. Conceal these modifications at the rear windows – one sash only each.	- Increased ventilation will aid in the preservation/ longevity of the historic fabric

Second Tower Photographs, 2009

MI-ST-01: Aerial from Old Michigan Lighthouse, 2009 (Source: AH DSC00578)

MI-ST-02: West elevation, 2009 (Source: AH DSC00680)



MI-ST-03: Tower base south elevation, 2009 (Source: AH DSC00821)

MI-ST-04: Tower base east elevation, 2009 (Source: AH DSC00824)

MI-ST-05: Tower base north elevation, 2009 (Source: AH DSC00825)

MI-ST-06: Tower base west elevation, 2009 (Source: AH DSC00826)

MI-ST-07: Entry stair foundation and column base (Source: AH IMGP2789)

MI-ST-08: Entry stair, east elevation (Source: AH DSC00823)

MI-ST-09: South entry (primary) door (Source: AH 102_9572)

MI-ST-10: South entry (primary) door, interior (Source: AH 102_9574)

MI-ST-11: Typical window, interior face (Source: AH CIMG3596-A)

MI-ST-12: Current exhibit along east wall (Source: AH CIMG3586)

MI-ST-13: Tower stairs, east elevation (Source: AH CIMG3572)

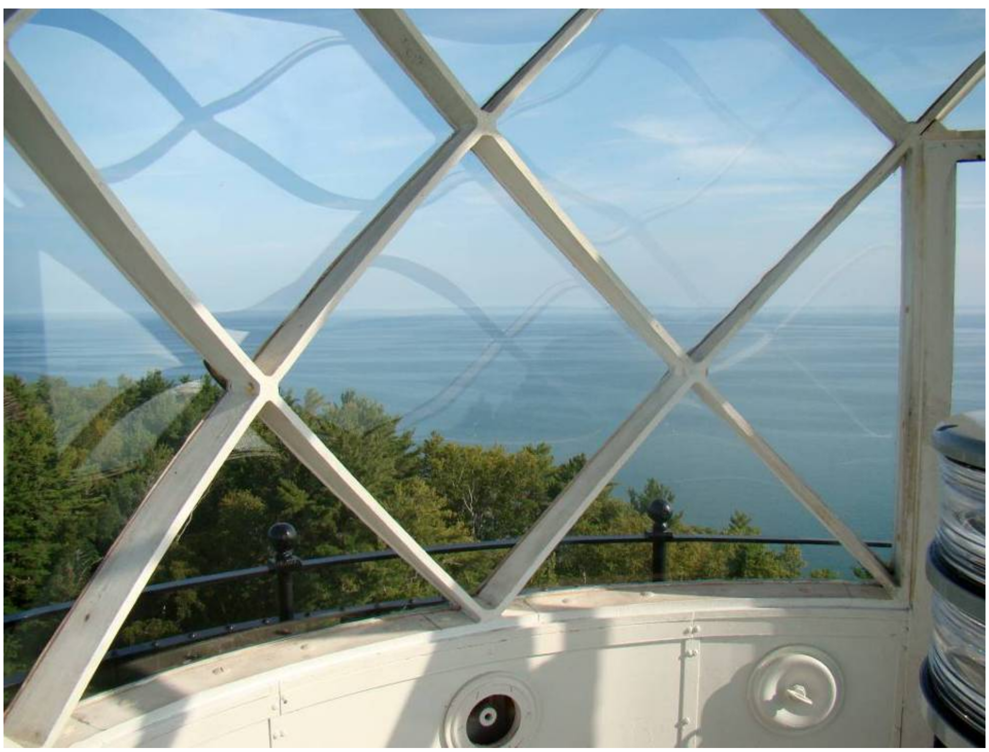
MI-ST-14: Tower base ceiling detail (Source: AH CIMG3595)

MI-ST-15: Lantern, 2009 (Source: AH DSC00584)

MI-ST-16: Tower stairs, looking down (Source: AH DSC00621)

MI-ST-17: Ship's ladder to lantern (Source: AH 100_9641)

MI-ST-18: Lantern (Source: AH 100_9633)



MI-ST-19: Lantern, looking southeast (Source: AH DSC00619)

MI-ST-20: Lantern door (Source: AH 100_9640)

MI-ST-21: Lantern ceiling (Source: AH 100_9632)

MI-ST-22: Lantern roof (Source: AH IMGP2769)

MI-ST-23: Lantern railing and walkway (Source: AH 100_9638)

MI-ST-24: Lantern glazing, walkway, and railing (Source: AH IMGP2782)

MI-ST-25: Lantern glazing and brass stop detail (Source: AH 100_9637)

MI-ST-26: Crack in column base (Source: Martin/Martin)

MI-ST-27: Crack in column base (Source: Martin/Martin)

KEEPERS QUARTERS

Chronology of Alterations and Use

Original Construction

The Michigan Island Keepers Quarters was built in 1929 as part of the Light Station upgrades associated with the Second Tower. It was built as the living quarters for the keeper and his family.[50]

The front porch of the building was once screened-in, as seen in an historic image from c.1939 (Historic Image MI-08). According to Robert E. Parker, Senior, whose father had a fish camp nearby, the porch was screened-in when the Quarters was completed in 1929.[51] A 1974 photo shows the east elevation of the Keepers Quarters with three covered windows and the covered east entry door (Historic Image MI-10). Currently, the house is being used for seasonal employees and all of the windows and doors are uncovered. Interior photos from 1975 show the living room and dining room in what appears to be good condition (Historic Images MI-11 and 12).

The 1929 construction plans for the Keepers Quarters show the porch with no screening (Historic Drawing MI-09 and 10).

Significant Alterations / Current Condition

Significant alterations to the Keepers Quarters consist of the 2004 rehabilitation of the main floor that involved the removal and replacement in-kind of rotten floor joists and subflooring and the refinishing of the interior floors. Between 1998 and 2009, the Historic Structure Preservation Team of the Park Service completed the rehabilitation of the foundation drainage, rebuilt the basement stairway, and painted the exterior woodwork.

The mechanical systems in the Keepers Quarters have been upgraded to modern standards to allow for seasonal housing for park employees and volunteers.

Electrical wiring and equipment was installed in 1929 when the building was built. There is evidence that upgrades have been performed including replacement of some luminaires with more modern fixtures. There is some evidence of a previous direct current power system for the building including battery racks and two liquid filled battery cells. How this system was utilized in the building is unknown. Electrical systems added in the recent past appear to follow current NEC requirements.

The kitchen entry and its associated exterior stairs were part of the original construction, though they appear to be an addition, as evidenced in the historic drawings.

The Keepers Quarters are currently in good condition.

[50] List of Classified Structures, National Park Service, 2009.
[51] Michigan Island Light Station Record Book, Volume II, Hazel Keller entry, July 23, 1988.

Summary of Documented Work on the Building

Date	Work Described	Source of Information
1930-Unknown	Maintenance each year: installed screens on Keepers Quarters porch in the early spring	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1975	Stabilization of Keepers Quarters	APIS/NPS Business Office File D3423
1976	Repair drainage at Keepers Quarters	APIS/NPS Business Office File D3423
1977	Repair and paint exterior walls of Keepers Quarters	APIS/NPS Business Office File D3423
1979	Emergency stabilization of Keepers Quarters brick at porch and northeast stoop	APIS/NPS Business Office File D3423
1981	Asbestos roofing installed	APIS/NPS Business Office File D3423
1985, August 21	Finished installation of "burglar-smoke alarm system" (Terry Blomberg)	From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," pages 7 and 8
1987, June 17	New kitchen floor and sink plumbing installed	From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 10
1987, September 9	Large propane tank hooked-up, kitchen cabinets installed	From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 11
1994, July 15	"Next Wednesday they will take asbestos wrapping insulating ducts in basement away. A specialist will do this…" (Darlene Wahl, VIP)	From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 21
1994, September 1-2	Asbestos crew removes asbestos in basement	From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 22
1995, August 21	Disconnected burglar alarms, placed them in cabinets	From "Excerpts from Michigan Island Volunteer Logs- 1978–1999," page 23
2004	Removal and replacement in-kind of rotten floor joists and subflooring	LCS, 2009 and HSPT Reports, 2009
2004	Partial repainting of interior	HSPT Reports, 2009
2004	Sanding and refinishing of interior floors	HSPT Reports, 2009
2008	Interior painted	Susan Mackreth, Volunteer Supervisor in 2008
2008	Basement I-beams reinforced	Randy Ross, Facility Manager, 2010

Notable Actions with Unknown Dates

Date Range	Work Described
Post-1929	Upgraded plumbing fixtures at the bath
Post-1929	HVAC ductwork dismantled
Post-1987	Propane heaters and appliances installed
Post-1987	Connected to nonpotable domestic supply tank at the Power House
Pre-1998	Rehabilitated foundation drainage
1998–2009	Rebuilt basement stairway

General Physical Description

The building is a 1 ½-story brick residential structure with a full basement, gable roof, two gable dormers, and an entry porch on the south elevation as well as an enclosed kitchen entry at the northeast corner. The main entry faces south toward the lake and the site tram stairway. The first floor has three rooms; the second floor has three as well.

Physical Description – Architecture

Architecture – Roof
The roof consists of the original asbestos shingle roofing, 9” wide × 7” exposure, and curved ridge caps attached to the main gable. The flashing appears to be the copper that is noted on the original construction drawings. The sheathing is solid (i.e. not spaced) consistent with the original asbestos application. The eave, extending 2’ at the main roof and 1’6” at the dormers, consists of exposed rafter tails and tongue and groove sheathing with a shaped 1x fascia, a 1x frieze board with a quarter-round closure trim, all wood painted white.

Architecture – Gutters and Downspouts
The original ogee style gutters and rectangular fluted downspouts are extant. The downspouts drain into a clay tile pipe underground system which day-lighted to the bluff, per the original drawings. The downspouts are 4¼” wide by 2¾” deep. The gutter is 4” tall 5” wide at the top, and 3” wide at the bottom (MI-KQ-06, 07, 08, and 09). The original construction drawings called for 22-gauge gutters and 24-gauge downspouts.

Architecture – Chimney
The chimney is red brick with a double clay flue and a sloped, cast concrete cap. The chimney is yellow brick at the interior.

Architecture – Exterior Walls
The walls are red brick masonry, running bond, with a soldier course at the base. The bricks are 8⅜” long, 2⅜” wide, and 3⅝” deep. There are stone sills and wall caps as well. There is painted wood lap siding and 1x wood trim at the northeast wall, matching the adjacent Assistant Keepers Quarters and Workshop.

A mortar sample taken indicates that the composition of the mortar is about five parts lime to seven parts sand. The mortar is gray colored, moderately soft, and the sand has a typical coarseness.

Architecture – Windows
Typical Windows. These windows are three-over-one, double hung, paired or single. This type of window has thumb turn locks, two finger sash lifts, sash cord and pulleys intact, and removable stops. The windows are painted white on the exterior and varnished wood on the interior. The interior trim matches the newer door trim at the Old Michigan Island Lighthouse, but the windows have ogee-shaped sills and skirts at the base. The muntins have an ogee profile. The exterior sills are wood over stone with a drip edge. Each window has a two-lite wood screen, mounted to the exterior with screen hooks. The screens are black. The typical dimensions for the windows are 2’6” × 4’9” (MI-KQ-18 and 41). The windows in the kitchen and bath have dimensions of 2’6” × 3’5”.

Basement Windows. The original basement windows are two- or three-lite metal casements. The northeast basement window is a contemporary wood vent with a wood screen (MI-KQ-20).

Architecture – Exterior Doors
Basement Entry, Main Entry, and Kitchen Entry Doors. This type of door is a six-lite over two vertical panels, made of wood, and is original to the building. Each door has its original “Yale” knob hardware with integral lock that is keyed on the exterior, thumb turn on the interior face, and two ball-tipped hinges. The exterior trim is 1x5 wood and the interior trim for the main and basement entries is built-up ¾” × 4¼”

wood with rounded edges. The overlay at the outside edge is an L-shaped trim piece (1” × 1⅛” × ±¼”) (MI-KQ-16 and 23). The interior trim for the kitchen entry is a simple ¾” × 3⅝” wood trim. This door also has a stone sill, while the other two entry doors have cast stone sills (MI-KQ-17). This type of door is 2’8” × 7’0” × 1¾”.

Screen Doors for Basement Entry, Main Entry, and Kitchen Entry Doors. This type of door is original to the building and is wood-framed with four vertical screen panels with one horizontal panel at mid-height. There are springs at the interior and an inset, rounded profile at the rails and stiles. There is a contemporary lever/latch, chain governor, and three ball-tipped hinges for each door. These doors are 2’8” × 7’0” × 1⅛” (MI-KQ-15 and 33).

Architecture – Exterior Trim

The exterior trim consists of 1x corner boards and belly band trim at the wood sided portion of the building. This trim at the northeast corner matches the corner trim of the Assistant Keepers Quarters and Workshop.

Architecture – Porch

The porch has a painted beadboard ceiling with a sloping concrete floor to drain. There appears to have been a separate pour for the topping slab at the porch and steps. Integral cast concrete drains are at the face of the south wall though the sloping drainage may be suspect as witnessed by the previous pointing work on the south wall. The porch was screened in at one time, though the original drawings do not indicate screens.

Architecture – Interior Doors

Five Panel Door (First and Second Floors). These original doors are five panel, wood doors (pine) with raised panels, wood trim, and varnished finish (except for the kitchen face of the dining room double-swing door and the basement door, which are painted white. These doors are the interior doors for the first and second floors with the exception of the first floor living room to dining room double doors. The trim is built-up ¾” × 4¼” with rounded edges. The overlay trim at the outside edge is an L-shaped piece (1” × 1⅛” × ±¼”). Both sides of each door have typical knobs and mortise plates and each door has two ball-tipped hinges. The widths of the doors vary, but the stile width is consistent, 4⅛,” so doors were custom. The typical door dimension for this type is 2’4” to 2’8” × 7’0” × 1¼”.

Living Room to Dining Room Double Doors. These 15-lite, paired wood French doors are original to the building and are varnished. The doors have inset rounded profiles at the muntins, two ball-tipped hinges, one throw bolt each at the top of the door, and no other hardware. The trim is built-up ¾” × 4¼” with rounded edges and the overlay at the outside edge is an L-shaped trim piece (1” × 1⅛” × ±¼”). Each door is 26” × 7’0” × 1¼” (MI-KQ-27).

Broom Closet Door. This is a single wood panel broom closet door, painted, and it is original to the building. It has a brass push button catch knob, (possibly “Handy Catch” by Keil, New York), the same knob that is in the kitchen cabinet at the Old Michigan Island Lighthouse. The trim is built-up ¾” × 4¼” with rounded edges and the overlay at the outside edge is an L-shaped trim piece (1” × 1⅛” × ±¼”). The door is 1’0” × 7’0” × 1⅛” (MI-KQ-31 and 32).

Architecture – Wall Finishes

The typical wall finish in this building is the original plaster over lath. The basement walls are red brick and the kitchen entry wall finishes are exterior brick on the south wall and horizontal 1⅝” beadboard painted white on the north, east, and west walls.

A paint sample from the kitchen reveals that the original paint color was a rich yellow. A sample from the second floor hall ceiling revealed three layers, the oldest being a warm yellow color. A paint sample from the second floor bath also revealed three layers, the oldest being pink in color.

A plaster sample from the second floor hall closet indicates that it is a mixture of gypsum and sand as opposed to lime and sand. The plaster is off-white in color and has surprisingly coarse sand. A plaster sample from the stair is very similar to the hall's plaster, except it has a very thin white skim coat.

Architecture – Ceiling Finishes
The typical ceiling finish in this building is the original plaster over lath. The basement has no ceiling finish as the floor framing is exposed. The kitchen entry has 1⅝" beadboard, painted white, as the ceiling finish.

Architecture – Interior Trim
The type of trim in the building is stained or painted wood 8" base with an ogee profile at the top and a simple base shoe. This trim is original to the building, and is the same as the base trim in the Old Michigan Island Lighthouse's kitchen and living room, c.1929 remodel work.

The living and dining room have wood picture rails, about 2" from the ceiling, stained. These moldings appear to be original (MI-KQ-24). The second floor south bedrooms also have picture rails, but only about 1" from the ceiling and with an almost cove-shaped profile, unlike the more traditional "S" shaped profiles for picture rails. These are also stained wood and appear to be contemporary (MI-KQ-43, 44, and 45).

Architecture – Floor
The typical floor is 2¼" wood tongue and groove boards, recently refinished. The kitchen closet's floor has not been refinished and the original wood condition and stain are visible. The kitchen entry's floor is concrete as is the basement flooring.

Architecture – Stairs
Exterior South (Front Porch) Stairs. These stairs are concrete with six risers at 6" high, except the first riser, which is 8¼" high. The stair treads are 5'11½" deep, except the bottom tread which is 7'11½". The side cheek walls are 1'2" wide cast concrete capping brick. The entry to the porch is 5'3" wide, and the distance from the edge of the stairs to the door is 6'6". The stairs are original to the building (MI-KQ-13 and 14).

Exterior East (Kitchen Entry) Stairs. These concrete stairs have a brick base, five risers to a concrete landing and then one more riser at the door threshold. The bottom riser is 10½" high, the other four risers are 7¼" high, and the riser at the door is 5" high. The four treads are 12" deep, 4'1" wide, and have a 1" nosing. The door threshold is 2'7" wide. The steel pipe railing, painted red, has a 1½" diameter with three posts and two rails. The top rail is 2'8" from the stair nosing to the center of the rail, and the lower rail is 1'4" from the nosing to the center of the rail. The railing is 3'9" from its center to the exterior wall. These stairs are original to the building (MI-KQ-11 and 12).

Basement to First Floor Stairs. These stairs have two flights of wood stairs connected by a landing which is the entry for the basement door. The lower flight, to the basement, is an open riser made of unfinished wood. This flight has seven risers at 8½" high with treads 9½" deep and 3'2" wide. There is no handrail in this portion. The landing is 3'6" long by 2'9" wide and is wood board painted gray. The upper flight of these stairs has five risers at 7½" high and treads are 10" deep and 3'0" wide. This set is made of wood, painted gray, and has closed risers and rubber tread mats in the center of the treads. The upper flight also

does not have any handrails. The upper flight and landing are original to the building, but the lower flight of unfinished wood is most likely a recent set of stairs (MI-KQ-21 and 22).

First Floor to Second Floor Stairs. These stairs are stained wood with two risers to a landing and then 14 risers to the second floor. The riser height is 7½" with the bottom tread width of 3'2" and the other treads are 3'0" wide. The depth of the treads is 11" and they all have a 1" nosing. The landing is 3'0½" long by 3'2" wide. There are no handrails. These stairs are original to the building (MI-KQ-38 and 39).

Architecture – Casework

Entry and Living Room Closets. The closets have painted boards for hooks.

Kitchen Entry. The kitchen entry has a built-in cabinet made with beadboard, painted white, which is the length of the west wall. There are two large two-door cabinets on the top with three shelves in the interior each, one large two-door cabinet on the bottom, and one open-out hinged door, possibly for trash, on the bottom. This cabinet is very similar to the cabinet in the kitchen of the Old Michigan Island Lighthouse, including the door hardware. The knobs on the doors are brass push button catch knobs, (possibly "Handy Catch" by Keil, New York) and the cabinet has surface-mounted butterfly hinges (each door has two). This cabinet has a slide out wood cutting board, painted white (MI-KQ-34 to 37).

Second Floor Hall Closet. The Hall closet has four built-in wood shelves on the north wall, painted white, and two simple wood hook boards (2¾" wide), painted white, on the east and west walls. There are no existing hooks. The shelving system appears to be historic, possibly original.

Second Floor Southeast Bedroom and Closet. The closet has two stained hook boards. There is an attic access hatch in this closet, trimmed with simple wood casing, stained. The hatch is made of beadboard, stained as well.

Second Floor Southwest Bedroom and Closet. The closet has a modern metal rod with wood blocks for support.

Second Floor Northwest Bedroom Closet. This closet has a simple painted wood board.

Architecture – Accessibility

The building is currently not accessible. The main entry door opening is 2'8" clear with a grade to finished floor elevation change of 3'5¾". The kitchen entry door opening is 2'8" clear with a grade to finish floor elevation change of 3'8¾". The basement entry door opening is 2'8" clear with a grade to finished floor elevation change of 3'1½". Within the building, there have been no upgrades to mitigate accessibility. The basement and upper level are not accessible.

Physical Description – Structural

Structural – Foundation

The perimeter foundation system consists of brick masonry. The interior foundations are concrete footings in the basement. The concrete footings below the adjustable steel columns were added in 2004.

Structural – Floor Framing

The basement floor is a concrete slab-on-grade.

The first floor framing was measured to be 2x10 joists spaced at about 16'. The joists span approximately 12'. The joists were installed in 2004 and are graded No. 1 or No. 2 Douglas Fir – Larch. The joists are supported on the perimeter foundation walls and 10" deep steel beams. The beams span approximately 3', 7', and 11'. The beams are supported on the perimeter foundation walls and three 3" diameter adjustable steel columns that bear on concrete footings. The columns were added in 2004. The subfloor over the joists is plywood or 1x diagonal sheathing. The plywood was installed in 2004.

The second floor framing was not accessible and could not be measured. The joists are supported on wood-framed partition walls and wood-framed exterior walls.

Structural – Roof Framing
The roof framing was measured to be 2x6 rafters spaced at about 16'. The rafters span approximately 14'. The rafters are supported on the exterior walls. The rafters are sheathed with solid wood underlayment.

The roof framing of the front and back porches could not be observed but is believed to be wood framing. The roofs span approximately 6'. The rafters are supported on the exterior walls and two masonry columns at the front.

Structural – Ceiling Framing
The ceiling framing of the second floor was measured to be 2x6 joists spaced at about 16". The joists span approximately 14'. The ceiling joists are supported on the exterior walls and the interior partition walls.

Structural – Wall Framing
The exterior walls are constructed of wood framing with a brick masonry veneer. The framing of the interior walls could not be observed but was shown to be wood framing on the 1929 drawings (Historic Drawing MI-03).

Structural – Lateral System
Lateral stability for the building is provided by the exterior masonry veneered walls.

Structural – Load Requirements
The required floor load capacity is 40 psf. The required attic live load capacity is 10 psf (no storage allowed). The required roof snow load capacity is 50 psf.

Physical Description – Mechanical

Mechanical – Plumbing Systems
A nonpotable domestic water supply enters the building below grade in the basement with copper distribution piping to the first floor kitchen and second floor bath. There is no hot water in the building.

The building waste lines are mainly cast iron with a PVC (polyvinyl chloride) drain connection at the kitchen sink. These lines connect to a 4" cast iron sewer main that exits the building in the basement. This 4" line connects to a 6" clay sewer pipe that runs to the southwest and into a septic tank located to the southwest of the Power House that serves the entire building complex. Two basement floor drains also connect to the 6" clay sewer.

Plumbing fixtures have been upgraded since the 1929 installation with a two-compartment stainless steel sink in the first floor kitchen and bathroom fixtures on the second floor. The bathroom fixtures consist of a wall mounted enameled cast iron lavatory and a tank type toilet (MI-KQ-48, 49, and 50).

Mechanical – HVAC
The original heating system consisted of a 1929 coal-fired International Heater Company No. 4824 furnace in the basement. The furnace is still located in the basement, but the distribution ductwork has been disconnected. Many of the original wall and floor grilles are still in place. A new Empire 25,000 British thermal unit per hour (btuh) console-type propane room heater has been installed in the first floor living room. The 4" aluminum flue pipe from the propane heater has been installed inside the original chimney stack. Two propane tanks are located to the west of the building. The copper propane piping enters the building on the west side with a pressure regulator located on the exterior wall and copper distribution piping through the basement up to the first floor. The propane piping serves the heater and kitchen stove. A second abandoned propane entry exists on the east side of the building and is still connected to the copper propane distribution piping with a locked-out valve.

Basement ventilation consists of a 24" × 30" ground level louver on the west side of the building with a wire mesh screen.

Mechanical – Fire Suppression
None in the building.

Physical Description – Electrical

Electrical – System Configuration
Alternating current power to the building originally came from the Power House via underground cable. The original underground feeder to the building has been removed. A 20 amp underground feed for PV power was installed within the past 10 years to connect very limited lighting in the building to the PV system in the Power House.

Electrical – Wiring Devices
Wiring Devices including receptacles and toggle switches are typical of the late 1920's era. In general, wiring devices are mounted in outlet boxes in walls. Receptacles are of the two prong type and do not include a ground connection. Wiring devices for alternating current are no longer connected to a source of power and are no longer utilized. Switching for newer PV powered lighting is via wall mounted toggle switches.

Electrical – Conductor Insulation
Conductors and cable within the building are generally of corrugated armor, rubber insulated construction, type BX. Existing BX cable is concealed in walls and ceilings on upper floors and exposed in basement and attic. Several lighting fixtures have been removed. Some of the original armored cable has been replaced with more modern NM (nonmetallic sheathed) type cable for the few light fixtures and receptacles that are now connected to the central photovoltaic system inverter. According to the Park Service, wiring in walls has been replaced with type NM cable. Newer electrical installations appear to conform to later versions of the NEC. Conductors originally used for alternating current are no longer connected to a source of power and are no longer utilized.

Electrical – Overcurrent Protection
Overcurrent protection was originally provided via a two pole 30 amp disconnect switch feeding a four circuit screw-in fuse box located in the basement. The disconnect remains in place. Fuses are still in place, but the box and connections have been disconnected from the building's circuits. Overcurrent protection for PV powered devices in the building is via a 1 pole circuit breaker located in the dc load center in the Power House.

Electrical – Lighting Systems
Original lighting systems inside of the building are incandescent lamp type. Luminaires are typical of the late 1920s era and consist of various ornamental surface mounted types, including drums, and pendants. Original switching was via wall mounted toggle switches. Fluorescent strip lights located in the kitchen area are powered from the photovoltaic system.

Electrical – Telecommunications
None in the building.

Electrical – Fire Alarm System
The building is equipped with several battery powered smoke detectors, but no centralized system or fire department signal connection exists.

Electrical – Lightning Protection
Lightning protection consists of brass air terminals and brass or copper down-cables that appear to be terminated on buried ground rods. Air terminals are located along the peak of the roof, at the peak of each dormer, and on the chimney.

Physical Description – Hazardous Materials

Landmark Environmental collected 12 bulk samples from a total of 12 different types of suspected Asbestos Containing Materials (ACMs) at Michigan Island. Of the 12 suspect ACMs that were sampled and analyzed, a total of 2 samples collected from 2 suspect ACMs resulted in concentrations of greater than 1% (positive for asbestos).

Hazardous Materials – Asbestos
Asbestos is confirmed to be present at the following homogeneous materials/areas:

1. Gray Granular plaster between slats in wall interiors.

The following suspected ACMs were not sampled due to inaccessibility or park limitations regarding potential for damage to structures. Asbestos is assumed to be present at the following locations:

1. Wall and Ceiling Plaster,
2. Ceiling Insulation (Black matting or felt paper observed above ceilings, this suspect ACM may also be present in wall interiors),
3. Adhesives (Multiple varieties of miscellaneous adhesives were seen on heater components, under remnant flooring applications, and around windows),
4. Thermal System Insulation (TSI) (Was not observed and asbestos is commonly present in insulation on water pipes, metal ducting for heating systems, behind floor registers, steam piping, etc.),
5. Roofing Materials (Roofing felt, tar, and shingles were observed that may contain asbestos),

6. Subflooring (Suspect ACMs in flooring applications were not observed and asbestos is commonly present in vapor barrier felts and tar-papers used in subflooring applications),
7. Brick and Block Filler (The exterior of the structure is brick and has the potential to have a block filler or grout that is potentially asbestos containing),
8. Caulk (Caulking was observed around window and door penetrations, which can also include gasket applications between the window assembly and the structure), and,
9. Asbestos-cement (Piping, wall-board, wall interior panels, roof flashing and roofing applications can be constructed of asbestos-cement. This type of application was not observed at the structure but may be present).

The confirmed ACM was observed to be in good condition, and the assumed ACMs were observed to be in fair condition, except isolated areas of plaster that were in poor condition.

Hazardous Materials – Lead Containing Paint

The LCP inspection included a visual inspection of the structure. A previous inspection and testing for LCP was conducted using an XRF detector coupled with bulk paint sampling and laboratory analysis. The XRF inspection was conducted by NPS staff in 1993. The findings of this study are incorporated into this report by reference.

Detectable lead in paint was confirmed for the following testing combinations:

1. Window Sash (Wood substrate of various colors),
2. Window Trims (Wood substrate of various colors),
3. Doors (Wood and metal substrates of various colors),
4. Door Trims (Wood substrate of various colors),
5. Walls (Various substrates of various colors), and,
6. Ceilings (Various substrates of various colors).

Detectable lead is assumed to be present in at the following locations:

1. Interior Painted Surfaces (Based on testing in the kitchen, living room, den, bathroom, and bedrooms LCP is assumed to be present on painted surfaces throughout the structure which, based on NPS testing is non-LCP), and,
2. Exterior Painted Surfaces (Based on testing of the trim by NPS LCP exists on exterior painted surfaces).

Based on the estimated dates of construction of the various structures and the available testing data, LCP is assumed to be present throughout the structure. The LCP was observed to be in fair condition, and the assumed LCP was observed to be in fair condition.

Loose/flaking LCP is not identified on the exterior walls of the structure. Paint chip debris is not noted on localized areas of surface soils surrounding the Keepers Quarters.

Hazardous Materials – Lead Dust

Surface wipe-sampling was conducted in the Keepers Quarters. A three wipe composite was collected from the living room, upstairs bedroom, and upstairs bathroom.

1. Laboratory analysis showed 119 micrograms of lead per square foot of floor space (µg/ft2).

Hazardous Materials – Lead in Soils

Historical paint maintenance activities such as manual scraping, power-washing, sanding, abrasive blasting or the general poor and peeling condition of exterior LCP may have created the potential to impact the surrounding soil. Areas of the surface soils adjacent to the structure were not observed to have LCP debris and additional areas may exhibit LCP debris or lead-contaminated soils, but are not observable due to

vegetative cover surrounding the structure. Preliminary lead-in-soil sampling was performed to assess whether these near-structure soils contain lead concentrations above applicable soil standards.

One four aliquot soil sample was collected from ground-surface soils at the roof (drip-line), approximately 3' from the foundation wall. One sample aliquot was taken from each side of the structure and these aliquots are composited together for analysis.

1. Analysis of the composite drip-line soil sample resulted in 160 milligrams of lead per kilogram of soil (mg/kg).

Hazardous Materials – Mold

Inspections of the structure were performed to identify the readily ascertainable visual extent of mold growth. Moisture testing in building materials was not performed nor was sampling of building materials performed for microbial analysis. Mold was visually identified.

Character-Defining Features

Mass/Form. A simple brick gable bungalow with a hipped-roof brick porch, brick chimney, a large centered gable dormer on the front and a smaller offset gable dormer on the back balanced by a one story wood-framed shed roof appurtenance with a concrete-topped brick landing and stair to grade.

Layout of Space. The arrangement of rooms is a more contemporary approach with separate circulation areas; all of the bedrooms are separate without connecting openings.

Exterior Materials. Red brick with stone sills, painted white wood trim, painted wood siding and an asbestos shingle roof.

Openings. Typically three-over-one wood double hung windows; Doors are six lite over two panel, wood painted.

Interior Materials. Wood floor, stained wood trim, panel doors, painted plaster walls and ceilings, brass mechanical damper control.

General Condition Assessment

In general, the Michigan Island Keepers Quarters is in good condition. The original interior finishes are in remarkably good condition, besides the alligatored stained floors on the second floor and the few instances of water infiltration into plaster. The original windows and doors are also in good condition, as is the historic casework.

Structurally, the Keepers Quarters is in good condition. The brick masonry below the landing at the back door needs further attention. The roof needs to be strengthened to support the required snow load.

Mechanically, the upgraded systems in the Keepers Quarters are generally in good condition.

Electrically, the equipment within this building is in fair condition considering its age. However, much of the existing equipment and equipment locations do not meet current installation codes and are past their serviceable lives. Except for the newer NM wiring and newer fluorescent luminaires, the electrical system for this building is not salvageable.

The following section is a discipline-by-discipline, component-by-component condition assessment of the building. Refer to Volume I, Chapter 2: Methodology for definitions of the condition ratings.

Condition Assessment – Architecture

Architecture – Roof
Condition: *Poor*
The roofing is in poor condition. It appears to be nearing its end of serviceable life and yellow algae exists pervasively. The eave and associated trim is in fair condition with several areas of damage and peeling paint.

Architecture – Gutters and Downspouts
<u>*Condition:*</u> *Poor*
Overall, the gutters and downspouts are in poor condition. The gutters have failure at joints, and the areas that have rusted through have resultant damage to masonry and trim. There is also a gutter missing at the eastern portion of the north elevation. The underdrain system's condition is unknown, but it is suspect.

Architecture – Chimney
<u>*Condition:*</u> *Good*
The chimney is in good condition.

Architecture – Exterior Walls
<u>*Condition:*</u> *Good*
Generally, the walls are in good condition with a few exceptions at the porch and rear stoop. Both locations have open cracks/joints at the brick. Materials testing indicate that the mortar is a gray, moderately soft lime, with a sand composition. At the concrete landing of the kitchen entry, moisture appears to have entered behind the stem wall resulting in spalling and efflorescence. The north wall adjacent to the missing gutter has also been damaged.

Architecture – Windows
<u>*Condition:*</u> *Good*
The typical double hung windows have some cracked and missing glazing putty, a few cracked panes, paint peeling on the exterior, and alligatored interior trim varnish. A few of the screens are missing screen stops and there are two patched screen areas. Overall, however, the windows in this building are in good condition.

Architecture – Exterior Doors
<u>*Condition*</u>*:* *Fair*
Basement Entry, Main Entry, and Kitchen Entry Doors. These doors are in fair condition as they have peeling paint and the lower rails for the basement and kitchen entry doors are deteriorating from rain and sun exposure.

Screen Doors for Basement Entry, Main Entry, and Kitchen Entry Doors. These doors are in good condition besides minor peeling paint.

Architecture – Exterior Trim
<u>*Condition*</u>*:* *Fair*
The trim is generally in fair condition with a few exceptions where the gutters have failed. The trim at the northeast matches the adjacent Assistant Keepers Quarters and Workshop.

Architecture – Porch
<u>*Condition*</u>*:* *Good*
The porch is generally in good condition but there is cracking at the porch topping slab. The south wall's masonry shows signs of previous repair, possibly due to the slope of the porch floor and its built-in drains.

Architecture – Interior Doors
<u>*Condition:*</u> *Good*
Five Panel Door (First Floor and Second Floor). These doors are in good condition with the exception of some missing knobs.

Living Room to Dining Room Double Doors. This set of doors is in good condition with the exception of the alligatored varnish.

Broom Closet Door. This door is in good condition.

Architecture – Wall Finishes
<u>*Condition:*</u> *Good*
The general state of the plaster walls is in good condition, with minor cracks and peeling of the paint. There are some areas in which the plaster wall finish is in poor condition. There are cracks in the plaster, missing plaster, and areas of moisture infiltration visible in the second floor hall and main stairway. The southeast second floor bedroom and closet have some plaster issues. The closet has some holes in the plaster. The kitchen entry's wall finishes are also in fair condition as there is minor board separation on the beadboard walls.

Architecture – Ceiling Finishes
<u>*Condition:*</u> *Good*
Overall, the original plaster ceiling finishes are in good condition with limited instances of cracks and peeling paint. The second floor hall and stairway have poor ceiling finishes, however, as these areas have heavy peeling, cracking, and obvious moisture issues. The southwest bedroom has a crack in the plaster running east to west with evident repair work. There is also a section of plaster missing at the southwest corner of the sloped roof line where sealant was applied in 2008 to cover the lath (S. Mackreth's recollection as volunteer's supervisor). The kitchen entry's ceiling finish of beadboard is in fair condition with some board separation.

Architecture – Interior Trim
<u>*Condition:*</u> *Good*
Overall, the base is in good condition. The trim on the first floor has minor wear and tear. The second floor trim has prevalent examples of poor stain jobs that have created the alligatored appearance of the stain.

The first and second floor picture rails are in good condition.

Architecture – Floor
<u>*Condition:*</u> *Fair*
The first floor wood flooring is in good condition with minor wear and tear and stains. The kitchen closet's floor that has not been refinished is also in good condition. Beginning at the stairwell to the second floor, the recent stain was applied poorly and the stain in all of the second floor rooms, hall, and stairwell are alligatored and unevenly stained. The alligatoring of the floor finish appears to be due to a too thick layer of finish applied. The second floor bath has poor wood floor finish as the stain is alligatored, there are paint and water stains, and the paper remnants and glue from previous flooring are sealed to the floor. The second floor north bedroom also has small water stains on the floor.

Architecture – Stairs
<u>*Condition:*</u> *Fair*
Exterior South (Front Porch) Stairs. These concrete stairs are in good condition, but they do not have a handrail and there are some minor cracks on the treads.

Exterior East (Kitchen Entry) Stairs. This concrete stair and railing are in poor condition as the brick base of the stairs is deteriorating. The mortar is too hard, and as a result, is disintegrating and the bricks are loosening and falling out. There is also a horizontal crack in the concrete landing that is associated with the brick foundation failing.

Basement to First Floor Stairs. These stairs are overall in good condition but neither flight has handrails.

First Floor to Second Floor Stairs. These stairs are in good condition although there are no handrails and the finish is badly alligatored.

Architecture – Casework
<u>*Condition:*</u> *Good*
In general, the casework is in good condition. The registers are in good condition. The kitchen entry's cabinet is in fair condition as the paint is peeling badly and cracking, the hinges are rusted, and upper cabinets' doors are misaligned.

Architecture – Accessibility
<u>*Condition:*</u> *Poor*
This building is not accessible.

Condition Assessment – Structural

Structural – Foundation
<u>*Condition:*</u> *Good*
The foundation system appears to be in good condition. There are a few small areas of brick deterioration that appear to have been caused by freeze/thaw damage.

Structural – Floor Framing
<u>*Condition:*</u> *Good*
The first floor framing is in good condition having been repaired in 2004. Floor joists that bear above windows are not properly supported on lintels. The second floor framing could not be observed, thus its condition is unknown. No obvious signs of distress or damage were observed.

Structural – Roof Framing
<u>*Condition:*</u> *Good*
The roof framing of the main building is in good condition. The calculated snow load capacity is approximately 30 psf which is 20 psf less than the required snow load. The roof framing of the porches could not be observed, thus its condition is unknown.

Structural – Ceiling Framing
<u>Condition:</u> *Good*
The ceiling framing of the second floor is in good condition.

Structural – Wall Framing
<u>Condition:</u> *Fair*
The exterior walls are in good condition with the exception of the masonry walls under the landing at the back door which are in poor condition. The walls at the landing are severely deteriorated. The concrete landing slab has cracked and is in fair condition. The damage to the bricks at the landing needs further investigation (MI-KQ-51 and 52). The framing of the interior walls could not be observed, thus their condition is unknown. No obvious signs of structural damage were observed.

Structural – Lateral System
<u>Condition:</u> *Good*
Lateral stability of the Keepers Quarters is good.

Structural – Load Requirements
<u>Condition:</u> *Fair*
The roof framing can support about 30 psf of snow which is less than the required load capacity. The second floor ceiling and first floor framing have adequate capacity to support the required loads. The capacity of the second floor framing is unknown.

Condition Assessment – Mechanical

Mechanical – Plumbing Systems
<u>Condition:</u> *Good*
The copper nonpotable domestic water distribution piping to the first floor kitchen and second floor bath is in good condition.

The cast iron building waste lines and PVC drain connection at the kitchen sink are in good condition. While the fixture drain and two basement floor drains are in good condition, the condition of the buried 6” clay sewer pipe that runs into the septic tank could not be determined.

The stainless steel kitchen sink, bathroom fixtures, and faucets are in good condition.

Mechanical – HVAC
<u>Condition:</u> *Good*
The original 1929 coal-fired furnace in the basement is in poor condition. The distribution ductwork has been disconnected. Many of the original wall and floor grilles are still in place and are in fair condition. The new Empire propane heater and associated flue vent are in good condition. However, the existing chimney stack is not adequately lined and does not meet current mechanical and building codes. The propane building entry, outside pressure regulator, and copper distribution piping through the basement up to the first floor are also in good condition.

The basement ventilation louver is in fair condition, but does not provide adequate ventilation for the space.

Mechanical – Fire Suppression
Condition: *N/A*

Condition Assessment – Electrical

Electrical – System Configuration
Condition: *Poor*
The underground power feed to the building has been removed. The existing power disconnect and fusing system is in poor condition and is beyond its serviceable life. The underground feed for PV power from the Pump House is in good condition.

Electrical – Wiring Devices
Condition: *Poor*
Wiring devices originally installed for alternating current systems are in poor condition.

Electrical – Conductor Insulation
Condition: *Poor*
The original conductors and cable within the building are in poor condition, and are well beyond their serviceable life. Type BX branch circuit cable is in poor condition. At 70 years old, insulation is suspect and potentially very fragile. Existing cables are two wire only and do not contain a separate ground wire. The integrity of remaining connections cannot be assured.

Electrical – Overcurrent Protection
Condition: *Poor*
Fuses are still in place, but the box and connections have been disconnected from the building's circuits.

Electrical – Lighting Systems
Condition: *Fair*
Lighting systems inside of the building appear to be in fair condition. Nevertheless, after 70 years of service in a humid environment, the integrity of connections cannot be assured. In addition, newer underwriter's requirements for fixture grounding have made these fixtures obsolete. Fluorescent strip lights that are powered from the photovoltaic inverter system are relatively new and are in good condition.

Electrical – Telecommunications
Condition: *N/A*

Electrical – Fire Alarm System
Condition: *Fair*
Existing single station smoke detectors are in fair condition, but were not tested.

Electrical – Lightning Protection
Condition: *Fair*
Lightning protection systems are intact and appear to be in fair condition, however over time, connections deteriorate and components corrode. The integrity of the system cannot be assured.

Condition Assessment – Environmental

Refer to "Physical Description – Environmental" for detailed descriptions of locations and conditions of hazardous materials.

Ultimate Treatment and Use

This building operated as a residence from 1929 to 1943 when the Second Tower was automated and the keeper and assistants were no longer needed.

The building is currently used as guided visitor access with artifacts on the main level for visitors to review. The upper level is used for seasonal staff/volunteer housing. The proposed use for the building will remain only as seasonal staff/volunteer housing. The intent of the park is to rehabilitate the building to 1929 condition while providing required upgrades for the housing function.

Rehabilitation is the recommended treatment for the building.

Requirements for Treatment

Compliance requirements for treatment currently include laws, regulations, and standards as outlined by the Park Service and listed in Volume I, Administrative Data section of this report.

The recommended treatments are tailored to the preferred alternative as the outcome of the Value Analysis/CBA for the project. As individual buildings are rehabilitated, specific alternatives will present themselves during design and construction. The following section is a discipline-by-discipline, component-by-component description of the treatments proposed for the rehabilitation of the building. Refer to Volume I, Chapter 2: Methodology for the priority rating definitions.

Treatment Recommendations – Architecture

Architecture – Roof
Priority: *Severe*
Remove the existing asbestos shingle roof and replace in kind with an asphalt shingle roof of 9” wide by 7” high exposure in keeping with the 1929 era. Verify/provide proper underlayment and flashings at all eaves, rakes, valleys and intersections. Scrape, sand, and repaint the wood trim at the eave, soffit, fascia and frieze using the paint analysis to guide the color selection.

Architecture – Gutters and Downspouts
Priority: *Severe*
Replace the existing ogee style 22-gauge gutter and 24-gauge fluted downspout system in kind. Verify/provide new attachments at sound substrate.

Architecture – Chimney
Priority: *Low*
No recommendations at this time.

Architecture – Exterior Walls
Priority: *Moderate*
Repair damaged masonry at the porch, rear stoop and north wall adjacent to the missing gutter. Utilize the mortar analysis to guide the mortar composition and color. Mortar joint tooling shall match the original. Clean all masonry with a mild detergent. Scrape, sand, and repaint the areas of wood siding and trim using the paint analysis to guide the color selection.

Architecture – Windows
Priority: *Low*
Repair select windows with damaged glazing. Replace cracked panes of glass. Replacement glass shall be clear, non-reflective and have a visual light transmittance of not less than 72%. Scrape, sand, and repaint exterior of windows and frame. Scrape sand and revarnish interior of windows and frame.

Architecture – Exterior Doors
Priority: *Moderate*
Repair lower rails exhibiting damage. Scrape, sand, and repaint the doors. Repair existing hardware as required to allow smooth operation.

Architecture – Exterior Trim
Priority: *Low*
Scrape, sand, and repaint the areas of wood trim at siding using the paint analysis to guide the color selection.

Architecture – Porch
Priority: *Low*
Scrape, sand, and repaint the porch using the paint analysis to guide the color selection. Monitor the topping slab cracking.

Architecture – Interior Doors
Priority: *Low*
Scrape, sand, and revarnish interior doors with alligatored finish. Replace missing knobs with finish to match original.

Architecture – Wall Finishes
Priority: *Moderate*
Repair damaged plaster and repaint using the paint analysis to guide the color selection.

Architecture – Ceiling Finishes
Priority: *Moderate*
Repair damaged plaster repaint using the paint analysis to guide the color selection.

Architecture – Interior Trim
Priority: *Low*
No recommendations at this time.

Architecture – Floor
Priority: *Moderate*
Refinish existing wood floor. Coordinate with enhanced ventilation of building.

Architecture – Stairs
<u>*Priority:*</u> *Severe*
Repair the landing of the kitchen entry stairs, coordinated with the masonry repair. Verify/provide proper slope away from the wall. Add code compliant handrails at the kitchen entry, basement and first and second floor stairs; painted metal at exterior and wood stained at interior.

Architecture – Casework
<u>*Priority:*</u> *Low*
No recommendations at this time.

Architecture – Accessibility
<u>*Priority:*</u> *Low*
Accessibility to this building is not readily achievable. Program access will be achieved by interpretive wayside signage. Options discussed and dismissed included providing a limited route of accessibility to the Quarters include (1) adding a ramp to the west with a new opening in the porch low wall and landing at the front door; or (2) adding a ramp and increasing door opening widths (existing is 2’8”) of the kitchen entry doors and interior path; or (3) investigating the addition of a PV/Battery operated mechanical lift at either location.

Treatment Recommendations – Structural

Structural – Foundation
<u>*Priority:*</u> *Low*
The cause of the freeze/thaw damage to the brick masonry should be investigated further.

Structural – Floor Framing
<u>*Priority:*</u> *Low*
The first floor joists at the windows should be supported on lintels or headers.

Structural – Roof Framing
<u>*Priority:*</u> *Low*
The roof framing should be investigated further to determine if it needs to be strengthened to support the required snow loads. The calculated capacity is 30 psf and the required capacity is 40 psf.

Structural – Ceiling Framing
<u>*Priority:*</u> *Low*
No recommendations at this time.

Structural – Wall Framing
<u>*Priority:*</u> *Low*
The damaged walls under the landing at the back door should be repaired or reconstructed and protected from future deterioration. The concrete landing slab should be replaced.

Structural – Lateral System
<u>*Priority:*</u> *Low*
No recommendations at this time.

Treatment Recommendations – Mechanical

Mechanical – Plumbing Systems
<u>*Priority:*</u> *Moderate*
It is recommended that the sewer and septic system be cleaned, tested, and inspected with repairs as necessary for an operational system.

Mechanical – HVAC
<u>*Priority:*</u> *Severe (Chimney Liner); Moderate (Ventilation and Piping)*
The existing chimney stack is not adequately lined and does not meet current mechanical and building codes. Installation of a chimney liner for the heater flue vent is highly recommended.

The existing basement ventilation louver does not provide adequate ventilation to prevent condensation and high humidity levels. The addition of mechanical and passive ventilation is recommended.

It is recommended that rusted propane piping at the pressure regulator be replaced and that all unused propane piping be removed.

Mechanical – Fire Suppression
<u>*Priority:*</u> *N/A*

Treatment Recommendations – Electrical

Electrical – System Configuration
<u>*Priority:*</u> *Moderate*
Electrical devices, lighting and wiring dating to the original 1929 installation are no longer connected to a source of power. These items should remain in place for historical context. Existing wiring in the building for PV powered systems is limited. It is recommended to expand the existing system with new wiring to provide power for new ventilation systems, new refrigerator, and new stove. All new electrical wiring and equipment shall be in accordance with the National Electrical Code.

Electrical – Wiring Devices
<u>*Priority:*</u> *Moderate*
It is recommended that new wiring devices for PV systems be installed where required. Wiring devices shall be in accordance with the National Electrical Code, NPS and Federal Standards and Regulations.

Electrical – Conductor Insulation
<u>*Priority:*</u> *Moderate*
It is recommended that new conductor insulation be consistent with wiring methods for proposed PV systems. Conductor insulation shall be in accordance with the National Electrical Code, NPS and Federal Standards and Regulations.

Electrical – Overcurrent Protection
<u>*Priority:*</u> *Moderate*
It is recommended that overcurrent protection for new PV system wiring be in accordance with the National Electrical Code, NPS and Federal Standards and Regulations.

Electrical – Lighting Systems
<u>*Priority:*</u> *Low*
No recommendations at this time.

Electrical – Telecommunications
<u>*Priority:*</u> *N/A*

Electrical – Fire Alarm System
<u>*Priority:*</u> *Moderate*
Existing battery powered smoke detectors are old. It is recommended that new detectors replace existing, that additional detectors be added inside and outside rooms intended for sleeping, and that carbon monoxide sensors be added as required.

Electrical – Lightning Protection
<u>*Priority:*</u> *Moderate*
Existing lightning protection is old and its effectiveness has not been established. It is recommended that the existing lightning protection system be removed prior to roof replacement. It is recommended that a new LPI-175 compliant lightning protection system be installed after roof replacement.

Treatment Recommendations – Hazardous Materials

Hazardous Materials – Asbestos
<u>*Priority:*</u> *Moderate*
Recommend Sampling of suspect asbestos containing materials, including wall and ceiling plaster, ceiling insulation, adhesives, TSI, roofing materials, subflooring, brick and block filler, caulking, and asbestos cement. Removal and replacement of asbestos roofing is recommended.

Hazardous Materials – Lead-Containing Paint and Lead Dusts
<u>*Priority:*</u> *Moderate*
Recommend stabilization or abatement of Lead Containing Paint.

Hazardous Materials – Lead In Soils
<u>*Priority:*</u> *Moderate*
Recommend further soils characterization to confirm applicable regulatory requirements.

Hazardous Materials – Mold/Biological
<u>*Priority:*</u> *Moderate*
Recommend water intrusion and mold mitigation.

Hazardous Materials – Petroleum Hydrocarbons
Priority: *Low*
No recommendations at this time.

Alternatives for Treatment

The following are several considerations of alternatives for the proposed treatments:

1. Visitor access into this building has been deemed unnecessary because of the ability for the Old Lighthouse to serve this function. If visitors were allowed in, upgrades for accessibility would need to be made.

Assessment of Effects for Recommended Treatments

The following table includes an analysis of the major treatment recommendations which affect Section 106 Compliance:

Recommended Treatment	Potential Effects	Mitigating Measures	Beneficial Effects
1. Additional Hazardous testing and mitigation	Mitigation of hazardous material may require removal of historic materials.	Any mitigation will need to be evaluated for benefit and implemented sensitively to minimize damage to the resource.	- Improves safety for visitors and staff - Removes hazards from the cultural resource
2. Replace existing roof with new asphalt shingle	Removes original material.	Roof is at end of serviceable life. New exposure of shingles and coloration shall match original.	- Abates a hazardous material - New roof will aid in the preservation of the structure
3. Add code compliant handrails at the stairs	Adding a modern element may be visually disruptive.	Design a guardrail that blends well with the historic fabric.	- Improves visitor and staff safety

Keepers Quarters Photographs, 2009

MI-KQ-01: Aerial, 2009 (Source: AH DSC00609)

MI-KQ-02: South elevation, 2009 (Source: AH DSC00635)

MI-KQ-03: East elevation, 2009 (Source: AH DSC00636)

MI-KQ-04: North elevation, 2009 (Source: AH DSC00640)

MI-KQ-05: West elevation, 2009 (Source: AH DSC00637)

MI-KQ-06: East gutter and roof detail (Source: AH IMGP2804)

MI-KQ-07: South roof, trim, gutter, and chimney detail (Source: AH IMGP2826)

MI-KQ-08: Porch roof, gutters, downspouts, trim and eaves, looking northwest (Source: AH IMGP2828)

MI-KQ-09: Downspout and underdrain detail (Source: AH IMGP2829)

MI-KQ-10: North elevation downspout, eaves, and roof (Source: AH IMGP2801)

MI-KQ-11: East porch (Source: AH IMGP2797-A)

MI-KQ-12: East porch detail, north elevation (Source: AH IMGP2798)

MI-KQ-13: Front porch detail (Source: AH CIMG3644)

MI-KQ-14: Front porch detail, looking west (Source: AH IMGP2795)

MI-KQ-15: South entry (primary) screen door (Source: AH 100_9594)

MI-KQ-16: East entry screen and wood doors (Source: AH 100_9606)

MI-KQ-17: North entry wood door (Source: AH 100_9607)

MI-KQ-18: Typical exterior window (Source: AH 100_9596)

MI-KQ-19: Attic window (Source: AH 100_9598)

MI-KQ-20: Basement and window (Source: AH CIMG3739)

MI-KQ-21: Basement stairs (Source: AH DSC00841)

MI-KQ-22: Stairs from basement entry to kitchen (Source: AH DSC00844)

MI-KQ-23: South entry door (primary) (Source: AH 100_9593)

MI-KQ-24: Living room south elevation (Source: AH CIMG3678)

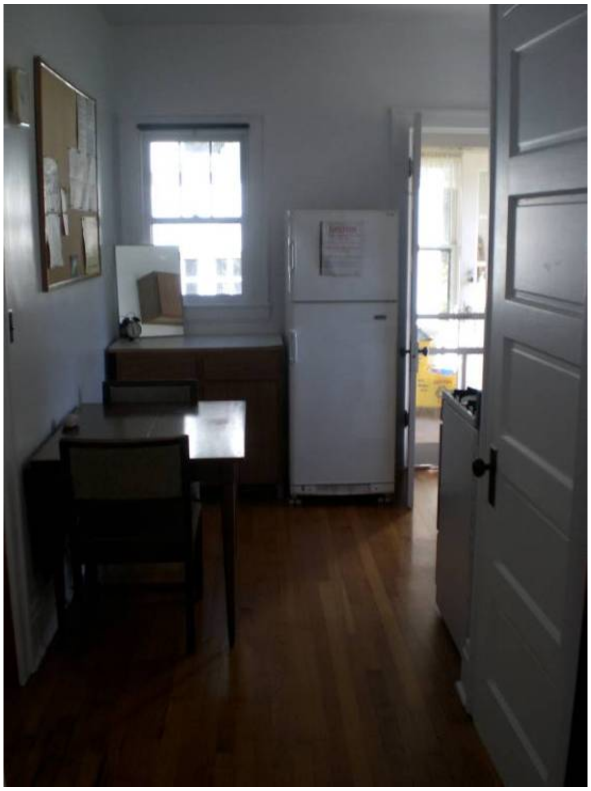
MI-KQ-25: Living room north elevation (Source: AH CIMG3675)

MI-KQ-26: Living room metal register on north wall and base trim (Source: AH CIMG3682)

MI-KQ-27: Living room double doors into dining room (Source: AH 100_9616)

MI-KQ-28: Dining room early vent control system (Source: AH CIMG3700)

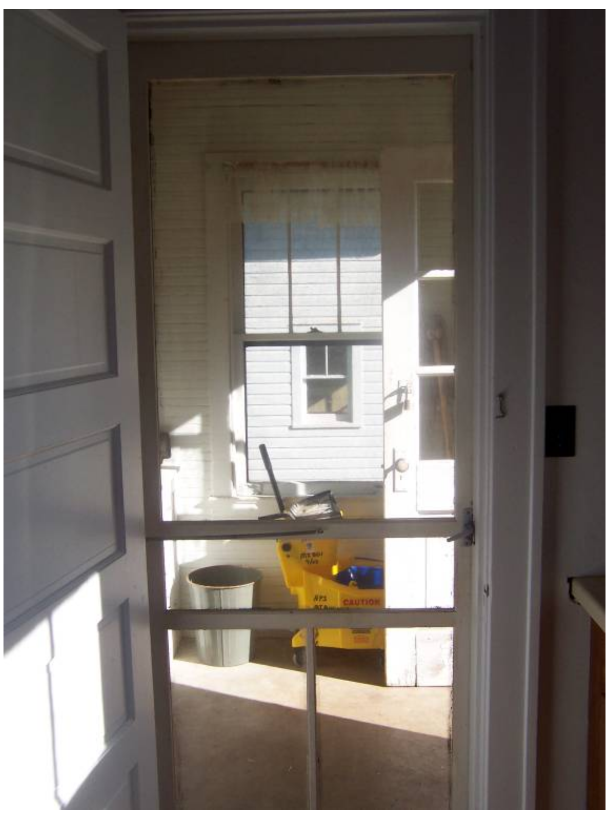
MI-KQ-29: Detail of vent control (Source: AH 100_9614)



MI-KQ-30: Kitchen north elevation (Source: AH CIMG3705)

MI-KQ-31: Kitchen broom closet door, east wall (Source: AH 100_9611)

MI-KQ-32: Kitchen broom closet latch (Source: AH 100_9610)



MI-KQ-33: Kitchen wood door and screen to kitchen entry (Source: AH 100_9608)

MI-KQ-34 and 35: Kitchen entry wood cabinet, south side (Source: AH CIMG3733 and CIMG3732)

MI-KQ-36 and 37: Kitchen entry wood cabinet, north side (Source: AH CIMG3734 and CIMG3735)

MI-KQ-38: Stairs from living room to second floor (Source: AH DSC00830)

MI-KQ-39: Stairs from living room to second floor (Source: AH DSC00835)

MI-KQ-40: Second floor hall, north elevation (Source: AH DSC00717)

MI-KQ-41: Southeast bedroom, south elevation (Source: AH DSC00724)

MI-KQ-42: Southeast bedroom, metal floor register, floor and base trim (Source: AH DSC00731)

MI-KQ-43: Southwest bedroom, west elevation (Source: AH DSC00743)


MI-KQ-44: Southwest bedroom ceiling, looking south (Source: AH DSC00749)


MI-KQ-45: Southwest bedroom, south ceiling detail and picture rail profile (Source: AH DSC00750)

MI-KQ-46: North bedroom, west elevation (Source: AH DSC00763)

MI-KQ-47: Bath, east elevation (Source: AH DSC00786)

MI-KQ-48: Bath, looking southeast (Source: AH DSC00787)

MI-KQ-49: Bath, toilet detail (Source: AH DSC00800)

MI-KQ-50: Bath, toilet detail (Source: AH DSC00799)

MI-KQ-51: Masonry wall deterioration (Source: Martin/Martin)

MI-KQ-52: Masonry wall deterioration (Source: Martin/Martin)

ASSISTANT KEEPERS QUARTERS AND WORKSHOP

Chronology of Alterations and Use

Original Construction

The Michigan Island Assistant Keepers Quarters and Workshop was likely built in 1927, though documentation varies. It was built as the living quarters for the second assistant keeper and his family (most likely the second assistant had been cooking in a shed and sleeping in Old Michigan Island Lighthouse prior) and as a workshop and storage building.[52]

Though the plans date to 1929, keeper's logs in 1927 and 1928 reference what appears to have been work on the building.[53] The construction plans show the same style and types of windows and doors that exist on the exterior today. It can be assumed that the windows and doors are original to the building. The original roofing is also still on the building (Historic Drawing MI-11).

Significant Alterations / Current Condition

There are no known significant alterations to the Assistant Keepers Quarters and Workshop.

The Assistant Keepers Quarters and Workshop are currently in stable condition. The workshop area (the first floor) is used by the Park Service as a maintenance and storage shed.

There is currently a hole in the roof in the northwest section and there are no active mechanical systems in the building.

The current electrical wiring and equipment was installed when the building was built. Generally, no observable upgrades to the equipment have been made.

General Physical Description

The building is a 1½-story wood-framed residential and utilitarian structure that has a gable roof, lap siding and corner boards, concrete foundation, three-over-one lite double-hung windows, shed wall dormer on the south and north, wood panel double doors, six-lite, centered on the south façade, single door on the east, and an interior brick chimney.

This building's first floor is currently in-use as a storage building. The second floor bedroom closet is storing storm windows and vertical wood panel doors. It is unknown from which building they originated.

Physical Description – Architecture

Architecture – Roof

The existing roofing is asbestos roof shingles 9" wide × 7" exposure. There is a hole in the roof (northwest), perhaps due to a tree fall. The ridge trim is missing at the west end (likely due to the same

[52] List of Classified Structures, National Park Service, 2009.

[53] Ambiguous references in the keeper's log: June 28, 1927: "…used up roll of paper for roof of Assistants house."; May 24, 1928: "Laid floor in Assistants place."; June 21, 1928: "Whitewashed Assistants quarters and worked in launch." Though labeled Assistants house, place or quarters, these references could be referring to either the building known today as the Assistants Keepers Quarters and Workshop or to the shed structure that served as the kitchen for the assistant.

damages that caused the hole at the roof) and has been repaired with wood. There does not appear to be any extant flashing. The roof appears to be original to the structure as it is consistent with the notes on the original construction drawings (MI-AKQ-07). The eave consists of exposed rafter tails and tongue and groove soffit which extends 2’0”. The fascia at the gable end matches the Keepers Quarters and is painted white. There is no fascia trim at the eave of the main roof or shed dormers.

Architecture – Gutters and Downspouts

There is a half-round gutter hung with wire ties to the roof. The downspouts are fluted, 3” diameter round shape. There is no underdrain system on this building. The original construction plans do not show the gutters and downspouts, so it is not known if they are original to the building. They are seen in photos as early as 1935 (MI-AKQ-08 and 09).

Architecture – Chimney

The chimney is exposed on the interior and is blond brick. The exterior portion of the chimney is red brick with a sloped cast concrete cap and clay flue. The chimney has a metal clean-out on the first floor. The chimney is 1’4¼” wide and 1’1” deep from its western face to the wall (MI-AKQ-15).

A mortar sample taken from the chimney at the interior indicated that the mortar is equal parts lime and sand by volume. The sand is very fine.

Architecture – Exterior Walls

The exterior walls consist of 2x4 framing at 16” on center, sheathing and wood drop siding with a concave, shaped top and 5” exposure, painted white.

A material sample from the siding revealed that there are three layers of white paint over extremely weathered wood.

Architecture – Windows

All but one window in the building are three-over-one (one window is two-over-one), double hung. Each window has a thumb turn latch, no lift hardware, sash cord and pulleys intact, and extant roller shade hanger hardware. The interior trim is ¾” × 4½” painted wood with a rounded edge, a sill and a skirt. The muntins have an inset, rounded profile. The exterior trim is 1” × 4½” painted white with a simple 2x sill. One window has a two-lite screen, painted black, and held in place with spring clips at the perimeter. The typical dimensions for these windows are 2’10” × 5’7” with the façade window slightly shorter. These windows are original (MI-AKQ-21).

Architecture – Exterior Doors

The exterior doors are six-lites over two vertical panels, made of wood, and are original to the building, similar to the Keepers Quarters exterior doors. The muntins have an inset, rounded profile. The south elevation has double doors with wood astragal, painted white (MI-AKQ-11 and 13). The east elevation is a single door painted white (MI-AKQ-10 and 14). Each door has a padlock, two ball-tipped hinges, and 2x wood sills. The east leaf of the double doors has a surface- mounted throw bolt. The double door is 2’6” × 7’0” × 1¾” and the single door is 3’0” × 7’0” × 1¾”.

Architecture – Exterior Trim
The exterior trim consists of base trim and corner boards all painted white. The corner trim is 1” × 4½”. The base trim is 1” × 5½” with a canted 1½” ‘drip’ trim member which protrudes past the siding 1”. The siding and trim match that of the adjacent wood-framed Keepers Quarters northeast corner.

A material sample taken at the exterior trim around a door revealed there are three layers of paint, but unlike the sample taken of the siding, the wood beneath is unweathered.

Architecture – Interior Doors
These original doors are five panel, wood doors with raised panels and are painted. The wood trim matches the interior window trim. Each door has knob hardware with mortise plates on both faces and two hinges. The typical door dimension for this type of door on the first floor is 2’8” × 7’0” × 1¼” and on the second floor is 2’0” to 2’8” × 6’8” × 1¼” (MI-AKQ-20).

Architecture – Wall Finishes
There are two types of wall finishes in this building. The first floor rooms have 7” wide wood planks, painted, running horizontally on the walls (the Paint Closet walls are unpainted). This wall treatment is original to the building. The second floor and stairwell have painted beadboard running horizontally as the wall finish. The beadboard is 2½” wide except in the living room closet (on the north and west walls) and in the bedroom closet (on the north and east walls) which is 1⅝” wide.

Architecture – Ceiling Finishes
The first floor has 7” wood boards, running east to west, painted blue-gray as the ceiling finish. The paint closet ceiling also shows the stair sheathing - unpainted vertical boards. The second floor has 2½” beadboard, painted white, also running east to west, as the ceiling finish.

Architecture – Interior Trim
The living room and the kitchen are the only two rooms that have typical wood base shoes, painted, while the bedroom’s walls have a different paint color exposed at the level where a base shoe most likely existed at some point in time.

Architecture – Floor
The first floor’s flooring is concrete slab-on-ground as it was built as a workshop. The second floor’s flooring is 3” wood board planking, painted blue-gray. There is also a rectangle of resilient flooring covering most of the kitchen’s wood floor.

Architecture – Stairs
First Floor to Second Floor Stairs. These stairs are painted wood with rubber tread mat glue residues remaining. There are nine risers to the landing and then five more risers. The riser height is 8” and the treads are 10” deep and 3’2” wide. There is a simple wood board railing, painted, on the upper set of stairs after the landing. The rail is 4” × 1½” and the distance from the nosing to the rail is 3’0” on center. These stairs are original to the building (MI-AKQ-18).

Architecture – Casework

Paint Closet. This room has two wood planks lining the length of the north wall (2½” thick), one wood shelf that is ¾” thick × 2’7” deep on the south wall, and one wood shelf that is ¾” wide × 1’4” deep on the south wall above the deeper shelf. There are three stacked rough wood cabinets (no front faces or doors) on top of the shallower wood shelf. The shelving in this room may be historic.

Second Floor Bedroom. This bedroom has a free-standing wood cabinet with 1⅝” beadboard door, painted blue-gray. The cabinet has a modern handle and latch and two surface-mounted butterfly hinges (same hinges as the kitchen cabinets in this building, the Keepers Quarters, and the Old Michigan Island Lighthouse). There are three interior, unpainted, wood shelves. The top of the cabinet is decorated with an ogee profile, crown molding style trim. The base has rounded vee profiles on the side faces. There is no trim on the front or back faces. The cabinet is 5’0” tall × 2’10⅜” wide × 12¼” deep. The door dimensions are 1’10¾” wide × 4’6” tall × ¾” thick (MI-AKQ-21 and 22).

Kitchen Cabinet. The kitchen has a built-in wood cabinet made of 1⅝” beadboard, painted white, with one two-door cabinet in the upper portion, one two-door cabinet in the lower portion, and two drawers in the lower portion above the doors. The hardware are slide latches and butterfly hinges. The hinges are seen in the other cabinets in the Keepers Quarters and the Old Michigan Island Lighthouse, but the latch type is not. The cabinet sits directly on the ground and has a blue-gray painted base shoe on the south elevation (MI-AKQ-27).

Kitchen Counter. The kitchen also has a built-in wood kitchen counter with sink cut-out and pull out wood drawer with metal pull. There is base shoe molding attached around the counter where it meets the wall. All of the wood and the metal drawer pulls are painted white (MI-AKQ-25). The kitchen sink was removed in 2005 and installed in Raspberry Island Lighthouse during the Raspberry Restoration Project.

Second Floor Bedroom Closet (Stored Items). This closet is currently storing a collection of vertical panel doors/hatches with latch locks, painted white, and three glazed windows with blue-gray painted frames nailed together and protected by wine box wood (“California” stamped on one face) (MI-AKQ-23).

Architecture – Accessibility

The first floor of the building is currently not accessible. The primary entry door opening on the south elevation is 5’ clear (but neither leaf meets ABAAS) with a grade to finished floor elevation change of less than 8”. Currently, there is a wood board ramp to grade but there is an insufficient landing and the ramp exceeds the allowable slope (MI-AKQ-12). The east entry door opening is 3’ clear with a grade to finish floor elevation change of more than 6”. Once inside the building, there have been no accessibility upgrades. Neither the bathroom on the first floor nor the upper level is accessible.

Physical Description – Structural

Structural – Foundation

The perimeter foundation system consists of concrete stem walls on continuous concrete footings based on information in the 1929 drawings (Historic Drawing MI-04).

Structural – Floor Framing

The first floor is concrete slab-on-grade.

The second floor framing consists of 2x10 joists at about 16” based on information in the 1929 drawings (Historic Drawing MI-04). The joists span approximately 16’. The joists are supported on wood-framed partition walls and the exterior wood-framed walls.

Structural – Roof Framing
The roof framing consists of 2x6 rafters spaced at about 16” based on information in the 1929 drawings (Historic Drawing MI-04). The rafters span approximately 9’. The rafters are supported on the exterior wood-framed walls. The rafters are sheathed with solid wood underlayment.

Structural – Wall Framing
The exterior walls are constructed of 2x4 studs spaced at about 16” based on information in the 1929 drawings (Historic Drawing MI-04). The interior walls are also framed with 2x4 studs.

Structural – Lateral System
Lateral stability for the building is provided by the exterior wood-framed walls that are sheathed on both sides with solid wood siding.

Structural – Load Requirements
The required floor load capacity is 40 psf and the required roof snow load is 50 psf.

Physical Description – Mechanical

Mechanical – Plumbing Systems
Domestic water originally served the first floor toilet and a sink on the second floor. There is currently no potable water service to the building.

A buried clay sewer pipe originally served the building and is likely still in place. Plumbing fixture drains have been disconnected.

The toilet on the first floor is still in place, although not functional. The toilet operated with an elevated tank and an A.M. Vogel Company seat activated flush valve (MI-AKQ-29 and 30). The second floor sink has been removed.

Mechanical – HVAC
There are no active heating or ventilation systems remaining in the building. There is an 8”x8” chimney stack which would have likely served to vent wood stoves on the first and second floor. There is a nonfunctioning cast iron wood stove located on the first floor.

Mechanical – Fire Suppression
None in the building.

Physical Description – Electrical

Electrical – System Configuration
Power to the building originally came from the Keepers Quarters via underground cable. As the Keepers Quarters is no longer connected to a source of alternating current power, the Assistant Keepers Quarters also has no source of alternating current power.

Electrical – Wiring Devices
Wiring Devices including receptacles and toggle switches are typical of the the late 1920's era. In general, wiring devices are mounted in outlet boxes in walls, or are surface mounted. Receptacles are of the two prong type and do not include a ground connection. Wiring devices for alternating current are no longer connected to a source of power and are no longer utilized.

Electrical – Conductor Insulation
Conductors and cable within the building are generally of corrugated armor, rubber insulated conductor, type BX. BX cable is concealed in walls and ceilings of the building. Several lighting fixtures have been removed. Receptacles are of the two wire ungrounded type. Conductors for alternating current are no longer connected to a source of power and are no longer utilized.

Electrical – Overcurrent Protection
Overcurrent protection was originally provided via a two pole 20 amp disconnect with integral two circuit screw-in fuse assembly located on the first floor. Fuses are missing, but the connections to the building's circuits are still in place.

Electrical – Lighting Systems
Lighting systems inside of the building are incandescent lamp type. Many lighting fixtures were suspended from their outlet boxes via cords and switching was at the lighting head via pull string or switch. Lighting systems for alternating current are no longer connected to a source of power and are no longer utilized.

Electrical – Telecommunications
None in the building.

Electrical – Fire Alarm System
None in the building.

Electrical – Lightning Protection
None on the building.

Physical Description – Hazardous Materials

Landmark Environmental collected 12 bulk samples from a total of 12 different types of suspected Asbestos Containing Materials (ACMs) at Michigan Island. Of the 12 suspect ACMs that were sampled and analyzed, a total of 2 samples collected from 2 suspect ACMs resulted in concentrations of greater than 1% (positive for asbestos).

Hazardous Materials – Asbestos
The following suspected ACMs were not sampled due to inaccessibility or park limitations regarding potential for damage to structures. Asbestos is assumed to be present at the following locations:

1. Wall and Ceiling Interiors (Gray granular plaster was observed in exposed wall interiors between wood slats. This suspect ACM is similar in appearance to confirmed ACM identified in the Keepers Quarters),
2. Ceiling Insulation (Black matting or felt paper observed above ceilings, this suspect ACM may also be present in wall interiors),
3. Adhesives (Multiple varieties of miscellaneous adhesives were seen on heater components, under remnant flooring applications, and around windows),
4. Thermal System Insulation (TSI) (Was not observed and asbestos is commonly present in insulation on water pipes, metal ducting for heating systems, behind floor registers, steam piping, etc.),
5. Roofing Materials (Roofing felt, tar, and shingles were identified),
6. Caulk (Caulking was observed around window and door penetrations, which can also include gasket applications between the window assembly and the structure), and,
7. Asbestos-cement (Piping, wall-board, wall interior panels, roof flashing and roofing applications can be constructed of asbestos-cement. This type of application was not observed at the structure but may be present).

The assumed ACM was observed to be in fair condition.

Hazardous Materials – Lead Containing Paint
The LCP inspection included a visual inspection of the structure. A previous inspection of and testing for LCP was conducted using an XRF detector. The XRF inspection was conducted by NPS staff in 1993. The findings of this study are incorporated into this report by reference.

Detectable lead in paint was confirmed for the following testing combinations:

1. Window Sash (Wood substrate of various colors),
2. Window Trims – Wood substrate of various colors,
3. Doors – Wood and metal substrate of various colors,
4. Door Trims – Wood and metal of various colors,
5. Walls – Various substrates and colors, and,
6. Ceilings - Various substrates and colors.

Detectable lead is assumed to be present in at the following locations:

1. Interior Painted Surfaces, and,
2. Exterior Painted Surfaces.

Based on the estimated dates of construction of the various structures and the available testing data, LCP is assumed to be present throughout the structure. The confirmed LCP was observed to be in poor condition, and the assumed LCP was observed to be in poor condition.

Loose/flaking lead-based paint (LBP) is identified on the exterior walls of the structure. Paint chip debris was noted on localized areas of surface soils surrounding the Assistant Keepers Quarters and Workshop.

Hazardous Materials – Lead Dust
Surface wipe-sampling for lead dust analysis was not conducted in the Assistant Keepers Quarters and Workshop because lead dust was assumed to be present in concentrations above applicable standards due to the poor condition of confirmed and assumed LCP.

Hazardous Materials – Lead in Soils

Historical paint maintenance activities such as manual scraping, power-washing, sanding, abrasive blasting or the general poor and peeling condition of exterior LCP may have created the potential to impact the surrounding soil. Areas of the surface soils adjacent to the structure were observed to have LCP debris and additional areas may exhibit LCP debris or lead-contaminated soils, but are not observable due to vegetative cover surrounding the structure. Preliminary lead-in-soil sampling was not performed to assess whether these near-structure soils contain lead concentrations above applicable soil standards.

Soil Sampling was not conducted around the Assistant Keepers Quarters and Workshop.

Hazardous Materials – Mold

Inspections of the structure were performed to identify the readily ascertainable visual extent of mold growth. Moisture testing in building materials was not performed nor was sampling of building materials performed for microbial analysis.

Mold was not visually identified. Areas of water damage were observed and mold is assumed to be present around water damaged areas.

Character-Defining Features

Mass/Form. A simple one-and-a-half story gable structure with a brick chimney and shed dormers on either side.

Layout of Space. The utilitarian function and the quarters/residential function are separated by a floor. The small quarters has a contemporary layout of an open kitchen, living area and a separate bedroom.

Exterior Materials. Wood siding painted white, exposed rafters, painted wood trim.

Openings. One pair of doors and one single door with six lites over two panels each; Wood double-hung windows with typically three- over one-lites, all painted white.

Interior Materials. Painted wood board paneling at walls and ceiling and a concrete floor on the first floor; linoleum in the kitchen; painted beadboard at walls and ceiling and painted wood tongue and groove flooring at the second floor.

General Condition Assessment

In general, the Michigan Island Assistant Keepers Quarters and Workshop is in good condition on the exterior with the exception of the hole in the roof at the northwest area and fair condition on the interior. The original interior finishes are in fair condition with some separation of beadboard paneling and water stains and possible damage in the kitchen. The original windows and doors are also in fair condition, as is the historic casework. The kitchen has a metal range with coffee pots used as burners (MI-AKQ-26).

Structurally, the Assistant Keepers Quarters and Workshop is in good condition, although the hole in the roof needs attention.

Mechanically, the original systems have either been removed or abandoned in place.

Electrically, the equipment in the building is in poor condition as it does not meet current installation codes. This system is not salvageable.

The following section is a discipline-by-discipline, component-by-component condition assessment of the building. Refer to Volume I, Chapter 2: Methodology for definitions of the condition ratings.

Condition Assessment – Architecture

Architecture – Roof
Condition: *Poor*
The roof shingles are in poor condition and at the end of their serviceable life.

Architecture – Gutters and Downspouts
Condition: *Poor*
The gutters and downspouts are in poor condition. There is no underdrain system. The gutters are rusted and have paint peeling.

Architecture – Chimney
<u>*Condition:*</u> *Good*
This chimney is in good condition. The chimney appears to have been recently repointed at the interior.

Architecture – Exterior Walls
<u>*Condition:*</u> *Good*
The exterior walls are in good condition with the exception of peeling paint.

Architecture – Windows
<u>*Condition:*</u> *Fair*
These windows are generally in fair condition as there is peeling paint, loose and missing glazing putty, a few windows sealed shut by paint, a torn screen, and a broken screen stop. Some screens are also missing although screen hardware is extant.

Architecture – Exterior Doors
<u>*Condition:*</u> *Fair*
These doors are in fair condition as they have peeling paint, missing door hardware, gapped and brittle glazing compound, and a broken wood sill on the south doors.

Architecture – Exterior Trim
<u>*Condition:*</u> *Good*
The exterior trim overall appears to be in good condition with the exception of peeling paint.

Architecture – Interior Doors
<u>*Condition:*</u> *Fair*
These doors are in fair condition as most of their knobs are missing on the second floor doors and are loose on the first floor doors.

Architecture – Wall Finishes
<u>*Condition:*</u> *Good*
The 7” wood board paneling is in good condition. The beadboard is also in good condition although there are some instances of board separation.

Architecture – Ceiling Finishes
<u>*Condition:*</u> *Fair*
The first floor’s ceiling finish is in good condition. The second floor and stairwell’s beadboard ceiling finishes are in fair condition as there is separation of the boards at the joints. The kitchen ceiling has a large number of separated boards at the northwest corner. Debris from the attic is falling into the kitchen. The water issues have developed from the poor roof condition resulting in the high moisture content in the attic.

Architecture – Interior Trim
<u>*Condition:*</u> *Fair*
The existing base shoe trim is in fair condition. In the kitchen, the base shoe at the northeast corner (under the sink) is deteriorated due to water damage, most likely from past sink issues or the poor roof condition.

Architecture – Floor
<u>*Condition:*</u> *Fair*
The concrete floors on the first floor are in fair condition and are typical of a work space. There are water stains on the floor in the bath, in the hall along the north wall, and in the paint closet at the south corner. The second floor wood planking is in fair condition as the paint is faded, the wood is worn and scratched (especially in the bedroom), and there are water stains under the sink in the kitchen. Also in the kitchen, the wood boards are pushing up at the northeast corner and the resilient flooring is in deteriorated condition as it has worn away in areas to show the wood beneath.

Architecture – Stairs
<u>*Condition:*</u> *Fair*
First Floor to Second Floor Stairs. These stairs are in fair condition as the upper set of stairs has an inadequate 2x4 wood railing and the bottom portion of the stairs has no railing. Also, the glue adhesive remains from the rubber tread mats and there are water stains on the landing.

Architecture – Casework
<u>*Condition:*</u> *Fair*
The paint closet's shelving is in good condition. The second floor bedroom's free-standing cabinet is in good condition except for the modern metal handle that is duct-taped together. The kitchen's cabinet is in good condition, while the kitchen counter is in poor condition as the base shoe molding has detached on the northeast corner and the wood is splitting at the south end with areas of peeling paint.

Architecture – Accessibility
<u>*Condition:*</u> *Poor*
This building is not accessible as the ramp does not meet ADA.

Condition Assessment – Structural

Structural – Foundation
<u>*Condition:*</u> *Good*
The visible portion of the foundation system appears to be in good condition.

Structural – Floor Framing
<u>*Condition:*</u> *Good*
The concrete slab-on-grade is in good condition. The second floor framing could not be observed, thus its condition is unknown. No obvious signs of distress or damage were observed.

Structural – Roof Framing
<u>*Condition:*</u> *Unknown*
The roof framing could not be observed, thus its condition is unknown. No obvious signs of distress or damage were observed with the exception of a small hole in the roof from falling tree branches (MI-AKQ-28).

Structural – Wall Framing
Condition: *Unknown*
The exterior wall framing could not be observed, thus its condition is unknown. No obvious signs of distress or damage were observed.

Structural – Lateral System
Condition: *Good*
Lateral stability of the building is provided by the exterior wood-framed walls and appears to be good. The framing could not be observed but there are no obvious signs of distress or damage.

Structural – Load Requirements
Condition: *Good*
The roof and floor framing have adequate capacity to support the required loads.

Condition Assessment – Mechanical

Mechanical – Plumbing Systems
Condition: *Poor*
There is currently no active water service to the building.

A buried clay sewer pipe that originally served the building is likely still in place. Plumbing fixture drains have been disconnected. The condition of the buried clay sewer pipe could not be determined.

The toilet on the first floor is still in place, although not functional and in poor condition. The second floor sink has been removed.

Mechanical – HVAC
Condition: *Poor*
There are no active heating or ventilation systems remaining in the building. The cast iron wood stove located on the first floor is in poor condition.

Mechanical – Fire Suppression
Condition: *N/A*

Condition Assessment – Electrical

Electrical – System Configuration
Condition: *Poor*
The underground cable feeding the building has been installed underground for over 70 years and is well beyond its useful serviceable life.

Electrical – Wiring Devices
Condition: *Poor*
Wiring Devices including receptacles and toggle switches within the building are in poor condition.

Electrical – Conductor Insulation
<u>*Condition:*</u> *Poor*
Branch circuit wiring within the building is past its useful life. Type BX branch circuit cable is in poor condition. At 70 years old, insulation is suspect and potentially very fragile. Existing cables are two wire only and do not contain a separate ground wire. The integrity of remaining connections is suspect. Receptacles are of the two wire ungrounded type, do not meet code, and are no longer usable.

Electrical – Overcurrent Protection
<u>*Condition:*</u> *Poor*
The existing power disconnect switch and fusing are beyond their serviceable life. The building is not connected to power at present.

Electrical – Lighting Systems
<u>*Condition:*</u> *Poor*
Lighting systems inside of the building date back to 1929 and do not meet present codes. Many fixtures have been removed.

Electrical – Telecommunications, Fire Alarm System, and Lightning Protection
<u>*Condition:*</u> *N/A*

Condition Assessment – Hazardous Materials

Refer to "Physical Description – Hazardous Materials" for detailed descriptions of locations and conditions of hazardous materials.

Ultimate Treatment and Use

This building operated as both the second Assistant Keepers Quarters on the second floor and as a workshop and storage area on the first floor. It was constructed c.1927-1929 and stopped functioning as living quarters in 1943, when the light was automated and habitation on the island was no longer needed.

The building is currently a storage facility for the Park Service with no visitor access. The proposed use for the building is to maintain this use and preserve the historic building.

Preservation is the recommended treatment for the building.

Requirements for Treatment

Compliance requirements for treatment currently include laws, regulations, and standards as outlined by the Park Service and listed in Volume I, Administrative Data section of this report.

The recommended treatments are tailored to the preferred alternative as the outcome of the Value Analysis/CBA for the project. As individual buildings are rehabilitated, specific alternatives will present themselves during design and construction. The following section is a discipline-by-discipline, component-by-component description of the treatments proposed for the preservation of the building. Refer to Volume I, Chapter 2: Methodology for the priority rating definitions.

Treatment Recommendations – Architecture

Architecture – Roof
Priority: *Severe*
Remove the existing asbestos shingle roof and replace with an asphalt shingle roof of 9” wide × 7” high exposure to match the dimensions of the 1927–1929 era. Repair the hole in the roof substrate at the eave. Verify/provide proper underlayment and flashings at all eaves, rakes, valleys and intersections. Scrape, sand, and repaint the wood trim at the eave, exposed rafter tails, exposed underside of the roof sheathing, fascia, and frieze using the paint analysis to guide the color selection.

Architecture – Gutters and Downspouts
Priority: *Moderate*
Replace the existing ½ round gutters in kind. Reuse the existing fluted downspouts and provide extensions to direct water away from the foundation. Add splash stones at each downspout. Coordinate gutter replacement with roofing work to allow for proper attachment of gutters.

Architecture – Chimney
Priority: *Low*
No recommendations at this time.

Architecture – Exterior Walls
Priority: *Low*
Scrape, sand, and paint siding.

Architecture – Windows
<u>*Priority:*</u> *Low*
Repair select windows with missing glazing putty and paint-sealed sash. Replace missing screens. Scrape, sand, and repaint exterior and interior of windows and frames.

Architecture – Exterior Doors
<u>*Priority:*</u> *Moderate*
Repair broken wood sill on the south doors and replace failing glazing compound where needed. Scrape, sand, and repaint the doors. Repair existing hardware as required to allow smooth operation.

Architecture – Exterior Trim
<u>*Priority:*</u> *Low*
Scrape, sand, and repaint the areas of wood trim at siding using the paint analysis to guide the color selection.

Architecture – Interior Doors
<u>*Priority:*</u> *Low*
Scrape, sand, and repaint interior doors where needed. Replace missing knobs with finish to match original and tighten existing hardware to allow smooth operation.

Architecture – Wall Finishes
<u>*Priority:*</u> *Low*
Monitor second floor closets' walls and ceilings for mold/algae development and appropriately mitigate if needed.

Architecture – Ceiling Finishes
<u>*Priority:*</u> *Moderate*
Repair/in-fill separated board joints in the beadboard ceilings on the second floor, particularly in the kitchen area where debris from the attic is falling into the interior space.

Architecture – Interior Trim
<u>*Priority:*</u> *Low*
Replace base shoe trim in-kind under the kitchen sink where it has deteriorated due to water damage.

Architecture – Floor
<u>*Priority:*</u> *Low*
Refinish existing wood floor on the second floor.

Architecture – Stairs
<u>*Priority:*</u> *Low*
Add code compliant handrails to the stairs from the first floor to the second floor.

Architecture – Casework
<u>*Priority:*</u> *Low*
No recommendations at this time.

Architecture – Accessibility
<u>*Priority:*</u> *Low*
Provide program access through interpretive wayside exhibits.

Treatment Recommendations – Structural

Structural – Foundation
<u>*Priority:*</u> *Low*
No recommendations at this time.

Structural – Floor Framing
<u>*Priority:*</u> *Low*
No recommendations at this time.

Structural – Roof Framing
<u>*Priority:*</u> *Moderate*
The roof should be repaired where it has been damaged.

Structural – Wall Framing
<u>*Priority:*</u> *Low*
No recommendations at this time.

Structural – Lateral System
<u>*Priority:*</u> *Low*
No recommendations at this time.

Treatment Recommendations – Mechanical

Mechanical – Plumbing Systems
<u>*Priority:*</u> *Low*
The existing plumbing fixtures and plumbing piping are no longer functional. It is recommended that the plumbing piping be removed or capped. The clay sewer pipe serving the building should be capped below grade.

Mechanical – HVAC
<u>*Priority:*</u> *Moderate*
There are no functional HVAC systems in the building. The addition of mechanical and passive ventilation is recommended for moisture control.

Mechanical – Fire Suppression
Priority: *N/A*

Treatment Recommendations – Electrical

Electrical – System Configuration
Priority: *Moderate*
Electrical devices, lighting and wiring dating to the original 1929 installation is no longer connected to a source of power. These items should remain in place for historical context. A new, National Electrical Code, NPS and Federal Standards and Regulations compliant electrical distribution system for PV power for new ventilation equipment should be installed.

Electrical – Wiring Devices
Priority: *Moderate*
It is recommended that new wiring devices consistent with proposed PV systems be installed as required. Wiring Devices shall be in accordance with the National Electrical Code, NPS and Federal Standards and Regulations.

Electrical – Conductor Insulation
Priority: *Moderate*
It is recommended that new conductor insulation be consistent with wiring methods for proposed PV systems. Conductor insulation shall be in accordance with the National Electrical Code, NPS and Federal Standards and Regulations.

Electrical – Overcurrent Protection
Priority: *Moderate*
It is recommended that overcurrent protection for new PV system wiring be in accordance with the National Electrical Code, NPS and Federal Standards and Regulations.

Electrical – Lighting Systems
Priority: *Low*
No recommendations at this time.

Electrical – Telecommunications, Fire Alarm System, and Lightning Protection
Priority: *N/A*

Treatment Recommendations – Hazardous Materials

Hazardous Materials – Asbestos
Priority: *Low*
Recommend sampling of suspect asbestos containing materials, including wall and ceiling interiors, ceiling insulation, adhesives, TSI, roofing materials, caulking, and asbestos cement. Removal and replacement of asbestos roofing is recommended.

Hazardous Materials – Lead-Containing Paint and Lead Dusts
Priority: *Low*
Recommend stabilization or abatement of Lead Containing Paint. Lead dust wipe sampling not recommended.

Hazardous Materials – Lead In Soils
Priority: *Low*
Recommend further soils characterization to confirm applicable regulatory requirements.

Hazardous Materials – Mold/Biological
Priority: *Low*
Recommend water intrusion and mold mitigation.

Hazardous Materials – Petroleum Hydrocarbons
Priority: *Low*
No recommendations at this time.

Alternatives for Treatment

The following are several considerations of alternatives for the proposed treatments:

1. One alternative considered and dismissed by the team was to introduce visitors into the building, possibly including accessible restrooms on the first level and visitor tours to the upper level. The restroom use required a more substantial plumbing and septic system than currently exists on the island. Because there are two other quarters on the site that are to be open to visitor tours, the introduction of a third was not deemed a high priority, though maintenance storage, the current use of the lower level was an identified need.

Assessment of Effects for Recommended Treatments

The following table includes an analysis of the major treatment recommendations which affect Section 106 Compliance:

Recommended Treatment	Potential Effects	Mitigating Measures	Beneficial Effects
1. Additional Hazardous Testing and Mitigation	Mitigation of hazardous material may require removal of historic materials.	Any mitigation will need to be evaluated for benefit and implemented sensitively to minimize damage to the resource.	- Improves safety for visitors and staff - Removes hazards from the cultural resource
2. Replace existing roof with new asphalt shingle	Removes original material.	Roof is at end of serviceable life. New exposure of shingles and coloration shall match original.	- Abates a hazardous material - New roof will aid in the preservation of the structure
3. Add splash stones	Adds a new element to the structure.	Using a stone (versus precast) will be less visually disruptive to the historic fabric.	- Improves existing drainage to flow away from the building

Assistant Keepers Quarters and Workshop Photographs, 2009

MI-AKQ-01: Aerial, 2009 (AH DSC00610)

MI-AKQ-02: South elevation, 2009 (Source: AH IMGP2830)

MI-AKQ-03: East elevation, 2009 (Source: AH DSC00665)

MI-AKQ-04 & 05: North elevation, 2009 (Source: AH DSC00670 and DSC00669)

MI-AKQ-06: West elevation, 2009 (Source: AH DSC00663)

MI-AKQ-07: West eave, trim, and roof (Source: AH IMGP2832)

MI-AKQ-08: Northwest corner downspout and foundation (Source: AH IMGP2833)

MI-AKQ-09: North elevation eave, roof, and gutter (Source: AH IMGP2834)

MI-AKQ-10: East entry door (Source: AH 100_9625)

MI-AKQ-11: South entry (primary) doors (Source: AH 100_9622)

MI-AKQ-12: South entry ramp (Source: AH DSC00852)

MI-AKQ-13: Storage room south entry doors, interior view (Source: AH CIMG3449)

MI-AKQ-14: Storage room, looking east to east entry (Source: AH CIMG3466)

MI-AKQ-15: Storage room, looking northeast (Source: AH CIMG3444)

MI-AKQ-16: Stove at chimney (Source: AH CIMG3450)

MI-AKQ-17: Water closet, looking east (Source: AH CIMG3486)

MI-AKQ-18: Stairs to second floor living quarters, looking down (Source: AH DSC00846)

MI-AKQ-19: Living room, west elevation (Source: AH CIMG3504)

MI-AKQ-20: Living room door to bedroom (Source: AH 100_9621)

MI-AKQ-21: Bedroom, west elevation (Source: AH CIMG3520)

MI-AKQ-22: Bedroom, cabinet detail and floor (Source: AH CIMG3535)

MI-AKQ-23: South bedroom closet with windows and doors stored (Source: AH CIMG3540)

MI-AKQ-24: Kitchen, north elevation (Source: AH CIMG3505)

MI-AKQ-25: Kitchen, looking east (Source: AH CIMG3553)

MI-AKQ-26: Kitchen stove with coffee pot burners (Source: AH CIMG3556)

MI-AKQ-27: Built-in kitchen cabinet (Source: AH CIMG3555)

MI-AKQ-28: Roof damage detail (Source: Martin/Martin)

MI-AKQ-29: Vogel seat activated toilet flush valve, in water closet (Source: RMH)

MI-AKQ-30: Vogel toilet detail (Source: RMH)

POWER HOUSE

Chronology of Alterations and Use

Original Construction

The Michigan Island Power House was built in 1928 as part of the site expansion associated with the Second Tower. On November 21, 1928, Keeper Lane writes in the Michigan Island Log that the crew, "Put [the] flue in Power House and put lock on door."[54] It was built to house a fog signal, but by the time it was completed, the technology had changed and an early radio beacon was installed instead. The building also houses the hoisting engine that powers the tramway.[55]

The tram cart photographed in 1975 may be different than the existing tram cart, which may have been taken from Outer Island (Historic Image MI-14). Two 1978 photos show the current concrete stairs with another flight of stairs from the dock leading to the beach that no longer exist today (Historic Images MI-18 and 19).

The historic construction drawings for the Power House from 1929 show in great detail the mechanical and electrical systems in the building (Historic Drawing MI-12).

Significant Alterations / Current Condition

Work on the Power House includes the mitigation of the bat infestation that the Historic Structure Preservation Team of the Park Service completed between 1998 and 2009.

The original electrical branch circuit wiring and equipment was installed in 1929 when the building was constructed. Lighting, receptacles, switches and wiring have not been replaced. However, major electrical equipment such as electric generators and hoisting systems have been removed and/or replaced with newer systems. Originally, the Power House was equipped with two small oil-fueled engine generators (one Kohler and one Cummins) to provide power for the facility and lighthouse equipment. There was an additional small gasoline-powered engine generator for power to the residences on the island. All of this original equipment has been removed. In the 1970s, the Coast Guard installed a replacement diesel engine generator to provide power for the tram hoist and for radio equipment on the site. At that time, a new hoist motor and winch was added along with a contactor assembly and control station for control of the hoist for the tram.

The Power House is currently in good condition.

[54] E. Lane, Michigan Island Log, Nov 23, 1926 – Aug 19, 1936.
[55] List of Classified Structures, National Park Service, 2009.

Summary of Documented Work on the Building

Date	Work Described	Source of Information
1928, October	Oct 2: “Crew laying rails on tramway and getting mixer.” Oct 15: “Crew finished putting in foundation for power house.”	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1928, November	Nov 9: “Crew put roof on Power House. Light snow flurries.” Nov 10: “Finished outside of Power House roof and chimney.” Nov 15: “Crew ready to start plastering Power House.” Nov 21: “Put flue in Power House and put lock on door.”	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1975	Stabilization of Power House	APIS/NPS Business Office File D3423
1979	Repoint Power House APIS/NPS Business Office File D3423)	APIS/NPS Business Office File D3423
1981	Asbestos roofing installed	APIS/NPS Business Office File D3423
1982	Reshingle Power House roof, reroute propane lines and install new hoses, install gasoline storage cabinets	APIS/NPS Business Office File D3423
1985, July 26	“Maintenance workers were out today taking final measurements for the new electric winch and generator, etc. to be installed next week. They were discussing how they could remove the old donkey engine and whether it should be left there for historic purposes.” (Terry Blomberg)	From “Excerpts from Michigan Island Volunteer Logs- 1978–1999,” page 7
1985, August 5	Maintenance crew dismantled and removed old engine from Power House, installed “numerous storage batteries and the new generator” (Terry Blomberg)	From “Excerpts from Michigan Island Volunteer Logs- 1978–1999,” page 8
1985, August 7	Work resumed on new water system that pumps water directly from the Lake into a small tank in the Power House	From “Excerpts from Michigan Island Volunteer Logs- 1978–1999,” page 8

Notable Actions with Unknown Dates

Date Range	Work Described
1998–2009	Mitigated bat infestation

General Physical Description

The building is a one-story, rectangular utilitarian structure, brick walls with a brick foundation. It has a gable roof, exposed rafter tails, panel doors on the north and south elevations, and a full basement. It is adjacent to the tram tracks.

Physical Description – Architecture

Architecture – Roof
The roofing is asbestos shingle with a 9” wide × 7” exposure, similar to three other buildings at the Light Station. This appears to be original roofing as it is consistent with notes on the original construction drawings. The step flashing at the chimney and south appurtenance is noted as copper. The exposed 1x6

sheathing is painted, tongue and groove. The eave, extends 1'6" and consists of exposed rafter tails with a 1x fascia and frieze board with an ogee closure trim, all wood painted white (MI-PH-07).

The roof of the south appurtenance is a reinforced concrete sloped slab.

Architecture – Gutters and Downspouts
There is currently no gutter and downspout system on the building although the original construction drawings call for their installation and there are remnants of their attachments in situ.

Architecture – Chimney
The chimney is red brick with a stone cap and a vent flue located due south of the chimney (MI-PH-06).

Architecture – Exterior Walls
The exterior walls consist of a red brick running bond face brick (noted as "Iron Spot Brick" on the original construction plans) and a 2½" tile block with plaster on the interior. There are stone sills, headers and thresholds and a brick soldier course at the first floor level.

A mortar sample of the exterior brick wall indicates it is a mixture of Portland cement and sand. The mortar is dark gray colored, hard and brittle, and has fine sand.

Architecture – Windows
Typical Windows. These windows are steel casements with eight lites and are paired. The windows are painted white and trimmed with beige brick on the interior. Each window has a limestone header and sill. The sills have drip edges. The typical dimensions for these windows are 3'2" × 4'3". These windows are original (MI-PH-14 and 21).

Gable Vents. These vents are screens at masonry openings.

Basement Vents. These vents are wood louvers in wood frames and open inward. They have metal screens on the interior. The vents are 2'3" × 3'0". They appear to be retrofit at the openings of former steel awning windows.

Architecture – Exterior Doors
The original two exterior doors are five-panel, painted wood doors with raised panels. These doors have wood frames set into masonry openings with brick trim at the interior. The exterior trim has a stone header, possibly limestone, and a concrete sill. The doors have metal thresholds, a padlock on the south elevation door, and three ball-tipped hinges per door. The doors are 2'8" × 7'0" × 1¾" (MI-PH-13).

Architecture – Exterior Trim
Refer to roof section.

Architecture – Interior Doors
The original interior doors are five-panel, painted wood doors with raised panels. The wood trim is ¾" × 4 ½" with rounded edges (similar to the trim at the remodeled spaces of the Old Michigan Island

Lighthouse). Each door has knobs with a mortise plate on both faces and two hinges. The typical door dimension for this type of door is 2'0" to 2'8" × 7'0" × 1¼" (MI-PH-16).

Architecture – Wall Finishes
There are three types of original wall finishes for this building. The primary type is plaster over 2½" tile block. This is the wall finish for the generator room, the hall, and the hoist room. The water closet has plaster over lath as its wall finish. The basement has red brick walls.

Architecture – Ceiling Finishes
There are two types of original ceiling finishes in this building. The generator room, the hall, the hoist room, and the water closet have plaster over lath ceilings. The basement's ceiling has a board-formed concrete ceiling.

Architecture – Interior Trim
The generator room, hoist room, and the hall have vertical beige brick trim lining the exterior walls. The water closet and the basement have no interior trim.

Architecture – Floor
The floor for each room in the building is concrete, once-painted gray.

Architecture – Stairs
These stairs are concrete with a landing separating the upper flight from the lower. The upper flight has five risers at 7" high with treads that are 11" deep and 3'4" wide. There is a steel pipe railing for the upper flight that is 1½" diameter and 3'0" from nosing to center of the rail. The landing distance is 5'0" from the wall to the bottom riser of the upper set of stairs. The lower flight of stairs has eight risers at 7½" high with treads that are 10" deep and 2'8" wide. There is no railing for this portion of the stairs. These stairs are original to the building (MI-PH-12 and 15).

Architecture – Accessibility
The building is currently not accessible. The south elevation entry door opening is 2'7" clear with a grade to finished floor elevation change of 13¼". The north entry door opening is 2'7" clear with a grade to finish floor elevation change of 11". At the interior there are no accessibility upgrades. The main entry doors are at a landing level, which along with the narrow door widths, precludes accessibility.

Physical Description – Structural

Structural – Foundation
The perimeter foundation system consists of brick masonry walls. The walls are supported on 12" thick by 18" wide continuous concrete footings reinforced with three #5 bars based on information in the 1928 drawings.

Structural – Floor Framing
The first floor is a reinforced concrete slab that is 6" thick. The slab is reinforced with #5 bars at 8" based on information in the 1928 drawings. The slab spans approximately 7½'. The slab is supported on the

perimeter foundation walls and a 10” deep by 12” wide reinforced concrete beam. The beam spans approximately 15’. The beam is supported on the perimeter foundation walls and an interior masonry wall.

Structural – Roof Framing
The wood roof framing was measured to be 2x6 rafters spaced at about 24”. The rafters span approximately 8’. The rafters are supported on the exterior masonry walls. The rafters are sheathed with 1x10 solid wood underlayment.

The concrete roof framing over the extension of the basement is a 4” thick reinforced concrete slab. The slab is reinforced in two directions with #3 bars spaced at about 12” based on information in the 1928 drawings.

Structural – Ceiling Framing
The ceiling framing was measured to be 2x6 joists spaced at about 16”. The joists span approximately 16’. The ceiling joists are supported on the exterior masonry walls.

Structural – Wall Framing
The interior and exterior walls are constructed of brick masonry. The interior walls in the basement are supported on 12” deep by 18” wide continuous concrete footings based on information in the 1928 drawings.

Structural – Lateral System
Lateral stability for the building is provided by the exterior masonry walls.

Structural – Load Requirements
The required floor load capacity for the power house is 150 psf. The required ceiling live load capacity is 10 psf (no storage allowed). The required roof snow load capacity for the power house is 40 psf.

Physical Description – Mechanical

Mechanical – Plumbing Systems
The original 2,000-gallon steel water pressure tank is still located in the basement of the building. The domestic water system has been replaced with a 200-gallon plastic tank and water filtration system with copper piping that serves the Keepers Quarters with nonpotable water. The galvanized steel domestic water piping to the first floor toilet and lavatory has been disconnected.

The basement floor drain is connected to a 3” sewer main. This 3” line connects to a 6” clay sewer pipe that runs to the southwest and into a septic tank and leach field located to the southwest of the Power House that serves the entire building complex. A second 4” cast iron sewer and vent stack that served the first floor toilet and lavatory has been capped at the first floor.

The toilet pedestal has been disconnected, but remains in the first floor toilet room. The lavatory and toilet tank have been removed.

Mechanical – HVAC
A coal furnace installed in 1929 is located in the basement of the building with a duct up to a floor grille on the first floor. The furnace is no longer functional.

Basement ventilation consists of a 32” x 24” ground level louver on the north side of the building. There is a grille and transfer duct to provide ventilation for the toilet room.

Mechanical – Fire Suppression
None in the building.

Mechanical – Other
The original 1,066-gallon steel fuel tank is still in the basement with a galvanized steel fuel intake pipe on the north side of the building. The fuel intake pipe has been capped. There is also a smaller steel gasoline tank (approximately 30-gallon capacity) that served a Kohler generator. The original generators have been removed. The current generator and fuel tank are in the generator room on the first floor.

Physical Description – Electrical

Electrical – System Configuration
Power for the building and for the facility comes from two separate systems. Power for the tram hoist and for selected lighting and receptacles in the building comes from a 15 kW (18.75 kVA), 120/240 volt three phase diesel engine generator. For this equipment to function, the engine generator must be manually started. The electrical distribution system is known as a “High Leg” system in that one phase has a higher voltage to ground (208 volts) than the other two phases (120 volts). With this system, care must be taken to insure that no single phase line-to-neutral loads are connected to the “high-leg” phase as downstream equipment failure will likely follow.

Power for small equipment within the building and power for selected equipment in the Keepers Quarters is provided via a PV (photovoltaic) system consisting of collector, controllers, and storage batteries. The photovoltaic collection array is a flat panel system approximately 80" by 52", located near the Shed on a freestanding rack. The collector provides dc power to the Power House building via an underground cable protected by two 15 ampere single pole circuit breakers at the collector. The dc power from the PV array charges three 100 ampere hour, 12 volt storage batteries located in the Power House through an Outback Power Systems Flexamp 60 charging controller. The system also employs a GNC Battery Company 33 ampere battery charger with 120 volt input and 12 volt output to charge the batteries when the generator system is running. A manual throwover switch is used to select whether the batteries are charged via generator or PV power. Power for small pumps and equipment in the Power House building is derived directly from the dc storage batteries at 12 volts dc via a dc load center. The dc load center is equipped with a 40 ampere 1 pole main breaker, two 15 amp 1 pole branch breakers and one 20 amp 1 pole branch breaker. These branch breakers feed dc equipment, including small pumps in the Power House, lighting in the Keeper's Quarters via an underground cable, and the generator battery charger. At present, there is a live circuit to the Keepers Quarters. At present, there is an empty conduit from the Power House to the Old Michigan Light House for future addition of PV derived power. The diesel engine starting batteries are charged directly from the PV battery system via a Harger BC Series dc to dc charging controller.

Electrical – Wiring Devices
Wiring Devices including receptacles and toggle switches are typical of the late 1920's era. In general, wiring devices are mounted in outlet boxes in walls. Receptacles are of the two prong type and do not include a ground connection.

Electrical – Conductor Insulation
Original branch circuit cable is generally of the corrugated armor, rubber insulated BX type. BX cable is exposed in utility areas and concealed in finished walls. Several lighting fixtures have been removed. Receptacles are of the two wire ungrounded type. Interconnecting cables for the hoist controllers, receptacles in the power plant and for newer lighting are thermoplastic insulated copper wiring in EMT (electro-metallic tubing) conduit.

Electrical – Overcurrent Protection
Overcurrent protection for the engine generator system is via engine control panel mounted 50 amp 3 pole circuit breaker which feeds the facility panel board. The facility panel board is rated 150 amps and contains 20 circuit breakers for circuits in the building. Building circuits fed from the generator panel board are limited to a few overhead lights and two receptacles.

Electrical – Lighting Systems
Lighting systems inside of the building are incandescent lamp porcelain keyless type, switched via toggle switches on the wall.

Electrical – Telecommunications
None in the building.

Electrical – Fire Alarm System
None in the building.

Electrical – Lightning Protection
None on the building.

Electrical – Other
The original tram hoist is in the Power House (MI-PH-25).

Physical Description – Hazardous Materials

Landmark Environmental collected 12 bulk samples from a total of 12 different types of suspected Asbestos Containing Materials (ACMs) at Michigan Island. Of the 12 suspect ACMs that were sampled and analyzed, a total of 2 samples collected from 2 suspect ACMs resulted in concentrations of greater than 1% (positive for asbestos).

Hazardous Materials – Asbestos

The following suspected ACMs were not sampled due to inaccessibility or park limitations regarding damage to structures. Asbestos is assumed to be present at the following locations:

1. Wall and Ceiling Insulation (black matting or felt paper observed above ceilings, this suspect ACM may also be present in wall interiors),
2. Brick and Block Filler (the exterior of the structure is stone and has the potential to have a block filler or grout that is potentially asbestos containing),
3. Roofing Materials (roofing felt, tar, and shingles were identified),
4. Gaskets (various gaskets were seen around tanks, ducting, and pipe fittings),
5. Adhesives (miscellaneous adhesives were seen at pipe/wall interfaces, between ducting, and on heater components),
6. Caulk (around window and door penetrations),
7. Wall and Ceiling Plaster (a plaster/ wallboard application was seen in the entry storage area and mechanical room),
8. Flooring and Subflooring (suspect ACMs in flooring applications were not observed and asbestos is commonly present in vapor barrier felts and tar-papers used in subflooring applications), and,
9. Thermal System Insulation (TSI) (was not observed and asbestos is commonly present in insulation on water pipes, metal ducting for heating systems, behind floor registers, steam piping, etc.).

The assumed ACM was observed to be in good condition.

Hazardous Materials – Lead Containing Paint

The LCP inspection included a visual inspection of the structure. A previous inspection and testing for LCP was conducted using an x-ray florescence (XRF) detector coupled with bulk paint sampling and laboratory analysis. The XRF inspection was conducted by NPS staff in 1993. The findings of this study are incorporated into this report by reference.

Detectable lead in paint was confirmed for the following testing combinations:

1. Window Sash (Wood Substrate with white paint),
2. Window Trim (Wood Substrate with white paint),
3. Doors (Wood Substrate with white paint),
4. Door Trim (Wood Substrate with white paint),
5. Walls (Walls of various substrates are dark gray on the lower half and yellow/tan on the upper half),
6. Ceilings, and,
7. Exterior Trim (Assumed wood substrate with white paint).

Detectable lead is assumed to be present at the following locations:

1. Interior Painted Surfaces (Based on testing of the first floor, LCP is assumed to be present on painted surfaces), and,
2. Exterior Painted Surfaces (The trim on this structure is the only exterior component currently painted and is confirmed to be LCP).

Based on the dates of construction of the various structures and the available testing data LCP is assumed to be present throughout the structure. The confirmed LCP was observed to be in poor condition and the assumed LCP was observed to be in fair condition.

Loose/flaking LCP is not identified on the exterior walls of the structure. Paint chip debris is not noted on localized areas of surface soils surrounding the structure.

Hazardous Materials – Lead Dust
Wipe sampling for lead dust analysis was not conducted in the Power House because this is a commercial rather than residential structure and also because the observed paints were in fair to good condition.

Hazardous Materials – Lead in Soils
Historical paint maintenance activities such as manual scraping, power-washing, sanding, abrasive blasting or the general poor and peeling condition of exterior LCP may have created the potential to impact the surrounding soil. Areas of the surface soils adjacent to the structure were not observed to have LCP debris and areas may exhibit LCP debris or lead-contaminated soils, but are not observable due to vegetative cover surrounding the structure. Preliminary lead-in-soil sampling was not performed to assess whether these near-structure soils contain lead concentrations above applicable soil standards.

Soil Sampling was not conducted around the Power House.

Hazardous Materials – Mold
Inspections of the structure were performed to identify the readily ascertainable visual extent of mold growth. Moisture testing in building materials was not performed nor was sampling of building materials performed for microbial analysis. Mold was not visually identified.

Character-Defining Features

Mass/Form. A simple gable structure with chimney and a small shed appurtenance at grade.

Exterior Materials. Red brick masonry with trim and windows painted white, exposed rafter tails, stone sills and lintels and an asbestos shingle roof.

Openings. Metal casement windows, eight lites each sash, and five panel wood doors, painted white.

Interior Materials. Exposed masonry and plaster, concrete floors, painted wood panel doors and plaster ceilings.

General Condition Assessment

In general, the Michigan Island Power House is in good condition. The original interior finishes are in remarkably good condition. The original windows and doors are also in good condition.

Structurally, the Power House is in good condition. However, the deterioration of the concrete roof framing and the exterior wall below the concrete roof requires further investigation.

Mechanically, a majority of the original 1929 mechanical components are still in place and are in poor to fair condition and they are no longer functioning. These include a domestic water pressure tank, coal furnace, and generator fuel tanks.

Electrically, the original branch circuit wiring and equipment is well beyond its expected life. The original 1929 electrical systems for this building are not salvageable. Newer systems added by the Park Service are generally in good condition and can provide continued service.

The following section is a discipline-by-discipline, component-by-component condition assessment of the building. Refer to Volume I, Chapter 2: Methodology for definitions of the condition ratings.

Condition Assessment – Architecture

Architecture – Roof
Condition: *Poor*
The asbestos roofing is in poor condition and at the end of its serviceable life. The concrete slab over the brick shed extension is in fair condition due to the drip line/drainage from the main roof. The eave and associated trim are in good condition.

Architecture – Chimney
Condition: *Poor*
The chimney is in poor condition due to spalling and cracks at the southwest and west faces, likely due to the proximity of the adjacent pipe/vent.

Architecture – Exterior Walls
<u>*Condition:*</u> *Good*
The exterior walls are in good condition with the exception of efflorescence at the north wall and damage due to the roof drainage drip line at the south appurtenance's east and west stem walls (MI-PH-04, MI-PH-08 and MI-PH-22 to 24).

Architecture – Windows
<u>*Condition:*</u> *Fair*
Typical Windows. The windows are in fair condition with a few broken panes, some rusting at the header support angle and window sash. The windows operate sluggishly, the glazing putty is brittle, and the paint is peeling.

Basement Vents. The wood vents are in good condition.

Architecture – Exterior Doors
<u>*Condition:*</u> *Good*
The doors are in good condition, but there is one panel missing at the north elevation exterior door and the hardware is loose.

Architecture – Exterior Trim
<u>*Condition:*</u> *N/A*

Architecture – Interior Doors
<u>*Condition:*</u> *Good*
The doors are in good condition but the hardware is loose.

Architecture – Wall Finishes
<u>*Condition:*</u> *Good*
The plaster over masonry walls are in fair condition with some peeling paint and cracks in the plaster. The plaster over lath wall finish in the water closet is in poor condition with cracks and scars in the plaster from previous fixtures. The basements brick walls are in good condition.

Architecture – Ceiling Finishes
<u>*Condition:*</u> *Good*
The original lath and plaster ceilings are in good condition with some cracks and unevenness in the hoist room and some areas of bubbling paint, signifying possible moisture issues, in the generator room. The basement's ceiling is in fair condition as above the oil tank at the south end, there are stains and damage in the concrete in the area around the pipes.

Architecture – Interior Trim
<u>*Condition:*</u> *Good*
The existing interior vertical brick trim is in good condition.

Architecture – Floor
Condition: Good
The concrete flooring is in good condition as it has typical wear and tear for a utility building. There are oil and water stains and most of the paint has disappeared.

Architecture – Stairs
Condition: Good
These stairs are in good condition except the existing handrail is not adequate and there is no handrail for the lower flight of stairs. Also, the upper flight of stairs has a large chip out of a step.

Architecture – Accessibility
Condition: Poor
This building is not accessible.

Condition Assessment – Structural

Structural – Foundation
Condition: Good
The visible portion of the foundation is in good condition.

Structural – Floor Framing
Condition: Good
The floor slab is in good condition.

Structural – Roof Framing
Condition: Good
The wood roof framing is in good condition. The concrete roof over the brick extension of the basement is in fair condition. The lower corners of the roof and the top surface are deteriorating due to freeze/thaw damage and the growth of moss and lichens (MI-PH-22 and 23).

Structural – Ceiling Framing
Condition: Good
The ceiling framing is in good condition.

Structural – Wall Framing
Condition: Fair
The interior walls are in good condition. The exterior walls are in good condition with the exception of the walls supporting the concrete roof. These walls are deteriorating due to freeze/thaw damage and the growth of moss and lichens (MI-PH-24).

Structural – Lateral System
Condition: Good
Lateral stability of the power house is good.

Structural – Load Requirements
<u>*Condition:*</u> *Good*
The roof, ceiling and floor framing have adequate capacity to support the required loads.

Condition Assessment – Mechanical

Mechanical – Plumbing Systems
<u>*Condition:*</u> *Poor*
The original 2,000-gallon steel water pressure tank in the basement is in poor condition with rust damage. The new domestic water system serving the Keepers Quarters is in good condition. This includes a 200-gallon plastic storage tank, water filtration system, and copper distribution piping. The original galvanized steel domestic water piping to the first floor toilet and lavatory has been disconnected and is in poor condition.

The cast iron building waste lines are in fair condition. While the basement floor drain is in good condition, the condition of the buried clay sewer pipe that runs to the septic tank could not be determined.

The first floor toilet pedestal is in poor condition and the toilet tank has been removed.

Mechanical – HVAC
<u>*Condition:*</u> *Fair to Poor*
A coal furnace installed in the basement is in poor condition with a large dent in the sheet metal siding and some rust on the vent stack. The furnace is not functional.

The basement ventilation louver on the north side of the building is in fair condition. The ventilation grille and transfer duct in the toilet room are also in fair condition. The basement ventilation louver is not adequately sized for the space.

Mechanical – Fire Suppression
<u>*Condition:*</u> *N/A*

Mechanical – Other
<u>*Condition:*</u> *Poor (Original Equipment), Good (Contemporary Equipment)*
The original 1,066-gallon fuel tank in the basement is in poor condition with considerable rust damage. The 30-gallon gasoline tank is dented and in poor condition. The current generator and fuel tank located in the first floor generator room are in good condition.

Condition Assessment – Electrical

Electrical – System Configuration
<u>*Condition:*</u> *Good*
The diesel generator set is approximately 22 years old and appears to be in good condition. The operating time meter indicates that the unit has been run for only 1,300 hours. The building’s distribution panel is in good condition as well.

Electrical – Wiring Devices
<u>*Condition:*</u> *Poor (1929 Equipment), Good (Modern Equipment)*
Wiring Devices installed in 1029 are in poor condition. Newer wiring devices are in good condition.

Electrical – Conductor Insulation
<u>*Condition:*</u> *Poor (1929 Equipment), Good (Modern Equipment)*
Conductor insulation remaining from the 1929 installation is in poor condition. Conductor insulation installed in 1987 as part of the new diesel generator addition and new tram hoist addition is in good condition. Conductor insulation installed as part of the photovoltaic equipment installation is in good condition.

Electrical – Overcurrent Protection
<u>*Condition:*</u> *Good*
Overcurrent protection devices in the building including circuit breakers in the generator control panel, generator panel boards, and in miscellaneous panel boards are in good condition. Overcurrent protection devices related to the PV system are in good condition.

Electrical – Lighting Systems
<u>*Condition:*</u> *Poor*
Lighting systems inside the building are old, inefficient, and do not meet current codes.

Electrical – Telecommunications, Fire Alarm System, and Lightning Protection
<u>*Condition:*</u> *N/A*

Electrical – Other
<u>*Condition:*</u> *Good*
The tram hoist, although in good condition, is not supported by its manufacturer (MI-PH-25). Parts and service are very difficult to obtain. PV system equipment is relatively new and is in good condition.

Condition Assessment – Hazardous Materials

Refer to “Physical Description – Hazardous Materials” for detailed descriptions of locations and conditions of hazardous materials.

Ultimate Treatment and Use

This building operated as a support building from 1929 until automation in 1943. It still retains some functioning equipment that provides basic systems for staff, volunteers and visitors.

The building is currently used for storage and systems use. The proposed use for this building is to retain its existing functions and to preserve the historic character of the building.

Preservation is the recommended treatment for the building.

Requirements for Treatment

Compliance requirements for treatment currently include laws, regulations, and standards as outlined by the Park Service and listed in Volume I, Administrative Data section of this report.

The recommended treatments are tailored to the preferred alternative as the outcome of the Value Analysis/CBA for the project. As individual buildings are rehabilitated, specific alternatives will present themselves during design and construction. The following section is a discipline-by-discipline, component-by-component description of the treatments proposed for the preservation of the building. Refer to Volume I, Chapter 2: Methodology for the priority rating definitions.

Treatment Recommendations – Architecture

Architecture – Roof
Priority: *Severe*
Remove the existing asbestos shingle roof and replace with an asphalt shingle roof of 9” wide × 7” high exposure to match the dimensions of the 1928-1929 era. Verify/provide proper underlayment and flashings at all eaves, rakes, valleys and intersections. Replace in kind (copper) as needed. Scrape, sand, and repaint the wood trim at the eave, exposed rafter tails and underside of sheathing, fascia, and frieze using the paint analysis to guide the color selection.

Monitor roof drainage at the concrete slab at the shed appurtenance.

Architecture – Gutters and Downspouts
Priority: *Severe*
Install a new half round gutter system with 3½” fluted downspouts to provide drainage away from the building. Add splash stones at each downspout

Architecture – Chimney
Priority: *Severe*
Repair chimney by replacing brick in-kind where spalling is evident. Repoint with mortar to match existing. Coordinate chimney repair with roof work to allow proper step flashing. Consider relocating the roof vent to allow better clearance to chimney to prevent future damage.

Architecture – Exterior Walls
Priority: *Low*
Repair damage due to the roof drainage drip line at the south appurtenance’s east and west stem walls.

Architecture – Windows
<u>*Priority:*</u> *Low*
Repair select windows with damaged glazing putty and replace cracked panes of glass. Replacement glass shall be clear, non-reflective and have a visual light transmittal of not less than 72%. Scrape, sand, and repaint exterior and interior of windows and frame. Repair existing hardware as required to allow smooth operation.

Architecture – Exterior Doors
<u>*Priority:*</u> *Low*
Replace in-kind the one panel missing at the north elevation exterior door and repair existing hardware as required to allow smooth operation.

Architecture – Interior Doors
<u>*Priority:*</u> *Low*
Repair or tighten existing hardware as required to allow smooth operation.

Architecture – Wall Finishes
<u>*Priority:*</u> *Low*
Repair damaged plaster repaint using the paint analysis to guide the color selection.

Architecture – Ceiling Finishes
<u>*Priority:*</u> *Low*
No recommendations at this time.

Architecture – Interior Trim
<u>*Priority:*</u> *Low*
No recommendations at this time.

Architecture – Floor
<u>*Priority:*</u> *Low*
No recommendations at this time.

Architecture – Stairs
<u>*Priority:*</u> *Low*
Add code compliant handrails and repair the large chip in a tread located at the upper flight of stairs.

Architecture – Accessibility
<u>*Priority:*</u> *Low*
Provide program access through interpretive wayside exhibits.

Treatment Recommendations – Structural

Structural – Foundation
<u>*Priority:*</u> *Low*
No recommendations at this time.

Structural – Floor Framing
<u>*Priority:*</u> *Low*
No recommendations at this time.

Structural – Roof Framing
<u>*Priority:*</u> *Low*
The concrete roof slab should be protected. Water and snow from the upper roof should not be allowed to fall on the slab. The height of the trees to the south of power house should be reduced to allow the sun to help keep the roof dry.

Structural – Ceiling Framing
<u>*Priority:*</u> *Low*
No recommendations at this time.

Structural – Wall Framing
<u>*Priority:*</u> *Low*
The damaged walls under the concrete roof slab should be repaired or reconstructed and protected from future deterioration.

Structural – Lateral System
<u>*Priority:*</u> *Low*
No recommendations at this time.

Treatment Recommendations – Mechanical

Mechanical – Plumbing Systems
<u>*Priority:*</u> *Low*
No recommendations at this time.

Mechanical – HVAC
<u>*Priority:*</u> *Moderate*
The existing basement ventilation louvers do not provide adequate ventilation to prevent condensation and high humidity levels. The additional passive ventilation is recommended.

Mechanical – Fire Suppression
<u>*Priority:*</u> *N/A*

Mechanical – Other
Priority: *Moderate*
The existing tram hoist is beyond its useful life and replacement parts are no longer available. Recommend replacing with a self-contained diesel powered winch.

Treatment Recommendations – Electrical

Electrical – System Configuration
Priority: *Moderate*
Electrical devices, lighting and wiring dating to the original 1929 installation are no longer connected to a source of power. These items should remain in place for historical context. Existing diesel engine generator system is old and is becoming unserviceable. The existing tram hoist is to be replaced with a diesel powered unit. With the deletion of electrically driven tram hoist, the need for a diesel engine generator ceases. It is recommended to remove the existing diesel engine generator along with all associated equipment such as fuel tank, muffler, starting batteries, and associated panelboard. It is recommended that the existing tram hoist contactors and wiring be removed. It is recommended to remove the ac battery charger and throwover switch feeding the existing PV battery bank. Existing PV systems including collector, controllers and batteries should remain to allow continued power for Power House loads as well as for lighting in the kitchen of the Keeper's Quarters.

Electrical – Wiring Devices
Priority: *Low*
No recommendations at this time

Electrical – Conductor Insulation
Priority: *Low*
No recommendations at this time.

Electrical – Overcurrent Protection
Priority: *Moderate*
Overcurrent protection for removed hoist contactors should be removed. Overcurrent protection for removed generator set and associated electrical equipment should be removed.

Electrical – Lighting Systems
Priority: *Low*
No recommendations at this time.

Electrical – Telecommunications, Fire Alarm System, and Lightning Protection
Priority: *N/A*

Electrical – Other
Priority: *Low*
No recommendations at this time.

Treatment Recommendations – Hazardous Materials

Hazardous Materials – Asbestos
Priority: *Low*
Recommend sampling of suspect asbestos containing materials, including adhesives, TSI, roofing materials, caulking, gaskets, and flooring. Removal and replacement of asbestos roofing is recommended.

Hazardous Materials – Lead-Containing Paint and Lead Dusts
Priority: *Low*
Recommend stabilization or abatement of Lead Containing Paint. Lead dust wipe sampling not recommended.

Hazardous Materials – Lead In Soils
Priority: *Low*
Recommend further soils characterization to confirm applicable regulatory requirements.

Hazardous Materials – Mold/Biological
Priority: *Low*
No recommendations at this time.

Hazardous Materials – Petroleum Hydrocarbons
Priority: *Low*
Further investigation and sampling is recommended.

Alternatives for Treatment

The following are several considerations of alternatives for the proposed treatments:

1. Although a new gutter and downspout system are proposed, consideration could be given to forgoing this recommendation given that the base of the exterior walls is in fair condition. It appears that the original gutter installation could not withstand the winter conditions on-site. Careful installation detailing would need to be designed for a successful gutter installation.
2. Consideration should be given to the location of the existing vent adjacent to the chimney. This may be promoting the deterioration seen at the chimney given their close proximity.

Assessment of Effects for Recommended Treatments

The following table includes an analysis of the major treatment recommendations which affect Section 106 Compliance:

Recommended Treatment	Potential Effects	Mitigating Measures	Beneficial Effects
1. Additional Hazardous Testing and Mitigation	Mitigation of hazardous material may require removal of historic materials.	Any mitigation will need to be evaluated for benefit and implemented sensitively to minimize damage to the resource.	- Improves safety for visitors and staff - Removes hazards from the cultural resource
2. Replace existing roof with new composite shingle	Removes original material.	Roof is at end of serviceable life. New exposure of shingles and coloration shall match original.	- Abates a hazardous material - New roof will aid in the preservation of the structure
3. Add splash stones	Adds a new element to the structure.	Using a stone (versus precast) will be less visually disruptive to the historic fabric.	- Improves existing drainage to flow away from the building
4. Add a gutter system	Original has failed likely due to snow/ice loads.	Design an attachment that can withstand the snow/ice loads.	- Controlling roof drainage will protect the resource and minimize the efflorescence

Power House Photographs, 2009

MI-PH-01: Aerial, 2009 (Source: AH DSC00608)

MI-PH-02: South elevation, 2009 (Source: AH DSC00649)

MI-PH-03: West elevation, 2009 (Source: AH DSC00650)

MI-PH-04: North elevation, 2009 (Source: AH DSC00646)

MI-PH-05: East elevation, 2009 (Source: AH DSC00647)

MI-PH-06: Chimney, trim, and roof (Source: AH IMGP2836)

MI-PH-07: Roof, trim, and eaves (Source: AH IMGP2837)

MI-PH-08: Detail of south appurtenance, east elevation (Source: AH IMGP2842)

MI-PH-09: Basement vent (Source: AH 102_9578)

MI-PH-10: Basement, east elevation (Source: AH 100_9673)

MI-PH-11: Basement, looking southeast (Source: AH 100_9676)

MI-PH-12: Stairs to north entry from basement, looking up (Source: AH DSC00819)

MI-PH-13: North entry, interior (Source: AH 102_9579)

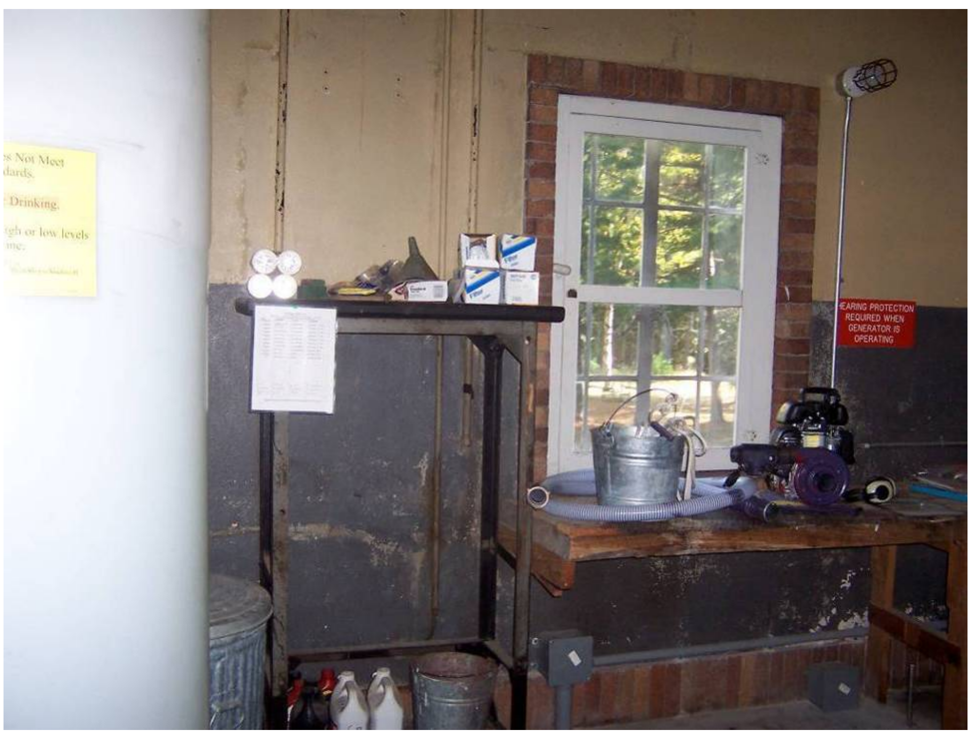
MI-PH-14: Hoist room, looking north (Source: AH 100_9684)

MI-PH-15: Stairs to main level, looking down (Source: AH DSC00818)

MI-PH-16: Generator room and water closet doors (Source: AH 102_9577)

MI-PH-17: Water closet (Source: AH 100_9664)

MI-PH-18: Generator room (Source: AH 100_9665)



MI-PH-19: Generator room, east elevation (Source: AH 100_9668)

MI-PH-20: Generator room, south elevation (Source: AH 100_9667)

MI-PH-21: Window latch detail (Source: AH 102_9576)

MI-PH-22: Roof damage (Source: Martin/Martin)

MI-PH-23: Roof damage (Source: Martin/Martin)

MI-PH-24: Masonry wall deterioration (Source: Martin/Martin)

MI-PH-25: Tram hoist winch (Source: RMH)

SHED

Chronology of Alterations and Use

Original Construction

The Michigan Island Shed was originally built in 1869. It was mostly used for storage and as barn space.[56] However, during Ed Lane's time as Keeper, before the construction of the Assistant Keepers Quarters and Workshop, the Shed was used by the Assistant Keeper as a place to cook and eat.[57] It was rebuilt in 1901 or 1902 according to Light House Board records.[58]

A photo from c. 1910 shows what appears to be the existing structure in relation to the Old Michigan Island Lighthouse (Historic Image MI-02). The Shed is also seen in a photo from 1975 that shows the building with boarded-up windows (Historic Image MI-13). A photo from 1978 of the Shed shows that the windows were no longer boarded, but otherwise the structure is in similar condition (Historic Image MI-17). Both the 1975 and 1978 photos show the Shed without signs of having an interior floor, while currently the interior floor is raised 1'8" from grade. Besides this addition of a floor, new paint and properly fitting wood boards over windows have been achieved since then.

There are no available historic drawings for this building.

Significant Alterations / Current Condition

There may have been significant alterations to the Shed. Keeper Robert Carlson, who lived on Michigan Island from 1893 to 1898, kept a cow which would have required a stall or manger or a door through which a cow could pass.[59] Also, there is a noticeable change in grade from the 1978 photo to present day but exactly when and why it occurred is unknown (Historic Image MI-17). It has no mechanical or electrical systems.

The Shed is currently in poor condition.

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[56] List of Classified Structures, National Park Service, 2009.
[57] Edna Lane Sauer interview with Kate Lidfors, S. Mackreth, 2011.
[58] Light House Board records show approval of rebuilding the barn in 1901, Terry Pepper's research at www.terrypepper.com/lights/superior/michigan_old/index.htm indicates a new barn was built in 1902.
[59] S. Mackreth, 2010.

Summary of Documented Work on the Building

Date	Work Described	Source of Information
1901-1902	Shed rebuilt	Light House Board Records
1927-1930	Documented whitewashing of Shed three times	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1928, October 12	"Mr. Law's crew fixed up shed for bunkhouse."	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1929, October 16	"Cleaned out benches in shed."	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1930, May 22	"Cleaned out shed of bunk-house, full of bed bugs. I burnt the mattresses and old stuff in it."	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1930, August	21: "Worked on coal-bin in the shed." 23: "Finished coal-bin." 30: "Removed the rails on car track near shed."	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1930, September 12	"Put a drain in front of shed."	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1975	Stabilization of Shed	APIS/NPS Business Office File D3423
1979	Repair foundation and paint exterior walls of Shed	APIS/NPS Business Office File D3423

Notable Actions with Unknown Dates

Date Range	Work Described
1978–2009	Grade change

General Physical Description

This building is a one-story, wood-framed rectangular utilitarian structure with a gable roof, board and batten walls, boxed rafter tails, and doors at the north and south elevations. There is a boarded-up window on the façade, and a second on the north elevation; plus a door on the north elevation (board and batten) and the hatch opening, on the west elevation.

Physical Description – Architecture

Architecture – Roof
Unlike any of the other structures at the light station, the Shed has wood shingle roofing. There is algae growth pervasive. The eave consists of a simple raked soffit of built up 1x trim for the fascia and frieze, extending ±6" (MI-S-06 and MI-S-07).

Architecture – Gutters and Downspouts
There is no gutter and downspout system.

Architecture – Exterior Walls
The exterior walls for the east and west elevations are 4x4 wood post framing at 38" on center. The north and south elevations are framed vertically and horizontally with 2x4 stud framing. All elevations are sheathed with board and batten vertical siding. There is a joint at the approximate floor line from alterations since 1978.

Architecture – Windows
Main (South) Elevation Window. This wood window is a six- over six-lite, double hung. It has a shaped profile at the muntins, no evidence of hardware, and is currently boarded over. The interior is natural wood and the exterior trim is 1” × 3¼”. This window is 2’7” × 4’6” and is original to the building (MI-S-12).

Rear (North) Elevation Window. This window is six lite, fixed, and is wood. The window appears to have been a salvaged upper sash that was fixed and is currently boarded over. The interior is natural wood while the exterior is painted white. The exterior trim is 1” × 3¼”. This window is 2’7” × 2’7” and may be original to the building (MI-S-13).

Side (West) Elevation Hatch. This hatch is painted wood boards with metal hinges at the bottom and a wood latch at the top. It is currently nailed shut.
Architecture – Exterior Doors
Main (South) Entry. This original door has four vertical panels with one horizontal panel at the center; all panels are raised and painted wood. The original hardware is a knob with mortise plate on one face. The interior frame is natural wood and the exterior frame is painted wood. This door is 2’8” × 6’7” × 1⅜” (MI-S-08 and 09).

Rear (North) Door. This original door is 1x plank with diagonal and horizontal bracing and 1x battens with bevels. The original hardware is a knob with mortise plate on one face. The door is natural wood on the interior and painted on the exterior, has two ball-tipped hinges, and a padlock. The only trim is on the exterior, which is ⅞” × 3½” with a 2x wood sill (MI-S-10).

Architecture – Exterior Trim
Refer to roof section.

Architecture – Wall Finishes
The original wall finish for this Shed is the interior face of the exterior wood board planking. The boards are 12” wide and are natural wood on the interior face (painted white on the exterior face) with natural wood bracing. There are also a variety of stamps and markings on the wood walls. The stamps say “Michigan Island,” and the markings appear to be in chalk and say, “Oil, 1080-40, 3065-30, 3050-20, 1065-3.” The stamps are original to the building but the chalk markings are most likely more recent.

Architecture – Ceiling Finishes
There is no ceiling just the underside of the wood gable roof. Wood sheathing, rafters, and a truss system are visible, all unpainted. The rafters are located on 3’0” centers (MI-S-15).

Architecture – Interior Trim
None in the building.

Architecture – Floor
The original underlying floor is wood plank, varying in widths from 5½” to 12,” with contemporary plywood covering the east half and part of the south area.

Architecture – Casework
None in the building.

Architecture – Accessibility
The building is currently not accessible. The south elevation primary entry door opening is 2’8” clear with a grade to finished floor elevation change of 1’8” with one 3½” tall step. The north entry door opening is 2’6” clear with a grade to finish floor elevation change of about 1’8”. Within the building, it is open and accessible.

Physical Description – Structural

Structural – Foundation
The floor framing of the shed is supported by wood beams that rest directly on the ground or are supported by concrete masonry blocks placed on the ground. The beams are not accessible and could not be measured.

Structural – Floor Framing
The floor is framed with FS 4 by 8 joists spaced at about 38.” The joists are supported on wood beams at the perimeter. The floor is sheathed with 2x planks.

Structural – Roof Framing
The roof framing consists of FS 2x4rafters spaced at about 38”. The rafters span approximately 8’. The rafters are supported on the exterior wood-framed walls. The rafters are sheathed with solid wood underlayment.

Structural – Wall Framing
The east and west walls are constructed of FS 4x4 posts spaced at about 38” with FS 2x4 girts at the top, bottom and middle of the wall. The north and south walls are framed vertically and horizontally with FS 2x4 studs. The walls are sheathed with vertical FS 1x sheathing.

Structural – Lateral System
Lateral stability for the building is provided by the exterior wood-framed walls.

Structural – Load Requirements
The required floor load capacity for the shed is 125 psf if it is used for light storage. The required snow load capacity for the shed is 40 psf.

Physical Description – Mechanical

Mechanical – Plumbing, Systems, HVAC, and Fire Suppression
None in the building.

Physical Description – Electrical

Electrical – System, Telecommunications, Fire Alarm System, and Lightning Protection
None in the building.

Physical Description – Hazardous Materials

Landmark Environmental collected 12 bulk samples from a total of 12 different types of suspected Asbestos Containing Materials (ACMs) at Michigan Island. Of the 12 suspect ACMs that were sampled and analyzed, a total of 2 samples collected from 2 suspect ACMs resulted in concentrations of greater than 1% (positive for asbestos).

Hazardous Materials – Asbestos

The following suspected ACMs were not sampled due to inaccessibility or park limitations regarding potential for damage to structures. Asbestos is assumed to be present at the following locations:

1. Adhesives – Varieties of miscellaneous adhesives were seen around windows doors and to seal penetrations Roofing Materials.
2. Roofing Materials – Tars, sealants, and patching materials could be present (This type of application was not seen but could be present).

Hazardous Materials – Lead Containing Paint

The LCP inspection included a visual inspection of the structure. A previous inspection of LCP was conducted using XRF meter. The XRF inspection was conducted by NPS staff in 1993.

Detectable lead in paint was confirmed for the following testing combinations:

1. Exterior Painted Surfaces.

Based on the estimated dates of construction of the various structures and the available testing data, LCP is assumed to be present throughout the exterior of the structure. The assumed LCP was observed to be in fair condition.

Paint chip debris was noted on localized areas of surface soils surrounding the Shed.

Hazardous Materials – Lead Dust

Surface wipe-sampling for lead dust analysis was not conducted in the Shed because it is a uninhabited structure.

Hazardous Materials – Lead in Soils

Historical paint maintenance activities such as manual scraping, power-washing, sanding, abrasive blasting or the general poor and peeling condition of exterior LCP may have created the potential to impact the surrounding soil. Areas of the surface soils adjacent to the structure were observed to have LCP debris and additional areas may exhibit LCP debris or lead-contaminated soils, but are not observable due to vegetative cover surrounding the structure. Preliminary lead-in-soil sampling was not performed to assess whether these near-structure soils contain lead concentrations above applicable soil standards.

Soil Sampling was not conducted around the Shed.

Hazardous Materials – Mold

Inspections of the structure were performed to identify the readily ascertainable visual extent of mold growth. Moisture testing in building materials was not performed nor was sampling of building materials performed for microbial analysis. Mold was not visually identified.

Character-Defining Features

Mass/Form. A simple rectangular, gable-roof utilitarian structure.

Exterior Materials. Painted wood vertical board and batten siding and wood shingle roof.

Openings. Covered window openings, a five panel door and a board and batten door.

Interior Materials. Exposed framing at walls and roof.

General Condition Assessment

In general, the Michigan Island Shed is in fair condition on the exterior and the interior. The original interior finishes are in fair condition with water stains and possible water infiltration at the floor level. The original windows are in poor condition as they are boarded up and missing their glazing and muntins (except for the main north window). The doors are in fair condition with rusty hardware, rotting around the base at the rear door, and overall peeling paint.

Structurally, the Shed is in poor condition. The framing for the entire building is inadequate. The building is not attached to an adequate foundation system for lateral and gravity loads. The entire building needs to be strengthened and placed on a proper foundation.

The following section is a discipline-by-discipline, component-by-component condition assessment of the building. Refer to Volume I, Chapter 2: Methodology for definitions of the condition ratings.

Condition Assessment – Architecture

Architecture – Roof
Condition: *Poor*
The existing wood shingles with moss growth are in poor condition.

Architecture – Exterior Walls
Condition: *Fair*
The exterior walls are in fair condition due to the peeling paint and lack of proper foundation.

Architecture – Windows
Condition: *Poor*
Main (South) Elevation Window. This window is in poor condition as the upper sash has two broken panes and the lower sash is missing all of its glass and muntins.

Rear (North) Elevation Window. This window is in poor condition as all muntins and glazing are missing, the bottom rail is also missing, and the bottom part of the stiles is rotting.

Side (West) Elevation Hatch. The hatch is in good condition, though it is inoperable.

Architecture – Exterior Doors
<u>Condition:</u> *Fair*
Main (South) Entry. This main door is in fair to poor condition as the hinge-side stile and the bottom rail are broken, the paint is alligatored and peeling, and the knob is loose.

Rear (North) Door. This door is in fair condition as the frame is rotting at the base, the knob is loose and rusted, and the paint is peeling.

Architecture – Exterior Trim
<u>Condition</u>: *Fair*
The exterior trim is in fair condition with peeling paint.

Architecture – Wall Finishes
<u>Condition:</u> *Fair*
The interior face of the exterior wood board is in fair condition with instances of water stains, gaps between boards, and paint stains.

Architecture – Ceiling Finishes
<u>Condition:</u> *N/A*

Architecture – Interior Trim
<u>Condition:</u> *N/A*

Architecture – Floor
<u>Condition:</u> *Fair*
The visible wood planking is in fair condition with water stains and typical wear for the utility function of this building. The contemporary plywood is in poor to deteriorated condition.

Architecture – Casework
<u>Condition:</u> *N/A*

Architecture – Accessibility
<u>Condition:</u> *Poor*
This building is not accessible.

Condition Assessment – Structural

Structural – Foundation
<u>Condition:</u> *Poor*
The foundation is in poor condition. The accessible portions of the foundation are concrete masonry blocks. In some locations, the floor framing rests directly on the ground. There are no connections between the floor framing and the blocks (MI-S-17). The wood beams that support the floor framing could not be observed, thus their condition is unknown.

Structural – Floor Framing
<u>Condition:</u> *Poor*
The floor framing is in poor condition. Much of the framing and planks could not be observed, thus their condition is unknown. The floor framing was uneven and not supported on an adequate foundation. The framing requires further investigation.

Structural – Roof Framing
<u>Condition:</u> *Fair*
The roof framing is in fair condition. However, the framing is not adequate to resist the required lateral and gravity loads.

Structural – Wall Framing
<u>Condition:</u> *Fair*
The wall framing is in fair condition. However, the framing is not adequate to resist the required lateral and gravity loads.

Structural – Lateral System
<u>Condition:</u> *Poor*
Lateral stability of the Shed is poor due to an inadequate foundation and wall framing.

Structural – Load Requirements
<u>Condition:</u> *Poor*
The roof and floor framing do not have adequate capacity to support the required loads.

Condition Assessment – Mechanical

N/A

Condition Assessment – Electrical

N/A

Condition Assessment – Hazardous Materials

Refer to “Physical Description – Hazardous Materials” for detailed descriptions of locations and conditions of hazardous materials.

Ultimate Treatment and Use

This building is a shed that was originally built in 1869 and rebuilt between 1901 and 1902.

This building is currently a storage area for the Park Service with no visitor access. The proposed use for the Shed is to preserve the historic structure and possibly install a Plexiglas panel (or similar product) at the door to allow for visitor visual access.

Preservation is the recommended treatment for the building.

Requirements for Treatment

Compliance requirements for treatment currently include laws, regulations, and standards as outlined by the Park Service and listed in Volume I, Administrative Data section of this report.

The recommended treatments are tailored to the preferred alternative as the outcome of the Value Analysis/CBA for the project. As individual buildings are rehabilitated, specific alternatives will present themselves during design and construction. The following section is a discipline-by-discipline, component-by-component description of the treatments proposed for the preservation of the building. Refer to Volume I, Chapter 2: Methodology for the priority rating definitions.

Treatment Recommendations – Architecture

Architecture – Roof
Priority: *Severe*
Remove existing wood shingle roof and replace in kind matching exposure. Verify/ provide proper flashings and replace any damaged open sheathing as needed in course of reroofing. Install a zinc strip just under the ridge cap to control future moss growth on shingles.

Scrape, sand, and repaint soffit, fascia, and trim.

Architecture – Exterior Walls
Priority: *Moderate*
Repair walls as needed after foundation work. Scrape, sand board, and batten vertical siding.

Architecture – Windows
Priority: *Moderate*
Remove boards over windows. Replace broken or missing panes and muntins in the windows. Replacement glass shall be clear, non-reflective and have a visual light transmittance of not less than 72%. On the north elevation window, epoxy stabilize existing sash damage. Scrape, sand, and repaint the window sash and frames.

Architecture – Exterior Doors
Priority: *Moderate*
Repair broken stiles and rails and epoxy stabilize areas of rotting wood components. Scrape, sand, and repaint doors. Repair existing hardware as required to allow smooth operation. Investigate the installation of a Plexiglas (or similar product) panel at the south entry for visitor viewing.

Architecture – Exterior Trim
Priority: *Low*
Scrape, sand, and repaint.

Architecture – Wall Finishes
Priority: *Low*
No recommendations at this time.

Architecture – Ceiling Finishes
Priority: *N/A*

Architecture – Interior Trim
Priority: *N/A*

Architecture – Floor
Priority: *Moderate*
Remove existing plywood covering areas of deterioration and repair floor with wood boards that match the original portion of the flooring. Coordinate work with the foundation repair.

Architecture – Accessibility
Priority: *Low*
Provide program access through interpretive wayside exhibits.

Treatment Recommendations – Structural

Structural – Foundation
Priority: *Low*
A new foundation in compliance with the IEBC and NPS requirements should be provided for the support of the shed.

Structural – Floor Framing
Priority: *Low*
The floor framing will require substantial strengthening and selective replacement to be in compliance with the IEBC and NPS requirements. The addition of new floor joists spaced at no more than 12" is needed. Replacement with a slab-on-grade may be a better long-term solution considering the lack of crawlspace depth and the need to provide a suitable foundation.

Structural – Roof Framing
Priority: *Low*
The roof framing will require substantial strengthening to be in compliance with the IEBC and NPS requirements. The addition of new roof joists spaced at no more than 12" is needed. Additional collar ties will be needed at every third joist, not to exceed 4' on center. Replacement with a new roof system may be a better long-term solution.

Structural – Wall Framing
<u>Priority:</u> *Low*
The wall framing will require substantial strengthening to be in compliance with the IEBC and NPS requirements. The addition of new wall studs, spaced to match the roof joist spacing, and two rows of horizontal bracing will be needed. Replacement with a new framing system may be a better long-term solution.

Structural – Lateral System
<u>Priority:</u> *Low*
The lateral load resisting systems should be checked for compliance with the IEBC and NPS requirements.

Treatment Recommendations – Mechanical

N/A

Treatment Recommendations – Electrical

N/A

Treatment Recommendations – Hazardous Materials

Hazardous Materials – Asbestos
<u>Priority:</u> *Low*
Recommend Sampling of suspect asbestos containing materials, including adhesives and roofing materials.

Hazardous Materials – Lead-Containing Paint and Lead Dusts
<u>Priority:</u> *Low*
Recommend stabilization or abatement of Lead Containing Paint. Lead dust wipe sampling not recommended.

Hazardous Materials – Lead In Soils
<u>Priority:</u> *Low*
Recommend further soils characterization to confirm applicable regulatory requirements.

Hazardous Materials – Mold/Biological
<u>Priority:</u> *Low*
No recommendations at this time.

Hazardous Materials – Petroleum Hydrocarbons
<u>Priority:</u> *Low*
No recommendations at this time.

Alternatives for Treatment

The following are several considerations of alternatives for the proposed treatments:

1. Although a secondary interior door (Plexiglas panel or similar product) has been proposed, consideration should be given if a physical barrier is required in allowing the Shed to be open to the public during the time of guided use at the light station. Such an addition might be more of a maintenance burden than the risk of the public entering the Shed.
2. Another alternative could be for the public to only experience the Shed from the exterior.
3. A third alternative for park consideration would be to retain the current function as NPS storage.

Assessment of Effects for Recommended Treatments

The following table includes an analysis of the major treatment recommendations which affect Section 106 Compliance:

Recommended Treatment	Potential Effects	Mitigating Measures	Beneficial Effects
1. Additional Hazardous Testing and Mitigation	Mitigation of hazardous material may require removal of historic materials.	Any mitigation will need to be evaluated for benefit and implemented sensitively to minimize damage to the resource.	- Improves safety for visitors and staff - Removes hazards from the cultural resource
2. Introduce a Plexiglas panel or similar product for visual access by visitors.	- Creates a false atmospheric division at structure. - Installation methods may damage historic fabric.	Study alternative methods for allowing visitors visual access to the structure.	- Improves visitor experience
3. Add a new foundation	A new foundation will disturb existing materials.	Design a new foundation that will be as unobtrusive as possible. Provide archeological monitoring during excavations.	- Improves staff safety - Protects the resource

Shed Photographs, 2009

MI-S-01: Aerial, 2009 (Source: AH DSC00581)

MI-S-02: South elevation, 2009 (Source: AH CIMG3241)

MI-S-03: West elevation, 2009 (Source: AH CIMG3240)

MI-S-04: North elevation, 2009 (Source: AH CIMG3243)

MI-S-05: East elevation, 2009 (Source: AH CIMG3242)

MI-S-06: South elevation roof and trim detail (Source: AH CIMG3252)

MI-S-07: Detail of roofing shingles (Source: AH CIMG3255)

MI-S-08: South elevation entry (primary) door (Source: AH CIMG3248)

MI-S-09: South elevation door, detail of lockset (Source: AH CIMG3269)

MI-S-10: North elevation entry door (Source: AH CIMG3250)

MI-S-11: West elevation hatch opening (currently inoperable) (Source: AH CIMG3246)

MI-S-12: South elevation of interior (Source: AH CIMG3263)

MI-S-13: North elevation of interior (Source: AH CIMG3260)

MI-S-14: West elevation of interior (Source: AH CIMG3258)

MI-S-15: North roof structure interior view, historic door storage (Source: AH CIMG3265)

MI-S-16: Roof structure interior, historic headboard storage (Source: AH CIMG3267)

MI-S-17: Foundation blocks (Source: Martin/Martin)

PRIVY

Chronology of Alterations and Use

Original Construction

The Michigan Island Privy was originally built in 1869 as a brick structure and then replaced between 1901 and 1912 with a Detroit built two-holer wood-framed privy with a casement window. [60]

There are no available historic drawings or photographs of this building.

Significant Alterations / Current Condition

There are no significant alterations to the Privy. It has no electrical system and its only mechanical attributes are a gravity vent on the roof and a vault vent at grade.

The Privy is currently in fair condition with the exception of its foundation which is in poor condition.

[60] Edna Lane Sauer Letter, 1978.

Summary of Documented Work on the Building

Date	Work Described	Source of Information
1901–1912	Keeper Lane's daughter writes about new wood-framed Privy with casement window delivered to the island from Detroit	1978 Letter from Edna Lane Sauer, from Mannikko, Nancy Farm and Robert W. Mackreth. "Apostle Islands Light Stations," National Historic Landmark Nomination—Draft. Bayfield, WI.: Apostle Islands National Lakeshore, n.d.
1931–1936	Documented painting of the roof of Privy three times.	E. Lane, MI Log, Nov 23, 1926–Aug 19, 1936
1975	Stabilization of Privy	APIS/NPS Business Office File D3423

General Physical Description

This building is a one-story rectangular utilitarian structure with clapboard siding and corner boards. The simple gable roof is made of stamped metal shingles with boxed rafter tails. The Privy has a concrete vault and pier foundation. The vault has a clean-out access to the north, covered by a wooden hatch.

Physical Description – Architecture

Architecture – Roof
The roof is a metal shingle roof with a stamped scalloped detail on the panel and an approximate exposure of 9" wide by 12" high. There is a curved ridge trim piece.

The eave consists of a raked soffit of 1x fascia and frieze, extending ±6". The sheathing is solid 1x boards as seen from the joints at the edge.

A paint sample from the metal roof reveals three finish layers of green paint over the oldest maroon layer that was probably a red lead prime coat.

Architecture – Exterior Walls
The exterior walls are made from 2x4 construction with sheathing and painted clapboard siding.

A paint sample taken from the exterior of the walls reveals three layers of white paint over weathered wood.

Architecture – Window
This wood window is a single-lite casement. The interior and exterior trim is 1⅛" × 4," painted white on both interior and exterior. There is a wood sill and a center latch. The window is 1'3" × 2'5" and is original to the building (MI-P-09).

Architecture – Exterior Door

This original door has four vertical panels with one horizontal panel at the center; all panels are raised and painted wood. The original hardware is knob type and the door also has a modern padlock. The painted wood trim is 1⅛" × 4" on the interior and exterior. The wood sill is 2x. This door is 2'6" × 6'2" × 1¼".

Architecture – Exterior Trim

The exterior trim consists of corner boards, 1x casing at openings and a water table with 1x flat trim below, all painted white.

Architecture – Wall Finishes

The original wall finish for this Privy is 3½" wide beadboard, horizontal, painted white. A paint sample taken of the interior wall reveals multiple layers of oil-based white paint over silver paint (the oldest layer). Silver paint was made from powdered aluminum, and since aluminum was not commercially produced until the 1930s, the paint cannot predate the 1930s.

Architecture – Ceiling Finishes

The ceiling finish is 3½" wide beadboard, painted white, running north-south.

Architecture – Floor

The original floor is 2" wide wood board flooring, painted blue-gray. The boards are not interlocking.

Architecture – Casework

The north side of the Privy has a two-seater made of wood, painted white. There is a metal, circular, vent pipe between the two seats along the north wall (MI-P-07 and 08).

There is also a small wood basket painted white attached to the west wall, south of the window. This basket appears to be historic and possibly original to the building (MI-P-10).

Architecture – Accessibility

The building is currently not accessible. The south elevation entry door opening is 2'5" clear with a grade to finished floor elevation change of 2'¼". The interior will not accommodate a 5'0" turning diameter.

Physical Description – Structural

Structural – Foundation

The rear of the Privy is supported on an unreinforced concrete vault with 8" thick walls. The front of the Privy is supported on a 10" by 12" pad footing at each corner.

Structural – Floor Framing

The floor is framed with FS 2x4 joists spaced at about 16". The floor is sheathed with solid wood subflooring.

Structural – Roof Framing

The roof framing could not be observed but is believed to be wood framing. The rafters span approximately 2½ '. The rafters are supported on the exterior wood-framed walls. The rafters are sheathed solid wood underlayment.

Structural – Wall Framing
The wall framing could not be observed but is believed to be wood framing. The walls are sheathed on both sides with solid wood siding.

Structural – Lateral System
Lateral stability for the building is provided by the exterior wood-framed walls.

Structural – Load Requirements
The required floor load capacity and roof snow load capacity for the Privy is 40 psf.

Physical Description – Mechanical

Mechanical – Plumbing, Systems, HVAC, and Fire Suppression
None in the building.

Mechanical – Other
The original gravity vent for the Privy vault remains from below the seating area up through the roof. A grade level clay pipe at the northwest corner of the structure likely served as intake vent for the vault below the Privy (MI-P-06).

Physical Description – Electrical

Electrical – System, Telecommunications, Fire Alarm System, and Lightning Protection
None in the building.

Physical Description – Hazardous Materials

Landmark Environmental collected 12 bulk samples from a total of 12 different types of suspected Asbestos Containing Materials (ACMs) at Michigan Island. Of the 12 suspect ACMs that were sampled and analyzed, a total of 2 samples collected from 2 suspect ACMs resulted in concentrations of greater than 1% (positive for asbestos).

Hazardous Materials – Asbestos
The following suspected ACMs were not sampled due to inaccessibility or park limitations regarding potential for damage to structures. Asbestos is assumed to be present at the following locations:

1. Ceiling Insulation (Black matting or felt paper observed above ceilings, this suspect ACM may also be present in wall interiors),
2. Plaster,
3. Adhesives (Varieties of miscellaneous adhesives were seen around windows doors and to seal penetrations), and,
4. Roofing Materials.

The assumed ACMs were observed to be in fair condition.

Hazardous Materials – Lead Containing Paint
Detectable lead is assumed to be present at the following locations:

1. Interior Painted Surfaces, and
2. Exterior Painted Surfaces.

Based on the estimated dates of construction of the various structures, LCP is assumed to be present throughout the structure. The assumed LCP was observed to be in poor condition.

Hazardous Materials – Lead Dust
Surface wipe-sampling for lead dust analysis was not conducted in the Privy because it is a uninhabited structure.

Hazardous Materials – Lead in Soils
Historical paint maintenance activities such as manual scraping, power-washing, sanding, abrasive blasting or the general poor and peeling condition of exterior LCP may have created the potential to impact the surrounding soil. Areas of the surface soils adjacent to the structure were observed to have LCP debris and additional areas may exhibit LCP debris or lead-contaminated soils, but are not observable due to vegetative cover surrounding the structure. Preliminary lead-in-soil sampling was not performed to assess whether these near-structure soils contain lead concentrations above applicable soil standards.

Soil sampling was not conducted around the Privy.

Hazardous Materials – Mold
Inspections of the structure were performed to identify the readily ascertainable visual extent of mold growth. Moisture testing in building materials was not performed nor was sampling of building materials performed for microbial analysis. Mold was not visually identified.

Character-Defining Features

Mass/Form. A simple small rectangular, gable-roof utilitarian structure.

Exterior Materials. Painted white wood clapboard siding; metal roof shingles and metal vent painted green.

Openings. One wood single lite casement window and one wood 5 panel door both painted white.

Interior Materials. Beadboard paneling at walls and ceiling painted white and wood tongue and groove flooring painted grey.

General Condition Assessment

In general, the Michigan Island Privy is in fair condition. The original interior finishes are in good to fair condition with peeling paint and some mold growth on the beadboard ceiling. The original window is in good condition and the door is in fair condition with a loose bottom rail and original knob. The two-seater is in fair condition with missing and peeling paint and rusty hinges. The metal roof is in fair condition while the exterior walls and trim are in good condition.

Structurally, the Privy is in fair condition. Deterioration of the foundations needs attention. The building needs to be attached to adequate foundations for lateral loads.

The following section is a discipline-by-discipline, component-by-component condition assessment of the building. Refer to Volume I, Chapter 2: Methodology for definitions of the condition ratings.

Condition Assessment – Architecture

Architecture – Roof
<u>Condition:</u> *Fair*
The roof is in fair condition with paint peeling from the shingles, exposing bare metal.

Architecture – Exterior Walls
<u>Condition:</u> *Good*
The exterior walls are in good condition with the exception of the foundation (see structural assessment).

Architecture – Window
<u>Condition:</u> *Good*
This window is in good condition with peeling paint.

Architecture – Exterior Door
<u>Condition:</u> *Fair*
This door is in fair condition as the bottom rail is loose, the knob is loose, and there is peeling paint.

Architecture – Exterior Trim
Condition: *Good*
The exterior trim is in good condition.

Architecture – Wall Finishes
Condition: *Good*
The beadboard is in good condition with peeling paint and minor separation of boards.

Architecture – Ceiling Finishes
Condition: *Fair*
The beadboard ceiling finish is in fair condition as the paint is badly peeling and there is some mold growth.

Architecture – Floor
Condition: *Good*
The wood board floor is in good condition.

Architecture – Casework
Condition: *Fair*
The two-seater is in fair condition with peeling paint, missing paint, and rusty hinges. The vent pipe is also in fair condition with badly peeling paint.

The small wood basket is in fair condition as it is warped and has peeling paint.

Architecture – Accessibility
Condition: *Poor*
This building is not accessible.

Condition Assessment – Structural

Structural – Foundation
Condition: *Poor*
The walls of the concrete vault at the rear of the Privy are in poor condition. The original concrete has freeze/thaw deterioration and previous repairs to the tops of the walls are failing. The original concrete is continuing to deteriorate below the repair (MI-P-11). The footings at the front of the Privy are in poor condition. They have been undermined and are rotating out from under the Privy (MI-P-12).

Structural – Floor Framing
Condition: *Good*
The floor framing is in good condition.

Structural – Roof Framing
Condition: *Unknown*
The roof framing could not be observed, thus its condition is unknown. No obvious signs of distress or damage were observed.

Structural – Wall Framing
Condition: *Unknown*
The wall framing could not be observed, thus its condition is unknown. No obvious signs of distress or damage were observed.

Structural – Lateral System
Condition: *Poor*
Lateral stability of the Privy is poor because the building is not physically attached to the foundations. No obvious signs of distress or damage were observed.

Structural – Load Requirements
Condition: *Good*
By inspection, the roof and floor framing have adequate capacity to support the required loads.

Condition Assessment – Mechanical

Mechanical – Plumbing, Systems, HVAC, and Fire Suppression
Condition: *N/A*

Mechanical – Other
Condition: *Fair and Poor*
The gravity vent on the roof of the Privy is in fair condition. The Privy vault vent at grade is in poor condition.

Condition Assessment – Electrical

N/A

Condition Assessment – Hazardous Materials

Refer to “Physical Description – Hazardous Materials” for detailed descriptions of locations and conditions of hazardous materials.

Ultimate Treatment and Use

The Privy was originally built in 1869 as a brick structure but was replaced between 1901 and 1912 with the existing wood-framed structure. It can be assumed that the Privy was infrequently used after the installation of plumbing in the early 1930s to the Old Lighthouse Quarters.

The building is currently vacant and has no public access. The use of the Privy is proposed as passive visitor access by means of visual access only to the interior as seen from the exterior. Various methods of allowing this could be studied and may include a Plexiglas or view panel that can be in place when the exterior door is open.

Rehabilitation is the recommended treatment for the building.

Requirements for Treatment

Compliance requirements for treatment currently include laws, regulations, and standards as outlined by the Park Service and listed in Volume I, Administrative Data section of this report.

The recommended treatments are tailored to the preferred alternative as the outcome of the Value Analysis/ CBA for the project. As individual buildings are rehabilitated, specific alternatives will present themselves during design and construction. The following section is a discipline-by-discipline, component-by-component description of the treatments proposed for the rehabilitation of the building. Refer to Volume I, Chapter 2: Methodology for the priority rating definitions.

Treatment Recommendations – Architecture

Architecture – Roof
Priority: *Severe*
Repair existing metal shingle roof. Scrape, sand, and repaint.

Architecture – Exterior Walls
Priority: *Moderate*
Scrape, sand, and repaint clapboard siding.

Architecture – Window
Priority: *Moderate*
Scrape, sand, and repaint the window sash and frame.

Architecture – Exterior Door
Priority: *Moderate*
Repair bottom rail, reattach knob and scrape, sand, and repaint the door. Investigate a Plexiglas (or similar product) panel inside the door.

Architecture – Exterior Trim
Priority: *Moderate*
Scrape, sand, and repaint trim.

Architecture – Wall Finishes
<u>Priority:</u> *Low*
Scrape, sand, and repaint the beadboard.

Architecture – Ceiling Finishes
<u>Priority</u>: *Low*
Scrape, sand, and repaint the beadboard ceiling.

Architecture – Floor
<u>Priority:</u> *Low*
Scrape, sand, and repaint the wood floor.

Architecture – Casework
<u>Priority:</u> *Low*
Scrape, sand, and repaint the casework.

Architecture – Accessibility
<u>Priority:</u> *Low*
Provide program access through interpretive wayside exhibits.

Treatment Recommendations – Structural

Structural – Foundation
<u>Priority:</u> *Low*
The walls of the concrete vault should be repaired or replaced. The spot footings should be replaced with new footings that bear at the same elevation as the concrete vault.

Structural – Floor Framing
<u>Priority:</u> *Low*
No recommendations at this time.

Structural – Roof Framing
<u>Priority:</u> *Low*
No recommendations at this time.

Structural – Wall Framing
<u>Priority:</u> *Low*
No recommendations at this time.

Structural – Lateral System
<u>Priority:</u> *Low*
The lateral load resisting system should be checked for compliance with the IEBC and NPS requirements.

Treatment Recommendations – Mechanical

Electrical – System, Telecommunications, Fire Alarm System, and Lightning Protection
<u>Priority:</u> *N/A*

Mechanical – Other
<u>Priority:</u> *Low*
No recommendations at this time.

Treatment Recommendations – Electrical

N/A

Treatment Recommendations – Hazardous Materials

Hazardous Materials – Asbestos
<u>Priority:</u> *Low*
Recommend Sampling of suspect asbestos containing materials, including adhesives, roofing materials, ceiling insulation, and plaster.

Hazardous Materials – Lead-Containing Paint and Lead Dusts
<u>Priority:</u> *Low*
Recommend stabilization or abatement of Lead Containing Paint. Lead dust wipe sampling not recommended.

Hazardous Materials – Lead In Soils
<u>Priority:</u> *Low*
Recommend further soils characterization to confirm applicable regulatory requirements.

Hazardous Materials – Mold/Biological
<u>Priority:</u> *Low*
No recommendations at this time.

Hazardous Materials – Petroleum Hydrocarbons
<u>Priority:</u> *Low*
No recommendations at this time.

Alternatives for Treatment

The following are several considerations of alternatives for the proposed treatments:

1. Although a secondary interior door (Plexiglas panel or similar product) has been proposed, consideration should be given if a physical barrier is required in allowing the Privy to be open to the public during the time of guided use at the light station. Such an addition might be more of a maintenance burden than the risk of the public entering the Privy.
2. Another alternative could be for the public to only experience the Privy from the exterior.
3. Consideration could be given to replacing the existing metal shingles which appear to be nearing their useful lifespan.

Assessment of Effects for Recommended Treatments

The following table includes an analysis of the major treatment recommendations which affect Section 106 Compliance:

Recommended Treatment	Potential Effects	Mitigating Measures	Beneficial Effects
1. Additional Hazardous Testing and Mitigation	Mitigation of hazardous material may require removal of historic materials.	Any mitigation will need to be evaluated for benefit and implemented sensitively to minimize damage to the resource.	- Improves safety for visitors and staff - Removes hazards from the cultural resource
2. Introduce a Plexiglas panel or similar product for visual access by visitors	- Creates a false atmospheric division at structure. - Installation methods may damage historic fabric.	Study alternative methods for allowing visitors visual access to the structure.	- Improves visitor experience

Privy Photographs, 2009

MI-P-01: Aerial, 2009 (Source: AH DSC00580)

MI-P-02: South elevation, 2009 (Source: AH DSC00538)

MI-P-03: East elevation, 2009 (Source: AH DSC00539)

MI-P-04: North elevation, 2009 (Source: AH DSC00541)

MI-P-05: West elevation, 2009 (Source: AH DSC00536)

MI-P-06: North roof vent (Source: AH DSC00597)

MI-P-07: North elevation (Source: AH CIMG3271)

MI-P-08: Seat detail (Source: AH CIMG3287)

MI-P-09: Window (Source: AH CIMG3278)

MI-P-10: Window and built-in box (Source: AH CIMG3282)

MI-P-11: Concrete wall deterioration (Source: Martin/Martin)

MI-P-12: Footing rotation (Source: Martin/Martin)

GLOSSARY OF TERMS

PRIMARY TREATMENT APPROACH – PRESERVATION

Preservation standards include measures necessary to sustain the existing form, integrity, and materials of a historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction. Preservation requires the retention of the greatest amount of historic fabric, including the landscape's historic form, features, and details as they have evolved over time. Limited and sensitive upgrading of mechanical, electrical and plumbing systems and other code-required work is permitted.

HOW TERMINOLOGY IS USED IN THE PRESERVATION APPROACH

Maintain – are those standard maintenance practices that are necessary to retain the features of a property as a contributing resource. Maintenance activities are usually not classified as repair, however minor repair such as replacement of posts or railings or segments of paving are included. Limited and sensitive upgrading of building systems (mechanical, electrical, plumbing) and other code related work is appropriate.

Plant – the removal and replanting of landscape plantings and vegetation as part of maintenance activities

Protect – short term and minimal measures used to stabilize and protect features, such as fencing around landscape features

Relocate – the removal and resetting of noncontributing features

Remove – the removal of nonhistoric features

Repair – features, components of features and materials that require additional work. These may include declining building features (e.g., roofing, foundation, mechanical systems) structures, small scale features (e.g., repair of a railing) or landscape plantings (e.g., repair mass planting by adding infill plantings). Features that are repaired will match the old in design, color, texture, and if possible, material. Distinctive features that are repaired will match the old in design, color, texture, and if possible, material. Replacement work will only occur when historic fabric is deteriorated beyond repair. Evaluation of restoration and low-impact options must be exhausted before replacement is considered feasible.

Retain –are those actions that are necessary to allow for a feature (contributing or noncontributing) to remain in place in its contributing current configuration and condition. Retention of historic fabric is the primary tenet for preservation treatment of historic properties. The extent of historic fabric represents historic integrity which is fundamental to the recognition and status of historical development.

Stabilize – immediate measures (more than standard maintenance practices) are needed to prevent deterioration, failure, or loss of features.

PRIMARY TREATMENT APPROACH – REHABILITATION

Rehabilitation in intended to return a property to a state of utility, through repair or alteration, which makes possible an efficient contemporary use while preserving those portions and features of the property which are significant to its historic, architectural, and cultural values. Rehabilitation allows for repairs, alterations, restoration of missing features, and additions necessary to enable a compatible use for a property as long as

the portions or features which convey the historical, cultural, or architectural values are preserved. Limited and sensitive upgrading of mechanical, electrical and plumbing systems and other code-required work is permitted.

HOW TERMINOLOGY IS USED IN THE REHABILITATION APPROACH

Maintain – are those standard maintenance practices that are necessary to retain the features of a property as a contributing resource. Maintenance activities are usually not classified as repair, however minor repair such as replacement of posts or railings or segments of paving are included. Limited and sensitive upgrading of building systems (mechanical, electrical, plumbing) and other code related work is appropriate.

Plant – the removal and replanting of landscape plantings and vegetation as part of maintenance activities or the restoration of missing features.

Reestablish – are those measures necessary to depict a landscape feature as it occurred historically. Reestablishment may include the replacement of missing landscape features such as views, planting patterns, spatial relationships, or small scale features.

Relocate – remove and reset noncontributing features

Remove – removal of nonhistoric features

Repair – features, components of features and materials that require additional work. These may include declining building features (e.g., roofing, foundation, mechanical systems) structures, small scale features (e.g., repair of a railing) or landscape plantings (e.g., repair mass planting by adding infill plantings). Features that are repaired will match the old in design, color, texture, and if possible, material. Distinctive features that are repaired will match the old in design, color, texture, and if possible, material. Replacement work will only occur when historic fabric is deteriorated beyond repair. Evaluation of restoration and low-impact options must be exhausted before replacement is considered feasible.

Restore – are those measures necessary to depict a feature or area as it occurred historically. Restoration may include repair of a feature so that it appears as it did historically or it may include replacement of missing features or qualities. Restoration is undertaken when a "period of significance" is determined and that period of significance (original construction or a succeeding period representing a continuum of change for the property) becomes a project goal. Restoration is only recommended when restorative details can be substantiated by documentary and physical evidence. Without indisputable evidence restorative work risks conjectural decision making, leading to inaccurate and inappropriate historical appearance. Restoration must avoid the creation of a false sense of historical development.

Retain –are those actions that are necessary to allow for a feature (contributing or noncontributing) to remain in place in its contributing current configuration and condition. Retention of historic fabric is the primary tenet for preservation treatment of historic properties. The extent of historic fabric represents historic integrity which is fundamental to the recognition and status of historical development.

Stabilize – immediate, more extensive measures (more than standard maintenance practices) are needed to prevent deterioration, failure, or loss of features.

PRIMARY TREATMENT APPROACH – RESTORATION

Restoration standards allow for the accurate depiction of a property as it appeared at a particular time in its history by means of the removal of features from other periods in its history and reconstruction of missing

features from the period of significance. The limited and sensitive upgrading of systems (mechanical, electrical, plumbing) and other code related work is appropriate.

HOW TERMINOLOGY IS USED IN THE RESTORATION APPROACH

Maintain – are those standard maintenance practices that are necessary to retain the features of a property as a contributing resource. Maintenance activities are usually not classified as repair, however minor repair such as replacement of posts or railings or segments of paving are included. Limited and sensitive upgrading of building systems (mechanical, electrical, plumbing) and other code related work is appropriate.

Plant – the removal and replanting of landscape plantings and vegetation as part of maintenance activities or the restoration of missing features

Relocate – remove and reset noncontributing features

Remove – removal of nonhistoric features

Reestablish – are those measures necessary to depict a landscape feature as it occurred historically. Reestablishment may include the replacement of missing landscape features such as views, planting patterns, spatial relationships, or small scale features.

Repair – features, components of features and materials that require additional work. These may include declining building features (e.g., roofing, foundation, mechanical systems) structures, small scale features (e.g., repair of a railing) or landscape plantings (e.g., repair mass planting by adding infill plantings). Features that are repaired will match the old in design, color, texture, and if possible, material. Distinctive features that are repaired will match the old in design, color, texture, and if possible, material. Replacement work will only occur when historic fabric is deteriorated beyond repair. Evaluation of restoration and low-impact options must be exhausted before replacement is considered feasible.

Restore – are those measures necessary to depict a feature or area as it occurred historically. Restoration may include repair of a feature so that it appears as it did historically or it may include replacement of missing features or qualities. Restoration is undertaken when a "period of significance" is determined and that period of significance (original construction or a succeeding period representing a continuum of change for the property) becomes a project goal. Restoration is only recommended when restorative details can be substantiated by documentary and physical evidence. Without indisputable evidence restorative work risks conjectural decision making, leading to inaccurate and inappropriate historical appearance. Restoration must avoid the creation of a false sense of historical development.

Retain –are those actions that are necessary to allow for a feature (contributing or noncontributing) to remain in place in its contributing current configuration and condition. Retention of historic fabric is the primary tenet for preservation treatment of historic properties. The extent of historic fabric represents historic integrity which is fundamental to the recognition and status of historical development.

Stabilize – immediate, more extensive measures (more than standard maintenance practices) are needed to prevent deterioration, failure, or loss of features.

CONDITION ASSESSMENT DESCRIPTION LEVELS
Feature Condition Definitions
(Note: These terms are also applied to the overall structure/building.)

GOOD The feature is intact, structurally sound and performing its intended purpose. The feature needs no repair or rehabilitation, but only routine or preventive maintenance.

FAIR The feature is in fair condition if either of the following conditions is present:

- There are early signs of wear, failure or deterioration though the feature is generally structurally sound and performing its intended purpose – or –
- There is failure of a portion of the feature.

POOR The feature is in poor condition if any of the following conditions is present:

- The feature is no longer performing its intended purpose – or –
- Significant elements of the feature are missing – or –
- Deterioration or damage affects more than 25% of the feature – or –
- The feature shows signs of imminent failure or breakdown.

UNKNOWN Not enough information is available to make an evaluation.

RATINGS OF TREATMENT SEVERITY
An impact is a detectable result of an agent or series of agents having a negative effect on the significant characteristics or integrity of a structure and for which some form of mitigation or preventative action is possible. The assessment should include only those impacts likely to affect the structure within the next five years.

The Level of Impact Severity and their definitions are given below. For all levels, except UNKNOWN, two criteria are given. At least one of the criteria must be met for the declared Level of Impact Severity.

SEVERE
1. The structure/feature will be significantly damaged or irretrievably lost if action is not taken within two (2) years.
2. There is an immediate and severe threat to visitor or staff safety.

MODERATE
1. The structure/feature will be significantly damaged or irretrievably lost if action is not taken within five (5) years.
2. The situation caused by the impact is potentially threatening to visitor or staff safety.

LOW
1. The continuing effect of the impact is known and will not result in significant damage to the structure/feature.
2. The impact and its effects are not a direct threat to visitor or staff safety.

UNKNOWN Not enough information is available to make an evaluation.

DEFINITIONS OF TERMS

A

AAS: Atomic Absorption Spectroscopy

AC: Alternating current; the movement of current through an electrical circuit that periodically reverses direction. Alternating current is the form of electric power that is delivered to businesses and residences.

ACM: Asbestos Containing Material

Accessibility: a term used to describe facilities or amenities to assist people with disabilities and can extend to Braille signage, wheelchair ramps, elevators/lifts, walkway contours, reading accessibility, etc. According to its website, the Park Service is "committed to making all practicable efforts to make NPS facilities, programs, services, employment, and meaningful work opportunities accessible and usable by all people, including those with disabilities. This policy reflects the commitment to provide access to the widest cross section of the public and to ensure compliance with the Architectural Barriers Act of 1968, the Rehabilitation Act of 1973, the Equal Employment Opportunity Act of 1972, and the Americans with Disabilities Act of 1990. The Park Service will also comply with section 507 of the Americans with Disabilities Act (42 USC 12207), which relates specifically to the operation and management of federal wilderness areas. The accessibility of commercial services within national parks are also covered under all applicable federal, state and local laws" (source: http://www.nps.gov/aboutus/eeo.htm).

AES-ICP: Atomic Emission Spectroscopy – Inductively Coupled Plasma

AIHA: American Industrial Hygiene Association

Air Terminal: A rod that extends above a surface to attract lightning strikes.

AL: Action Level

B

***Beam**:* a structural member, usually horizontal, with a main function to carry loads cross-ways to its longitudinal axis.

Branch Circuit: Insulated conductors used to carry electricity to an associated device or devices that originate from a single circuit breaker.

BTUH: British Thermal Unit per Hour; A traditional unit of energy.

BX Cable: Cable with flexible steel armored outer tube with individual copper conductors insulated with rubber and covered with a cotton braided sheath.

C

Cantilever: refers to the part of a member that extends freely over a beam or wall, which is not supported at its end.

Cast Iron: a large group of ferrous alloys that are easily cast. Cast iron tends to be brittle and is resistant to destruction and weakening by oxidation. The amount of carbon in cast irons is 2.1 to 4 wt%.

CFR: Code of Federal Regulation

Cistern: An underground receptacle for storage of liquids, usually water.

Clay Sewer: Sewer pipe made from vitrified clay that is highly resistant to corrosion.

Column: a main vertical member that carries axial loads from beams or girders to the foundation parallel to its longitudinal axis.

D

DC: Direct current; the unidirectional flow of current through an electrical circuit. Direct current is produced through such sources as batteries, thermocouples, or photovoltaic solar cells.

Dead Load: describes the loads from the weight of the permanent components of the structure.

Deflection: the displacement of a structural member or system under a load.

DRO: Diesel-Range Organics

E

ELPAT: Environmental Lead Proficiency Analytical Testing

EMT: Electro-metallic tubing; A metallic tube raceway that is used to carry and protect current carrying conductors or cables.

EPA: Environmental Protection Agency

F

Flue Vent: A duct or pipe conveying combustion by-products from a heater or furnace.

Fluorescent: A source of light that emits light radiation at longer wavelengths and lower energy.

Footing: a slab of concrete or an assortment of stones under a column, wall, or other structural member to transfer the loads of the member into the surrounding soil.

Foundation: supports a building or structure.

FRP: Fiberglass reinforced plastic

Full Sawn (FS): Lumber cut, in the rough, to its full nominal size.

G

Gable: located above the elevation of the eave line of a double-sloped roof.

Galvanized Steel: Steel coated with zinc carbonate to resist corrosion.

GPM: Gallon per minute; a standard unit of volumetric liquid flow rate.

Grade: the ground elevation of the soil.

Gravity Vent: Openings in a roof intended to vent hot air by the action of convection.

Gray Water: Wastewater generated from domestic washing activities and not containing human waste.

GRO: Gasoline Range Organics

H

Header: a member that carries joists, rafters or beams and is placed between other joists, rafters or beams.

Hip Roof: a roof sloping from all four sides of a building.

HUD: Housing and Urban Development

HVAC: Heating, Ventilation, and Air Conditioning.

I

IAQ: Indoor Air Quality

IEUBK: Integrated Exposure Uptake Biokinetic

Incandescent: A source of light that works by incandescence, or works by a heat-driven light emission through black-body radiation.
Inverter: A device that converts electrical direct current (DC) to electrical alternating current (AC).

J

Joist: a horizontal structural load-carrying member which supports floors and ceilings.

K

kVA: Kilovolt-ampere equal to 1,000 volt-amperes. kVA is a unit to express the apparent power consumed in an electrical circuit or electrical device.

kW: Kilowatt equal to 1,000 watts. A kilowatt is typically used to express the output power consumption of large devices or electrical systems.

L

LBP: Lead-Based Paint

LCP: Lead-Containing Paint

LCS: Lead-Contaminated Soils

Leach Field: A drain field used to remove contaminants and impurities from liquid that emerges from a septic tank.

LED: Light emitting diode; a semiconductor light source that can emit light in various colors and brightness.

Live Load: nonpermanent loads on a structure created by the use of the structure.

Load: an outside force that affects the structure or its members.

Louver: An opening with horizontal slats angled to allow passage of air while keeping out rain and snow.

M

Mg/kg: Milligrams per Kilogram

N

NEC: National Electric Code.

NESHAP: National Emission Standards for Hazardous Air Pollutants

Nonpotable Water: Water that has not been approved for safe human consumption.

NVLAP: National Voluntary Laboratory Accreditation Program

O

OSHA: Occupational Safety and Health Administration

Overcurrent Protection: A fuse, circuit breaker or relay that will open the electrical circuit when the downstream electrical current exceeds the stated current rating.

P

Passive Ventilation: Ventilation of a building without the use of a fan or other mechanical system.

Pitch: the slope of a member defined as the ratio of the total rise to the total run.

PLM: Polarized Light Microscopy

PV: Photovoltaic; An array of solar modules or cells that collect solar energy and convert the energy into direct current electricity.

PVC: Polyvinyl Chloride; A biologically and chemically resistant plastic widely used for household sewage pipe.

R

Rafter: a sloped structural load-carrying member which supports the roof.

RBM: Regulated/Hazardous Material

Reaction: the force or moment developed at the points of a support.

RLM: Industrial stem mounted reflector.

Romex: Wiring with rubber insulated conductors in an overall sheath of braided cotton fiber.

S

Seismic Load: loads produced during the seismic movements of an earthquake.

Septic Tank: A sewage tank containing anaerobic bacteria which decomposed waste discharged into the tank.

Shear: forces resulting in two touching parts of a material to slide in opposite directions parallel to their plane of contact.

Shelter: a structure that can be used for rustic camping in the event that staff are not able to leave the island due to weather. No utilities are provided.

Snow Load: loads produced from the accumulation of snow.

Span: the distance between supports.

Step-down Transformer: A device that converts a high voltage down to a lower voltage through a series of winding coils.
***Structural Steel*:** an iron alloy with a carbon content of 0.16% to 0.29%. Steel is malleable, and easily welded.

Strut: a structural brace that resists axial forces.

Stud: a vertical wall member used to construct partitions and walls.

T

Thermal Expansion Tank: A tank used in a closed water heating system to absorb excess water pressure caused by thermal expansion.

TSI: Thermal System Insulation

Turbine Vent: Vents utilizing rotating wind vanes to create air flow.

V

Vent Stack: A vertical pipe proving ventilation.

W

WAC: Wisconsin Administrative Code

WDNR: Wisconsin Department of Natural Resources

Wrought Iron: an iron alloy with very low carbon content, in comparison to steel. Wrought iron is tough, malleable, ductile, and easily welded.

X

XRF: X-ray fluorescence analyzer

Other

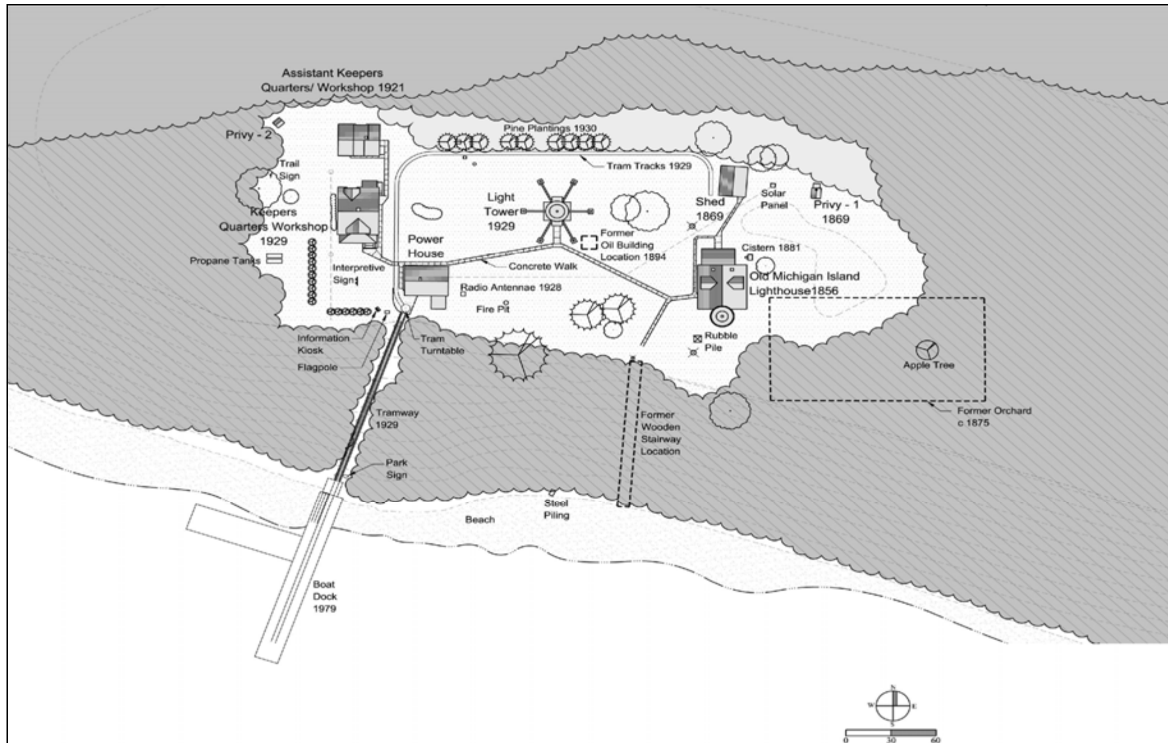
30 µg/m3: 30 micrograms per cubic meter

µg/SF: Micrograms of Lead Dust per Square Foot of Floor Space

1x: Piece of dimensional lumber 1” (nominal) / ¾” (actual) thick

APPENDIX A: MATRIX OF TREATMENT ALTERNATIVE

REVISED 07.12.2011



Existing Conditions Site Plan - for reference only

General Description:
This treatment alternative proposes rehabilitating each island's cultural landscape to best portray the continuum of navigational history that characterizes the Apostle Islands as a system of light stations. Each island (and each light station) conveys specific characteristics related to particular periods of development in the navigation of the archipelago. This treatment will reveal this continuum by restoring missing historic features, and by repairing or altering others to convey the full historical significance of the system. Additions that are necessary to enable the compatible use of the light stations or islands are allowed as long as portions or features that convey the historical, cultural, or architectural values are preserved.

Period of Significance: 1856 - 1943

Please refer to the proposed treatments below.

	Old Michigan Island Lighthouse	Second Tower	Keepers Quarters	Assistant Keepers Quarters & Workshop	Power House	Shed	Privy
Proposed Use of Building	Rehabilitate and allow for self-guided visitor use at Quarters; guided at Tower.	Rehabilitate for guided visitor use.	Rehabilitate and use as seasonal NPS housing.	Preserve and maintain current use as NPS storage.	Preserve and maintain current use as NPS storage and systems use.	Preserve for storage for NPS use; possible plexi panel at door to allow visitor visual access.	Rehabilitate; plexi panel at door to allow visitor visual access.
Architecture	Reroof; add gutter/downspout system; increase basement and tower ventilation; repair rust at walk and lantern walls, repaint; seal joints; replace wood wall shingles at dormers; repair windows and repaint; repair all doors and hardware and repaint; paint exterior trim on doors and window; repair masonry walls and repaint; repair damaged plaster at walls and ceilings and paint interior complete; refinish wood floors; add handrails to stairs; repair and paint casework. Add a security gate at the base of tower that allows for air movement.	Increase ventilation; investigate replacing one lower sash on a north window(s) for a secure louver; replace missing brass intake caps and verify operation of all others; repair interior plaster/paint damage; repair wood frame at door and paint; verify/provide sealant at all exterior joints.	Reroof; repair gutters and downspouts; repaint trim on windows and doors; repair NE stair landing; repair windows and doors; replace missing hardware; repair cracks at plaster and repaint walls and ceilings; refinish trim and wood floor with alligatored finish coat; repair and paint the casework;	Reroof; repair gutters; repaint siding and trim; repair windows and doors	Reroof; add gutters; repair chimney; repair windows and doors; repaint exterior of windows, doors, and trim	Reroof; foundation repair; repaint siding and trim; repair windows and doors and repaint; install plexi panel system (operable) to allow visitor to see in but closeable to maintain security and weather tight closure	Restore roof shingles; repair foundation; repaint windows, doors, siding, and trim; install plexi panel system (operable) to allow visitor to see in but closeable to maintain security and weather tight closure
Structural	Improve basement ventilation or reduce humidity in basement to reduce the moisture content of the first floor framing, properly frame first floor joists at windows and stair. Investigate center beam at first floor framing and kitchen floor framing.	Investigate cracked column bases to determine the structural significance of the cracks, repair or monitor cracks	Properly frame first floor joists at windows, replace concrete stair landing, repair masonry walls at rear stair, investigate load capacity of roof framing and strengthen if necessary	Repair damaged area of roof	Repair masonry walls below concrete roof slab, protect concrete roof slab from continued deterioration	Construct a concrete foundation, repair and strengthen first floor joists or replace with concrete slab-on-grade, strengthen or reframe walls, strengthen or reframe roof	Repair walls of concrete vault, reset or replace both spot footings
Mechanical	Increase ventilation for moisture control. Curate plumbing fixtures and remove piping. Retain boiler, boiler piping, and radiators; repaint.	Increase ventilation for moisture control and visitor comfort.	Clean, inspect, and test sewer/septic system. Repairs as needed for operational system. Increase basement ventilation for moisture control. Replace rusted propane piping. Install a chimney liner. Remove propane piping to refrigerator and stove.	Cap and seal unused plumbing piping. Increase ventilation for moisture control.	Replace tram hoist. Increase basement ventilation for moisture control.	No action at this time.	No action at this time.
Electrical	Provide additional PV power to facilitate running of new ventilation equipment. Remove existing lightning protection system and, after re-roofing, replace with new system. Remove lighting fixtures, receptacles and junction boxes.	Provide additional PV power to facilitate running of new ventilation equipment. Engage an LPI (Lightning Protection Institute) certified inspector to perform an inspection of the lightning protection system and provide findings and recommendations in accordance with LPI-175.	Remove existing lightning protection system and, after re-roofing, replace with new system. Provide additional PV power to building to accommodate new ventilation equipment. Provide smoke/CO2 detectors as required.	Provide additional PV power to facilitate running of new ventilation equipment as needed. Replace existing underground power feed and upgrade building wiring to accommodate new ventilation equipment as needed. Provide smoke/CO2 detectors as required.	Replace existing tram hoist with new as required. Provide site power distribution for other rehabilitated buildings as required.	No action at this time.	No action at this time.
HazMat	Bat guano abatement; water intrusion/mold mitigation; soil characterization (lead); asbestos sampling of materials to be rehabilitated; remove/stabilize lead paint; remove and replace asbestos roofing.	Soil characterization (lead).	Water intrusion/mold mitigation; soil characterization (lead); asbestos sampling of materials to be rehabilitated; remove/stabilize lead paint; remove and replace asbestos roofing.	Water intrusion/mold mitigation; remove/stabilize lead paint; remove and replace asbestos roofing.	Asbestos sampling of materials to be rehabilitated; remove/stabilize lead paint; remove and replace asbestos roofing.	Remove/stabilize lead paint.	Remove/stabilize lead paint.
Accessibility	Add a freestanding ramp at the west entry door and increase the door opening width as well as openings within the first floor. Accessibility by mechanical means to the 2nd floor and Tower is not included at this time.	Program access through interpretive wayside exhibits.	Program access through interpretive wayside exhibits.	Program access through interpretive wayside exhibits.	Program access through interpretive wayside exhibits.	Program access through interpretive wayside exhibits.	Program access through interpretive wayside exhibits.

APPENDIX B: SUMMARY OF HAZARDOUS MATERIAL FINDINGS

OLD MICHIGAN ISLAND LIGHTHOUSE

Building Number	LCS ID 006371
Building Name	Old Michigan Island Lighthouse
>1% Asbestos Confirmed	Heater Component Adhesive
Asbestos Assumed[61]	Wall/Ceiling Plaster, Wall/Ceiling Interiors, Wall/Ceiling Insulation, Adhesives, Thermal Systems Insulation, Roofing Materials, Flooring, Tar and Tar Paper, Brick/Block Filler, Caulk, and Transite
Detectable Lead in Paint Confirmed	Window Sashes and Trims and Door and Door Trims
Detectable Lead in Paint Assumed	Exterior Painted Surfaces and Tower
Lead Dust on Floors >40 µg/SF Confirmed[62]	
Lead Dust on Floors >40 µg/SF Assumed[2]	Throughout
Lead Dust on Floors <40 µg/SF Confirmed[2]	
Visual Mold	Yes
Lead in Soils >50 mg/kg[63]	Roof Drip line
Lead in Soils <50 mg/kg	
Lead in Soils Assumed	

< = Greater Than
< = Less Than
µg/SF = Micrograms of Lead Dust per Square Foot of Floor Space
mg/kg = Milligrams of Lead per Kilogram of Soil

[61] Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment.

[62] In accordance with EPA 40 CFR part 457 the clearance level for lead dust on floors in child occupied housing is 40 micrograms of lead dust per square foot of floor space.

[63] In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment level for lead in soil based on human health risk from direct contact (ingestion or inhalation) related to nonindustrial land use and considering more than one contaminant may be present in the soil. However, site specific Risk Assessment is recommended to identify the site specific clean up levels for lead contaminated soil at each of these sites.

KEEPERS QUARTERS

Building Number	LCS ID 006389
Building Name	Michigan Island Keepers Quarters
>1% Asbestos Confirmed	Granular Plaster Between Wall Slats
Asbestos Assumed[64]	Wall/Ceiling Plaster, Wall/Ceiling Interiors, Wall/Ceiling Insulation, Adhesives, Thermal Systems Insulation, Roofing Materials, Flooring, Tar and Tar Paper, Brick/Block Filler, Caulk, and Transite
Detectable Lead in Paint Confirmed	Window Sash and Trims, Doors and Door Trims, Walls and Ceilings
Detectable Lead in Paint Assumed	Interior and Exterior Painted Surfaces
Lead Dust on Floors >40 µg/SF Confirmed[65]	
Lead Dust on Floors >40 µg/SF Assumed[2]	
Lead Dust on Floors <40 µg/SF Confirmed[2]	Living Room Floor
Visual Mold	
Lead in Soils >50 mg/kg[66]	
Lead in Soils <50 mg/kg	
Lead in Soils Assumed	

< = Greater Than
< = Less Than
µg/SF = Micrograms of Lead Dust per Square Foot of Floor Space
mg/kg = Milligrams of Lead per Kilogram of Soil

[64] Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment.
[65] In accordance with EPA 40 CFR part 457 the clearance level for lead dust on floors in child occupied housing is 40 micrograms of lead dust per square foot of floor space.
[66] In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment level for lead in soil based on human health risk from direct contact (ingestion or inhalation) related to nonindustrial land use and considering more than one contaminant may be present in the soil. However, site specific Risk Assessment is recommended to identify the site specific clean up levels for lead contaminated soil at each of these sites.

SECOND TOWER

Building Number	LCS ID 006372
Building Name	Michigan Island Second Tower
>1% Asbestos Confirmed	
Asbestos Assumed[67]	Insulation, Plaster and Adhesives
Detectable Lead in Paint Confirmed	Window Sash and Trims, Doors and Door Trims, Walls and Ceilings
Detectable Lead in Paint Assumed	Interior and Exterior Painted Surfaces
Lead Dust on Floors >40 µg/SF Confirmed[68]	
Lead Dust on Floors >40 µg/SF Assumed[2]	Throughout
Lead Dust on Floors <40 µg/SF Confirmed[2]	
Visual Mold	
Lead in Soils >50 mg/kg[69]	Roof Dripline and Low Lying Areas Outside of Dripline
Lead in Soils <50 mg/kg	
Lead in Soils Assumed	

< = Greater Than
< = Less Than
µg/SF = Micrograms of Lead Dust per Square Foot of Floor Space
mg/kg = Milligrams of Lead per Kilogram of Soil

[67] Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment.
[68] In accordance with EPA 40 CFR part 457 the clearance level for lead dust on floors in child occupied housing is 40 micrograms of lead dust per square foot of floor space.
[69] In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment level for lead in soil based on human health risk from direct contact (ingestion or inhalation) related to nonindustrial land use and considering more than one contaminant may be present in the soil. However, site specific Risk Assessment is recommended to identify the site specific clean up levels for lead contaminated soil at each of these sites.

ASSISTANT KEEPERS QUARTERS AND WORKSHOP

Building Number	LCS ID 006388
Building Name	Michigan Island Assistant Keepers Quarters and Workshop
>1% Asbestos Confirmed	
Asbestos Assumed[70]	Wall/Ceiling Plaster, Wall/Ceiling Interiors, Wall/Ceiling Insulation, Adhesives, Thermal Systems Insulation, Roofing Materials, Flooring, Tar and Tar Paper, Brick/Block Filler, Caulk and Transite
Detectable Lead in Paint Confirmed	Window Sash and Trims, Doors and Door Trims, Walls and Ceilings
Detectable Lead in Paint Assumed	Interior and Exterior Painted Surfaces
Lead Dust on Floors >40 µg/SF Confirmed[71]	
Lead Dust on Floors >40 µg/SF Assumed[2]	Throughout
Lead Dust on Floors <40 µg/SF Confirmed[2]	
Visual Mold	
Lead in Soils >50 mg/kg[72]	
Lead in Soils <50 mg/kg	
Lead in Soils Assumed	Yes

< = Greater Than
< = Less Than
µg/SF = Micrograms of Lead Dust per Square Foot of Floor Space
mg/kg = Milligrams of Lead per Kilogram of Soil

[70] Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment.
[71] In accordance with EPA 40 CFR part 457 the clearance level for lead dust on floors in child occupied housing is 40 micrograms of lead dust per square foot of floor space.
[72] In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment level for lead in soil based on human health risk from direct contact (ingestion or inhalation) related to nonindustrial land use and considering more than one contaminant may be present in the soil. However, site specific Risk Assessment is recommended to identify the site specific clean up levels for lead contaminated soil at each of these sites.

POWER HOUSE

Building Number	LCS ID 006386
Building Name	Michigan Island Power House
>1% Asbestos Confirmed	
Asbestos Assumed[73]	Wall/Ceiling Plaster, Wall/Ceiling Insulation, Adhesives, Thermal Systems Insulation, Roofing Materials, Flooring, Gaskets, Brick Filler and Caulk
Detectable Lead in Paint Confirmed	
Detectable Lead in Paint Assumed	Interior and Exterior Painted Surfaces
Lead Dust on Floors >40 µg/SF Confirmed[74]	
Lead Dust on Floors >40 µg/SF Assumed[2]	Throughout
Lead Dust on Floors <40 µg/SF Confirmed[2]	
Visual Mold	
Lead in Soils >50 mg/kg[75]	
Lead in Soils <50 mg/kg	
Lead in Soils Assumed	Yes

< = Greater Than
< = Less Than
µg/SF = Micrograms of Lead Dust per Square Foot of Floor Space
mg/kg = Milligrams of Lead per Kilogram of Soil

[73] Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment
[74] In accordance with EPA 40 CFR part 457 the clearance level for lead dust on floors in child occupied housing is 40 micrograms of lead dust per square foot of floor space.
[75] In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment level for lead in soil based on human health risk from direct contact (ingestion or inhalation) related to nonindustrial land use and considering more than one contaminant may be present in the soil. However, site specific Risk Assessment is recommended to identify the site specific clean up levels for lead contaminated soil at each of these sites.

SHED

Building Number	LCS ID 006373
Building Name	Michigan Island Shed
>1% Asbestos Confirmed	
Asbestos Assumed[76]	Insulation, Plaster, Transite, Roofing Materials and Adhesives
Detectable Lead in Paint Confirmed	
Detectable Lead in Paint Assumed	Interior and Exterior Painted Surfaces
Lead Dust on Floors >40 µg/SF Confirmed[77]	
Lead Dust on Floors >40 µg/SF Assumed[2]	
Lead Dust on Floors <40 µg/SF Confirmed[2]	
Visual Mold	
Lead in Soils >50 mg/kg[78]	
Lead in Soils <50 mg/kg	
Lead in Soils Assumed	Yes

< = Greater Than
< = Less Than
µg/SF = Micrograms of Lead Dust per Square Foot of Floor Space
mg/kg = Milligrams of Lead per Kilogram of Soil

[76] Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment.
[77] In accordance with EPA 40 CFR part 457 the clearance level for lead dust on floors in child occupied housing is 40 micrograms of lead dust per square foot of floor space.
[78] In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment level for lead in soil based on human health risk from direct contact (ingestion or inhalation) related to nonindustrial land use and considering more than one contaminant may be present in the soil. However, site specific Risk Assessment is recommended to identify the site specific clean up levels for lead contaminated soil at each of these sites.

PRIVY

Building Number	LCS ID 006385
Building Name	Michigan Island Privy
>1% Asbestos Confirmed	
Asbestos Assumed[79]	Insulation, Plaster, Transite, Roofing Materials and Adhesives
Detectable Lead in Paint Confirmed	
Detectable Lead in Paint Assumed	Interior and Exterior Painted Surfaces
Lead Dust on Floors >40 µg/SF Confirmed[80]	
Lead Dust on Floors >40 µg/SF Assumed[2]	Throughout
Lead Dust on Floors <40 µg/SF Confirmed[2]	
Visual Mold	
Lead in Soils >50 mg/kg[81]	
Lead in Soils <50 mg/kg	
Lead in Soils Assumed	

< = Greater Than
< = Less Than
µg/SF = Micrograms of Lead Dust per Square Foot of Floor Space
mg/kg = Milligrams of Lead per Kilogram of Soil

[79] Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment.
[80] In accordance with EPA 40 CFR part 457 the clearance level for lead dust on floors in child occupied housing is 40 micrograms of lead dust per square foot of floor space.
[81] In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment level for lead in soil based on human health risk from direct contact (ingestion or inhalation) related to nonindustrial land use and considering more than one contaminant may be present in the soil. However, site specific Risk Assessment is recommended to identify the site specific clean up levels for lead contaminated soil at each of these sites.

APPENDIX C: MATERIAL ANALYSIS REPORTS, MICHIGAN ISLAND

MICHIGAN ISLAND ACM SAMPLE CHART

Sample #	Sample Date	API ID	Sample Location	Material Description	Laboratory Result
B-MIAKQ-SF-01	9/14/2009	26589	Assistant Keepers Quarters and Workshop	Green pattern sheet flooring	ND
B-MIS-TP-01	9/14/2009	26585	Shed	Tar paper	ND
B-MIKQ-WT-01	9/14/2009	26766	Keepers Quarters	White texture and White/multicolored paint	ND
B-MIKQ-WP-01	9/14/2009	26766	Keepers Quarters	White granular plaster between slats	2% Chrysotile
B-MIOLH-WP-01	9/14/2009	26572	Old Michigan Island Lighthouse	Wall plaster between slats	ND
B-MIOLH-WM-01	9/14/2009	26572	Old Michigan Island Lighthouse	Black/gray fibrous window matting in tower	ND
B-MIOLH-WT1-01	9/14/2009	26572	Old Michigan Island Lighthouse	Thick troweled on wall texture	ND
B-MIOLH-MA1-01	9/14/2009	26572	Old Michigan Island Lighthouse	Silver mastic on heater	ND
B-MIOLH-MA2-01	9/14/2009	26572	Old Michigan Island Lighthouse	Black mastic between heater components	4% Chrysotile
B-MIOLH-WB-01	9/14/2009	26572	Old Michigan Island Lighthouse	Cement wall board with texture	ND
B-MIOLH-WB2-01	9/14/2009	26572	Old Michigan Island Lighthouse	Cement wall board with texture	ND
B-MIOLH-SF1-01	9/14/2009	26572	Old Michigan Island Lighthouse	Blue/tan square sheet flooring with black backing	ND

ND=None Detected
TR=Trace, <1% Visual Estimate

MICHIGAN ISLAND LEAD SAMPLE CHART

Sample ID	Sample Type	API ID	Sample Location	Sample Date	Sample Area (sq ft)	Lead (ug)	Reporting Limit (ug/sq ft)	Lead Concentration (ug/sq ft)
W-091409-MIKQ-01	Composite Wipe	26766	Keepers Quarters	9/14/2009	0.33	39	15	119

APPENDIX D: FABRIC ANALYSIS

Fabric Analysis
Michigan Island
Apostle Island National Lakeshore
October, 2009

On Tuesday, October 6, 2009, David Arbogast, architectural conservator, of Davenport, Iowa, received a large box containing paint and mortar samples from Elizabeth Hallas, AIA, LEED AP. Senior Associate of Anderson Hallas Architects, PC of Golden, Colorado. She is in the process of preparing Historic Structures Reports for the historic lighthouse complexes of the Apostle Islands National Lakeshore, headquartered in Bayfield, Wisconsin. As part of the HSRs paint and mortar/plaster analysis is required in an attempt to ascertain historic finishes, mortars, and plasters for the subject structures. The samples were divided into sets contained within large manila mailing envelopes. The analysis follows the order in which the large envelopes have been arranged. The three sets which are contained within this report were from the Michigan Island Lighthouse Complex. There were 26 samples in the first set, of which 21 were paint samples and the final five samples were of plaster and mortar, all of which were collected from the Old Michigan Lighthouse. The second set of samples (nos. 27 – 50) contained 24 samples, of which 22 were paint samples and two (nos. 39 and 40) were of plaster and mortar. These were collected from miscellaneous structures at the complex on Michigan Island. The third set of samples (nos. 51 – 63) consisted of ten paint samples and three mortar and plaster samples (nos. 51, 54, and 60).

During the preceding twenty or more years Mr. Arbogast has performed paint analyses for various structures at the Apostles Islands. Those samples and his reports are in the archives at the headquarters in Bayfield and may be examined in relation to the findings from this analysis.

The paint samples were visually examined on Wednesday, October 7, using an optical Olympus microscope having magnification between 14 and 80 power. Each layer observed was color matched to the Munsell System of Color using natural north light. Only opaque, pigmented layers (i.e. paint layers) were matched. It is impossible to determine colors match for finishes such as metallic paints and leafs and shellacs and varnishes because their color is directly affected by their translucency and reflectance.

The Munsell System of Color is a scientific system in which colors have been ranged into a color fan based upon three attributes: hue or color, the chroma or color saturation, and the value or neutral lightness or darkness. Unlike color systems developed by paint manufacturers, the Munsell system provides an unchanging standard of reference which is unaffected by the marketplace and changing tastes in colors.

The hue notation, the color, indicates the relation of the sample to a visually equally spaced scale of 100 hues. There are 10 major hues, five principal and five intermediate within this scale. The hues are identified by initials indicating the central member of the group: red R, yellow-red YR, yellow Y, yellow-green YG, green G, blue-green BG, blue B, purple-blue PB, purple P, and red-purple R. The hues in each group are identified by the numbers 1 to 10. The most purplish of the red hues, 1 on the scale of 100, is designated as 1R, the most yellowish as 10R, and the central hue as 5R. The hue 10R can also be expressed as 10, 5Y as 25, and so forth if a notation of the hue as a number is desired.

Chroma indicates the degree of departure of a given hue from the neutral gray axis of the same value. It is the strength of saturation of color from neutral gray, written /0 to /14 or further for maximum color saturation.

Value, or lightness, makes up the neutral gray axis of the color wheel, ranging from black, number 1, to white at the top of the axis, number 10. A visual value can be approximated by the help of the neutral gray

chips of the Rock or Soil Color chart with ten intervals. The color parameters can be expressed with figures semi-quantitatively as: hue, value/chroma (H, V/C). The color "medium red" should serve as an example for presentation with the three color attributes, 5R 5.5/6. This means that 5R is located in the middle of the red hue, 5.5 is the lightness of Munsell value near the middle between light and dark, and 6 is the degree of the Munsell chroma, or the color saturation, which is about in the middle of the saturation scale.

The paint samples themselves were submitted in zippered plastic bags which were labeled and numbered. The analysis follows the numbering system used in the collection process. The quality of the samples ranged from fair to quite excellent. Because of the exposed nature of many of the samples the paint exhibited weathering and appeared in several cases to be missing older layers seen in other, better samples. The layers are listed from top (most recent) to bottom (oldest). The following results were obtained from the analysis:

Old Michigan Lighthouse

Sample 1	**Munsell**
Dark green	10GY 3/4
Green	5G 5/2

The first sample was collected from the exterior window shutters. There were only two paint layers on its wood surface with the green probably serving as a prime coat. Both were latex paints and could not date from the construction of the building.

Old Michigan Lighthouse

Sample 2	**Munsell**
Dark green	10GY 3/4
Green	5G 5/2
Black	5G 3/1
Dark green	5G 4/2
White	5Y 9/1

The second sample came from the exterior window sash. It revealed several additional paint layers not seen in the first sample, including an oldest layer of white paint.

Old Michigan Lighthouse

Sample 3	**Munsell**
Dark green	5G 3/4
White	5Y 9/1
White	5Y 9/1
Black	5G 3/1
White	5Y 9/1
Black	5G 3/1
Dark green	5G 3/4
Black	5G 3/1
White	5Y 9/1

The third sample was removed from the exterior window trim. Its layers, although thin, were easily discerned with strong differences in color. As in the second sample, the oldest layer was white. This was an oil paint which had yellowed to its present shade but was probably white originally.

Old Michigan Lighthouse	
Sample 4	**Munsell**
White	N 9.5/
White	N 9.5/
White	N 9.5/
White	N 9.5/
White	N 9.5/
White	N 9.5/

The fourth sample was from the exterior wall. There were several layers of stark white paint above multiple layers of whitewash. The whitewash readily dissolved in muriatic acid; the paint did not. Because whitewash does not form distinct layers it was impossible to determine the precise number of layers.

Old Michigan Lighthouse	
Sample 5	**Munsell**
Dark green	5G 3/4
Green	5G 5/2
White	5Y 9/1
Black	5G 3/1
Green	5G 5/2
White	5Y 9/1

The fifth sample was found on the roof trim. Its oldest white layer, like that of the third sample, was cleanly separated from its substrate.

Old Michigan Lighthouse	
Sample 6	**Munsell**
Dark green	5G 3/4
White	5Y 9/1

The sixth sample was collected from the roof trim of the new addition. Like the first sample it retained only two layers of latex paint.

Old Michigan Lighthouse	
Sample 7	**Munsell**
Green	5G 5/4
Dark green	5G 3/4
Dark green	5G 3/4
Very dark green	5G 3/2
Green	5G 5/2
Very dark green	5G 3/2
Dark green	5G 3/4
Green	5G 5/4
Dark green	5G 3/4
Green	5G 5/4
Dark green	5G 3/4
Green	5G 5/4
Dark green	10GY 3/4

Green	5G 5/4
White	5Y 9/1
White	5Y 9/1
Gray	5Y 7/1
White	5Y 9/1

The seventh sample began a series of samples from the interior of the Old Michigan Lighthouse. It was collected from the living room trim. It revealed an extraordinarily large set of thin, evenly applied paint layers. The gray layer was completely detached from the white layer above it. The oldest white layer was very thin and probably served as a prime coat for the gray layer.

Old Michigan Lighthouse

Sample 8	**Munsell**
Off-white	5Y 8.5/1

The eighth sample came from the new living room trim. It retained only one paint layer on its wood surface.

Old Michigan Lighthouse

Sample 9	**Munsell**
Gray	N 7.0/
Gray	N 6.5/

The ninth sample was removed from the living room wall. It retained only two layers of paint. It is quite possible that the wall may have been painted with calcimine paint originally in light of the fact that the exterior was whitewashed. Less likely, although possible, might have been the use of wallpaper on the walls.

Old Michigan Lighthouse

Sample 10	**Munsell**
Light green	2.5BG 7/4
Dark green	5G 3/4
White	5Y 9/1
Gray	N 6.5/

The tenth sample was from the dining room wall. It retained four paint layers with the oldest of the set matching the older of the two paint layers of the living room.

Old Michigan Lighthouse

Sample 11	**Munsell**
Tan	2.5Y 7/3

The eleventh sample was found on the kitchen wall. It retained only a single layer of paint on its surface.

Old Michigan Lighthouse

Sample 12	**Munsell**
Tan	2.5Y 7/3
Tan	2.5Y 7/3

The twelfth sample was collected from the dining room/living room/kitchen ceiling. It retained two layers of tan paint on its surface in contrast to the single layer seen in sample 11.

Old Michigan Lighthouse

Sample 13	**Munsell**
Gray	N 6.0/
Tan	2.5Y 7/3
Off-white	5Y 9/2
Red	7.5R 5/6
Off-white	5Y 8.5/1

The thirteenth sample came from the entry wall. It revealed five layers of paint with off-white being the oldest of the set.

Old Michigan Lighthouse

Sample 14	**Munsell**
Off-white	5Y 8.5/1

The fourteenth sample was removed from the watchroom wall. It retained a single layer of off-white paint on its surface.

Old Michigan Lighthouse

Sample 15	**Munsell**
Off-white	5Y 8.5/1
White	5Y 9/1
Tan	2.5Y 7/3
Off-white	5Y 8.5/1
Off-white	5Y 8.5/1
Light blue	7.5B 8/4
White	N 9.5/
White	N 9.5/

The fifteenth sample was from the watchroom ceiling. In contrast with the previous sample, this retained at least eight layers of which the oldest two stark white layers were relatively crumbly and may have actually been whitewash rather than paint.

Old Michigan Lighthouse

Sample 16	**Munsell**
Light green	2.5BG 7/3
Off-white	5Y 8.5/1
White	N 9.5/
White	N 9.5/

The sixteenth sample was found on the wall/ceiling of bedroom #1. Its oldest pair of stark white layers matched those of sample 15.

Old Michigan Lighthouse

Sample 17	Munsell
Light green	2.5G 8/4
Tan	2.5Y 7/3

The seventeenth sample was collected from under the window seat of bedroom #1. It revealed a pair of paint layers with tan as the older of the two.

Old Michigan Lighthouse

Sample 18	Munsell
White	N 9.5/
White	N 9.5/
White	N 9.5/

The eighteenth sample came from the tower window. It consisted of multiple layers of whitewash – the exact number of layers being impossible to determine given the nature of the material.

Old Michigan Lighthouse

Sample 19	Munsell
Off-white	5Y 8.5/1
White	5Y 9/1
Off-white	5Y 8.5/1
White	5Y 9/1

The nineteenth sample was removed from the window trim of the tower. It retained four alternating layers of off-white and white oil-based paint.

Old Michigan Lighthouse

Sample 20	Munsell
White	N 9.5/
White	N 9.5/
White	N 9.5/

The twentieth sample was from the tower wall. Like sample 18, it consisted entirely of multiple layers of whitewash.

Old Michigan Lighthouse

Sample 21	Munsell
Dark brown	10YR 4/1
Black	5Y 2/1
Black	5Y 2/1
Black	5Y 2/1
Black	5Y 2/1
White	N 9.5/
White	N 9.5/
White	N 9.5/

Sample 21 was found on the stair trim of the tower. Beneath multiple layers of black paint were multiple layers of whitewash.

As noted in the introduction above samples 22 through 26 from the Old Michigan Lighthouse on Michigan Island consisted of mortar and plaster samples. These were analyzed on Thursday, October 8 utilizing the standard testing procedure developed by E. Blaine Cliver, Regional Historical Architect of the North Atlantic Region of the National Park Service.

Sample 22 was from the kitchen plaster. It was off-white in color and consisted of small bits of plaster. There was no reaction with the hydrochloric acid, indicating a mixture of gypsum and sand as opposed to lime and sand. The sand sieve analysis revealed relatively fine sand. The portion which passed all of the sieves was white as opposed to the darker color of the sand. It was probably gypsum powder.

Sample 23 was taken from the watchroom plaster. It was similar to the first sample, but with a very thin skim coat of white plaster on its surface. It also contained a few hairs in the plaster. When tested with hydrochloric acid there was a very miniscule reaction which was not measurable. There is no doubt that, like the first sample, this was composed of gypsum and sand and not lime and sand. The sand sample was unusually large. It revealed both sand and gypsum as in the first sample. However, the gypsum appeared at both ends of the spectrum – as white dust passing all of the sieves and as large bits of the white skim coat which were unbroken and undissolved by the acid and which did not pass any of the sieves. Discounting for that factor, the sand appeared to be similar, if not the same, as in the first sample.

Sample 24 was of the mortar of the light tower. It was tan in color and was moderately hard. It had a very prolonged reaction which produced a thick foam. Interestingly, there was a very low water displacement as a result. These two factors – a prolonged reaction with a very low water displacement are typical of cement and sand mortars. The color is not typical, however, nor is the moderate hardness, as well as the moderate filtering time. Portland cement mortars typically produce gelatinous by-products but none were found here. Likewise, they typically take several days to filter, which was not the case here. It appears, then, that natural cement was used with the sand rather than Portland cement or lime. Natural cement, as its name implies, is quarried from the ground and is similar to the cements the Romans used for their construction. Portland cement, named after Portland, England where it was invented and first manufactured, is synthetic cement. The primary difference is that natural cement contains a wider range of possible elements which can affect its performance whereas Portland cement is completely predictable and consistent. As a result, Portland cement is hard, impervious, and brittle. Natural cements tend not to be as hard or impervious or brittle, plus their color is different (shades of gray to white for Portland cement and tan or buff for natural cement). Natural cements were overtaken by Portland cement in the later decades of the nineteenth century as natural cement quarries played out and production costs for Portland cement became competitive. Generally, if one encounters natural cement it is an indication that it is from a nineteenth century structure. The sand sieve analysis revealed very nicely graded, fine sand of which virtually all passed the largest sieve and less than 4% passed all of the sieves. Almost 60% was trapped in sieve #30.

Sample 25 was collected from the closet plaster. Although of a considerably smaller size than sample 23, it was virtually identical to it in its other aspects such as a thin white skim coat, tan plaster, miniscule reaction, and an extraordinarily fast filtering speed. There is no doubt that this is also a gypsum and sand plaster. The sand sieve analysis was also roughly similar with a larger proportion of gypsum powder passing all of the sieves and a smaller proportion of bits of skim coat trapped in the largest sieve.

Sample 26 was from the living room plaster. Its statistical reliability was somewhat hampered by its small size. Although there was a miniscule amount of fines produced, they were not large enough to be weighed. The sample bore the closest resemblance to sample 22. Like it and samples 23 and 25 it gave clear evidence of being a sand and gypsum mixture. The sand sieve analysis resulted in all of the sand passing the largest sieve and a relatively high proportion of gypsum dust passing all of the sieves.

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 22
Building: Old Michigan Lighthouse, Michigan Island, Apostle Islands NL
Location: Kitchen plaster
Sample Description: Off-white, very soft, no reaction, extremely fast filtering time

Test No. 1 – Soluble Fraction

Data:
1. 185.5 Container A weight
2. 208.6 Container A and sample
3. 761.24 Barometric pressure
4. 23 Temperature
5. 0.00 Liters of water displaced
6. Off-white Filtrate color
7. Tan Fines color
8. No Hair or fiber ______ type
9. 2.7 Fines and paper weight
10. 2.6 Filter paper weight
11. 204.3 Sand and Container A weight
12. 15.0 cc. of sand
13. 47.5 Weight of graduated cylinder and sand
14. 28.7 Weight of graduated cylinder

Computations:
15. 23.1 Starting weight of sample: No. 2 – No. 1
16. 0.1 Weight of fines: No. 9 – No. 10
17. 18.8 Weight of sand: No. 11 – No. 1
18. .80 Sand density: No. 12 divided by (No. 13 – No. 14)
19. 4.2 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.00 Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 0 00 Gram weight of CaCO3: 100 x No. 20
22. 4.2 Gram weight of Ca(OH)2: No. 19 – No. 21
23. .0568 Mols. of Ca(OH)2: No. 22 divided by 74
24. 4.2 Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25. 0.00 Gram weight CO2: No. 20 x 44
26. 2.50 Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27. ------ %CO2 gain: No. 25 divided by No. 26

Conclusions:
28. 23.10 Gram weight of sample: No. 15 – No. 25
29. 0.43 Fine parts/volume: No. 16 divided by No. 28
30. 64.94 Sand parts/volume: (No. 17 divided by No. 28) x No. 18
31. ______ Lime parts/volume: (No. 24 divided by No. 28) x 1.1

Cement (if present)
32. ______ Portland cement parts/volume: (No. 16 divided by No. 28) x 0.78
33. ______ Natural cement parts/volume: (No. 16 divided by No. 28) x 0.86

34.____________Lime with cement parts/volume: (No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	106.8	106.8	0.0	0
No. 20	107.3	106.4	0.9	4.84
No. 30	101.3	99.3	2.0	10.75
No. 40	108.7	100.8	7.9	42.47
No. 50	99.3	93.2	6.1	32.80
Base	72.9	71.2	1.7	9.14

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 23
Building: Old Michigan Lighthouse, Michigan Island, Apostle Islands NL
Location: Watchroom plaster

Sample Description: Off-white with very thin white skim coat, moderately hard, extremely minimal reaction, extremely rapid filtering time

Test No. 1 – Soluble Fraction

Data:
1. 188.9 Container A weight
2. 208.9 Container A and sample
3. 761.24 Barometric pressure
4. 23 Temperature
5. 0.00 Liters of water displaced
6. Off-white Filtrate color
7. Tan Fines color
8. Yes Hair or fiber______type
9. 3.4 Fines and paper weight
10. 3.3 Filter paper weight
11. 204.5 Sand and Container A weight
12. 12.0 cc. of sand
13. 44.2 Weight of graduated cylinder and sand
14. 28.7 Weight of graduated cylinder

Computations:
15. 20.0 Starting weight of sample: No. 2 – No. 1
16. 0.1 Weight of fines: No. 9 – No. 10
17. 15.6 Weight of sand: No. 11 – No. 1
18. .774 Sand density: No. 12 divided by (No. 13 – No. 14)
19. 4.3 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.00 Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 0.00 Gram weight of CaCO3: 100 x No. 20
22. 4.3 Gram weight of Ca(OH)2: No. 19 – No. 21
23. .0581 Mols. of Ca(OH)2: No. 22 divided by 74
24. 4.3 Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25. 0.00 Gram weight CO2: No. 20 x 44
26. 2.56 Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27. -------- %CO2 gain: No. 25 divided by No. 26

Conclusions:

28. 20.00	Gram weight of sample:	No. 15 – No. 25
29. 0.50	Fine parts/volume:	No. 16 divided by No. 28
30. 60.37	Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
31. ____	Lime parts/volume:	(No. 24 divided by No. 28) x 1.1

Cement (if present)

32. ____	Portland cement parts/volume:	(No. 16 divided by No. 28) x 0.78
33. ____	Natural cement parts/volume:	(No. 16 divided by No. 28) x 0.86
34. ____	Lime with cement parts/volume:	(No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	115.5	106.8	8.7	8.18
No. 20	123.7	106.4	17.3	16.26
No. 30	124.9	99.3	25.6	24.06
No. 40	145.6	100.8	44.8	42.11
No. 50	101.5	93.2	8.3	7.80
Base	72.9	71.2	1.7	1.60

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 24

Building: Old Michigan Lighthouse, Michigan Island, Apostle Islands NL

Location: Light tower mortar

Sample Description: Tan, moderately hard, prolonged and foamy reaction, moderately slow filtering time

Test No. 1 – Soluble Fraction

Data:

1. 185.1	Container A weight	8. No	Hair or fiber ____ type
2. 205.1	Container A and sample	9. 4.0	Fines and paper weight
3. 761.24	Barometric pressure	10. 2.9	Filter paper weight
4. 23	Temperature	11. 197.3	Sand and Container A weight
5. 0.10	Liters of water displaced	12. 8.7	cc. of sand
6. Yellow-green	Filtrate color	13. 40.9	Weight of graduated cylinder and sand
7. Tan	Fines color	14. 28.7	Weight of graduated cylinder

Computations:

15. 20.0	Starting weight of sample: No. 2 – No. 1
16. 1.1	Weight of fines: No. 9 – No. 10
17. 12.2	Weight of sand: No. 11 – No. 1
18. .7131	Sand density: No. 12 divided by (No. 13 – No. 14)
19. 6.7	Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. .00041125	Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)

21.____.41____Gram weight of $CaCO_3$: 100 x No. 20
22.____6.29____Gram weight of $Ca(OH)_2$: No. 19 – No. 21
23.__.0849831__Mols. of $Ca(OH)_2$: No. 22 divided by 74
24.____6.59____Gram total weight of $Ca(OH)_2$: 74 x (No. 20 + No. 23)
25.____0.18____Gram weight CO_2: No. 20 x 44
26.____3.92____Gram weight total possible CO_2: 44 x (No. 20 + No. 23)
27.____4.59____%CO_2 gain: No. 25 divided by No. 26

Conclusions:

28.____19.82____	Gram weight of sample:	No. 15 – No. 25
29.____5.55____	Fine parts/volume:	No. 16 divided by No. 28
30.____43.89____	Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
31.____________	Lime parts/volume:	(No. 24 divided by No. 28) x 1.1

Cement (if present)

32.____________	Portland cement parts/volume:	(No. 16 divided by No. 28) x 0.78
33.____4.77____	Natural cement parts/volume:	(No. 16 divided by No. 28) x 0.86
34.____________	Lime with cement parts/volume:	(No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	107.3	106.8	0.5	0.45
No. 20	108.0	106.4	1.6	1.44
No. 30	113.0	99.3	13.7	12.36
No. 40	166.6	100.8	65.8	59.39
No. 50	118.4	93.2	25.2	22.74
Base	75.3	71.3	4.0	3.61

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No.__________25
Building:__________Old Michigan Lighthouse, Michigan Island, Apostle Islands NL
Location:__________Closet plaster
Sample Description:____Off-white with very thin white skim coat, moderately hard, extremely minimal reaction, extremely rapid filtering time

Test No. 1 – Soluble Fraction

Data:

1.____187.8____Container A weight	8.__Yes__Hair or fiber______type
2.____206.8____Container A and sample	9.__3.3__Fines and paper weight
3.____761.24____Barometric pressure	10.__3.2__Filter paper weight
4.____23____Temperature	11.__201.1__Sand and Container A weight
5.____0.00____Liters of water displaced	12.__10.1__cc. of sand
6.__Off-white__Filtrate color	13.__42.0__Weight of graduated cylinder and sand
7.____Tan____Fines color	14.__28.7__Weight of graduated cylinder

Computations:
15.____19.0____Starting weight of sample: No. 2 – No. 1
16.____0.1____Weight of fines: No. 9 – No. 10
17.____13.3____Weight of sand: No. 11 – No. 1
18.____.7594____Sand density: No. 12 divided by (No. 13 – No. 14)
19.____6.6____Weight of soluble content: No. 15 – (No. 16 + No. 17)
20.____0.00____Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21.____0.00____Gram weight of CaCO3: 100 x No. 20
22.____6.6____Gram weight of Ca(OH)2: No. 19 – No. 21
23.____.089____Mols. of Ca(OH)2: No. 22 divided by 74
24.____6.6____Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25.____0.00____Gram weight CO2: No. 20 x 44
26.____3.92____Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27.____--------____%CO2 gain: No. 25 divided by No. 26

Conclusions:

28.____19.00____	Gram weight of sample:	No. 15 – No. 25
29.____0.53____	Fine parts/volume:	No. 16 divided by No. 28
30.____53.16____	Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
31.____________	Lime parts/volume:	(No. 24 divided by No. 28) x 1.1

Cement (if present)

32.____________	Portland cement parts/volume:	(No. 16 divided by No. 28) x 0.78
33.____________	Natural cement parts/volume:	(No. 16 divided by No. 28) x 0.86
34.____________	Lime with cement parts/volume:	(No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	107.0	106.8	o.2	1.52
No. 20	108.3	106.4	1.9	14.39
No. 30	101.2	99.3	1.9	14.39
No. 40	104.1	100.8	3.3	25.00
No. 50	97.6	93.2	4.4	33.33
Base	72.7	71.2	1.5	11.36

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No.____ 26
Building:____ Old Michigan Lighthouse, Michigan Island, Apostle Islands NL
Location:____ Living room plaster
Sample Description:____ Off-white, soft, no reaction, extremely rapid filtering time

Test No. 1 – Soluble Fraction

Data:

1. 192.0	Container A weight	8. Yes	Hair or fiber ______ type
2. 197.7	Container A and sample	9. 2.7	Fines and paper weight
3. 761.24	Barometric pressure	10. 2.7	Filter paper weight
4. 23	Temperature	11. 196.3	Sand and Container A weight
5. 0.00	Liters of water displaced	12. 2.7	cc. of sand
6. Off-white	Filtrate color	13. 33.0	Weight of graduated cylinder and sand
7. Tan	Fines color	14. 28.7	Weight of graduated cylinder

Computations:

15. 5.7 Starting weight of sample: No. 2 – No. 1
16. 0.0 Weight of fines: No. 9 – No. 10
17. 4.3 Weight of sand: No. 11 – No. 1
18. .7442 Sand density: No. 12 divided by (No. 13 – No. 14)
19. 1.4 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.00 Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 0.00 Gram weight of CaCO3: 100 x No. 20
22. 1.4 Gram weight of Ca(OH)2: No. 19 – No. 21
23. .0189 Mols. of Ca(OH)2: No. 22 divided by 74
24. 1.4 Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25. 0.00 Gram weight CO2: No. 20 x 44
26. 0.83 Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27. -------- %CO2 gain: No. 25 divided by No. 26

Conclusions:

28. 5.7	Gram weight of sample:	No. 15 – No. 25
29. 0.00	Fine parts/volume:	No. 16 divided by No. 28
30. 56.14	Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
31. ______	Lime parts/volume:	(No. 24 divided by No. 28) x 1.1

Cement (if present)

32. ______	Portland cement parts/volume:	(No. 16 divided by No. 28) x 0.78
33. ______	Natural cement parts/volume:	(No. 16 divided by No. 28) x 0.86
34. ______	Lime with cement parts/volume:	(No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	106.8	106.8	o.o	0
No. 20	106.5	106.4	0.1	2.44
No. 30	99.7	99.3	0.4	9.76
No. 40	102.1	100.8	1.3	31.71
No. 50	94.9	93.2	1.7	41.46
Base	71.8	71.2	0.6	14.63

Privy

Sample 27	**Munsell**
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1

White	5Y 9/1
White	5Y 9/1
Silver	--------

Sample 27 was the first of the second set of samples. Analysis of this set began on Friday, October 9. The sample was collected from the interior of the privy. Beneath multiple layers of oil-based white paint were remnants of silver paint which was probably used to enhance the low light levels of the interior. Silver paint is made using powdered aluminum. In light of the fact that commercial aluminum production did not commence until the 1930's, this paint cannot predate that decade.

Privy

Sample 28	**Munsell**
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1

Sample 28 came from the exterior of the privy. Beneath three layers of white paint was extremely weathered wood, indicating paint loss through weathering if, indeed, it was painted. If it was painted there is a strong possibility that it was whitewashed rather than painted, thereby explaining the loss of the finish as whitewash is considerably less durable than paint.

Old Michigan Lighthouse Tower

Sample 29	**Munsell**
Black	N 0.5/
White	N 9.5/
Gray	5Y 7/1

Sample 29 was removed from the exterior window of the Old Michigan Lighthouse tower. It revealed three widely-divergent paint layers with gray being the oldest known layer.

Privy

Sample 30	**Munsell**
Green	2.5G 4/4
Gray-green	2.5G 5.5/2
Dark green	2.5G 3/4
Maroon	7.5R 3/4

Sample 30 was from the privy roof. Three finish layers of green survived, which is comparable in number to those of the exterior sample, no. 28. The oldest maroon layer was probably a red lead prime coat.

Shed

Sample 31	**Munsell**
White	N 9.5/
White	N 9.5/
White	N 9.5/
White	N 9.5/

Sample 31 was found on the exterior of the shed. Beneath a layer of white paint were multiple layers of whitewash which dissolved readily in hydrochloric acid, leaving the paint layer behind.

Shed

Sample 32	**Munsell**
Blue-green	10BG 5/4
Paper	--------
Blue-green	10BG 5/4

Sample 32 was collected from the interior of the shed. It consisted of a very thick and stiff layer of paper, or cardboard, with paint on both sides. The paint was probably applied during the manufacturing process of the paper.

New Tower

Sample 33	**Munsell**
Tan	10YR 8.5/4
White	N 9.5/
White	5Y 9/1

Sample 33 was collected from the interior wall of the new tower light base. It consisted of three layers of latex paint.

New Tower

Sample 34	**Munsell**
Black	N 0.5/
Charcoal	N 2.0/
White	N 9.5/
White	N 9.5/
Black	N 1.0/
Brown	7.5YR 5/6

Sample 34 came from the exterior of the new tower light base. At the bottom of a series of black and white layers were remnants of a coat of brown paint.

New Tower

Sample 35	**Munsell**
White	N 9.5/
Clear varnish	--------
White	N 9.5/

Sample 35 was removed from the exterior of the new tower light base. Its upper white coat was very shiny. Beneath it was a very glossy coat of clear varnish. Beneath the varnish was a layer of stark white paint.

Power House

Sample 36	**Munsell**
White	5Y 9/1
White	5Y 9/1

White	5Y 9/1

Sample 36 was from the interior trim paint of the power house. It revealed three layers of identical white oil-based paint.

Power House

Sample 37	**Munsell**
Blue-gray	5BG 4/1
Gray	5Y 7/1
White	5Y 9/1

Sample 37 was found on the interior of the power house. Like its counterpart, sample 36, it revealed three paint layers of which the oldest was white.

Power House

Sample 38	**Munsell**
Yellow	2.5Y 8/4
Yellow	2.5Y 8/4
Yellow	2.5Y 8/4

Sample 38 was collected from the interior of the power house. It revealed three identical layers of yellow paint.

As noted in the introduction above samples 39 and 40 are mortar samples. These were analyzed on Saturday, October 10.

Sample 39 was from the exterior brick mortar of the power house. It was dark gray in color and gave most indications of being a mixture of Portland cement and sand. It was hard and brittle and had a very small reaction which was quite prolonged. Its unusually small size probably accounts for the relatively rapid filtering time (Portland cement samples frequently take days to filter) and the absence of gelatinous by-products typically found with Portland cement samples. The sand sieve analysis revealed fine sand of which all passed the largest sieve sieves and 14% passed all of the sieves.

Sample 40 was taken from the exterior mortar of the keeper's house. It was gray in color and was moderately soft. Its softness in conjunction with a fast and bubble reaction, a relatively large water displacement, and a rapid filtering time were indications of a lime and sand composition with approximately five parts of lime to seven parts of sand, by volume. The sand sieve analysis Revealed typical sand of which virtually all passed the largest sieve and almost 7% passed all of the sieves.

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 39
Building: Power House, Michigan Island, Apostle Islands NL
Location: Exterior brick mortar

Sample Description: <u>Dark gray, hard and brittle, prolonged and bubbly reaction, extremely fast filtering time</u>

Test No. 1 – Soluble Fraction

Data:

1. 185.5 Container A weight
2. 193.1 Container A and sample
3. 769.88 Barometric pressure
4. 23 Temperature
5. 0.10 Liters of water displaced
6. Yellow-green Filtrate color
7. Light gray Fines color
8. No Hair or fiber ______ type
9. 2.7 Fines and paper weight
10. 2.6 Filter paper weight
11. 190.5 Sand and Container A weight
12. 3.8 cc. of sand
13. 33.7 Weight of graduated cylinder and sand
14. 28.7 Weight of graduated cylinder

Computations:

15. 7.6 Starting weight of sample: No. 2 – No. 1
16. 0.1 Weight of fines: No. 9 – No. 10
17. 5.0 Weight of sand: No. 11 – No. 1
18. .76 Sand density: No. 12 divided by (No. 13 – No. 14)
19. 2.5 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.00416 Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 0 42 Gram weight of CaCO3: 100 x No. 20
22. 2.08 Gram weight of Ca(OH)2: No. 19 – No. 21
23. .028 Mols. of Ca(OH)2: No. 22 divided by 74
24. 2.39 Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25. 0.18 Gram weight CO2: No. 20 x 44
26. 1.42 Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27. 12.68 %CO2 gain: No. 25 divided by No. 26

Conclusions:

28. 7.42 Gram weight of sample: No. 15 – No. 25
29. 1.35 Fine parts/volume: No. 16 divided by No. 28
30. 51.21 Sand parts/volume: (No. 17 divided by No. 28) x No. 18
31. ____________ Lime parts/volume: (No. 24 divided by No. 28) x 1.1

Cement (if present)

32. 1.05 Portland cement parts/volume: (No. 16 divided by No. 28) x 0.78
33. ____________ Natural cement parts/volume: (No. 16 divided by No. 28) x 0.86
34. ____________ Lime with cement parts/volume: (No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	106.8	106.8	0.0	0
No. 20	106.7	106.4	0.3	6.00
No. 30	100.0	99.2	0.8	16.00
No. 40	102.5	100.8	1.7	34.00
No. 50	94.7	93.2	1.5	30.00
Base	71.9	71.2	0.7	14.00

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 40
Building: Keeper's House, Michigan Island, Apostle Islands NL
Location: Exterior mortar
Sample Description: Gray, moderately soft, fast and bubbly reaction, extremely rapid filtering time

Test No. 1 – Soluble Fraction

Data:

1. 188.9 Container A weight
2. 208.9 Container A and sample
3. 769.88 Barometric pressure
4. 23 Temperature
5. 0.56 Liters of water displaced
6. Yellow-green Filtrate color
7. Tan Fines color
8. No Hair or fiber ______ type
9. 3.2 Fines and paper weight
10. 2.7 Filter paper weight
11. 202.7 Sand and Container A weight
12. 8.0 cc. of sand
13. 42.5 Weight of graduated cylinder and sand
14. 28.7 Weight of graduated cylinder

Computations:

15. 20.0 Starting weight of sample: No. 2 – No. 1
16. 0.5 Weight of fines: No. 9 – No. 10
17. 13.8 Weight of sand: No. 11 – No. 1
18. .5797 Sand density: No. 12 divided by (No. 13 – No. 14)
19. 5.7 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.02329 Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 2.33 Gram weight of CaCO3: 100 x No. 20
22. 3.37 Gram weight of Ca(OH)2: No. 19 – No. 21
23. .04555 Mols. of Ca(OH)2: No. 22 divided by 74
24. 5.09 Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25. 1.02 Gram weight CO2: No. 20 x 44
26. 3.03 Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27. 33.66 %CO2 gain: No. 25 divided by No. 26

Conclusions:

28. 18.98 Gram weight of sample: No. 15 – No. 25
29. 2.63 Fine parts/volume: No. 16 divided by No. 28
30. 42.15 Sand parts/volume: (No. 17 divided by No. 28) x No. 18
31. 31.94 Lime parts/volume: (No. 24 divided by No. 28) x 1.1

Cement (if present)

32. ____________ Portland cement parts/volume: (No. 16 divided by No. 28) x 0.78
33. ____________ Natural cement parts/volume: (No. 16 divided by No. 28) x 0.86
34. ____________ Lime with cement parts/volume: (No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	106.9	106.8	0.1	0.35
No. 20	109.7	106.4	3.3	11.46
No. 30	107.5	99.3	8.2	28.47
No. 40	111.2	100.8	10.4	36.11
No. 50	98.0	93.2	4.8	16.67
Base	73.2	71.2	2.0	6.94

Keeper's House

Sample 41	**Munsell**
White	5Y 9/1
White	5Y 9/1

Sample 41 continued the series of paint samples. It came from the exterior window trim of the keeper's house. It retained two layers of white oil-based paint.

Keeper's House

Sample 42	**Munsell**
Black	N 0.5/
Gray	5Y 7/1
Black	N 0.5/

Sample 42 was removed from the exterior window sash of the keeper's house. It revealed a gray layer sandwiched between two glossy layers of black paint, which is a very typical sash color used in the late nineteenth and early twentieth centuries.

Keeper's House

Sample 43	**Munsell**
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1
Gray	5Y 7/1
Gray	5Y 7/1

Sample 43 was from the exterior wood siding of the keeper's house. The pair of oldest gray layers are typical exterior colors commonly used in the early twentieth century.

Keeper's House

Sample 44	**Munsell**
White	5Y 9/1
White	N 9.5/
White	N 9.5/
White	N 9.5/
Gray	5Y 7/1

Sample 44 was found on the exterior door trim of the keeper's house. It was similar to its counterpart, sample 43.

Keeper's House	
Sample 45	**Munsell**
White	N 9.5/
White	N 9.5/
Light gray	5Y 8/1
Light gray	5Y 8/1
Yellow	2.5Y 8/4

Sample 45 was collected from the kitchen wall of the keeper's house. Its oldest layer was a rich yellow color.

Keeper's House	
Sample 46	**Munsell**
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1

Sample 46 came from the interior kitchen door trim of the keeper's house. It retained at least six layers of white, oil-based paint.

Keeper's House	
Sample 47	**Munsell**
Light yellow-green	7,5Y 8/2
Dark gray	5Y 5/1

Sample 47 was removed from the stair to the basement in the keeper's house. Beneath the upper light yellow-green paint was a distinct, but thin layer of dark gray paint.

Keeper's House	
Sample 48	**Munsell**
White	5Y 9/1
White	5Y 9/1
Gray	5Y 7/1

Sample 48 was from the exterior wall of the kitchen porch of the keeper's house. Beneath a pair of white layers was a gray layer matching those of its counterparts, samples 43 and 44.

Keeper's House	
Sample 49	**Munsell**
Light yellow-green	7,5Y 8/2

Sample 49 was found on the wall of the stair to the second floor of the keeper's house. It revealed only a single layer of light yellow-green paint matching the top layer of its counterpart, sample 47.

Keeper's House

Sample 50	**Munsell**
Pastel blue-green	5BG 9/1

Sample 50 was collected from the second floor wall of the keeper's house. It retained only a very thin layer of pastel blue-green paint on its surface.

Sample 51 was the first sample of the third set of samples. It continued the mortar and plaster samples. Taken from the second floor plaster of the keeper's house, it was off-white in color and consisted of small bits of plaster. There was a miniscule reaction with the hydrochloric acid, indicating a mixture of gypsum and sand as opposed to lime and sand. The sand sieve analysis revealed surprisingly coarse sand of which 37 ½% was trapped in sieve #20 and, in a statistical anomaly, equal amounts were trapped in sieves #30, #40, and #50.

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 51
Building: Keeper's House, Michigan Island, Apostle Islands NL
Location: Second floor plaster
Sample Description: Off-white, soft, miniscule reaction, extremely fast filtering time

Test No. 1 – Soluble Fraction

Data:
1. 185.1 Container A weight
2. 195.2 Container A and sample
3. 761.24 Barometric pressure
4. 23 Temperature
5. 0.00 Liters of water displaced
6. Off-white Filtrate color
7. Dark gray Fines color
8. No Hair or fiber ______ type
9. 2.7 Fines and paper weight
10. 2.6 Filter paper weight
11. 191.5 Sand and Container A weight
12. 5.4 cc. of sand
13. 35.1 Weight of graduated cylinder and sand
14. 28.7 Weight of graduated cylinder

Computations:
15. 10.1 Starting weight of sample: No. 2 – No. 1
16. 0.1 Weight of fines: No. 9 – No. 10
17. 6.4 Weight of sand: No. 11 – No. 1
18. .84375 Sand density: No. 12 divided by (No. 13 – No. 14)
19. 3.6 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.00 Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 0 00 Gram weight of CaCO3: 100 x No. 20
22. 3.6 Gram weight of Ca(OH)2: No. 19 – No. 21
23. .0486 Mols. of Ca(OH)2: No. 22 divided by 74
24. 3.6 Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25. 0.00 Gram weight CO2: No. 20 x 44
26. 2.14 Gram weight total possible CO2: 44 x (No. 20 + No. 23)

27.___------____%CO2 gain: No. 25 divided by No. 26

Conclusions:

28. 10.10	Gram weight of sample:	No. 15 – No. 25
29. 0.99	Fine parts/volume:	No. 16 divided by No. 28
30. 53.47	Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
31.____	Lime parts/volume:	(No. 24 divided by No. 28) x 1.1

Cement (if present)

32.____	Portland cement parts/volume:	(No. 16 divided by No. 28) x 0.78
33.____	Natural cement parts/volume:	(No. 16 divided by No. 28) x 0.86
34.____	Lime with cement parts/volume:	(No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	107.2	106.8	0.4	6.25
No. 20	108.8	106.4	2.4	37.50
No. 30	100.3	99.3	1.0	15.625
No. 40	101.8	100.8	1.0	15.625
No. 50	94.2	93.2	1.0	15.625
Base	71.8	71.2	0.6	9.375

Keeper's House

Sample 52	**Munsell**
White	5Y 9/1
White	5Y 9/1
Yellow	2.5Y 8/4

Sample 52 continued the paint sample series. The sample was collected from the second floor hallway ceiling of the keeper's house. It retained three layers of paint of which the oldest was a warm yellow.

Keeper's House

Sample 53	**Munsell**
White	5Y 9/1
Off-white	2.5Y 8.5/2
Pink	10R 8/3

Sample 53 came from the second floor bathroom wall of the keeper's house. Like sample 52, it revealed three layers of paint with pink being the oldest of the three.

Sample 54 continued the plaster and mortar samples. It was a plaster sample from the stair of the keeper's house. It was quite similar to the first sample but with bits of a very thin white skim coat. It also gave every evidence of being a gypsum and sand plaster. Its sand sieve analysis revealed moderately coarse sand of which the largest bits that failed to pass any of the sieves were pieces of the skim coat.

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 54
Building: Keeper's House, Michigan Island, Apostle Islands NL
Location: Stair plaster
Sample Description: Off-white with very thin white skim coat, moderately hard, extremely minimal reaction, extremely rapid filtering time

Test No. 1 – Soluble Fraction

Data:
1. 187.8 Container A weight
2. 205.4 Container A and sample
3. 761.24 Barometric pressure
4. 23 Temperature
5. 0.00 Liters of water displaced
6. Off-white Filtrate color
7. Tan Fines color
8. No Hair or fiber ______ type
9. 2.7 Fines and paper weight
10. 2.6 Filter paper weight
11. 202.0 Sand and Container A weight
12. 10.4 cc. of sand
13. 42.9 Weight of graduated cylinder and sand
14. 28.7 Weight of graduated cylinder

Computations:
15. 17.6 Starting weight of sample: No. 2 – No. 1
16. 0.1 Weight of fines: No. 9 – No. 10
17. 14.2 Weight of sand: No. 11 – No. 1
18. .7324 Sand density: No. 12 divided by (No. 13 – No. 14)
19. 3.3 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.00 Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 0.00 Gram weight of CaCO3: 100 x No. 20
22. 3.3 Gram weight of Ca(OH)2: No. 19 – No. 21
23. .00446 Mols. of Ca(OH)2: No. 22 divided by 74
24. 3.3 Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25. 0.00 Gram weight CO2: No. 20 x 44
26. 1.96 Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27. -------- %CO2 gain: No. 25 divided by No. 26

Conclusions:
28. 17.60 Gram weight of sample: No. 15 – No. 25
29. 0.57 Fine parts/volume: No. 16 divided by No. 28
30. 59.09 Sand parts/volume: (No. 17 divided by No. 28) x No. 18
31. ______ Lime parts/volume: (No. 24 divided by No. 28) x 1.1

Cement (if present)
32. ______ Portland cement parts/volume: (No. 16 divided by No. 28) x 0.78
33. ______ Natural cement parts/volume: (No. 16 divided by No. 28) x 0.86
34. ______ Lime with cement parts/volume: (No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	107.3	106.8	0.5	3.60

No. 20	110.0	106.4	3.6	25.90
No. 30	102.6	99.3	3.3	23.74
No. 40	105.5	100.7	4.8	34.53
No. 50	94.6	93.2	1.4	10.07
Base	71.5	71.2	0.3	2.16

Power House

Sample 55	**Munsell**
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1

Sample 55 continued the paint sample series. It was removed from the exterior window of the power house. Its analysis revealed three layers of white paint atop a putty substrate.

Assistant Keeper's House

Sample 56	**Munsell**
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1

Sample 56 was from the exterior siding of the assistant keeper's house. It retained three layers of white paint over an extremely weathered wood substrate.

Assistant Keeper's House

Sample 57	**Munsell**
White	5Y 0/1
White	5Y 9/1
White	5Y 9/1

Sample 57 was found on the exterior trim of the assistant keeper's house. Like its counterpart, sample 56, it retained three layers of white paint, but the wood substrate was unweathered.

Assistant Keeper's House

Sample 58	**Munsell**
Off-white	5Y 8.5/2
White	5Y 9/1
Gray	5Y 7/1

Sample 58 was collected from the stair well wall of the assistant keeper's house. Its analysis showed three layers of paint, of which the oldest was a typical gray paint.

Assistant Keeper's House

Sample 59	**Munsell**
White	5Y 9/1
Gray	5Y 7/1
Yellow	2.5Y 8/4

Gray	5Y 7/1

Sample 59 was collected from the second floor wall and ceiling of the assistant keeper's house. It revealed four layers of paint, of which a typical gray was the oldest layer.

Sample 60 continued the plaster and mortar samples. It was collected from the chimney mortar of the assistant keeper's house. The sample size was quite small with the result being that its statistical reliability is open to question. It showed characteristics of a lime and sand sample with approximately equal parts of each, by volume. The sand sieve analysis revealed very fine sand of which over 30% passed all of the sieves, all of it passed the two largest sieves, and over half was trapped in the finest sieve.

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 60
Building: Assistant Keeper's House, Michigan Island, Apostle Islands NL
Location: Chimney mortar
Sample Description: Off-white, soft, fast and bubbly reaction, extremely rapid filtering time

Test No. 1 – Soluble Fraction

Data:

1. 192.0 Container A weight
2. 198.7 Container A and sample
3. 761.24 Barometric pressure
4. 23 Temperature
5. 0.10 Liters of water displaced
6. Off-white Filtrate color
7. Tan Fines color
8. Yes Hair or fiber ______ type
9. 2.8 Fines and paper weight
10. 2.7 Filter paper weight
11. 196.3 Sand and Container A weight
12. 2.5 cc. of sand
13. 33.0 Weight of graduated cylinder and sand
14. 28.7 Weight of graduated cylinder

Computations:

15. 6.7 Starting weight of sample: No. 2 – No. 1
16. 0.1 Weight of fines: No. 9 – No. 10
17. 4.3 Weight of sand: No. 11 – No. 1
18. .5814 Sand density: No. 12 divided by (No. 13 – No. 14)
19. 2.3 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.0041125 Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 0.41 Gram weight of CaCO3: 100 x No. 20
22. 1.89 Gram weight of Ca(OH)2: No. 19 – No. 21
23. .0255 Mols. of Ca(OH)2: No. 22 divided by 74
24. 2.19 Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25. 0.18 Gram weight CO2: No. 20 x 44
26. 1.30 Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27. 13,85 %CO2 gain: No. 25 divided by No. 26

Conclusions:

28. 6.52 Gram weight of sample: No. 15 – No. 25

29.___1.53___	Fine parts/volume:	No. 16 divided by No. 28
30.___38.34___	Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
31. ___36.95___	Lime parts/volume:	(No. 24 divided by No. 28) x 1.1

Cement (if present)

32.__________	Portland cement parts/volume:	(No. 16 divided by No. 28) x 0.78
33.__________	Natural cement parts/volume:	(No. 16 divided by No. 28) x 0.86
34.__________	Lime with cement parts/volume:	(No. 16 x o.2) divided by No. 28 x 1.1

Test No. 2 – Sand Sieve Analysis

Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
No. 10	106.8	106.8	0.0	0.00
No. 20	106.4	106.4	0.0	0.00
No. 30	99.4	99.3	0.1	2.33
No. 40	101.4	100.7	0.7	16.28
No. 50	95.4	93.2	2.2	51.16
Base	72.5	71.2	1.3	30.23

Assistant Keeper's House

Sample 61	**Munsell**
Gray	5Y 7/1

Sample 61 continued the last three paint samples of the set. It was from the garage wall of the assistant keeper's house. It retained only a single layer of standard gray paint on its wood substrate.

Assistant Keeper's House

Sample 62	**Munsell**
Dark gray	N 4.0/
Gray	N 5.75/
Gray	N 5.75/

Sample 62 was removed from the interior trim of the assistant keeper's house. Its gray paint was darker than the typical gray paint seen elsewhere and was not yellowed.

Assistant Keeper's House

Sample 63	**Munsell**
Off-white	5Y 8.5/2
White	5Y 9/1
Gray	5Y 7/1

Sample 63 was from the first floor entry stair wall of the assistant keeper's house. It revealed a relatively typical set of three paint layers with the oldest being a standard gray.

A number of conclusions can be drawn from the analysis, as follow:

1. There was a low degree of consistency between the samples, making it difficult to draw any firm conclusions.

2. A number of samples had so few layers that one of the following conclusions can be reached:

    a. The oldest layers had either weathered away over time, which is probable with exterior paint.

    b. They may have been stripped. This would be especially true if the older finish was a calcimine paint, which is impossible to cover with any coating, including calcimine paint itself. It was an extremely popular paint for interior plaster surfaces during the nineteenth and early twentieth centuries. In light of the use of whitewash, which is a related waterborne paint, the probability of calcimine paint here is very high.

    c. The element itself had been replaced or is of recent date.

    d. Other coverings such as wallpaper or calcimine paint may have preceded the paint and were removed prior to painting. Wallpaper was a popular covering, especially for damaged plaster.

    e. Because very little is known today about calcimine paint a few comments are in order to explain it, as follow:

       It was immensely popular throughout the nineteenth century and into the early twentieth century. It was cheap, easily applied and removed, had a very soft and lustrous sheen, and could be mixed and used by the average homeowner who could not afford a painter. In this case it could have been applied by Coast Guard personnel rather than painters. Decorative painters frequently used it because of its sheen. It is still in production to this day, although it is very rarely used.

       It is waterborne glue distemper paint which, unlike its cousin, whitewash, must be entirely removed prior to repainting. The difference between calcimine paint and whitewash is in the formulation. Calcimine paint was developed for interior use only and was developed to carry a pigment whereas the high lime content of whitewash prevented it from taking on a pigment. Whitewash was primarily used for exteriors and for dark service areas of interiors.

       Nothing will stick to it, including calcimine paint. Its absence, therefore, is about the only means of its detection. This is a real Catch-22. Because it was typically removed prior to repainting its presence is usually indicated either through historic documentation (which is very rare) or the very small number of layers where many would normally be found or where other, similar surfaces retain considerably more.

3. There is no doubt that many of the tower elements were whitewashed as their probable original finish.

4. Of the other samples, only sample 7 appears to have the most complete, by far, stratigraphy. It was truly excellent in its quality leaving little doubt that gray was the original color in that situation.

5. As can be seen with many of the mortar sample discussions no relative ratios of sand to Portland cement or sand to Portland cement and lime has been stated. The acid reduction method which was used is better than other methods for determining lime to sand ratios. Hence, they were provided

for those samples composed of sand and lime. For samples containing Portland cement, the best this form of testing can do is to indicate the presence of Portland cement and the sand itself.

The primary goal in repointing is to achieve a compatible mortar. This can be done for lime and sand samples that were analyzed. It can also be done for Portland cement samples with a bit of trial and error. If the mortar is very hard then a higher ratio of Portland cement to sand will work. One must take into consideration any deterioration of the masonry as a result of the mortar. If this has been the case it may be advisable to use a softer mortar for repointing.

The other primary mode of mortar analysis is spectrographic testing. Unfortunately, it also cannot accurately determine exact ratios of Portland cement to sand and/or to lime.

The secondary goal is to match the appearance of the mortar, which depends to a very large extent on the sand. This is where acid reduction testing shines. It provides and exact calculation of the sand grain sizes as well as a sample of the sand for matching of color. If the sand is carefully matched then the appearance will be successful. This is especially critical in partial repointing and patching.

6. There are instances where the narrative of the mortar make up refers to Portland – but the data sheet following does not include it in line #32. The reason for this is that rather than a number for lime content, the calculation is made for lime with Portland cement content. If the sample merely had Portland cement and sand there would be a number for Portland cement.

As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

NPS D-633/106,232 / July 2011