CULTURAL LANDSCAPE REPORT • HISTORIC STRUCTURE REPORT

Apostle Islands National Lakeshore – Bayfield, Wisconsin

VOLUME III OF VI: OUTER 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 III

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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APOSTLE ISLANDS NATIONAL LAKESHORE

NATIONAL PARK SERVICE
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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 Outer 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 conditions for associated buildings, structures, features, and vegetation, an analysis of the cultural landscape and historic structures, and the recommended treatment for the Outer Island Light Station. Supplemental information applicable to all of the light stations, including Outer Island, is presented in Volume I, *Introduction and Overall Development History*.

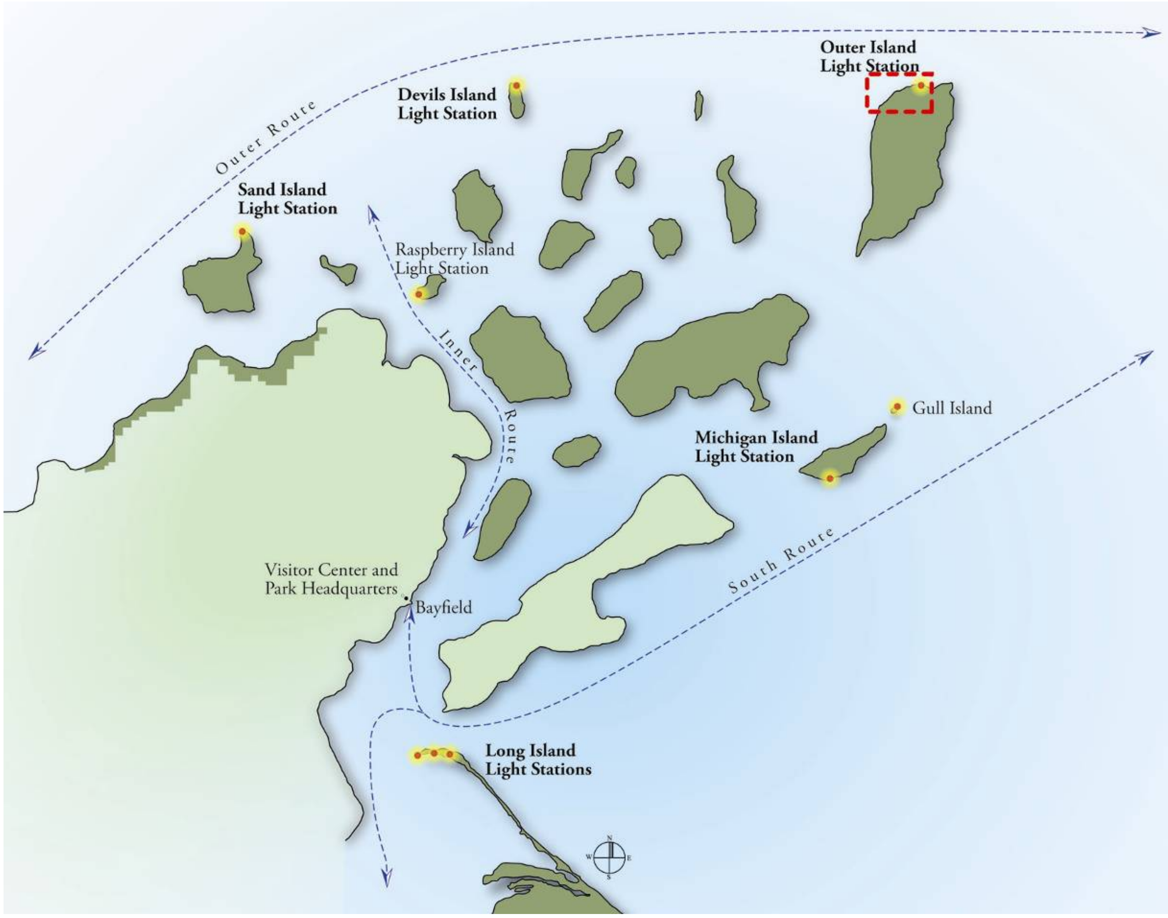
The island history is presented first, followed by the CLR and finally the HSR. Together, the combined CLR/HSR will guide the treatment and use of the significant resources associated with the Outer Island Light Station. In addition, this CLR/HSR provides guidance for the continued management of these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

STUDY AREA

Outer Island is one of seven islands within the park, which includes the six light stations and Gull Island, which provide aids to navigational aids for Lake Superior. The study area encompasses the Outer Island light station reservation and the light station grounds. Outer Island is 7.0 miles long, 2.8 miles wide, and approximately 7,999 acres in size. The island is located on the furthest northeastern edge of the park, approximately 27 miles from Bayfield, Wisconsin and 28 miles from Little Sand Bay. The Outer Island Light Station Reservation is located on the northern end of the island and occupies approximately 200 acres. The remainder of the island outside the light station reservation is part of the Gaylord Nelson Wilderness area, designated in 2004.

Outer Island is the first navigational aid encountered when traveling west from eastern Lake Superior. The light station is located on a bluff above Lake Superior and is surrounded by maturing second-growth and old-growth northern hardwood forest.

Today, the island's land use is classified as the Apostle Islands National Lakeshore under the jurisdiction of the National Park Service (NPS). The light station continues to serve as an aid to navigation; the automated light is operated and maintained by the United States Coast Guard (USGS). The NPS maintains the site and buildings, and the light station grounds are frequented by visitors and park staff for the station's cultural and natural resources.



Outer Island Light Station Context (Source: MBD 2010)

SIGNIFICANCE OF OUTER ISLAND LIGHT STATION

Outer Island is the furthest northeast of all the light stations in the Apostle Islands, signaling either the beginning or terminus of the outer shipping route to passing ships on Lake Superior. In 1874, the Outer Island Light Station housed the first fog signal of its kind in the Apostle Islands. The period of significance is 1874 to 1961, beginning with the initial development of the light station and continuing until automation of the Outer Island Tower. The island plays an important role in depicting the history of the light stations and navigational aid technology in the Apostle Islands because of its remote location and architecture. The entire 200 acres of the Outer Island Light Station Reservation comprises its cultural landscape. However, the majority of its contributing features occur in a core area of 1.5 acres associated with the light station grounds at the northern end of the island.

Five contributing buildings on the List of Classified Structures include the Outer Island Tower and Keepers Quarters, the Fog Signal Building, the Oil Storage, and the Privy. Contributing features include the historic clearing, vegetation, organization of buildings and structures, boat dock, tramway, tram tracks, concrete walks, small scale features, and the bluff.

With many of its original features intact and in good condition, the Outer Light Station Reservation 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 Outer Island Light Station are focused on revealing the role that the light station played in the navigational history of the Apostle Islands, and in conveying the historical significance of the light station's cultural landscape and historic structures. The treatment recommendations are addressed in detail in the CLR/HSR.

Rehabilitation has been identified as the general treatment approach for the Outer 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, non-compatible 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 portions of the historic cleared area of the light station;
2) Reestablish views from Lake Superior to the light station;
3) Repair and maintain circulation features including the tramway, tram tracks, and concrete walks;
4) Retain the historic location and configuration of the boat dock;
5) Maintain extant landscape plantings;
6) Remove non-compatible features;
7) Rehabilitation of the Outer Island Tower, Keepers Quarters, and Fog Signal Building;
8) Preservation of the Oil Storage and Privy.

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 improved efficiency of park operation 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

The Wisconsin State Legislature requested an appropriation from Congress for a new light station on Outer Island in 1868. The Legislature's March 6 plea said "This (island) is the easternmost of a dangerous group of islands lying off a point right on the course of vessels bound in and out of the important and much frequented harbor of Superior…" [3] Apparently Congress needed to be further convinced because they did not provide the funding. After repeated requests, a $40,000 appropriation finally came through for Outer Island Light Station on March 3, 1873.

Lighthouse District Engineer, Major Orlando M. Poe, obtained the lighthouse reservation that year. Louis Lederle supervised the work crews, who began work in August of 1873, but extremely bad weather made for a brief construction season. The crews were only able to complete the boat landing and the foundations for the house and tower before the weather forced them off the island in early October.

The work resumed by May of 1874 and proceeded until it was discovered that the station was in the wrong place. The correct site was actually located about 1,300' away. Crews cleared four new acres and started over at a feverish pace to build the house, privy, tower and fog signal building. They completed the project in September of 1874. The lamp was placed in a third order revolving Fresnel lens built by Saulter and Company. "It gives a splendid light." remarked the lighthouse keeper in the log entry for the light's inaugural day on October 20, 1874.[4] Located high above the water, atop a bluff, the light from the more than 80-foot tall tower was visible for more than 19 miles. The ten-inch fog steam whistle blasted for the first time on November 5. It was the first fog whistle in the Apostle Islands, but it would not survive for long.

The brick Keepers Quarters (LCS ID 101140) was constructed on a locally quarried brownstone foundation. A one-story passageway connected the house to the conical whitewashed-brick tower (LCS ID 006376). The lighthouse was very similar to one under construction at Au Sable, which was also instigated while Major Poe was the District Engineer.

After a distinguished career during the Civil War, Major Orlando Poe was appointed the Chief Engineer of the 11th Lighthouse District and served from 1870 to 1873. Lighthouse designs under Poe's supervision were elegant departures from the previously plain schemes used on these utilitarian structures. The Outer Island Light Station incorporated details such as a cut stone foundation for the brick house, 16 ornate brackets supporting the tower walkway and hooded arched windows gracing the whitewashed tower. The designs of the Poe-influenced stations incorporated elements used in the Italianate architectural style and brought praise from Army Quartermaster General Montgomery Meigs, who wrote, "I rejoice to see that the Board is paying some attention to architectural design in the newer lighthouses, and that there is a prospect that hereafter the Bald (sic) towers which for so many years… have offended all persons of taste… will give place, at very little increase of original cost, to buildings which it will be a pleasure to regard."[5]

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[3] Memorial, Letter 234, page 39 in Snyder, David L. "A Compendium of Written Communication of the Light House Board for the Twelve Light Stations of the Midwest Region, the National Park Service, 1839-1881." 1992 .Page 61. Manuscript on file at the Apostle Islands National Lakeshore.
[4] Keepers logs are located on file at the Apostle Islands National Lakeshore. 1992.
[5] Letter of January 9, 1873 in Snyder, David L. "A Compendium of Written Communication of the Light House Board for the Twelve Light Stations of the Midwest Region, the National Park Service, 1839-1881." Manuscript on file at the Apostle Islands National Lakeshore. 1992.

Masonry light towers with bracket-supported walkways and decorative window surrounds were popular design choices at the time. At least eight other similar towers were built between 1871 and 1880 on the Great Lakes.

The Privy (LCS ID 006380) was designed in a manner worthy of the elegant new lighthouse, including a beadboard interior and an arched entry. It was constructed at the same time as the lighthouse.

Exposed to the fury of Lake Superior, the Outer Island station battled with the elements from day one. On October 28, eight days after the first lighting, the keeper noted in the log "The dock has all washed away, and our new boat would have gone with the dock if it had not been for the assistance of the gentleman working on the fog whistle." Two days later a storm washed the bank away, creating a new shoreline within 8' of the new fog signal building.

The signal building went down in a landslide in November within weeks of the first whistle blast. It was too late in the year to do anything about the lost building, but the keeper built a new boat dock. The next year, the keeper worked on remodeling the dock to try to keep the boats from "…getting smashed to peaces (sic)".The keeper turned the light off for the season in December and remained on the island through the winter.

Crews constructed a new fog signal building in June and July of 1875. The signal was a ten-inch steam powered whistle with a coal fired boiler. The keeper's logs provide some insight into the difficulty of running the fog signal. The log entries note the coal was of poor quality and it was difficult to generate adequate heat to produce steam in the colder months. The tanks to the boiler also suffered from cracks and leaks, requiring steady vigilance of the system.

In late 1876 the well providing the water source for the steam ran dry and did not replenish itself until May of 1877. A new well and cistern were eventually installed. Just getting fuel to the signal house was a challenge. While they were at Outer Island to complete the new signal building, the crew from the supply ship *Dahlia* unloaded 26 tons of coal, which the crew "wheeled" up the hill, presumably using a hand powered hoist for the tram. The transfer of coal took two full working days.[6]

A duplicate signal building was constructed in September of 1878 and held a second fog signal whistle. H. Bamber's (1893) survey map of the light station shows "Whistle House 1" and "Whistle House 2" located about 100' apart. The cistern is just south of Whistle House 1. The Outer Island fog signals were the first steam powered whistles to be established in the Apostle Islands.[7]

Bamber's survey map also illustrates the pier and dock configuration, which was constructed to provide a protected landing for the boats and to attempt to reduce erosion of the shoreline. On October 16 and 17, 1880, the Keeper reported the fiercest storm he had ever seen on the lake. The light tower "…swayed like the top of a tree", and the boat dock was entirely washed away. Inspection reports in 1882 noted the bluff was washing away and addressed plans to build a boathouse and pier.

In 1883 crews remodeled the boathouse and constructed a new pier. The estimated total cost for both projects was $7,572. Over time the boat dock, pier and shoreline received more than five major alterations or adjustments. Two new cribs were added in 1894. The boat landing was rebuilt in 1901, 1948 and 1958. In the 1960s the boathouse was washed away by heavy storms. Work in the 1980s, 1990s and the early 2000s continued to address shoreline erosion.

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[6] Information in this paragraph derived from log entries for 1876-1877.
[7] Letter from the Lighthouse District Engineer written May 1, 1879 and included in Snyder's compendium of Lighthouse Board correspondence.

Other elements of the light station did not suffer quite as much as the boat dock. In 1886 work crews installed a steam powered injector that delivered water from the lake to the signal houses and the Keepers Quarters. The next year the crew extended the tram tracks down the pier and replaced the old hand powered tram hoist with a steam powered mechanism.

Up on the bluff, in August 1892, Henry Crump the District Lampist replaced the lard oil lamps with kerosene fueled lamps. A brick Oil Storage Building (LCS ID 006379) was constructed in 1895 to provide storage for the volatile fuel. The two fog signal buildings received new brick foundations in 1894.[8] In 1900, the western most fog signal building (#2) was taken down and salvaged to add on to the eastern fog signal building. The tram route was rerouted slightly to accommodate the remodel. The steam powered tram hoist machine shared quarters with the fog signal equipment in the newly reconfigured building, which is the currently standing building (LCS ID 006378). A new pair of diaphones with diesel powered compressors was installed in the signal building in 1929. The keeper noted the occasion with a terse "Air signal in commission." in his October 31, 1929, entry. The keeper built a saddle for the fuel barrel in April of 1930.

A. Klette, the District Lampist, replaced the wick lamp with an incandescent oil vapor lamp on May 28, 1913.[9] The lamp was put into use on June 5, and subjected to some on-the-job trial and error training by the keeper.

Dormers were added to the house in 1925 to convert the third floor attic space into comfortable quarters for a new second assistant keeper. Other improvements on the island are only briefly noted in various records. Siblings Walter Daniels and Isabel Daniels Cassidy revisited their childhood home (1917-1937) and remembered gardens located between the house and the privy. The Daniels children remembered the garden had corn, potatoes and vegetables.[10]

The keeper's logs refer to storing potatoes at the end of the chicken coop and also reference a cow that was brought over to the island in at least two different years. A barn and a chicken coop burned down in 1930. Former keeper, Ben Hudak, served at Outer Island in the 1930s. He remembered keeping a goat and commented that there were no other buildings at the station beyond the tower, house, privy, oil house and signal building. Entries in the keeper's logs in the 1930s refer to a shed and to a smokehouse. Lighthouse Keeper A.G. Carpenter built the ladder rack in July of 1939, noting the work in his keeper's log.

Nearby Activity

Outer Island was a remote and lonely place to work. The island saw a little more activity when the Schroeder Lumber Company established a logging operation on the opposite end of the island. The lumber company, anticipating profits from escalating post-World War I demands, had purchased the timber rights by 1920. A five-mile long railroad line and a 650-foot dock were completed and logging began in 1924. The last year the company worked on the island was 1930, when 225 men cut six million board feet of timber.[11] The logging camp provided a mail station and an alternative landing site for employees of the light station.

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[8] *Ashland Daily Press*. "Outer Island Most Isolated Place in State of Wisconsin". September 4, 1958. describes the work completed in 1886-1895. Also see the Keepers Logs for the dates noted in the text.

[9] Lighthouse Keepers logs for that date on file at the Apostle Island National Lakeshore.

[10] Notes to the file regarding the Daniels visit in 1987 are located in the Apostle Islands National Lakeshore topical file on Outer Island.

[11] 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 229.

The Lullabye Furniture Company purchased the remaining productive logging acreage on Outer Island - effectively all of the island that was not within the lighthouse reservation - in 1936 and the loggers returned in 1942. Lullabye built a logging camp about 1.5 miles southeast of the lighthouse and an airstrip at the south end of the island." They used gas powered vehicles. Logging ended on the island in the 1960s.
New Technology

Technological advances continued. The United States Coast Guard (USCG) assumed responsibility for all lighthouses in 1939 and worked to modernize and streamline the operations. The *Amaranth* lighthouse tender delivered a radio transmitter on September 14, 1939, as part of the Apostle Islands radio system. In that same year the rotating mechanism for the light was electrified. The light and fog signal system were electrified in May, 1942. The first electric lamp (bulb) shone on May 15.[12] New radio equipment with a radio phone was installed later that year.

Currently the Fog Signal Building contains two compressors made by the Ingersoll Rand Company. Identical plates on the compressors identify the machinery as provided under Purchase Order No. CG-12627-C, dated December 17, 1948. A General Motors Diesel motor Model PTA-2109, serial number 91491, is also in the building along with other equipment. It appears the USCG replaced some equipment as part of the extensive repair and restoration work they did to the boat dock and pier in 1948. The tram track is extant.

A three person crew tended the Light Station until it was automated on October 5, 1961. A solar powered 12 volt DC optic was installed and was replaced in 1992 with a VEGA VRB-25 solar powered optic.

HISTORIC EVIDENCE

The historic photos date back to 1893 and show the no longer existing west fog signal building, boathouse and dock, and tramway ramp. For more detailed descriptions of the photos, see the CLR and each building's Chronology of Alterations and Use in the HSR.

A historic site plan states that on July, 21, 1871, the site was officially reserved for the lighthouse by the President, the first buildings were built in 1874, and the area of the reservation is 200 acres (although noted in the document "Questionnaire covering real estate owned by the United States" from the National Archives that the reservation in 1871 was precisely 278.94 acres). In 1877 and 1893, two site plans depict two "Whistle Houses," both connected to the tramway. (HSR Historic Drawings OI-01 and 02) A 1901 or 1910 version of the site plan shows only one building in the location, now called the "Fog Signal House." (HSR Historic Drawing OI-03) There was a well to the southeast of the quarters (also shown in 1893), a cistern to the south of the Fog Signal Building (also shown in 1893), and a boathouse and station house on the dock in the 1910 plan. There was a boathouse shown in the 1893 plan, but its orientation and size indicate that the 1910 boathouse was a different structure. (HSR Historic Drawing OI-02 and 03) In a construction drawing from 1930, titled "Reconstruction of Boathouse," a wood frame structure with vertical board and batten siding and a painted sheet metal roof is shown. The "plank crib," as it's called on both site plans, is described as a "pier filled with stone" and is in the same location on both the 1893 and 1910 plans, but today does not appear to exist.

Undated drawings show the Light Tower and Keepers Quarters plans and elevations. (HSR Historic Drawings OI-04 and 05) Also, a set of 1925 plans shows the Keepers Quarters existing 2nd floor conditions with two separate living areas. The drawings indicate conversion of the attic into a new living area,

[12] Researchers will note that this date is later than what has been given in most of the available material, which suggests electrification in 1941. This date is taken from the keeper's log and clearly indicates this is the first date of electrification of the light.

installation of a stair from the 2nd floor to the attic, the addition of dormers on the west and east elevations, and the addition of a wood frame entry to the "Wood Shed"/ Kitchen exterior door. (HSR Historic Drawings OI-06 and 07) The Fog Signal Building's 1929 drawing for installing new fog horns details the space and equipment used during that period. (HSR Historic Drawings OI-08)

OVERVIEW OF DEVELOPMENT AND USE

Date	Work Described
1852	Congress authorizes construction of 1st lighthouse in the Apostle Islands (J. Busch, 2008)
1868	Wisconsin State Legislature requests new light station on Outer Island from Congress (J. Busch, 2008)
Annual Report of 1871	*"Outer Island, Lake Superior*. – The through commerce to and from the western end of Lake Superior, increasing so rapidly as the railroads having their termini at Du Luth are extended to the westward, all passes outside the Apostle Islands, and is greatly in need of a Light-house on the northern end of Outer Island. This should be respectfully recommended to be appropriated." Repeated in 1872 ("1871 Annual Report of the Lighthouse Board," Outer Island Light in annual reports 1850-1920)
Annual Report of 1873	*"Outer Island, Lake Superior, Wisconsin*. – Under the appropriation made by act of March 3, 1873, the construction of the buildings required at this new station will be begun during the present season and pushed to completion as soon as possible." ("1873 Annual Report of the Lighthouse Board," Outer Island Light in annual reports 1850-1920)
1873	Congress appropriates $40,000 for Outer reservation; District Engineer Orlando Poe obtains reservation control (J. Busch, 2008)
1874	Lighthouse, Fog Signal Building, and Privy completed (LCS, 2009 and J. Busch, 2008) Oct 30: "The bank around the fog whistle has caved in very much on the Lake side. The sea has washed it away within 6 or 8 feet of the building." (O.K. Hall, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I)
1875	Fog Signal Building re-built due to caved-in bank (LCS, 2009 and J. Busch, 2008) July 8: "The fog whistle completed today so that we was able to get up steam and sound the alarm." (O.K. Hall, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I)
1877, Oct 1	"Mr. G.W. Bond finished work on the cistern….Mr. Jerome Sauzon is in charge of the building of the Signal and Light House now being constructed." (H.A. Kuchli, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I)
1878, June 27	"Government boat 'Warrenton' arrived at 6 AM; left material for a dublicate [sp] Fog Signal, lumber for building, and all the machinery; unloaded by means of a scow." (H.A. Kuchli, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I)
1877-1879	West Fog Signal Building built next to 1875 East Fog Signal (Letter from District Engineer, 1879)
1880, October 16	"The cap on top of the chimney blowed off…The Tower swayed like the top of a tree; and the Lens, well, it is a wonder to me that a piece of it is left." (H.A. Kuchli, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I)
1880-1947	Documented painting of the interior of buildings 29 times; including at times the following buildings: Keepers Quarters (in 1914, mentioned change of color of kitchen and upstairs from gray to green); Tower, regularly mentioned the Lantern, Watch Room, and stairs (part of stairs painted in 1916 "metallic brown"); Fog Signal Building; Oil Storage; and Privy (in 1937, painted gray inside). (OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I and II)
1880-1947	Documented painting of the exterior of buildings 30 times; including at times the following buildings: Keepers Quarters, specifically mentioned the kitchen portion that was painted white in 1917 (in 1928, the Quarter's dormers were painted red while west end and gable end windows were painted white, in 1938 the Quarters' windows and trim were painted gray); Tower (brackets and trim consistently painted black with whitewash as primary color); Fog Signal Building (in 1931, trim, floors, and windows were painted green, in 1938 the windows were black, and in 1946 the eaves and windows were gray); Oil Storage and the Privy. (OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I and II)

Date	Work Described
1883	Shore protection and boat harbor for pier protection built (*Ashland Daily Press 9/4/58: Outer Island – Most Isolated Place In State of Wisconsin*)
1886	Pipe box constructed pumping water from the Siphon House to the East Fog Signal Building (*Ashland Daily Press 9/4/58: Outer Island – Most Isolated Place In State of Wisconsin*)
1887	Tramway improvements (*Ashland Daily Press 9/4/58: Outer Island – Most Isolated Place In State of Wisconsin*)
Annual Report of 1887	"*Outer Island, one of the Apostle Group, Lake Superior, Wisconsin*. – In October, 1886, a steam injector was installed to pump water from the lake to the fog-signals and dwelling, and it works well and gives an abundant supply of water. The work of erecting a steam-hoisting engine-house, extending and improving the tramway, and converting an old well into a cistern, was commenced late in June and has been finished. Repairs were made to the boilers and machinery of the signals." ("1887 Annual Report of the Lighthouse Board," Outer Island Light in annual reports 1850-1920)
1892	Lard oil lamps replaced by kerosene lamps (J. Busch, 2008 and LCS, 2009)
1895	Oil Building constructed (*Ashland Daily Press 9/4/58: Outer Island – Most Isolated Place In State of Wisconsin*)
Annual Report of 1895 Fiscal Year	"Outer Island, Apostle Group, Lake Superior, Wisconsin. – A brick oil house was erected, with iron roof, door, and shelving, located 60 feet southwest of the dwelling." ("1895 Annual Report of the Lighthouse Board," Outer Island Light in annual reports 1850-1920)
1897-1945	Documented whitewashed buildings 23 times; including at times the following buildings: Tower, exterior and interior; Keepers Quarters "Storm House" and the interior of the basement and kitchen; and the exterior of the Privy. (OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I and II)
1900, July	July 23: "… helping to raise Signal House No. 2." July 25: "… helping to move Signal House." (John Irvine, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I)
Annual Report of 1900	*"Outer Island, Lake Superior, Wisconsin.* – Material for building the fog signal houses into one building, providing new fog signal boilers, changing machinery, rebuilding the tramway, renewing defective timbers and decking of the landing wharf, providing screens and storm doors for dwelling, and making other minor repairs was delivered at the station. Minor repairs were made." ("1900 Annual Report of the Lighthouse Board," Outer Island Light in annual reports 1850-1920)
Annual Report of 1901	*"Outer Island, Lake Superior, Michigan*. – Fog-signal house No. 2 was built on the east side of building No. 1, and the two structures were connected. The old plant of signal No. 1 was removed, the new Plant was placed, and the steam and water pipes were changed as needed. The landing was rebuilt and refilled with stone, and the structure was re-decked. A crib was sunk in the gap at the rear of the old pier, and filled with stone. A tramway was built from the brow of the bluff to the signal house. Various repairs were made." ("1901 Annual Report of the Lighthouse Board," Outer Island Light in annual reports 1850-1920)
1908	Aug 24: "The work done here is as follows: layed cement walks, shingled all roofs with metallic shingles, layed new planks on cribs, plastered the foundation with cement, layed drain tile all around dwelling and relayed sewer pipes, by Alex H. Young." Sept 7: "Made steps on tramway." (Otto Olson, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II)
1910, August 2	"John W. Miller arrived with a carpenter …they come here to … lay the hardwood floors, and put hand rail in Tower." (Otto Olson, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II)
1912, Nov 20	"Brought new Vapor Light soap and Timemarker, and stove fittings." (Otto Olson, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II)
1912-1947	Documented painting of the roofs of buildings 17 times; including the Keepers Quarters, Tower, Oil Storage, Privy and Fog Signal Building (tar shingled in 1944) (OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I and II)
1913	Wick lamp replaced by incandescent oil vapor lamp (Otto Olson, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II)
1915, November	Nov 2: "Setting up frame of storm house." Nov 5: "Got siding on storm house, also roof. Started to put on lining in side." Nov 6: "Working on storm house. Putting in window." Nov 16: "Fitting door on storm house." (Otto Olson, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II)
1925	Keepers Quarters had dormers added and attic and 2^{nd} floor converted into separate living spaces

Date	Work Described
	for 1st and 2nd assistants (Historic Drawings, 1925) Oct 23: "Making new platform for whistles." (Daniels, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II)
1926-1943	Documented varnishing of floors seven times; including at times the following buildings: Keepers Quarters, specifically mentioned hallways, handrails, and 1st and 2nd assistants quarters (linoleum was installed in Quarters in 1945); and the Tower, specifically mentioned the Watch Room floor. (OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I and II)
1929	Diesel-powered air diaphones (2) installed in Fog Signal Building (J. Busch, 2008) Oct 1: "Painted new siding on Signal." Oct 31: "Air signal in commission." (Daniels, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II)
1930, Oct 29	"Piped shower bath." First mention of indoor plumbing. (Daniels, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II)
1933, November	Nov 18: "Devils [boat] arrived with O. Joiner to install Winter Light." Nov 20: "Winter Light in commission." (Daniels, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II)
1934	July: Tramway improvements Oct 10: "Installed new radio." Oct 12: "Bolted stand on balcony for Winter Light." (Daniels, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II)
1937, April	April 22: "Mr. F. C. Biesel came out with us to work on engines and put in new Light." April 23: "Put in new Light, and put No. 1 Engine in commission and painted water tanks inside with cement…" (A. G. Carpenter, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II)
1939, May	May 19: "Amaranth" arrives with supplies and "Mr. R.H. Robson came ashore at 6:45 A.M. to put [in] electric motor to drive Lens." (A. G. Carpenter, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II)
1941	Nov 4: "Received part of a message stating that the Coast Guard will, after November 1, operate as part of the U.S. Navy." (V.T. Barningham, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II) -United States Coast Guard (USCG) renovates radio and electrical systems in Fog Signal Building (Electrical Plans)
1942	May 13: "Worked in Fog Signal and Tower. Wiring and putting partition in." May 15: "Put partition in…Turned Light on to electricity for the first time. Now is a full pledge [fledge] Coast Guard Station." Oct 29: "Worked on radio equipment; installing the same. Went on the air at 7 P.M. this date; all working good." (V.T. Barningham, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II)
1943, September	Sept 1: "Digging cesspool for bathroom. Getting up gravel." Sept 2: "Tearing down partition." Sept 3: "Left for Bayfield via Michigan Island to pick up bathroom equipment." Sept 4: "Installing hot water tank." Sept 7: "Working on bathroom and water pipes for hot water tank." (V.T. Barningham, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II)
1944, October	Oct 13: "… tarring shingles." Oct 19: "Tarring roofs." (V.T. Barningham, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II)
1945	May 4: "Installing hot water tank in kitchen." May 9: "Cutting doorway in upstairs quarters." May 14: "Working on entry to bedroom in second floor quarters." June: "Laying linoleum…" throughout Keepers Quarters (V.T. Barningham, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II)
1947	May 28: "Dismantled old fish house on dock and hauled it up the hill back of the Fog Signal building to be used to build a coal bin." July 23: "Captain Wodyhosesfue and Mr. Porter and Field Mechanic arrived on picket boat to inspect ground in front of Light Tower and find means of checking edge of bank from getting closer to Tower." (Ted Schelnan, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II)
1948	Diesel-driven air compressors installed in Fog Signal Building (Electrical Plans)
1952	Mechanical and electrical remodel of Light Station Quarters (Mechanical Plans)
1961	Light automated (J. Busch, 2008)

Date	Work Described
1970	Apostle Islands National Lakeshore authorized
1976	Stabilization of USCG tower and Light Station (APIS/NPS Business Office File # D3423-Outer)
1977	Installed ¼" lexan for Tower windows, repoint and paint the Tower (APIS/NPS Business Office File # D3423-Outer)
1978	Repair and paint Oil Storage and Privy (APIS/NPS Business Office File # D3423-Outer)
1982	Repoint brickwork and paint trim for Oil Storage, Privy, Light Station, and Fog Signal Building; whitewash exterior Tower walls; installed generator on roof of Fog Signal Building and ran cable underground to connect to Quarters (APIS/NPS Business Office File # D3423-Outer)
1984	Removed existing lexan glass in lantern, installed new single pane ¼" laminated safety glass with new gaskets (APIS/NPS Business Office File # D3423-Outer)
1992	VEGA VRB-25 solar powered optic replaced 12 volt DC optic (J. Busch, 2008)
2002	Keepers Quarters and Fog Signal Building re-roofed (HSPT Reports, 2009)
2004	Erosion control efforts on the Light Station's banks: rock revetment and drainage trench installed (2005 park newspaper article)
2005	Erosion control efforts on the Light Station's banks: bioengineering techniques used to stabilize slope (2005 park newspaper article)

CHAPTER 3: CULTURAL LANDSCAPE REPORT

OUTER ISLAND EXISTING CONDITIONS

Introduction

The cultural landscape of Outer Island Light Station is a composition of features that remain from its development over the last 137 years as a light station and aid to navigation. As one of six light stations in the Apostle Islands, the Outer Island Light Station plays an important role in the 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 Outer Island 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 limited 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.[13] 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 Outer 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. In the CLR, the portion of the reservation that contains structures and buildings is referred to as the grounds. 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 Outer Island Light Station.

The existing condition 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 provided by park staff.

[13] 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 each light station as 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 Outer Island begins with the construction of the Outer Light Tower and Keepers Quarters in 1874, and ends with the Light Tower's automation in 1961. Six periods of landscape change document the evolution of the Apostle Islands light station's cultural landscape. Three of the six periods of landscape change are within the Outer Island Light Station's period of significance; these periods are noted by italics:

- Pre-Light Station (1852 – 1873)
- *Early Light Station (1874-1900)*
- *Light Station (1901-1938)*
- *Coast Guard (1939-1960)*
- Automated Light Station (1961 – 1969)
- National 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 I, Chapter 3: *Context, Current Designations, and Park Significance*.

Pre-Light Station (1852–1873)

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. The location was later changed to Long Island. Before construction began the location was again revised, and the first lighthouse was ultimately built on Michigan Island in 1856.[14]

In 1871, District Engineer Major Orlando M. Poe recognized the need for additional lighthouses and made efforts to secure land and funds for a light station at Outer Island. Gull, Sand and Devils Islands were also considered, but Outer Island was selected because of its northeastern-most location in the archipelago. In 1873, the light station reservation was established on Outer Island.[15] No permanent physical improvements related to the light station were built on Outer Island during this period. Construction of the Outer Island Tower and Keepers Quarters began in 1873 but halted when it was discovered that the foundations were placed in the wrong locations.[16]

[14] 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 126
[15] Ibid, page 128
[16] Ibid, page 128

Early Light Station (1874–1900)

In 1874, with locations corrected, construction resumed on the Outer Island Tower and Keepers Quarters. The light station reservation was located on the center peninsula of the island's north shore (its most northern point). The level bluff was cleared of trees to allow for construction of the light station buildings and features. The bank was cleared to allow greater visibility of the Outer Island Tower (Site Image OI-01).

The Outer Island Tower and Fog Signal were completed in the early autumn of 1874. The Fog Signal was the first of its kind to be built in the Apostle Islands. Unfortunately, the original Fog Signal Building was built into the bank, which was a poor location, for the bank caved in around the building the week following its construction. It was rebuilt west of the Keepers Quarters and Tower in 1875. In 1879, a second Fog Signal (2) was built west of the original Fog Signal (1). H. Bamber's 1893 map (Site Image OI-02) refers to those structures as Whistle House 1 and Whistle House 2.

The initial docks at Outer Island were problematic, requiring many repairs and modifications during this period. The keeper's logs document the dock being washed away several times during the light station's earliest years. In 1883, a boat dock and pier were built creating a boat harbor.[17] The dock extended north-south with a pier extending to the west (Site Image OI-02).

Heavy wave action, storms and winter conditions of Lake Superior make any structure built along its shorelines susceptible to damage. The Boathouse had to be rebuilt on multiple occasions during this period. The date of the first Boathouse is unknown, but historic photographs indicate a Boathouse present in 1891. The 1893 map (Site Image OI-04) shows the Boathouse at the base of the cliff on the shore, oriented in a north to south direction. A Siphon House was built circa 1886 north of the Boathouse to pump water up to the Fog Signal Buildings and Keepers Quarters.[18]

Wooden walkways predated concrete walks on the light station grounds during this period. Site Image OI-10, a historic photo from 1893, clearly shows the wooden walkways leading to a well located southeast of the Keepers Quarters. A cistern was built south of Fog Signal 1, which is still extant today, and the former location of the well is marked by two wooden boards.

Keeper's logs and historic photographs indicate that early in this period an inclined wooden tramway was built on the bank and dock, and was used for transporting goods and fuel from the boat dock up to the light station.[19] A wooden pipe box and staircase connected the Siphon House to both Fog Signals through a pipe that ran east-west in front of the buildings. The box provided water needed to operate the Fog Signals. The pipe box followed the bank and was parallel to, and west, of the tramway. Both the tramway and the staircase associated with the pipe box provided pedestrian routes up the bank, but the staircase was the primary route. Tramway improvements and modifications were done in 1887 and again in 1908.

The Oil Building (Storage) was built in 1895 west of the Tower and Keepers Quarters.[20]

By the end of this period the basic spatial arrangement of the light station was in place. The grounds were cleared of forest vegetation, the primary structures were in place and access (boat dock) and circulation routes were established.

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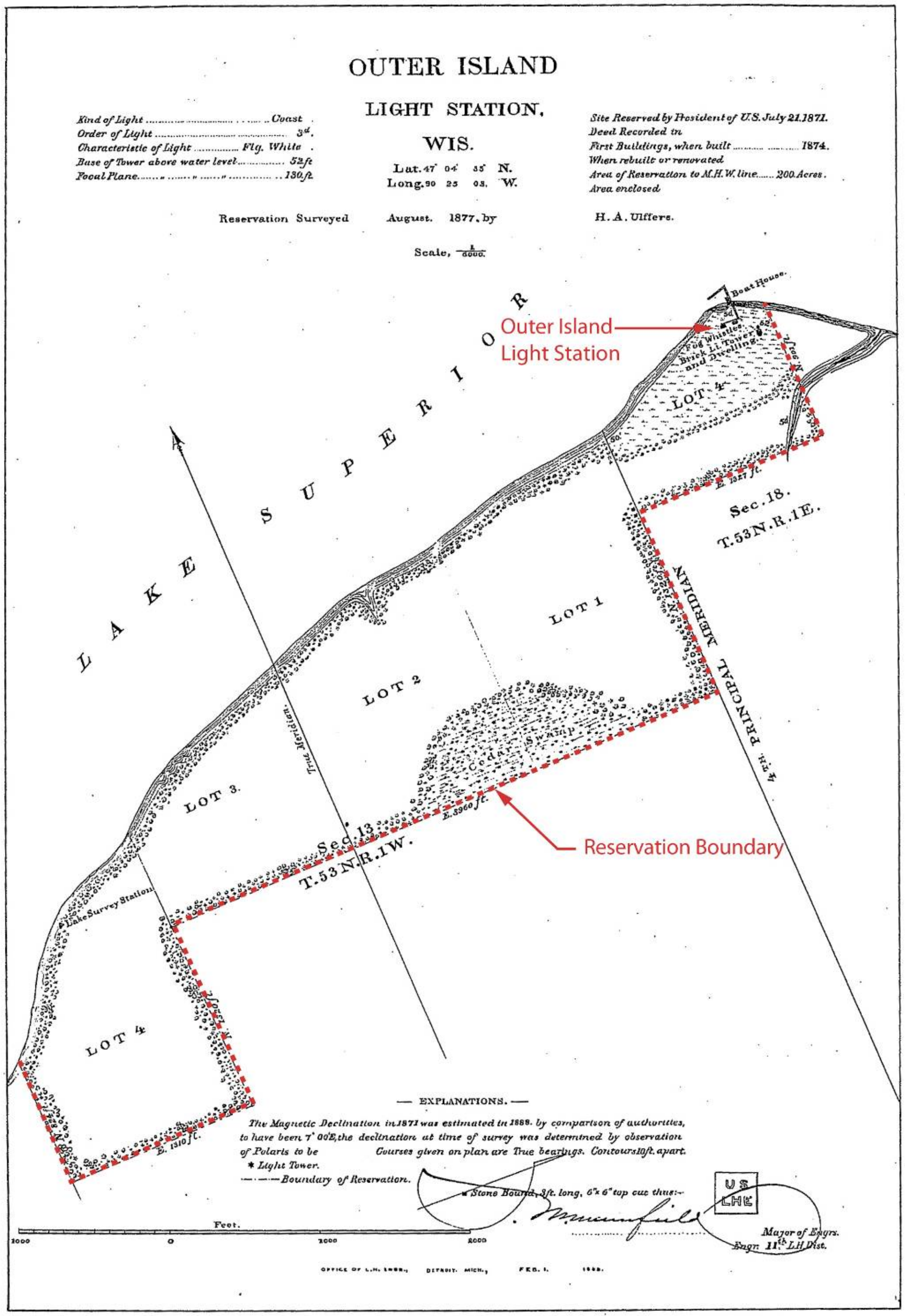
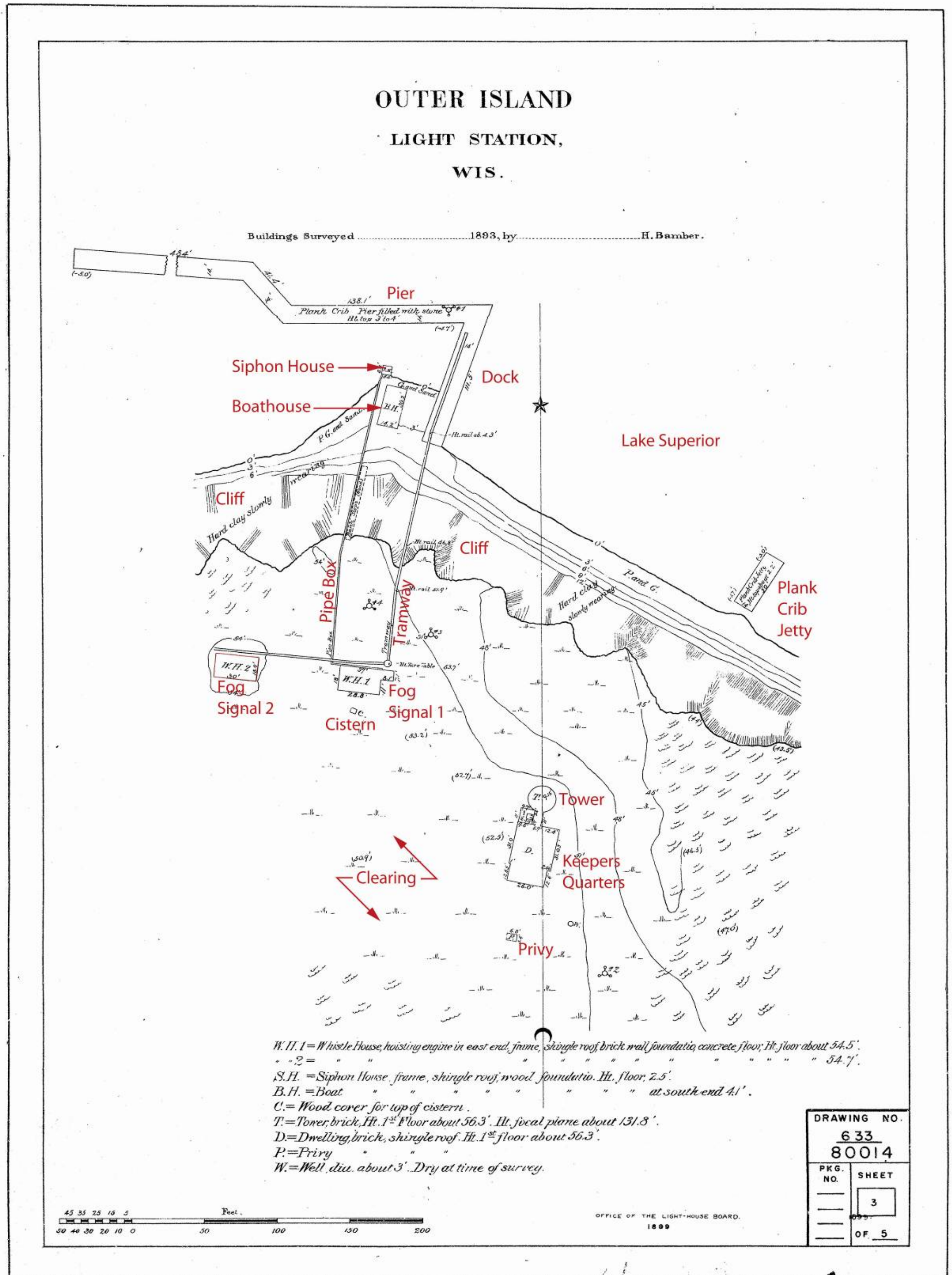
[17] Ashland Daily Press 9/4/58: *Outer Island – Most Isolated Place In State of Wisconsin*
[18] Ashland Daily Press 9/4/58: *Outer Island – Most Isolated Place In State of Wisconsin*
[19] Outer Island Keepers Log, page 4
[20] Ashland Daily Press 9/4/58: *Outer Island – Most Isolated Place In State of Wisconsin*

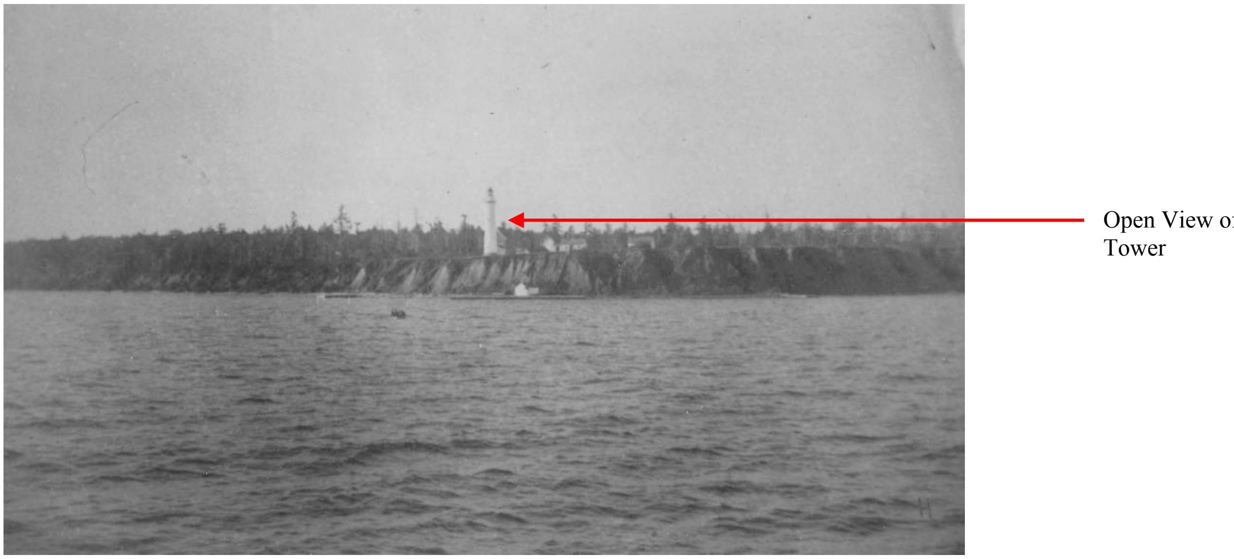
Pre-Light and Early Light Station Historic Survey and Photographs



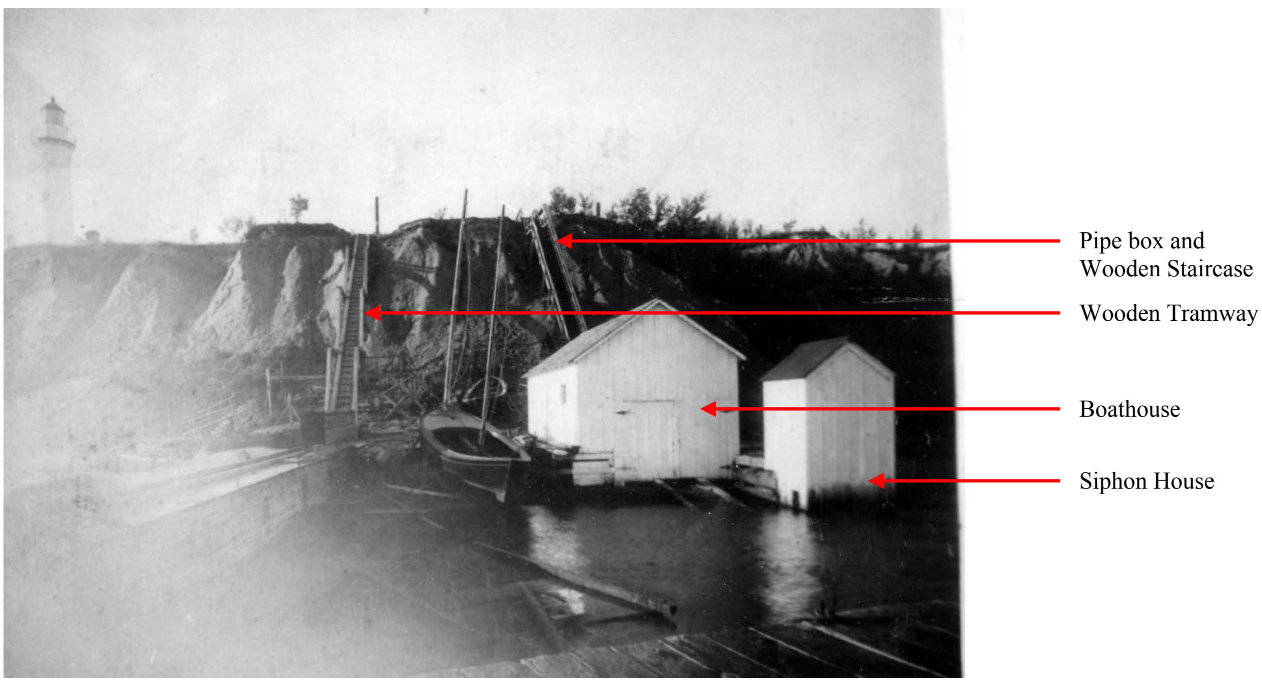
Site Image OI-01: Outer Island Light Station Reservation Map, 1877, updated 1888 (Source: NPS APIS Archives)



Site Image OI-02: Outer Island Light Station, 1893, represents the Early Light Station (1874-1900) period (Source: NPS APIS Archives)

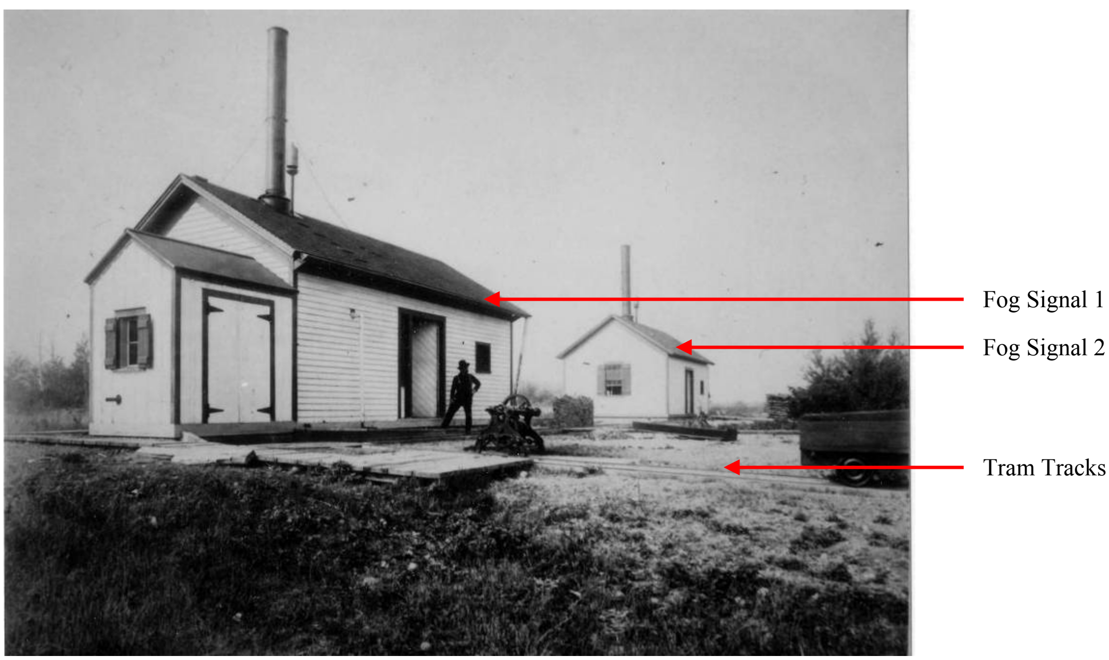


Site Image OI-03: Outer Island Light Station from Lake Superior, note cleared top of bluff, 1891 (Source: NPS APIS Archives)



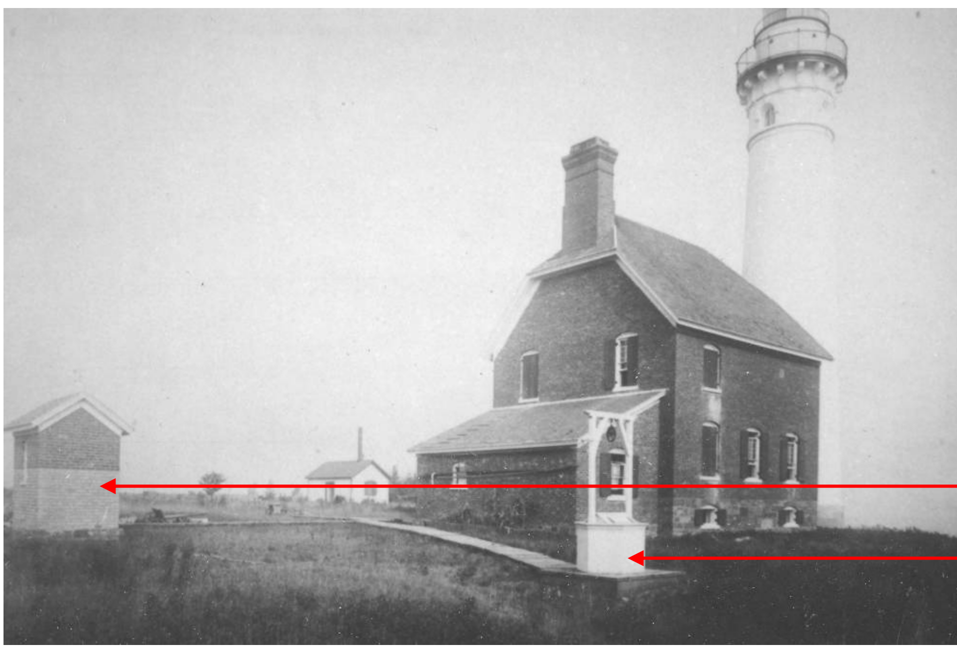
Site Image OI-04: Outer Island Boathouse and Siphon House, the pipe box extends up the cliff on the right and the original wooden tramway is on the left. Tower at left, c. 1893 (Source: NPS APIS Archives)

Site Image OI-05: Outer Island original wooden tramway (left) and pipe box (right) Tower at left, c. 1893 (Source: NPS APIS Archives)



Site Image OI-06: Outer Island Fog Signal Building 1 in foreground with tram tracks inset on wooden platform; and Fog Signal Building 2 with pipe box in background, c. 1893 (Source: NPS APIS Archives)

Site Image OI-07: Outer Island Tower and Keepers Quarters, note wood planks in foreground, c. 1893 (Source: NPS APIS Archives)



Site Image OI-08: Outer Island Tower and Keepers Quarters, Privy, Fog Signal Building 2 and well, note wood planks to well, c. 1893 (Source: NPS APIS Archives)

Light Station (1901–1938)

Change to the landscape during this period included the removal of Fog Signal (2) and the expansion of Fog Signal (1). It appears that the materials from #2 were used for the addition to #1. [21] The pipe box and staircase structures were removed and a new pipe constructed adjacent to a new concrete tramway. The new concrete tramway and adjacent pipe changed the appearance of the entryway to the station; now just one structure ascended the embankment rather than two.

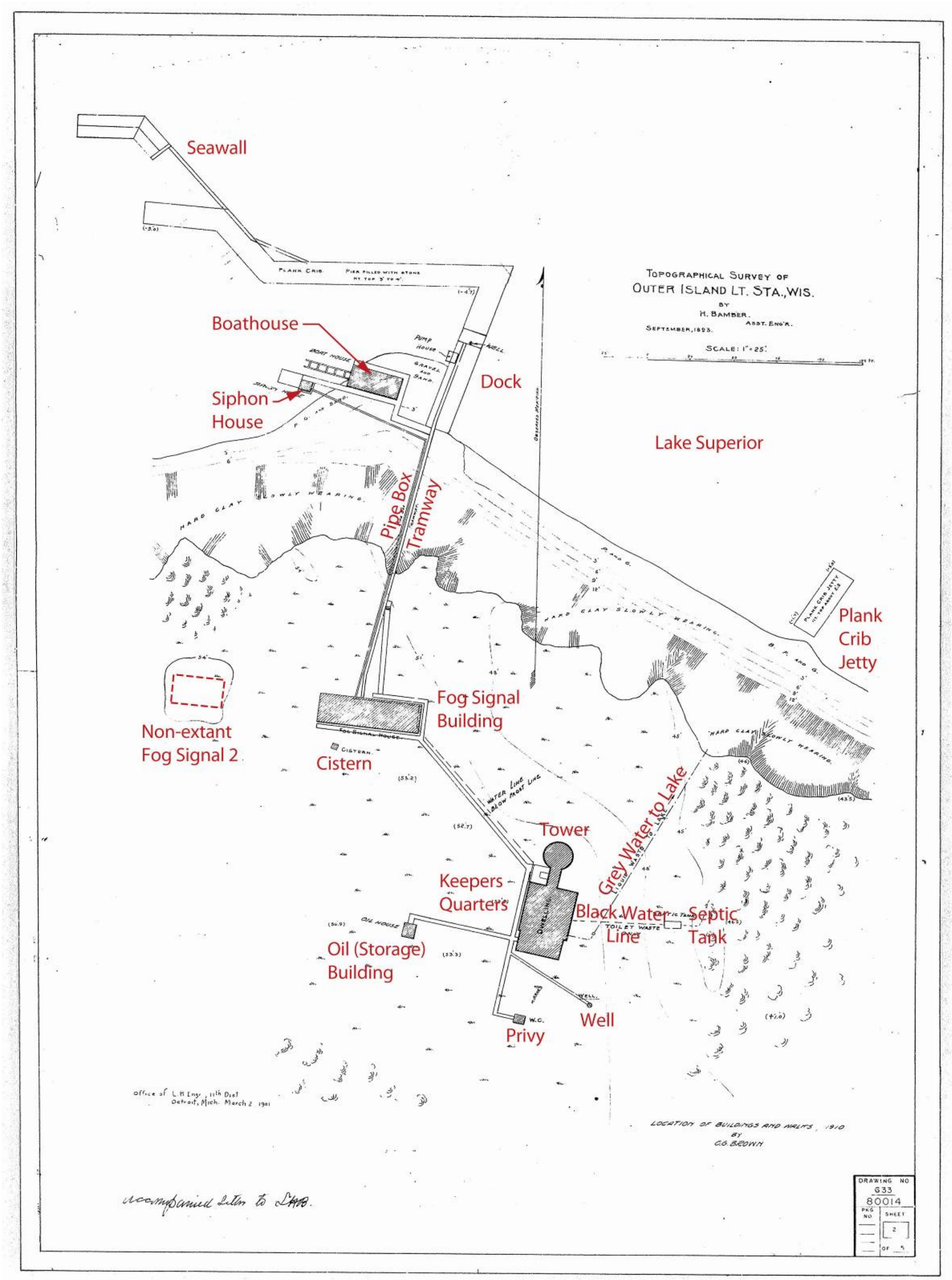
Heavy wave action, storms and winter conditions of Lake Superior continued to be problematic to the structures along the shoreline during this period. In the 1910s, a new Boathouse and Siphon House were built in the previous Boathouse location, but re-oriented in an east to west direction (Site Image OI-11). The Boathouse was again modified in the 1930s and placed in a new location further from the shore and adjacent to the pier.

In the early 1930s, the wooden tramway structure was removed and replaced with a concrete structure. The wooden tram track platform between the top of the tramway and Fog Signal Building was replaced with a concrete pad for the tracks. Historic photos indicate this was complete prior to 1934.[22] The boat dock was also modified and repaired during this period. Brown's annotation in 1910 of H. Bamber's 1893 map indicates that a seawall was built northwest of the dock. The map also indicates that a plank crib jetty existed southeast of the dock, at the bottom of the bank northwest of the Outer Island Light Tower and Keepers Quarters.

The keeper's logs refer to a culture of husbandry at the light station grounds. A garden with corn, potatoes, and other vegetables was planted between the Keepers Quarters and the Privy. Currants and raspberry bushes were planted along the west side of the Keepers Quarters. The logs refer twice to a cow being brought to the light station, and to a chicken coop, barn, shed and smokehouse, none of which are extant today and their previous locations are unknown.[23]

[21] Ashland Daily Press 9/4/58: *Outer Island – Most Isolated Place In State of Wisconsin*
[22] Outer Island Keeper's Log, page 1032
[23] Outer Island Keeper's Log

Light Station Historic Survey and Photographs

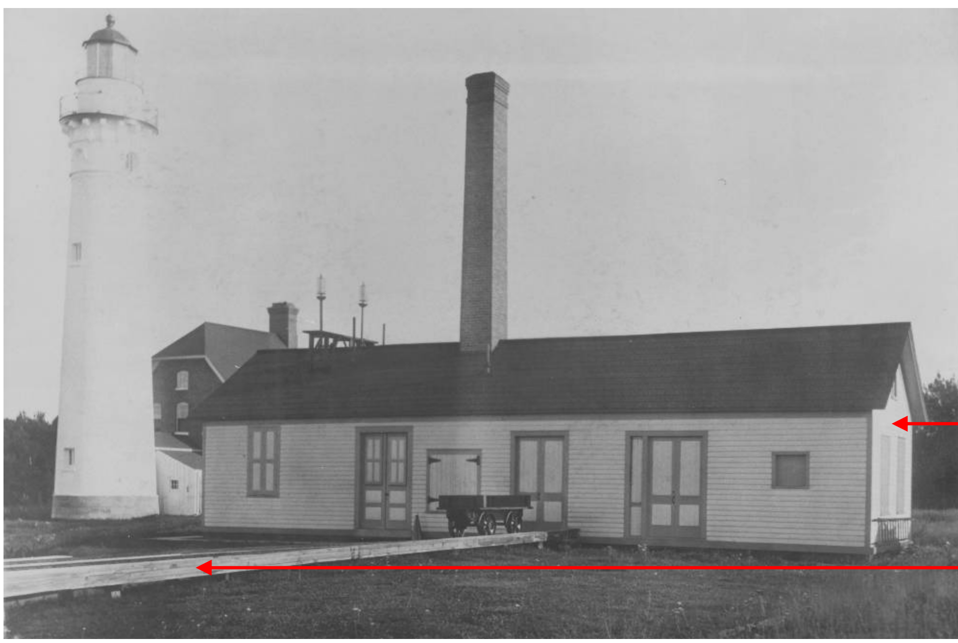


Site Image OI-09: Outer Island Light Station, 1910, represents the Light Station (1901-1938) period (Source: NPS APIS Archives)

Note Extent of
Cleared Area

Note Meadow
Condition of Light
Station Grounds

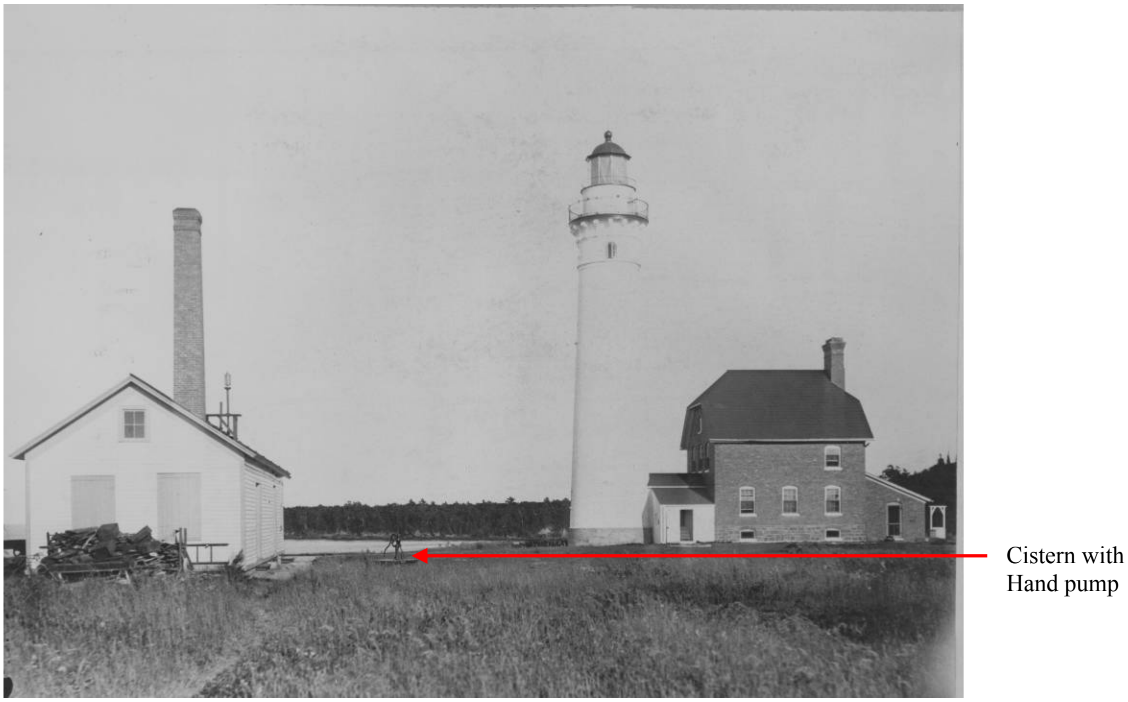
Site Image OI-10: From left: Fog Signal Building, Outer Island Tower and Keepers Quarters, Oil Storage, and Privy, c. 1905 (Source: NPS APIS Archives)



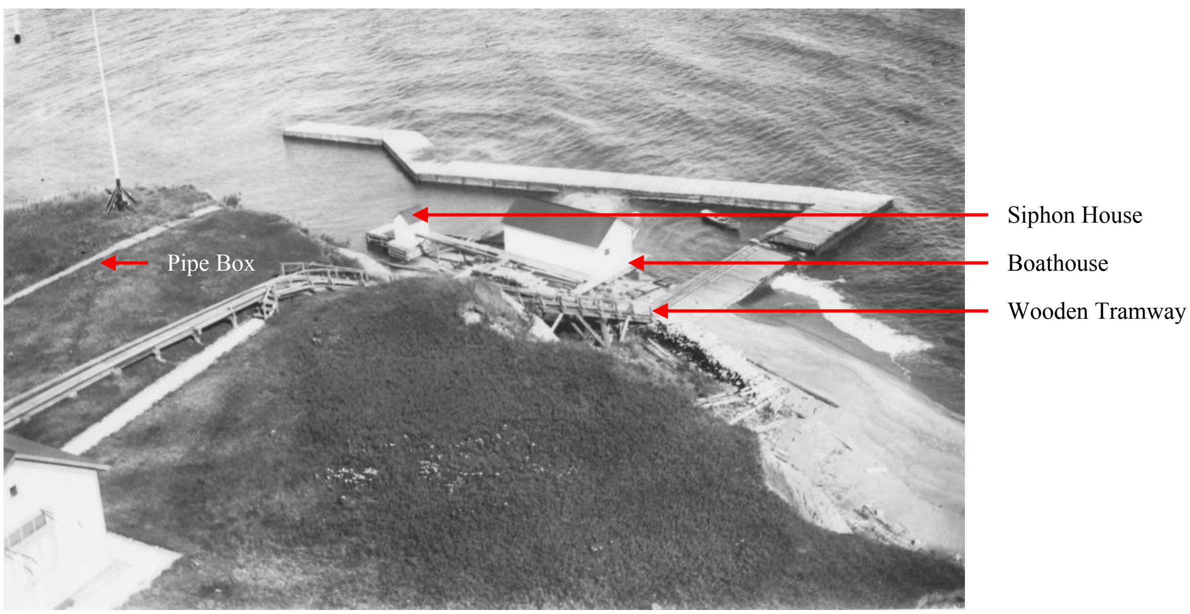
Fog Signal Building (Formerly
Fog Signal 1 with a new west
addition)

Wood Plank Platform and
Tram Tracks connecting
Tramway to Fog Signal Building

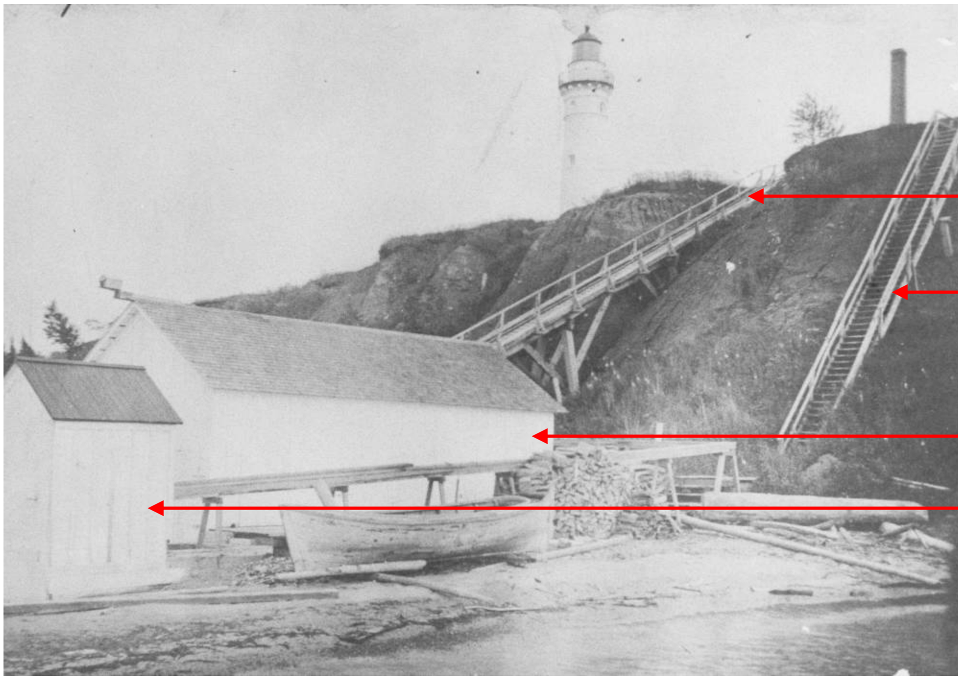
Site Image OI-11: Outer Island Fog Signal Building, c. 1913 (Source: NPS APIS Archives)

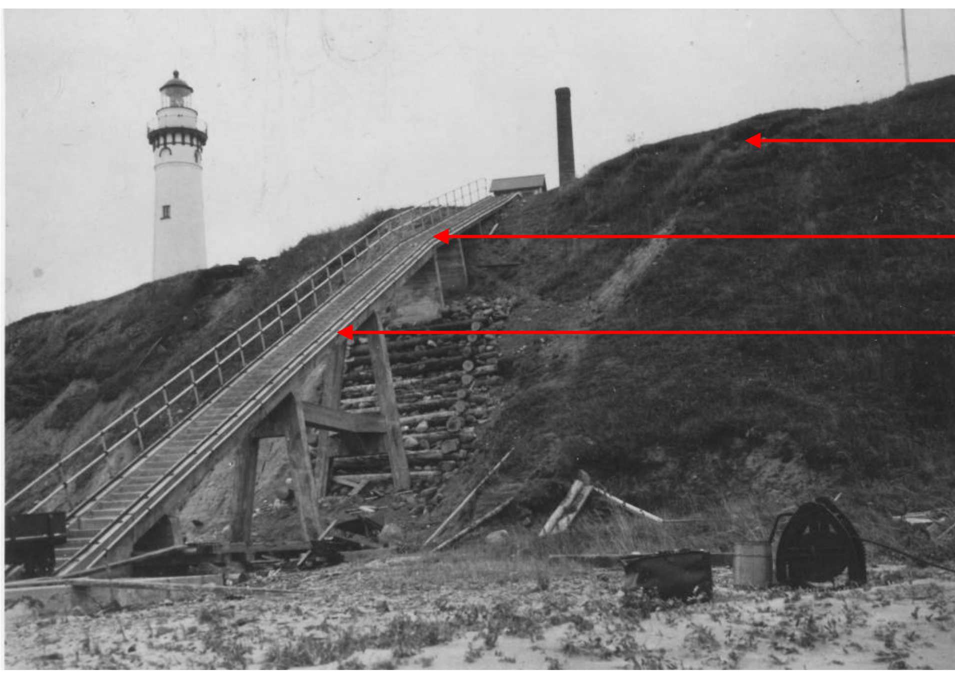


Site Image OI-12: Outer Island Fog Signal Building and Outer Island Tower and Keepers Quarters. Note cistern with hand pump, c. 1913 (Source: NPS APIS Archives)

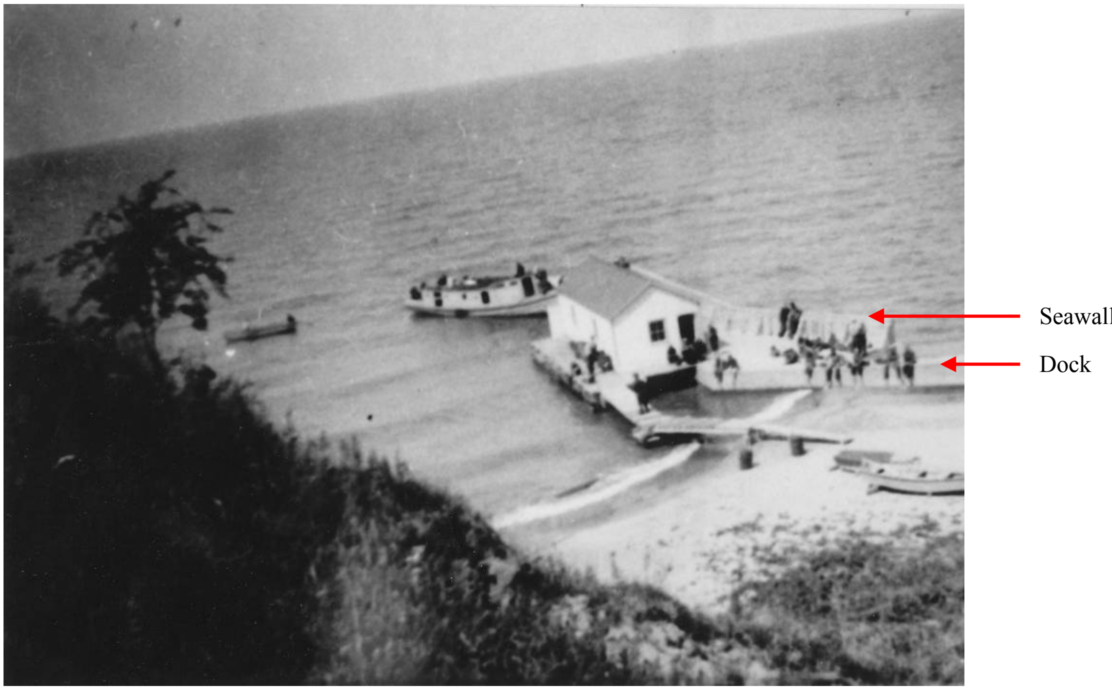


Site Image OI-13: Outer Island Siphon House, Boathouse, original wooden tramway, and dock, c. 1913 (Source: NPS APIS Archives)





Site Image OI-14: Outer Island tramway. Above, c. 1904; below, c. 1938 (Source: NPS APIS Archives)



Site Image OI-15: Outer Island Boathouse and dock, c. 1937 (Source: NPS APIS Archives)

Site Image OI-16: Outer Island Boathouse and dock, c. 1937 (Source: NPS APIS Archives)

Site Image OI-17: Outer Island Tower and Keepers Quarters. Note tree in foreground, c. 1937 (Source: NPS APIS Archives)

Site Image OI-18: Outer Island Keepers Quarters from west. Note small white building in background, c. 1937 (Source: NPS APIS Archives)

Coast Guard (1939-1960)

In 1939, the United States Bureau of Lighthouses was eliminated and the United States Coast Guard (USCG) took over the operation of the Outer Island Light Station. Soon after, civilian lighthouse keepers were replaced by Coast Guard staff. A Coast Guard crew remained on Outer Island until automation in 1961.

This period resulted in limited additions to the light station grounds with only a few improvements added, including the conversion to electricity in 1939.[24] The large fuel tank west of the Keepers Quarters (currently extant) was added, obscuring the open space between the Keepers Quarters and the Fog Signal Building. The tramway and boat dock received extensive repair and restoration in 1948. After the departure of the light keeper, many of the domestic plantings, such as the vegetable garden, no longer received annual maintenance and slowly fell into disrepair and were ultimately removed.

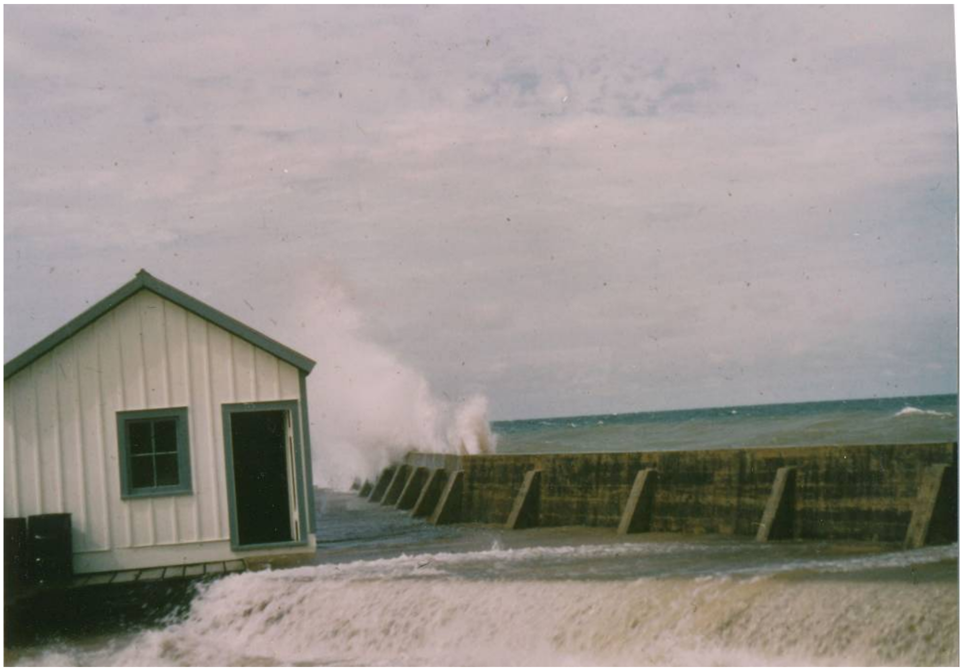
The area that had been cleared of vegetation around the light station remained open during this period, with clear views between the light station and Lake Superior (Site Image OI-19).

Coast Guard (USCG) Photographs

Note Extent of Clearing

Site Image OI-19: Outer Island Boathouse, Fog Signal Building, Tower and Keepers Quarters viewed from the west, c. 1943 (Source: NPS APIS Archives)

[24] 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 132



Site Image OI-20: Outer Island Boathouse and seawall, c. 1943 (Source: NPS APIS Archives)

Site Image OI-21: Outer Island Tower, Keepers Quarters, Oil Building (Storage), and Fog Signal Building. Note three trees near Keepers Quarters, c. 1943 (Source: NPS APIS Archives)

Automated Lighthouse (1961-1969)

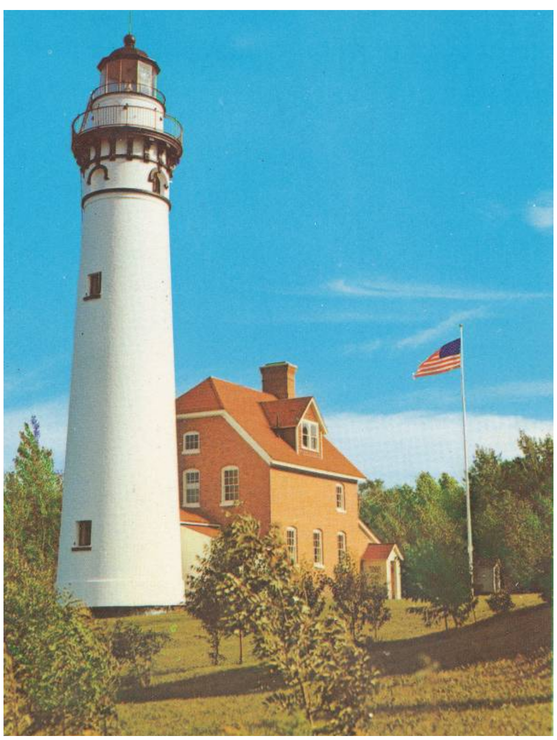
This period began in 1961 with the automation of the Light Tower. Automation eliminated the need for a USCG to maintain a manned presence on the island. The primary physical changes during this period were associated with the loss or diminishment of landscape features. The open, cleared area of the reservation was slowly reduced as the adjacent forest vegetation encroached onto the light station grounds.

National 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 visitors and brought about changes in the landscape that primarily related to island access, recreation and visitor use, and maintenance. The alterations to the light station included the addition of visitor trails, park signage, a vault toilet restroom, a solar panel, and also preservation of the buildings and structures.

The most substantial modifications to the light station grounds were related to a stabilization project undertaken in 2004 and 2005 to reduce erosion of the steep shoreline banks. At the edge of the bluff, a drainage system was installed to intercept surface and ground water before it reaches the highly erodible banks. The drainage swale extends along the entire north end of the grounds, subtly altering the topography. Additional erosion control work on the shoreline banks included the placement of rip-rap at the toe of the bank and the terracing and planting of other portions of the bank.

Park Service Photographs



Site Image OI-22: Outer Island Tower, Keepers Quarters, flagpole, and Privy. Note encroaching vegetation in foreground, c. 1974 (Source: NPS APIS Archives)

Site Image OI-23: Outer Island Tower, Keepers Quarters, and Fog Signal Building. Note encroaching vegetation in foreground and behind Tower and Keepers Quarters, c. 1977 (Source: NPS APIS Archives)

Site Image OI-24: Outer Island Fog Signal Building. Note encroaching vegetation in foreground, c. 1977 (Source: NPS APIS Archives)

Site Image OI-25: Outer Island Tower, Keepers Quarters, Fog Signal Building. Note bank stabilization work to the left of the tramway, 1981 (Source: NPS APIS Archives)

ENVIRONMENTAL CONTEXT

Outer Island is 7.0 miles long and 2.8 miles wide and is approximately 7,999 acres in size. The maximum elevation above the lake is 268'.[25] The pre-settlement forest on Outer Island was dominated by large hemlock, white pine, and yellow birch, with sugar maple, white cedar, balsam fir, red oak, white birch, and red maple also present.[26] Most of the island was commercially logged from the 1920s through the 1950s. Currently, the majority of the vegetation on Outer Island is dominated by the mesic forest type, which includes the hemlock/white pine/hardwood community.[27] The light station reservation on Outer Island was not commercially logged. A 200 acre old growth forest occurs on the northern end of the island within the light station reservation, and is one of the oldest remaining stands of northern hardwood hemlock forest remaining in the Great Lakes region.[28] This stand is also unique because the island has never had a resident population of deer and the forest has not been subjected to browsing. Canada yew and mountain maple form a dense understory in this unlogged tract. The vegetation within the light station grounds is mostly a mowed lawn with scattered trees and shrubs. Forest trees now grow in the formerly cleared areas to the west, south, and east of the light station grounds. Nonnative species are present, including weedy species on the steep clay bank and steps in front of the lighthouse.[29] Unusual plant communities are found along the ledges and bluff, and include rare species such as marsh grass-of-parnassus and butterwort (*Pinguicula vulgaris*).[30]

As with the other islands, wildlife on Outer Island is not as diverse or abundant as that on the mainland.[31] 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*). Outer Island is one of only several islands without a history of deer.[32] Outer Island is a very important migratory bird concentration area, especially during the fall.

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[25] National Park Service (NPS). 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.
[26] Judziewicz and Koch 1993
[27] NPS 2009
[28] Judziewicz and Koch 1993
[29] Judziewicz and Koch 1993
[30] see the Federal and State Threatened and Endangered Species section
[31] ibid
[32] ibid

EXISTING CONDITION ASSESSMENT AND LANDSCAPE ANALYSIS

The existing condition assessment and landscape analysis for the Outer 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 Outer 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.

- <u>Spatial Organization</u> - is the arrangement of elements creating the ground, vertical and overhead planes that define and create space, including the arrangement of topography and buildings.
- <u>Topography</u> – is the three-dimensional configuration of the landscape surface characterized by features and orientation; including bluffs, cliffs, slopes and drainages.
- <u>Views and Vistas</u> – 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.
- <u>Circulation</u> – are spaces, features, and materials that constitute systems of movement.
- <u>Buildings</u> - buildings that are either currently or were historically habitable are presented in the Historic Structure Report.
- <u>Structures</u> - are smaller non-habitable buildings or significant features (now or historically) such as privies, tramways, and outbuildings.
- <u>Small Scale Features</u> – 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.
- <u>Vegetation</u> – Indigenous or introduced trees, shrubs, vines, ground covers, and herbaceous materials; including lawns, and landscape garden areas.

The existing condition of the Outer 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 Outer 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, and dock as these defined the setting and lifestyle of the keepers that created many of the landscape features.

Spatial Organization

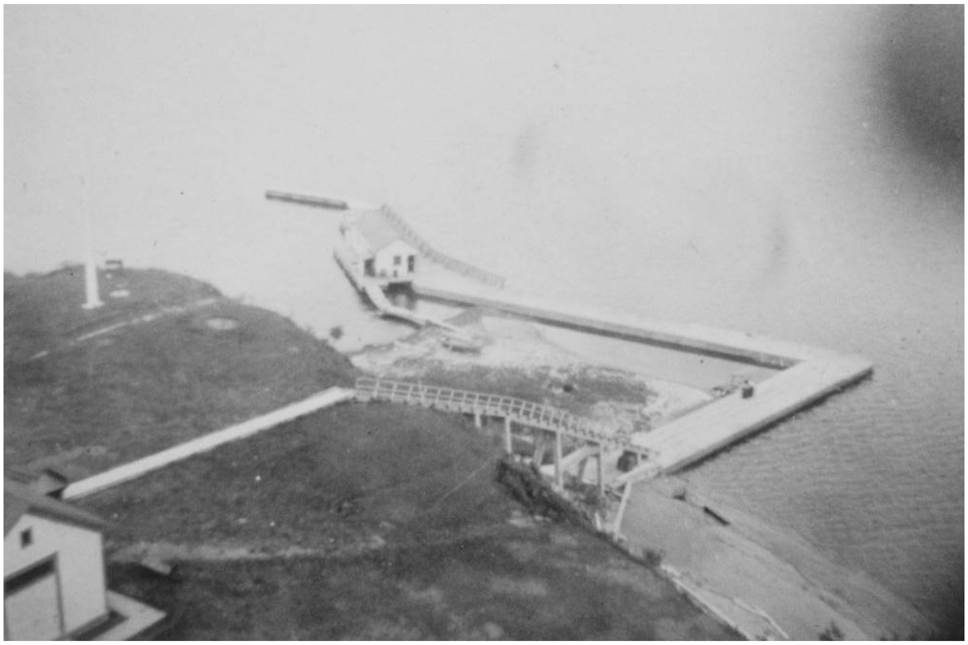
Spatial organization at the Outer Island Light Station is of two distinct scales, the organization of the reservation and that of the light station grounds. While they are distinct they are also directly related. The cleared area of the reservation is also discussed in the vegetation section.

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.

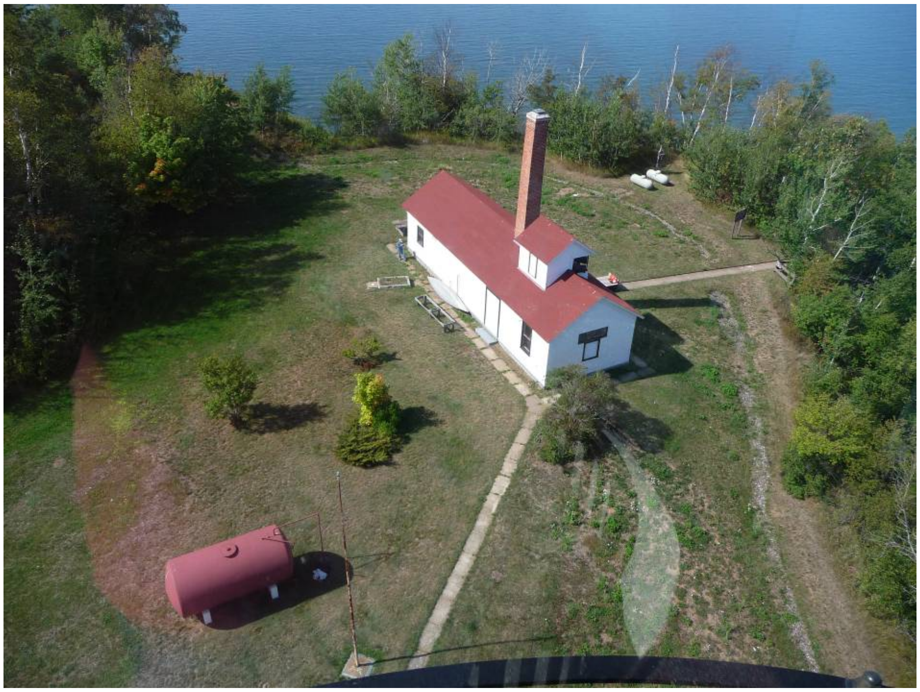
The light station grounds are arranged in a southeast progression from the top of the tramway, with the buildings and forest edge defining the core of the light station grounds. Within the grounds, the structures, tram tracks, and concrete walks reinforce this outdoor common space. The dominant elements are the Outer Island Tower and Keepers Quarters, defining the eastern edge of the light station grounds. The siting of the Oil Storage directly west of the Keepers Quarters, along with the mountain ash tree and lilacs, creates the feeling of separated areas within the light station grounds, one south between the Oil Storage and Privy, and one north between the Oil Storage and the Fog Signal Building. The north perimeter of the grounds along the cliffs is edged by new growth on the embankment and is more open and exposed than the remaining three sides. The overall feeling is one of enclosure, 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.. 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 OI-24, OI -25). Automation of the light eliminated the need for a manned presence on the light station. After the USCG removed this presence, the grounds and reservation were not cleared as extensively or as regularly. Spatial composition is an important contributing feature to the cultural landscape, and the encroachment of the forest and reduction in the cleared area has diminished the integrity of this feature and the light station.

Spatial Organization Photographs



Site Image OI-26: View west from Light Tower with boat dock, tram tracks, and concrete walk from Fog Signal Building to the Keepers Quarters: above, after 1934 (Source: NPS APIS Archives); below, 2009 (Source: MBD P1010893.JPG)



Site Image OI-27: Light station grounds from Light Tower, looking west to Fog Signal Building. Note the vegetation on the embankment, 2009 (Source: MBD P1010887.jpg)

Site Image OI-28: View of light station grounds from Light Tower looking south, 2009 (Source: MBD P1010890.jpg)

Topography

Existing Condition. The light station grounds on Outer Island are located on a bluff, rising approximately 50' 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 the Outer Island Tower, Keepers Quarters, and Fog Signal Building occupying the highest points of the site. The remainder of the site slopes gently south, east, and west towards the bordering forest. A drainage swale, constructed in 2005, runs the length of the light station grounds along the northern perimeter. At the north edge of the grounds, steep banks slope down to Lake Superior. The embankment slope is highly erodible but currently stable. The shoreline adjacent to the light station has stone revetment approximately 50' wide at the bottom of the bank. Overall, the condition of the light station's topography is good, with the exception of the shoreline bank, which is fair with high erosion potential.

Analysis. The topography of the light station reservation remains generally as it has since development of the light station. One exception is the extensive erosion control measures on the northern banks which were implemented in the early 1980s and again in 2005 to reduce erosion of the banks and potential impacts to the light station grounds and structures. The work included stone revetment covering the shoreline zone (which was once a sandy beach), bioengineering along the shoreline banks primarily with log cribs and planting of native shrubs and forbs, a drainage swale along the northern edge of the light station grounds, and terracing portions of the banks. The drainage swale has created a subtle change to the landscape while the slope terracing has a more apparent impact to the topography.

The topography of the light station reservation and light station grounds is a contributing feature. The visual character of the erosion control work has diminished the integrity of the cultural landscape.

Topography Photographs, 2009

Site Image OI-29: Banks and shoreline with erosion control and stone revetment looking east from the dock, 2009 (Source: MBD DSC00606.JPG)

Site Image OI-30: Banks and shoreline with erosion control and stone revetment looking west from the dock, 2009 (Source: MBD P1010839.JPG)

Site Image OI-31: Drainage swale along northern edge of the site, view east from north of the Outer Island Tower, 2009 (Source: MBD P1020009.JPG)

Site Image OI-32: View south from the Keepers Quarters of the ground's gentle slope south and west, 2009 (Source: MBD P1010953.JPG)

Views and Vistas

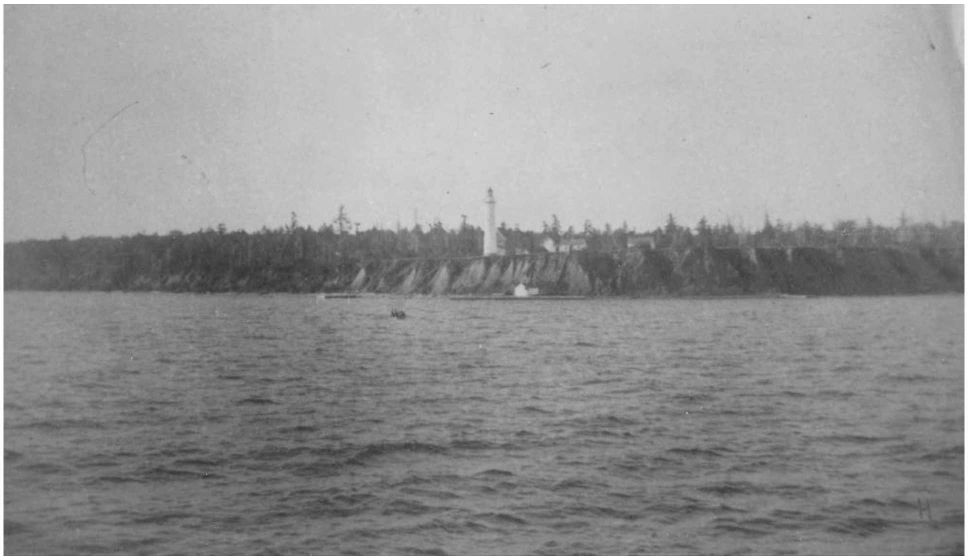
Existing Condition. Notable views to Outer Island include those of the Light Tower from passing ships and pleasure boats on Lake Superior. Notable views from the island include those to the north over Lake Superior from the light station grounds, and those from the top of the Light Tower across the island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

Analysis. The Outer Island Tower is the furthest east and north of all the Apostle Islands light stations. The view to the tower historically served as a reference point and navigational aid for passing ships. This continues today with the tower signaling either the beginning or terminus of the Apostle Islands.

The extent of views to and from the light station grounds has been reduced due to the encroachment of forest vegetation resulting from a reduction in vegetation clearing. A review of historic photographs indicates that the Light Tower, Keepers Quarters and Fog Signal Building were clearly visible from the water during the period of significance. Today, views from Lake Superior to the light station are obscured by vegetation, however the Light Tower remains visible above the trees due to its height, reducing the need for clearing the forest. The Keepers Quarters and Fog Signal Building are only visible from Lake Superior where recent erosion control activities have re-opened vistas. Views from the light station grounds are also obscured due to encroaching and maturing vegetation. Views from the Light Tower over Lake Superior and south over 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 Outer Island Light Station. The loss of these diminishes the integrity of the light station.

Views and Vistas Photographs



Site Image OI-33: View to Tower from Lake Superior; above, 1891 (Source: NPS APIS Archives); below, current view obscured by encroaching vegetation, 2009 (Source: MBD P1010831.JPG)

Site Image OI-34: View from Tower to the west, 2009 (Source: MBD P1010881.JPG)

Site Image OI-35: View from Tower to the north, 2009 (Source: MBD P1010897.JPG)

Site Image OI-36: View from Tower to the east, 2009 (Source: MBD P1010894.JPG)

Circulation/Accessibility

Existing Condition. Circulation on Outer 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 is a method of transporting goods between the two. Tram tracks atop concrete paving connect the tramway and the Fog Signal Building. Concrete walks connect the Fog Signal Building, Tower, Keepers Quarters, buildings and small scale features. A natural surface trail originates approximately 50' south of the Privy and leads south, through the forest across 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 Outer Island has remained similar to the original access and basic routes that were established during the Early Light Station period (1874-1900). Primary transit to the island was historically and continues to be by boat, landing at the boat dock on the island's north side. Originally, pedestrian circulation from the shore to the light station was along the wooden staircase associated with the pipe box leading to Fog Signal 2 in the area west of the current tramway. An inclined wooden tramway leading to Fog Signal 1 existed early on in the area of the current tramway. During the Light Station period (1901-1928), the wooden tramway was removed and the concrete tramway was built in the same location. The pipe box was rerouted as part of the new construction and ascended the bank adjacent to the tramway. This substantial change brought new technology and a more efficient method of transporting goods and water up to the light station. The concrete tramway remains today. The tram tracks from the top of the tramway to the Fog Signal Building served as both a means for moving goods and fuel as well as pedestrian circulation.

The concrete sidewalks were installed on the grounds during the Lighthouse period, and remain today. Typical to the Apostle Islands light stations, the concrete walks were precast units, narrow in width, and placed on the ground surface in straight lines connecting buildings and other site features. Concrete walks linked the Fog Signal Building to the Tower and Keepers Quarters, then south to the Privy, and eventually west to the Oil Storage. The concrete walks were preceded by wooden plank walks, laid on the ground surface. In the 1990s, a trail was built leading from the light station south into the forest.

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 station's significance as a cultural landscape. The 1990s 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: 108 steps on the tramway connecting the boat dock to the light station; steps leading into and through buildings and structures; the narrow width of site walks (30") and isolated areas of site walk settlement that present tripping hazards (>1/2"). The terrain of the light station grounds are generally flat and present few barriers to improved accessibility. 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.

Circulation Photograph

Site Image OI-37: View west from Tower with boat dock, tram tracks, and concrete walk from Fog Signal Building to the Keepers Quarters, 2009 (Source: MBD P1010893.JPG)

Buildings

The Outer Island Light Station buildings include: the Outer Island Tower, Keepers Quarters, Fog Signal Building, Oil Storage and Privy. For information refer to the Historic Structure Report directly following the CLR.

Structures

The structures on Outer 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, 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 is 14’ wide and extends from the shore in an ‘L’ shape to the north (100’) and then jogs west (200’), to form the breakwater. The existing dock was constructed in 1958. It is a steel sheet pile structure in-filled with stone rubble, capped and sided with concrete. The top of the boat dock has approximately 80’ of tram rails set into the surface, which are connected to the inclined tramway. The boat dock is in good condition.

Analysis. The existing location and “L” shape of the boat dock is designed to protect the harbor and it reflects the design of the original 1883 crib construction. The dock has been modified and repaired multiple times since the initial implementation in the Early Light Station period but remains in the same locations and retains a similar configuration.

Several Boathouses have previously existed near the dock, in varying orientations, but always within the protected area southwest of the dock. There is no extant boathouse remaining on the site. The current boat dock dates to 1958 and is a contributing feature.

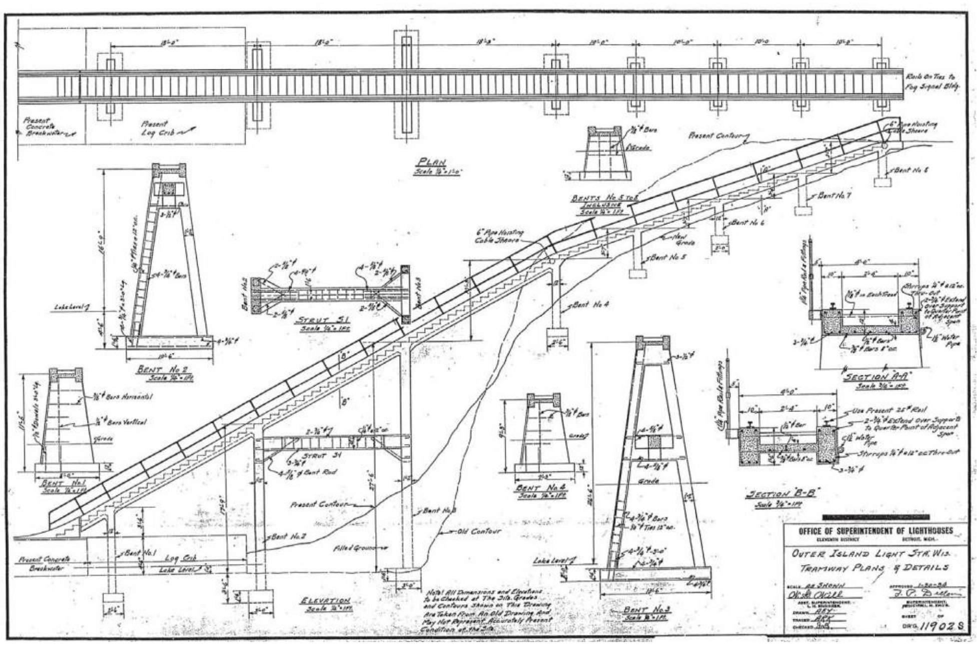
Boat dock planning work is currently under study by the NPS under separate but related projects, including the Great Lakes Restoration Initiative.

Tramway

Existing Condition. The inclined concrete tramway is 105’ long and connects the boat dock to the top of the bluff, rising approximately 50’ above the shoreline. The tramway consists of: concrete structural support footings, cast iron tram rails with formed concrete steps between the rails, a tram hoist at the top of the tramway, and a steel pipe railing located on the east side of the structure. The tramway is built of cast-in-place reinforced concrete and is supported by eight concrete structural supports with footings, four spaced evenly at 18’ along the lower portion, and four spaced evenly at 10’ along the upper portion. The structural supports and footings are the same width as the tramway (4’) at the top and have a wider base as they reach the ground. All exposed portions of the footings have a board form finish. The tram bed is 4’ wide with 25-pound rails spaced at 36” on center. The rails are secured to the concrete with flats and embed bolts at approximately 24” on center. The steps are 28” wide and centered in the structure. The lower portion of the tramway has 9.5” treads and the upper portion has 10.5” treads. The 108 risers vary between 5” to 6” in height. The steel pipe railing is secured to the outside vertical surface of the tramway structure with steel brackets. The upper portion of the tramway structure (approximately 40’) is constructed at a slope of approximately 19 degrees. The lower portion (approximately 65’) is constructed at a steeper slope of approximately 28 degrees.

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

Historic Drawing of Tramway, 1934



Site Image OI-38: Historic Drawing of the Outer Island Tramway, 1934 (Source: NPS APIS Archives)

Analysis. The tramway was built in 1934, and with the tram tracks, was a major improvement in technology, providing a more durable structure and more efficient method of transporting goods up to the light station. The tramway and stairs replaced the original wooden tramway in the same location. The concrete tramway also eliminated the need for the pipe box and wooden staircase west of the tramway. The water line that previously ran up the pipe box was rerouted to run along the tramway, much like that of Michigan Island. The concrete tramway and tram tracks retained the physical organization of the landscape and improved the efficiency of the light station's operations.

The tramway received extensive repair and restoration in 1948. The tramway underwent minor repairs during the 2004-2005 erosion control efforts along the Outer Island Light Station shoreline. Spalling sections around construction joints were repaired and sealed, a spalled stair tread was repaired, and the steel pipe handrails were recoated.

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 treads of the steps, 9.5" on the lower portion, and 10.5" on the upper portion, do not meet the 11" requirement; 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 west side of the structure. The tramway is considered a contributing feature.

Tram Tracks

Existing Condition. The tram tracks lead from the top of the tramway to the Fog Signal Building. The tracks are cast iron 25-pound rails, spaced 36" on center matching the tramway and secured to concrete paving. The tracks as a system are intact and remain in place, although vegetation is beginning to encroach on the edges of the concrete paving. Overall the tram tracks are in good condition.

Analysis. The tram tracks were built in 1934 towards the end of the Light Station period as part of the tramway system and were an integral part of the technological advances in equipment on the light station. Tram tracks are a feature common to Devils, Michigan, and Raspberry islands, making the transportation of goods within the station easier and more efficient. The tram tracks were originally set on a wooden platform that was located in the same area as the extant tracks. In 1934, the tracks were reset on a 4' wide concrete base. This work was associated with the construction of the tramway. Because the tracks are set on concrete paving, they are in much better condition than the tracks at other stations. The tram tracks are a contributing feature.

Remnant Structures

There are currently no extant sheds or small structures on the light station grounds. The Privy and Oil Storage are described as buildings in the HSR. The historic photos and the keeper's log indicate small structures on the site that are no longer in existence. A 1937 photograph shows a shed-like structure south of the Privy (Site Image OI-18 in the Light Station period section earlier in this chapter).

The remnants of a cabin exist in the forest east of the light station grounds. The cabin is approximately 10' x 12', log construction, with a collapsed sheet metal roof, paneled wood door and one window. The cabin is in poor condition.

NPS Vault Toilet

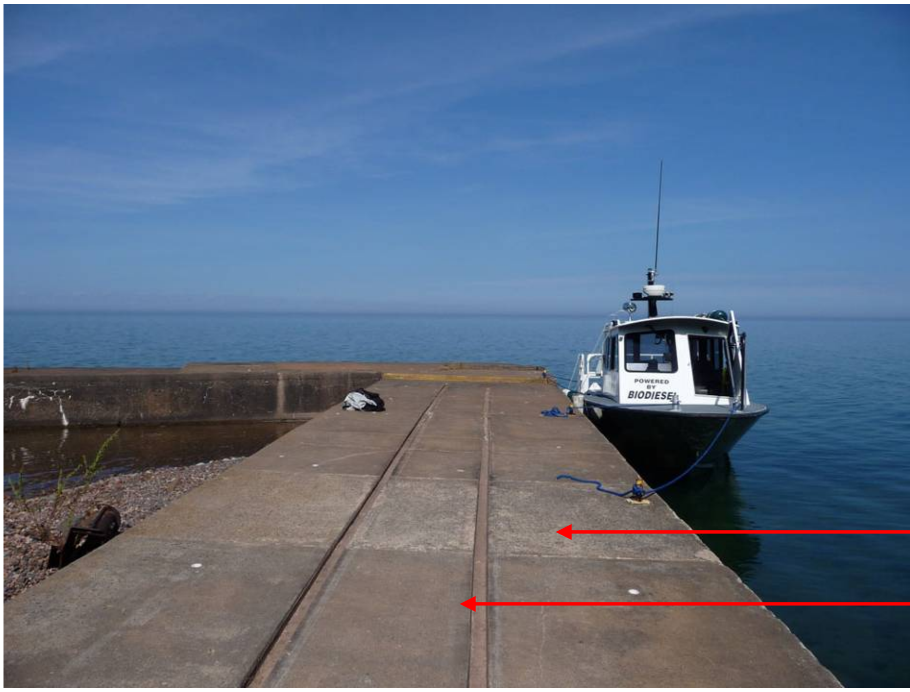
Existing Condition. The NPS vault toilet is a wood-framed structure and vault located south of the historic Privy. The NPS vault toilet is not an accessible structure and is in fair condition.

Analysis. The NPS Vault Toilet is a recent addition to the station and is a noncontributing feature. The Vault Toilet is a compatible feature as the location, set in the forest, does not detract from the spatial organization of the light station.

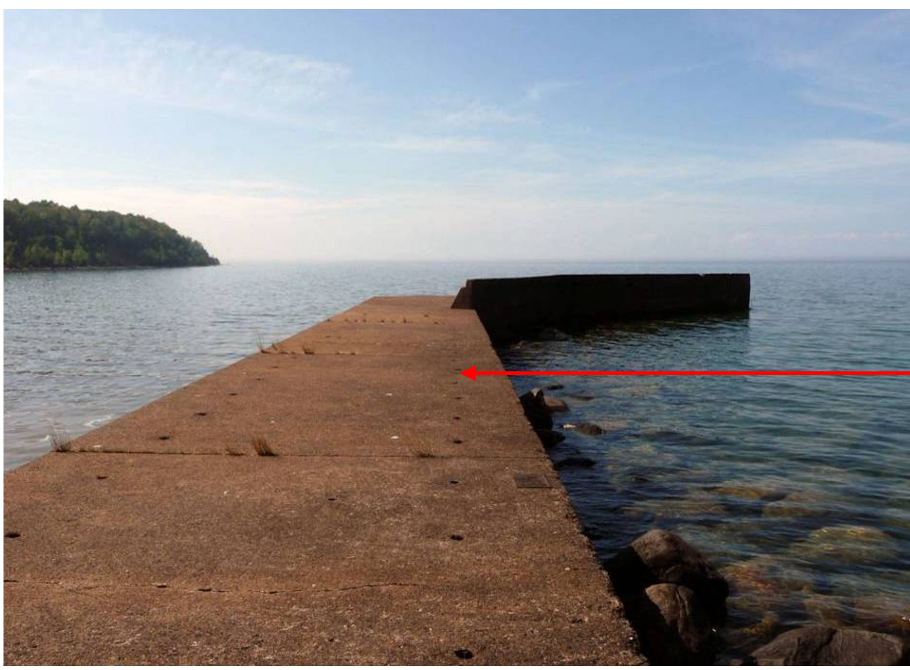
Table OI-1: Structures

Feature	Site Image #	Description	Condition	Contributing? /Rationale
Boat Dock (c. 1958)	OI-39, OI-40	see above	Good	Contributing
Tramway (c. 1934)	OI-41, OI-42, OI-43	see above	Good	Contributing
Tram Tracks (c. 1934)	OI-39, OI-42, OI-44	see above	Good	Contributing
NPS Vault Toilet (1970–2009)		NPS wood-framed Vault Toilet	Good	Noncontributing – contemporary Compatible
Remnant Cabin	OI-45	see above	Poor	Contributing

Site Structure Photographs, 2009



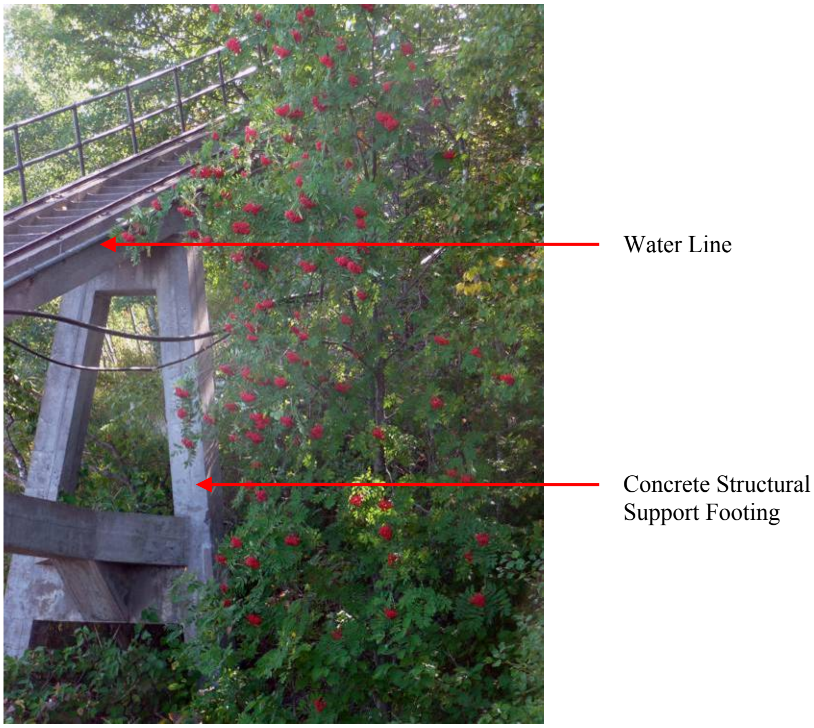
Site Image OI-39: Concrete boat dock viewed from the south, tram tracks in center, 2009 (Source: MBD P1010860.JPG)



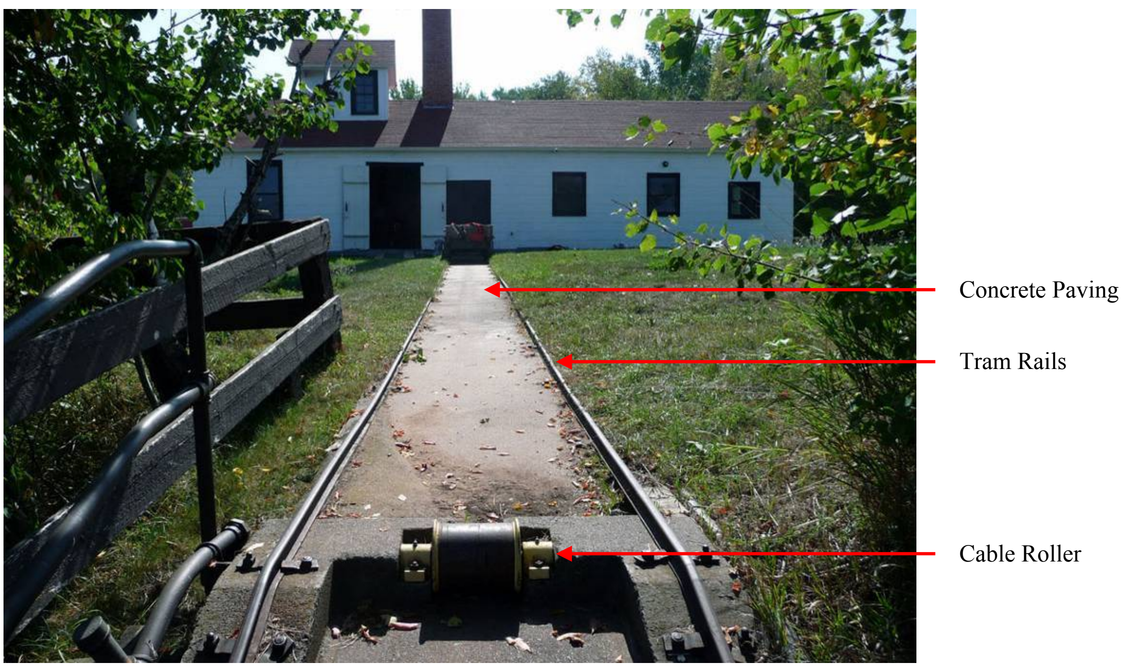
Site Image OI-40: Western portion of concrete boat dock, viewed from the east, 2009 (Source: MBD P1010863.JPG)

Site Image OI-41: Tramway viewed from the north, 2009 (Source: MBD P1010865.JPG)

Site Image OI-42: Tramway steps and tram tracks, 2009 (Source: MBD P1010868.JPG)



Site Image OI-43: Tramway concrete footing, 2009 (Source: MBD P1010844.JPG)



Site Image OI-44: Tram tracks from tramway to Fog Signal Building viewed from the north, 2009 (Source: MBD P1010860.JPG)

Site Image OI-45: Remnant cabin east of light station grounds, 2011 (Source: MBD DSC00931.JPG)

Small Scale Features

The small scale features at Outer Island Light Station include concrete walks, two flag poles, a cistern, signs, fencing 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 at the light station and influenced the manner in which the station operated. At the Outer Island Light Station, these notable features include concrete walks, flagpoles and the ladder stand. Descriptions of the remaining individual features, many of which are contributing, and their respective condition are included in table OI-2.

The addition of concrete walks relates to the evolution of the light station grounds and contributes 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.

Concrete Walks

Existing Condition. The concrete walks were installed during the Light Station period (1901–1938) many of them following the previous layout of the wood plank walks. Typical to several of the Apostle Islands light stations, the walks appear to be constructed of precast units 2.5'×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. Vegetation has encroached, in places, into the joints between slabs.

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 state 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 walks also represent the locations of nonextant wood plank walkways. The concrete walks are important contributing features.

Flagpoles

Existing Condition. There are two flagpoles on the light station grounds, the original flagpole and the second flagpole. The original flagpole is near the top of the tramway, approximately 45' west of the light station's main entrance. Historic photographs indicate flagpoles have been located in this area but have been removed or lost due to harsh climatic conditions on the bluff edge. The extant original flagpole remains from the Light Station period (1901-1938) and is constructed of a single wood mast pole, mounted between two shorter wood base columns, with through bolt connections. The center pole is broken, and stands approximately 10' tall. The two columns are approximately 8" in diameter and mounted in a concrete footing. The original flagpole is in poor condition.

The second flagpole is centrally located between the Fog Signal Building and the Tower and Keepers Quarters along the west side of the concrete walk. The second flagpole dates to the Coast Guard period (1939-1960) and is notable for the compass rose engraved on its square concrete footing which is 3'x3'. The pole is steel and stands approximately 30' high. It appears that it was painted white, but now is heavily rusted. The flagpole is in fair condition.

Analysis. The flagpoles are important features because they were part of historic use, operation and management of the light station at a time when the stations were manned by light keepers and the USCG. Flagpoles are an element common to all of the light stations in the Apostle Islands and have been historically used to convey information to passing ships. The original flagpole at the Outer Island is of a similar design to the extant flagpole (second) at the Michigan Island Light Station. The flagpoles are contributing features.

Fog Signal Cistern

Existing Condition. The fog signal cistern is located south of the Fog Signal Building, approximately 10' in from the building's southwest corner. The northern portion of the fog signal cistern is 3.5'x 6', bordered by a concrete curb with remnant white paint, 6" wide and 1' tall. This portion is filled with soil and vegetation. The southern portion is covered by an unsecured, unpainted, wooden lid, approximately 18"x24". The depth of the cistern is unknown. The fog signal cistern is in poor condition.

Analysis. The fog signal cistern is significant to the Outer Island Light Station because it was present during the earliest years of the light station. Brown's 1910 annotation of H. Bamber's 1893 map (Site Image OI-09) indicates a cistern in the same location where the fog signal cistern exists today. Site Image OI-12 shows the fog signal cistern once had a hand pump. The fog signal cistern is a contributing feature.

Ladder Stand

Existing Condition. The wooden ladder stand is located approximately 60' south of the Oil Storage. It is approximately 30' long and 5' wide. The ladder stand has three wood posts and a triangular roof made of wood panels approximately 30"x6". The feature has remnant white paint, two remnant ladders, and is collapsed and in poor condition.

Analysis. Lighthouse Keeper A.G. Carpenter built the ladder rack in July of 1939, noting the work in his keeper's log. The feature represents the end of lighthouse keepers and their families occupying the station, built just before the USCG took over the operation of the Outer Island Light Station. The ladder stand is a contributing feature and one that is unique to Outer Island.

Table OI-2: Small Scale Features

Feature	Site Image #	Description	Condition	Contributing? /Rationale
Concrete Walks (1901-1938)	OI-46	2 – 2.5' x 4' concrete panels. Vegetation encroaching on many panels.	Fair	Contributing; See text
Original Flagpole (1901-1938)	OI-49	Wood flagpole northwest of Propane Tanks.	Poor	Contributing; See text
Second Flagpole (1939-1960)	OI-46, OI-47, OI-48	3' x 3' decorative base with metal pole located between Tower and Fog Signal Building. Rust evident.	Fair	Contributing; See text
Fog Signal Cistern (1873-1900)	OI-50	3.5' x 6' concrete foundation, 1' tall, and 6 inches wide with 1.5' x 2' covered well opening south of the Fog Signal Building	Good	Contributing; Historic photographs and drawings indicate Cistern was present during the Early Light Station and Light Station periods and modified during the Coast Guard period. The photographs indicate the cistern had a historic hand pump, which is nonextant today.
Ladder Stand (c. 1939)	OI-51	20' x 5' collapsed wood structure south of Oil Storage c. 1939	Poor	Contributing; See text
Tramway Guard Railing (1934)	OI-52	Steel pipe railing attached to the east side of the tramway.	Fair	Contributing
Park Sign (1970 - present)	OI-53	Contemporary "Outer Island" park sign	Good	Noncontributing, Compatible
Interpretive Sign (1970 - present)	OI-54	Contemporary park sign with a brief history of Outer Island	Fair	Noncontributing – contemporary, Compatible
Wood Fence and Warning Sign (1970 - present)	OI-55	Contemporary park sign and painted wood fence	Fair	Noncontributing – contemporary, Compatible
USGS Marker (c. 1978)	OI-56	Metal marker located centrally on the Tram Tracks between the Tramway and Fog Signal Building.	Good	Noncontributing – contemporary, Compatible
Propane Tanks (2) (1970 - present)	OI-57	Metal Tanks 2' x 7' at the northwest corner of site.	Good	Noncontributing – contemporary, Compatible
Concrete Foundation and Wall (1901-1938)	OI-58	12' x 12' concrete foundation, 1' tall, 6" wide and (2) 2.5' tall, 6' long, 1' wide walls west of Fog Signal Building. Wood planks sit atop the walls. Historic photographs indicate this area was used for chopped wood and oil storage.	Concrete: Good Wood: Poor	Contributing; Historic photographs indicate this area was present during the Light Station period and modified during the Coast Guard Period
Wood Structure at Fog Signal Building	OI-59	2.5' x 10' Wood Structure at 2' tall south of Fog Signal	Fair	Contributing; from the period of significance

Feature	Site Image #	Description	Condition	Contributing? /Rationale
(1939-1960)		Building		
Fuel Tank (1939-1960)	OI-60	15' x 6' painted metal tank with metal pipe extending north 4' from north end of tank.	Good	Contributing; from the period of significance
Solar Panel (1970 - present)	OI-61, OI-62	Contemporary solar panel, approximately 15' tall located south of Keepers Quarters	Good	Noncontributing-contemporary; Could be Compatible with appropriate siting.
Fiberglass Battery Vault (1970 - present)	OI-61, OI-62	Adjacent to solar panel, 3.5' x 3.5' x 1' tall concrete structure.	Fair	Noncontributing-contemporary; Could be Compatible with appropriate siting.
Wood Planks (2) (1970 - present)	OI-61, OI-63	(2) 3' x 6" wood planks located southeast of solar panel, marking location of the original well	Fair	Noncontributing – contemporary, Compatible
Concrete Footing (date unknown)	OI-61, OI-64	Circular concrete footing with 2' diameter.	Good	Noncontributing, safety hazard
Trail Sign (1970 - present)	OI-65	Contemporary park sign	Good	Noncontributing-contemporary, Compatible
Restrooms Sign (1970 - present)	OI-65	Contemporary park sign	Good	Noncontributing-contemporary, Compatible
Horseshoe Pegs (2) (1939-1960)	OI-66	(2) 1' tall metal horseshoe pegs with north/south orientation located between collapsed ladder stand and fire pit	Fair	Contributing, Compatible
Fire Pit (1970 - present)	OI-67	2'9" diameter contemporary fire pit located northwest of Privy	Good	Noncontributing-contemporary; Noncompatible
Weather Gauge (1970 - present)	OI-68	5'9" tall painted wood post with thermometer north of fire pit.	Poor	Noncontributing, Noncompatible
Remnant Post (date unknown)	OI-69	2'4" tall wood post west of weather gauge	Poor	Noncontributing, Noncompatible
Clothesline (date unknown)	OI-70	Approximately 70' long extending from White Birch near the collapsed ladder stand to the Mountain Ash near the Oil Storage	Fair	Noncontributing, Compatible

Small Scale Feature Photographs

Site Image OI-46: Concrete sidewalk viewed from west side of the Keepers Quarters northwest to Fog Signal Building. Fuel tank and second flagpole at left and center, 2009 (Source: MBD P1010949.JPG)

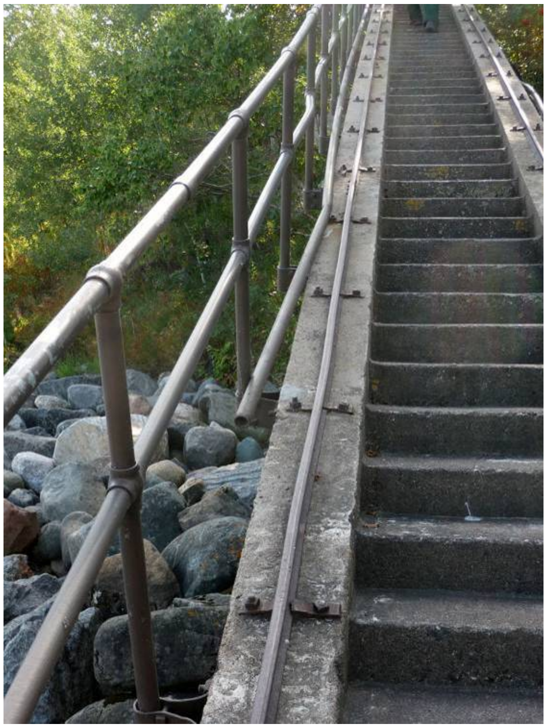
Site Image OI-47: Second flagpole in foreground at right of image. Outer Light Tower and Keepers Quarters viewed from the northwest, 2009 (Source: MBD P1010934.JPG)

Site Image OI-48: Second flagpole base and compass rose, 2009 (Source: MBD P1010935.JPG)

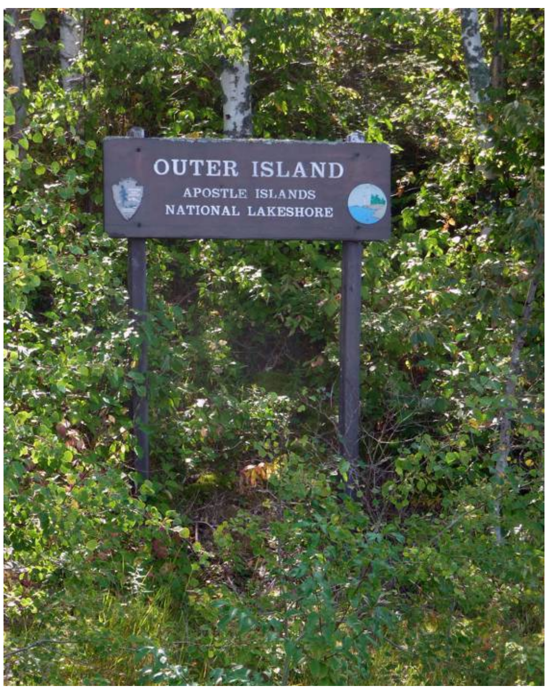
Site Image OI-49: Original flagpole, 2009 (Source: MBD P1010916.JPG)

Site Image OI-50: Fog signal cistern foundation, 2009 (Source: MBD P1010929.JPG)

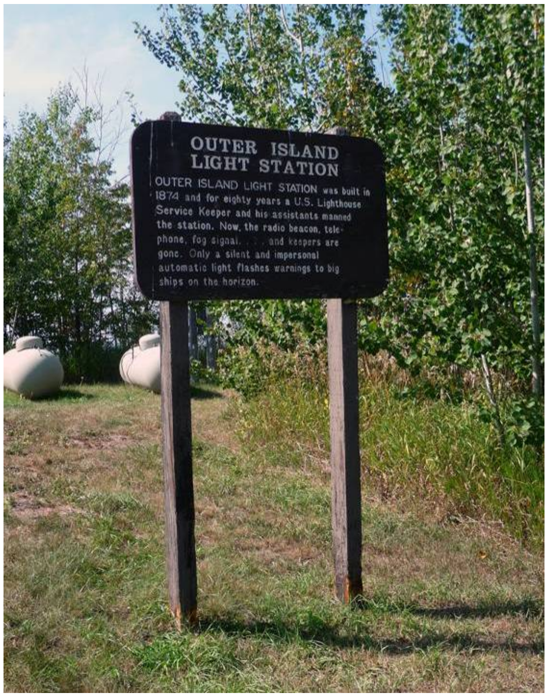
Site Image OI-51: Collapsed ladder stand (c. 1939), above: c. 1980 (Source: NPS APIS Archives); below: c. 2009 (Source: MBD P1010984.JPG)



Site Image OI-52: Concrete tramway pipe railing, 2009 (Source: MBD P1010867.JPG)



Site Image OI-53: Park sign, 2009 (Source: MBD P1010842.JPG)



Site Image OI-54: Interpretive sign, 2009 (Source: MBD P1010904.JPG)

Site Image OI-55: Wood fence and warning sign, 2009 (Source: MBD P1010903.JPG)

Site Image OI-56: USGS marker, 2009 (Source: MBD P1020006.JPG)

Site Image OI-57: Propane tanks (2) and original flagpole, 2009 (Source: MBD P1010905.JPG)

Site Image OI-58: Concrete foundation and wall, 2009 (Source: MBD P1010925.JPG)

Site Image OI-59: Wood structure, 2009 (Source: MBD P1010930.JPG)

Site Image OI-60: Fuel tank, 2009 (Source: MBD P1010937.JPG)

Site Image OI-61: Solar panel and fiberglass battery storage unit at the south side of the Keepers Quarters, wood planks at right, and concrete footing in foreground, 2009 (Source: MBD P1010960.JPG)

Site Image OI-62: Solar panel and fiberglass battery storage unit, 2009 (Source: MBD P1010954.JPG)

Site Image OI-63: Wood planks marking site of original well, 2009 (Source: MBD P1010958.JPG)

Site Image OI-64: Concrete footing, 2009 (Source: MBD P1010962.JPG)

Site Image OI-65: Restroom and trail sign, 2009 (Source: MBD P1010966.JPG)

Site Image OI-66: Horseshoe peg, 2009 (Source: MBD P1010976.JPG)

Site Image OI-67: Fire pit, 2009 (Source: MBD P1010986.JPG)

Site Image OI-68: Weather gauge, 2009 (Source: MBD P1010972.JPG)

Site Image OI-69: Remnant post in foreground and collapsed ladder stand in background, 2009 (Source: MBD P1010974.JPG)

Site Image OI-70: Clothesline. Oil Storage and Fog Signal Building in background, 2009 (Source: MBD P1010979.JPG)

Site Image OI-71: Concrete marker, 2011 (Source: MBD DSC00936.JPG)

Vegetation

Existing Condition. Vegetation at Outer Island includes natural forested areas, cleared and maintained areas, and domestic plantings. The forest area is a mixed northern hardwood forest and is the predominant landscape of the island. The light station grounds also include historically cleared areas that have been infiltrated by the adjacent forest and are now brush landscape types. The core of the light station is a maintained lawn of mown grasses. Domestic plantings exist near the Fog Signal Building and the Oil Storage, and at the south end of the site, near the Privy. These plantings include: lilac (*Syringa* sp.), serviceberry (*Amelanchier* sp.), juniper (*Juniperus* sp.), maples (*Acer* sp.) and mountain ash (*Sorbus* sp). Trees at the south end of the site, near the Privy include: dogwood (*Cornus* sp.), white birch (*Alnus tenuifolia*), and poplar (*Populus* sp). The condition of the vegetation on the light station grounds varies from good to poor. The cleared area of the light station is in poor condition.

Analysis. The cleared area of the light station is an important contributing feature. Historic drawings and photographs indicate that a significantly larger cleared area present on the reservation than that which exists today. Since the early Coast Guard period (1939-1960), the cleared area of the light station has continued to decline from approximately 9.5 acres to 1.6 acres in 2009. During the period of significance the light station grounds were maintained as lawn or other low vegetation. The cleared area immediately adjacent to the light station grounds were maintained as open fields by seasonal burning. Today, a large portion of these open fields have been filled by encroaching forest and the field vegetation type is missing from the landscape.

During the Early Light Station period, the light station grounds were maintained as lawn or low vegetation. According to the keeper's log, the first keeper in 1874 brought currant and raspberry bushes, planting them near the Keepers Quarters. Historic photos show plantings along the west side of the Keepers Quarters as late as 1939. The keeper's log also has several references to planting potatoes and trees. Siblings Walter Daniels and Isabel Daniels Cassidy revisited their childhood home (1917-1937) and remembered gardens with corn, potatoes, and vegetables located between the house and the privy. Garden and landscape plantings made a substantial contribution to the cultural landscape of Outer Island during the Early Light Station and Light Station periods, but the precise location of the gardens is unknown.

Today, there are areas near the Fog Signal Building and Oil Storage with mature plantings. The mountain ash tree and lilacs east of the Oil Storage as well as the lilac east of the Fog Signal Building are contributing features and can be seen in Site Image OI-21. The lilac east of the Fog Signal Building is the latest blooming lilac in the state of Wisconsin.

Based on historic photographs, the plantings south of the Fog Signal Building appear to have been planted after the period of significance although no documentation exists as to the precise date they were planted. Vegetation features present on the site are described in Table OI-03 and their condition is stated.

The trees at the south end of the site, near the Privy, appear to be encroaching forest vegetation. These trees are noncontributing features, but compatible, as they do not interrupt the views between the light station grounds and Lake Superior.

The relationship between the extent of the cleared area and forest vegetation on the reservation has changed significantly since the period of significance. The extensive encroachment of forest vegetation has diminished the integrity of the light station.

Table OI-3: Vegetation

Feature	Site Image #	Description	Condition	Contributing? /Rationale
Lawn Area	OI-72	Maintained lawn area of light station grounds	Fair	Contributing; See text
Domestic Plantings Near Fog Signal Building	OI-73	Junipers, service berry, and maple near southeast corner of Fog Signal Building	Good	Noncontributing, Noncompatible
Lilac at Fog Signal Building	OI-74	Lilac near southeast corner of Fog Signal Building	Good	Contributing; See text
Domestic Plantings Near Oil Storage	OI-75	Mountain ash and lilacs east of Oil Storage	Good	Contributing; See text
Trees near Privy	OI-76	White birch, dogwood, and poplar, encroaching forest	Fair to Poor	Noncontributing, Compatible
Slope Vegetation	OI-26	Encroaching vegetation on light station’s embankments	Good	Noncontributing, Noncompatible

Vegetation Photographs

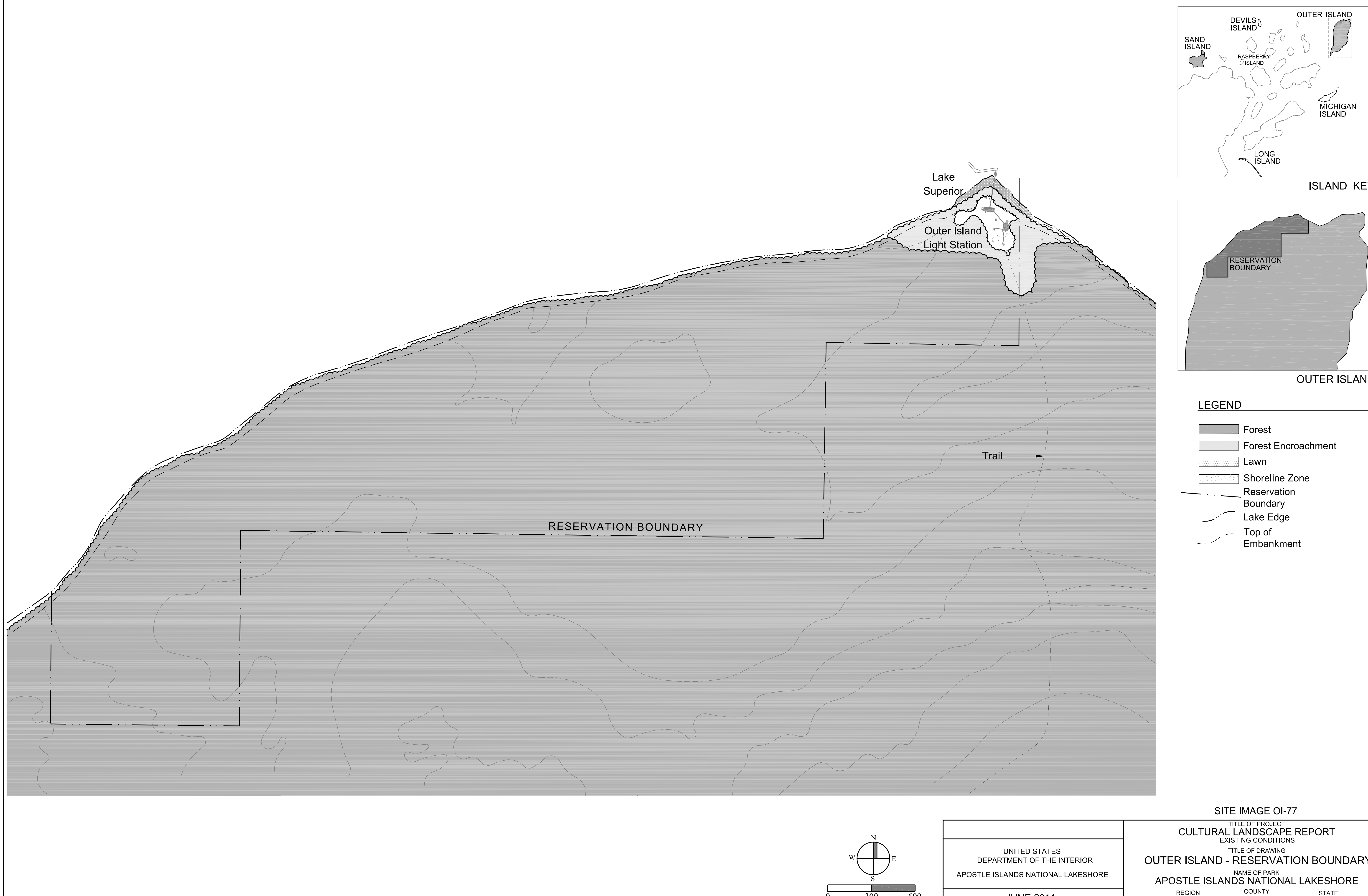
Site Image OI-72: Lawn area, 2009 (Source: MBD P1010952.jpg)

Site Image OI-73: Domestic plantings near Fog Signal Building (Serviceberry, Juniper, and Maple), 2009 (Source: MBD P1010940.JPG)

Site Image OI-74: Lilac near Fog Signal Building, 2009 (Source: MBD P1010933.JPG)

Site Image OI-75: Mountain Ash and Lilacs near Oil Storage, 2009 (Source: MBD P1010988.jpg)

Site Image OI-76: Encroaching forest near Privy, 2009 (Source: MBD DSC00620.JPG)



SITE IMAGE OI-77

UNITED STATES
DEPARTMENT OF THE INTERIOR
APOSTLE ISLANDS NATIONAL LAKESHORE

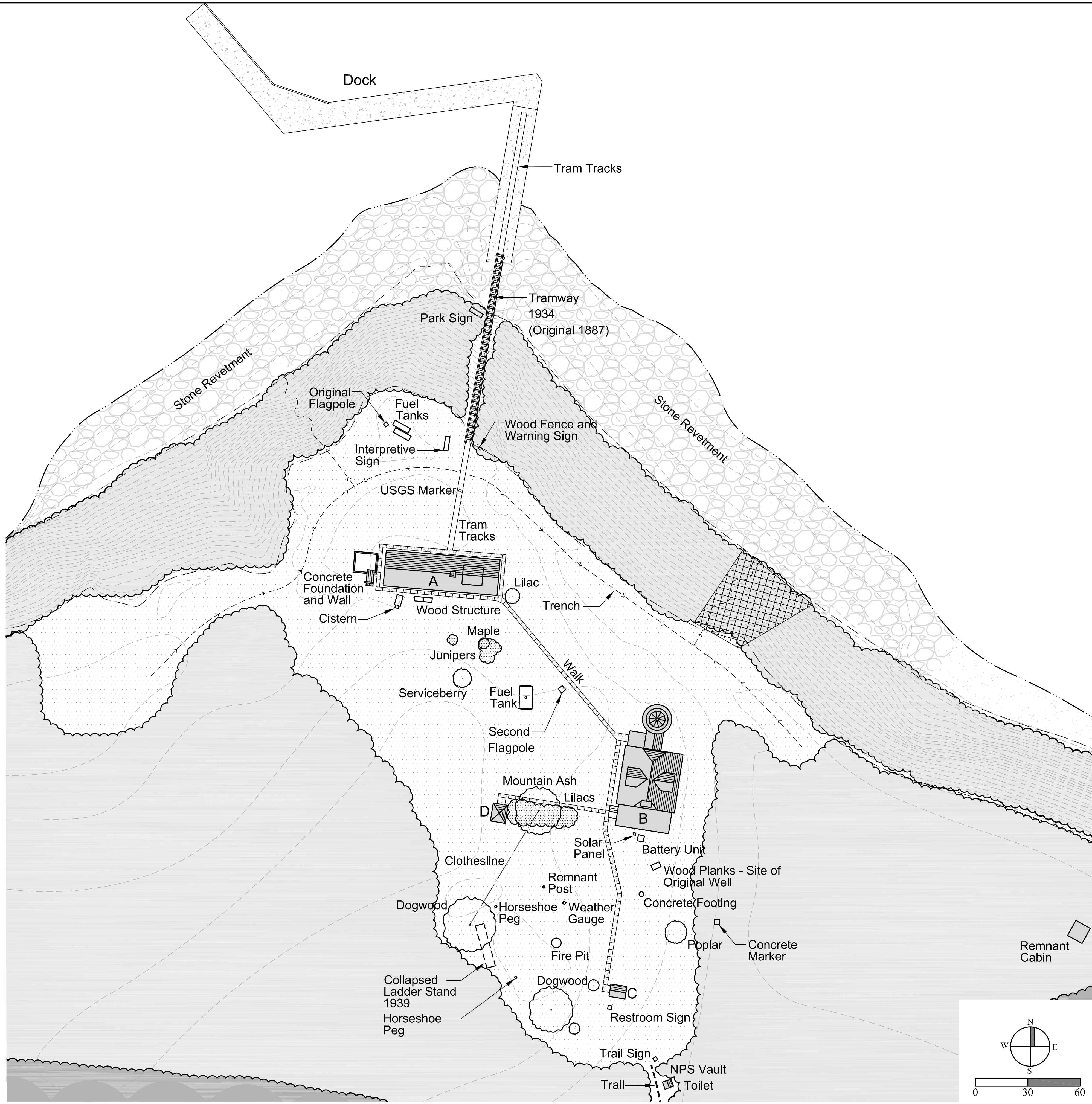
JUNE 2011

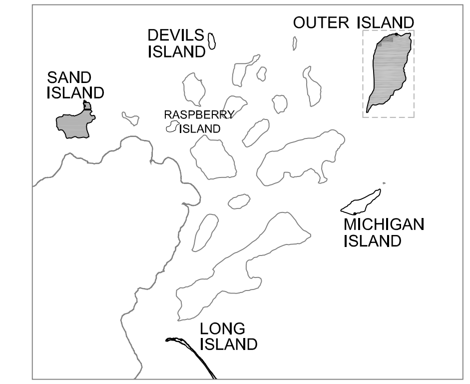
TITLE OF PROJECT
CULTURAL LANDSCAPE REPORT
EXISTING CONDITIONS

TITLE OF DRAWING
OUTER ISLAND - RESERVATION BOUNDARY

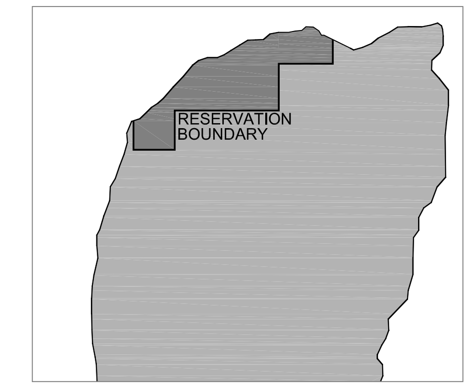
NAME OF PARK
APOSTLE ISLANDS NATIONAL LAKESHORE

REGION	COUNTY	STATE
MIDWEST	ASHLAND	WISCONSIN





ISLAND KEY



OUTER ISLAND

LEGEND

- Forest
- Forest Encroachment
- Lawn
- Beach
- Stone Revetment
- Erosion Control
- Deciduous Tree
- Tram Tracks
- Concrete Walk
- Trench
- Top / Bottom of Embankment
- Lake Edge

BUILDINGS

A. Fog Signal Building (1901)
B. Outer Light Tower and Keepers Quarters (1874)
C. Privy (1874)
D. Oil Storage (1895)

SITE IMAGE OI-78

UNITED STATES
DEPARTMENT OF THE INTERIOR

APOSTLE ISLANDS NATIONAL LAKESHORE

JUNE 2011

TITLE OF PROJECT
CULTURAL LANDSCAPE REPORT
EXISTING CONDITIONS

TITLE OF DRAWING
OUTER ISLAND LIGHT STATION

NAME OF PARK
APOSTLE ISLANDS NATIONAL LAKESHORE

REGION	COUNTY	STATE
MIDWEST	ASHLAND	WISCONSIN

OUTER 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 Outer 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.[33] 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.

[33] Landscape Lines.

Remove. The actions required to remove non-historic or noncontributing features. This is usually associated with non-compatible 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 Outer Island Light Station is significant to the Apostle Islands system of light stations because of 1) its representation of the development of navigational aids along the outer shipping route to Duluth and across eastern Lake Superior, 2) its clear depiction of improvements in navigational and light station technology, and 3) its position as the most remote of the light stations. 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 Outer Island Light Station.

The intent of the preferred treatment is to rehabilitate the cultural landscape of the Outer 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 Outer Island Light Station (1874 –1961) begins with the establishment of the Outer Island Light Tower and Keepers Quarters and ends with automation of the light. The extant contributing features best represent the Light Station (1901- 1938) and Coast Guard (1939-1960) periods described in the Site Development section of this chapter. The treatment approach for extant contributing features emphasizes these periods 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 OI- 79, Site Image OI-80)

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 is a key feature of the cultural landscape and is primarily defined at the Outer Island Light Station by the relationship between the buildings, structures, circulation features and the cleared area of the light station within the reservation. While the arrangement of buildings, structures and circulation features have remained intact, the cleared area of the light station grounds and the larger reservation has been substantially reduced from the period of significance. The landscape analysis portion of this report addresses this change. The incremental encroachment of forest vegetation into the historically cleared areas of the reservation has reduced the cleared area immediately adjacent to the light station grounds and has changed the open character of the light station. Views from the waters of Lake Superior to the light station are also an important component of the cultural landscape. The growth and encroachment of forest vegetation, specifically forest trees, has also impacted views from the lake to the light station. This encroachment of forest vegetation 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*.

The treatment recommendations for spatial organization and views/vistas include 1) preserving the existing organization of buildings, structures, and site features; 2) reestablishing the cleared area of the landscape to better depict its condition during the period of significance; and 3) reestablishing views from the lake to the light station by selective removal of trees along the shoreline banks. Individual treatment measures are described as follows:

Spatial Organization - General

The basic location and composition of the buildings, structures (e.g. tramway), circulation features (concrete walks) shall remain in place, preserving the composition of the cultural landscape. Any new features shall be located outside of the core of the historic fabric and shall not interfere with views to and from the station.

Light Station Clearing (Meadow)

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 Station (1901-1938) and Coast Guard (1939–1960) periods. Specific actions related to clearing are addressed 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 of clearing areas first. Emphasis should be placed on 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 area immediately east of the Light Tower and Keepers Quarters
- The area southwest of the Fog Signal Building
- Selective tree removal from areas along the shoreline bank that impact views from the water to the Outer Light Tower and Keepers Quarters

Shoreline Bank - Selective Clearing

The intent of this treatment measure is to reestablish open views of the Outer Light Tower, Keepers Quarters, Fog Signal Building, and other structures to better represent the condition during the period of significance, specifically the Light Station (1901-1938) and Coast Guard (1939-1960) periods.

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 banks at the Outer Island Light Station are stable but have high erosion potential. Experience has shown that erosion of the shoreline banks could result in the loss of portions of the light 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 appropriate plan for long-term biostabilization must accompany any clearing and incorporate two key concepts. Firstly is the concept of 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.

An area of approximately 1.2 acres 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. Selective clearing within the identified area should be to sections of the shoreline bank further targeted that 1) could be damaged by large tree blow-down and 2) will best clear views to the Light Tower and Keepers Quarters from the water.

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/ACCESSIBILITY

The circulation patterns and features on the site remain and are important elements of the cultural landscape. The circulation patterns on the site were significantly improved in 1934 with the construction of the concrete tramway, tram tracks, and concrete walks. All of these improvements were installed to support the navigational and day-to-day operations of the light station. These features remain in much the same locations and patterns as they were during the Light Station period (1901–1938). The circulation features help to define the 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. Features important to maintaining the integrity of the light station include the tramway, tram tracks and concrete walks. The treatment recommendations for the tramway and boat dock are described in the Structures section.

Tram Tracks

Maintain tram tracks between top of tramway and Fog Signal Building. The work includes minor vegetation removal, and the securing of tracks where needed.

Concrete Walks

Stabilize all concrete walks in their current, historic locations and configurations. A detailed description of treatment measures for concrete walks can be found in small scale features.

Trails and Paths

Maintain the trail leading south from the light station into the forest.

Accessibility (ABAAS)

An Accessibility Self Evaluation and Transition 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 Outer Island Light Station are:

- Provide an outdoor accessible route to a new accessible NPS Vault Toilet (under a separate project)
- Provide programmatic access to the Outer 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. 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.
- Repair of the tramway railing including repair of attachments on the east side of concrete tramway and painting.
- Maintain the concrete tramway footings by ensuring that adequate soil and rock protection remains at the base of each abutment, particularly in eroded areas.
- The tramway lacks a handrail meeting ABAAS standards; however installing a handrail meeting these standards will impede the use of the tram carts on the tramway.
- Recommendations for the tramway hoist are included in the HSR (Fog Signal Building).

Boat Dock

The boat dock should retain its current, historic location and general configuration. The general location of the boat dock has remained consistent since the Early Light Station period. The boat dock should be repaired as determined by the NPS. Further discussion regarding the boat dock is included in Volume I, Chapter 5: Management Issues.

Remnant Cabin

Stabilize the remnant cabin and remove vegetation from the area immediately surrounding the structure.

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 OI-4. 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, non-compatible features (with the exception of the Solar Panel and Battery unit, which will remain in place, and the fire pit, which will be relocated in the area southwest of the Fog Signal Building).

Concrete Walks

Maintain all concrete walks in the current, historic locations. Maintenance includes vegetation removal from joint and edges and minor leveling to eliminate trip hazards. Any 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 match the finish of the historic material including aggregate size, texture and tooling.

Cistern and Pump Foundation

Remove the existing wood cistern cover and replace with a new wood, lockable cover to secure the cistern for safety purposes. Remove the top 12” of vegetation and soil from the pump foundation and replace with clean gravel, provide a wood planking deck on the top of the pump foundation to better depict its use during the period of significance.

Original Flagpole

Restore the original flagpole by replacing the wood mast pole with new mast pole matching the historic material. Retain historic base columns if determined to be structurally sound at the time of construction. If unsuitable, replace with matching new material. After repair, prep and paint white.

Second Flagpole

Maintain the flagpole by repainting the pole. Color shall be white, sample remnant paint from pole to verify.

Ladder Stand

Repair the ladder stand retaining as much of the historic fabric as feasible. Replace the wooden columns and reset in concrete footings. Retain beams and sister together as required. Replace decayed roof planks with new material matching the dimensions of existing. Retain existing roof planks where possible. After repair, prep and paint ladder stand white.

USGS Marker

Retain bronze marker in place.

Concrete Marker

Retain concrete marker in place.

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 *Parks Long Range Interpretive Plan* and other studies. Additional discussion regarding interpretation is included in Volume I, Chapter 5: *Management Issues*.

The following table (Table OI-4) provides recommendations for small scale features identified as noncontributing.

Table OI-4. 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
Propane Tanks	Noncontributing; Compatible	Remove propane tanks
Fire Pit	Noncontributing; Noncompatible	Relocate fire pit to compatible location
Solar Panel	Noncontributing; Compatible	Retain in place

VEGETATION

Reservation Vegetation

Light Station Clearing (Meadow)

As previously discussed 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, drawings and correspondence from this period indicate the area outside and adjacent to the current light station grounds was cleared of forest trees and shrubs and vegetated with grasses and wildflowers. The treatment recommendation to address the light station clearing includes the removal of forest vegetation (approximately 1.2 acres) that has encroached into the historic cleared area of the light station, and the establishment of a meadow-like vegetation to reestablish the spatial qualities of the light station. This would reestablish approximately 43% of the clearing present during the period of significance. 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. Clearing should also be done to maintain adequate fire protection from historic structures. For purposes of this study a general rule of a 50' break has been used. 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" to 24" height by mowing on a regular basis.

Areas of the light station reservation that are to remain forested should be monitored for invasive plants. Do not introduce potentially invasive plant material into the light station reservation.

Old Growth Buffer

Forest vegetation within the historic reservation includes both secondary and old growth northern hardwood hemlock stands. These areas should be protected from any impacts associated with clearing operations. Where possible, provide a minimum of 100' of forest buffer between the cleared area of the light station and the old growth forest southeast of the Light Tower and Keepers Quarters.

Station Vegetation

Historically, domestic landscape plantings, including ornamental plantings and vegetable gardens, played a role in the development cultural landscape of the Outer Island Light Station. Historic correspondence indicates that the lighthouse keepers planted and maintained both domestic ornamental plantings and vegetable gardens on the light station. The vegetable gardens were planted primarily for consumption by the keeper's families as the long distance between Outer Island and the mainland made trading or selling these impractical. While this tradition is documented in narrative, no extant vegetable gardens or historic photographs of gardens were found during the production of this report.

Several domestic ornamental plantings remain from the period of significance including the mountain ash and lilacs east of the Oil Storage building and the lilac east of the Fog Signal Building. The intent of this treatment recommendation is to maintain the extant, contributing landscape features with an emphasis on the late Light Station (1901-1938) and early Coast Guard (1939-1960) periods when the landscape plantings were most intact.

Recommended treatment actions include:

- Remove noncontributing domestic plantings from the light station including the junipers and serviceberry, south of the Fog Signal Building.
- Maintain the lilac shrub near southeast corner of Fog Signal Building.
- Maintain contributing domestic plantings on the light station including, mountain ash and lilacs near Oil Storage building.
- Remove all noncontributing trees in lawn area.

Light Station Clearing (Lawn)

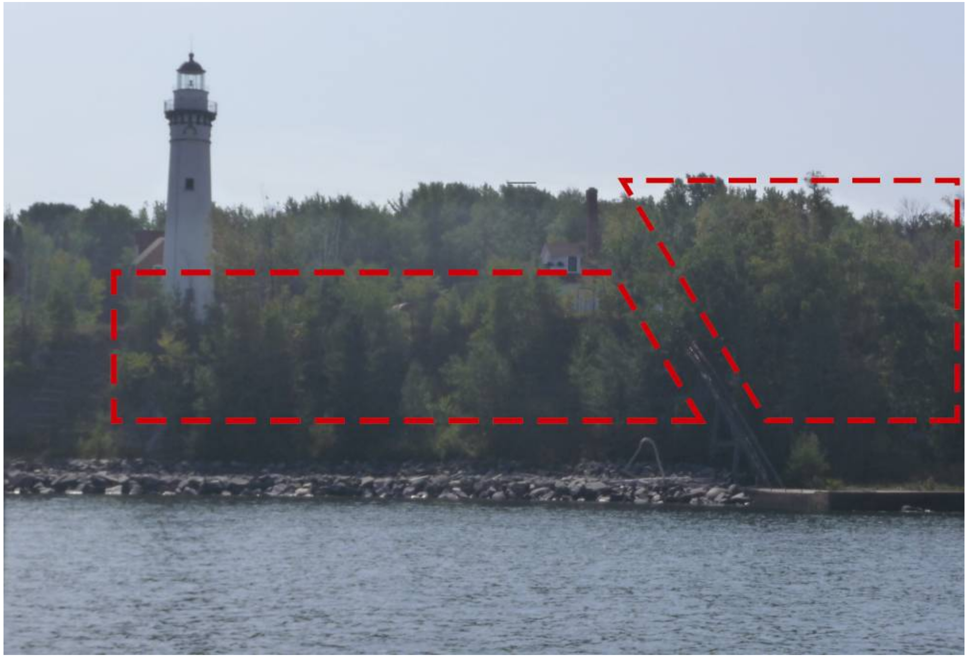
This treatment measure is a moderate expansion of the existing cleared lawn area (east of the Tower and Keepers Quarters) of approximately 3,500 square feet. The work includes clearing of forest trees, shrubs and ground covers and establishing lawn grasses in the newly cleared area. Maintenance includes regular mowing of the lawn area to discourage forest encroachment.

AREAS OF FURTHER INVESTIGATION

Archeological Investigations

Complete an archeological survey for all known resources in the light station (including the remnant cabin southeast of the Light Tower) using nondestructive investigations to document the extent of buried or nonvisible cultural resources, including the original foundation, 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.

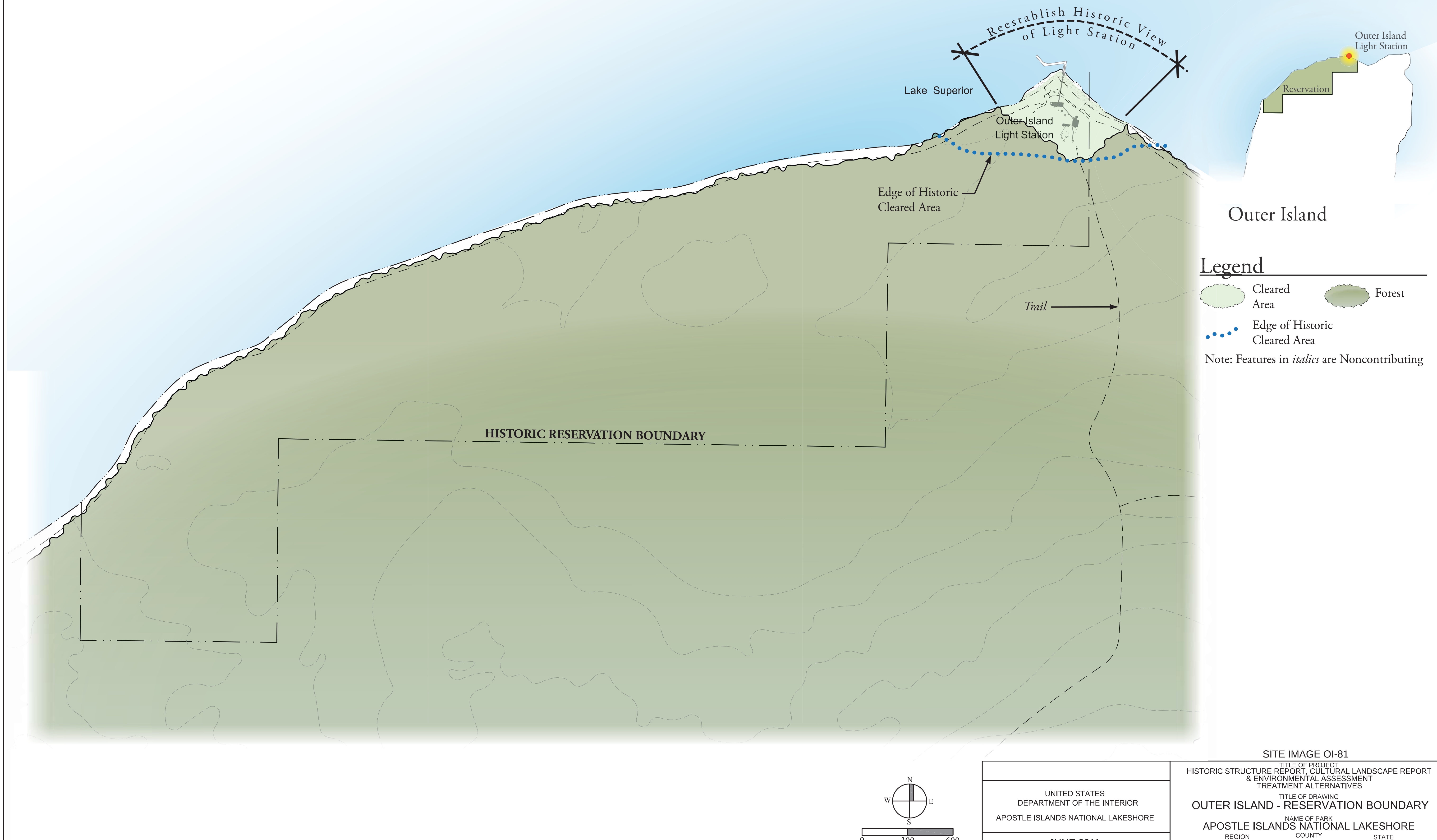
Areas of Further Investigation Photographs



Site Image OI-79: Area of selective clearing for the restoration of views to the light station from Lake Superior, 2010 (Source: MBD P1010831_annotated.JPG)

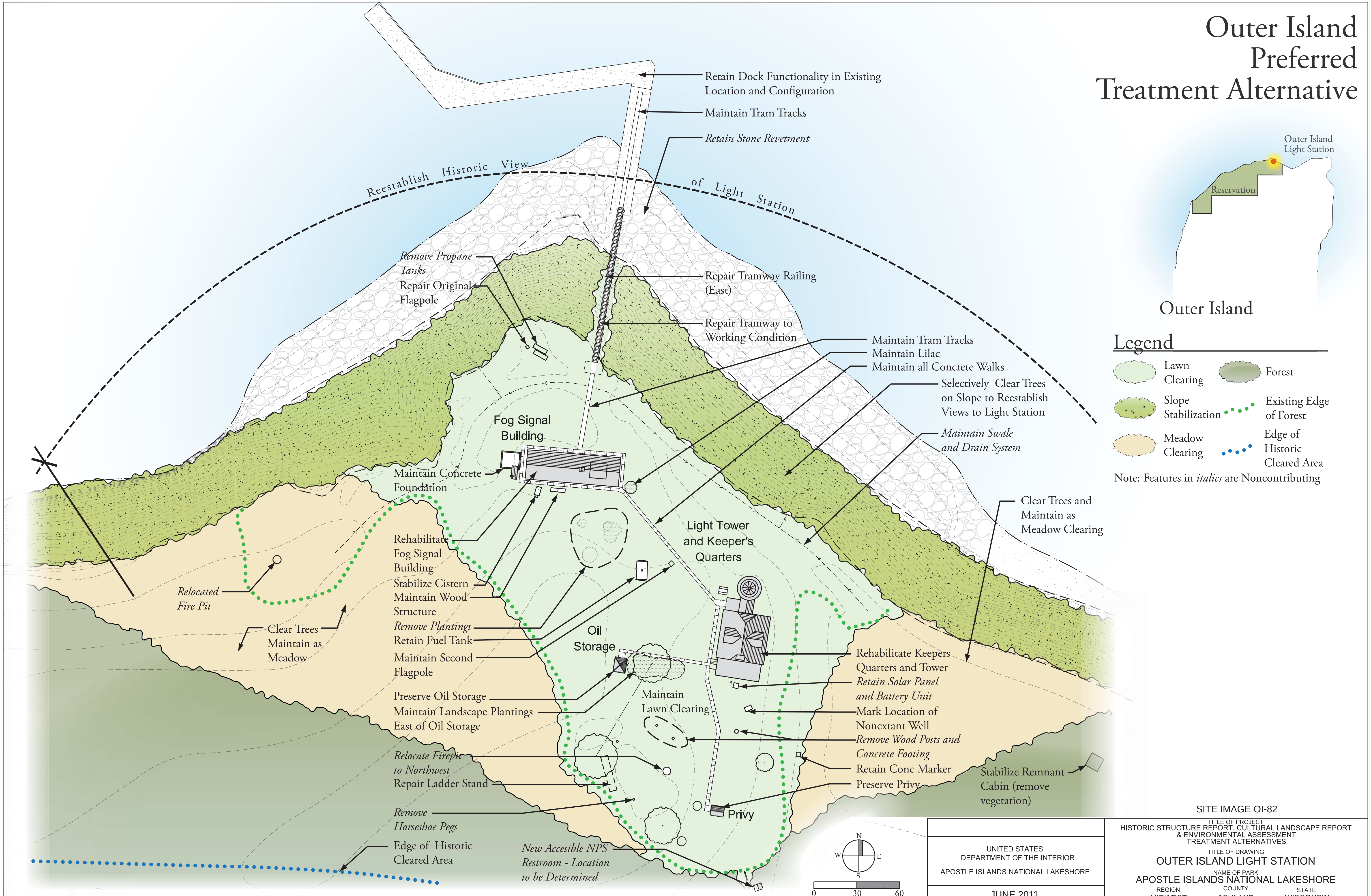
Site Image OI-80: Historic condition of cleared area west of the Outer Island Tower/Keepers Quarters and Fog Signal Building, c. pre-1901 (Source: NPS APIS Archives)

Outer Island Reservation Preferred Treatment Alternative



SITE IMAGE OI-81

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 OUTER ISLAND - RESERVATION BOUNDARY NAME OF PARK APOSTLE ISLANDS NATIONAL LAKESHORE
JUNE 2011	REGION MIDWEST · COUNTY ASHLAND · STATE WISCONSIN



Outer Island
Preferred
Treatment Alternative
Outer Island Light Station
Reservation
Outer Island
Legend
Lawn Clearing
Forest
Slope Stabilization
Existing Edge of Forest
Meadow Clearing
Edge of Historic Cleared Area
Note: Features in *italics* are Noncontributing
Retain Dock Functionality in Existing Location and Configuration
Maintain Tram Tracks
Retain Stone Revetment
Reestablish Historic View of Light Station
Remove Propane Tanks
Repair Original Flagpole
Repair Tramway Railing (East)
Repair Tramway to Working Condition
Maintain Tram Tracks
Maintain Lilac
Maintain all Concrete Walks
Selectively Clear Trees on Slope to Reestablish Views to Light Station
Maintain Swale and Drain System
Fog Signal Building
Maintain Concrete Foundation
Clear Trees and Maintain as Meadow Clearing
Light Tower and Keeper's Quarters
Rehabilitate Fog Signal Building
Stabilize Cistern
Maintain Wood Structure
Remove Plantings
Retain Fuel Tank
Maintain Second Flagpole
Relocated Fire Pit
Clear Trees Maintain as Meadow
Oil Storage
Preserve Oil Storage
Maintain Landscape Plantings East of Oil Storage
Maintain Lawn Clearing
Rehabilitate Keepers Quarters and Tower
Retain Solar Panel and Battery Unit
Mark Location of Nonextant Well
Remove Wood Posts and Concrete Footing
Retain Conc Marker
Preserve Privy
Stabilize Remnant Cabin (remove vegetation)
Relocate Firepit to Northwest
Repair Ladder Stand
Remove Horseshoe Pegs
Edge of Historic Cleared Area
New Accesible NPS Restroom - Location to be Determined
Privy
N
W
E
S
0
30
60
SITE IMAGE OI-82
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
OUTER ISLAND LIGHT STATION
NAME OF PARK
APOSTLE ISLANDS NATIONAL LAKESHORE
REGION
MIDWEST
COUNTY
ASHLAND
STATE
WISCONSIN

CHAPTER 4: HISTORIC STRUCTURE REPORT

OUTER ISLAND INTRODUCTION

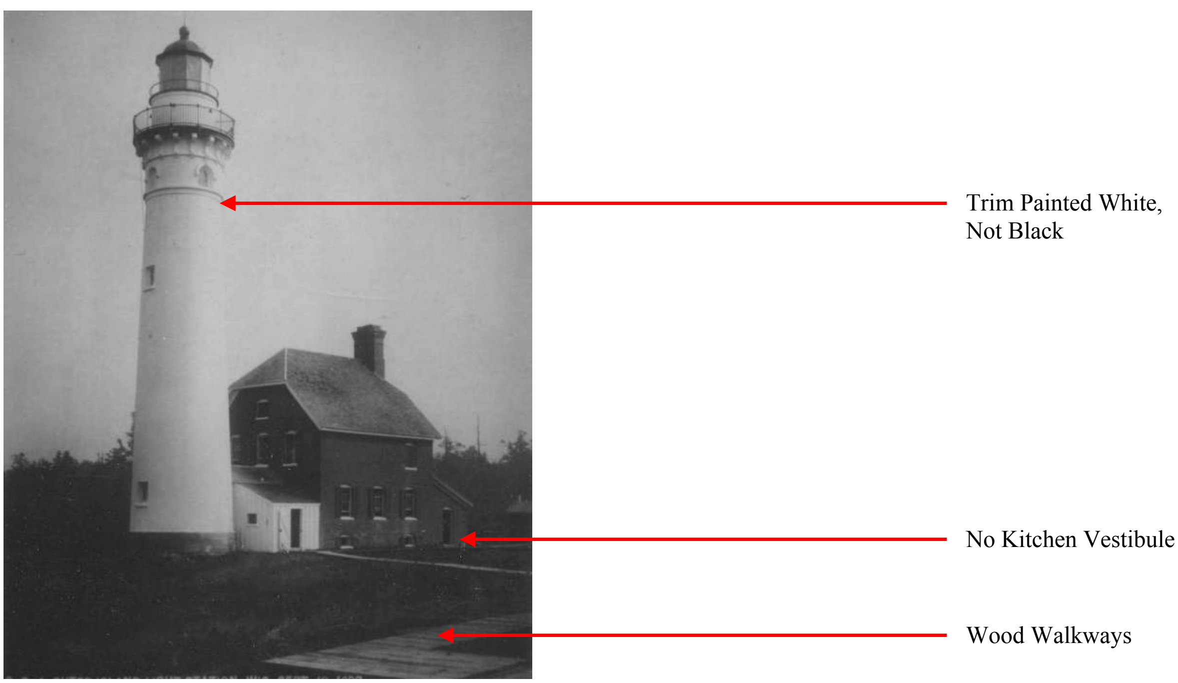
The following sections commence the HSR for Outer Island. The disciplines of Architecture, Structural, Mechanical (HVAC and plumbing), Electrical and Environmental Engineering are addressed individually (refer to Volume I Chapters 1 and 2 for more details on report organization and methodology). The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

- Outer Island Tower
- Keepers Quarters
- Fog Signal Building
- Oil Storage
- Privy

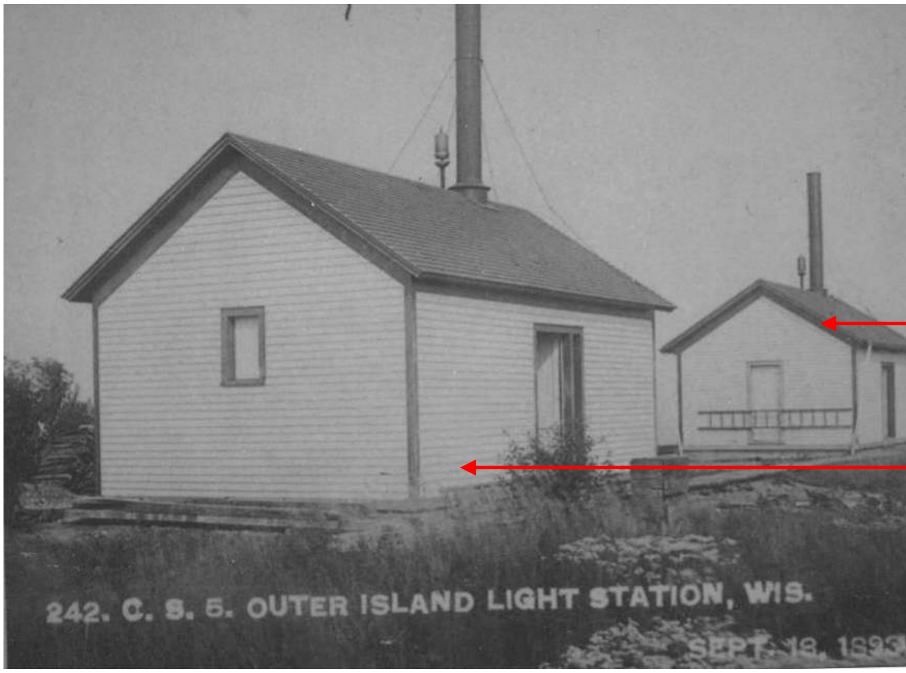
Original construction of each building is discussed, followed by its specific history/chronology of alterations (determined by studying historic photos, historic drawings, examining park records and archives and on site investigations and observations by the Study Team).

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.

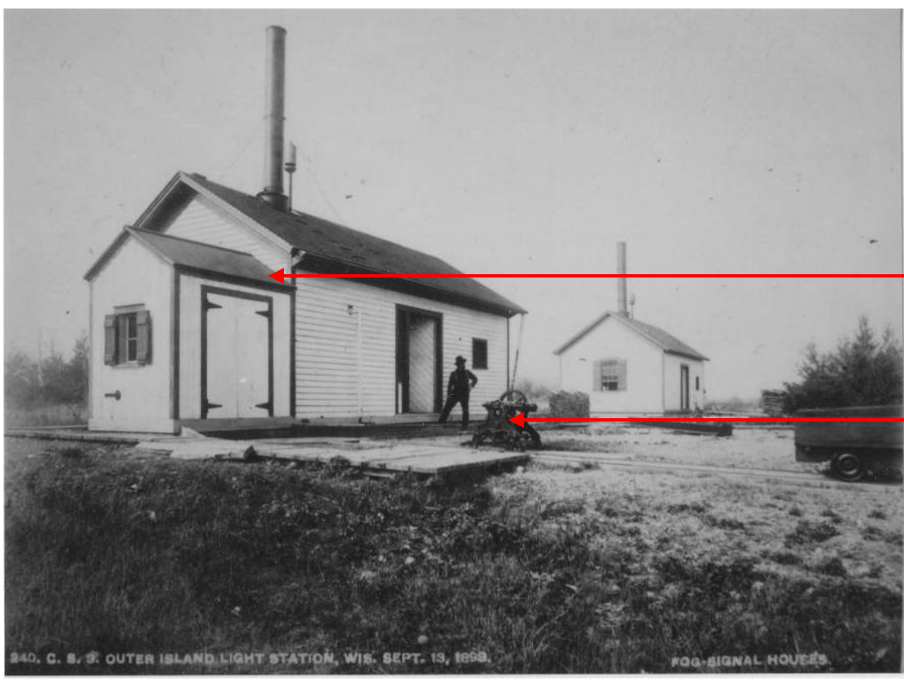
Historic Photographs



Historic Image OI-01: Northwest view of the Light Tower, 1893 (Source: NPS APIS Archives)

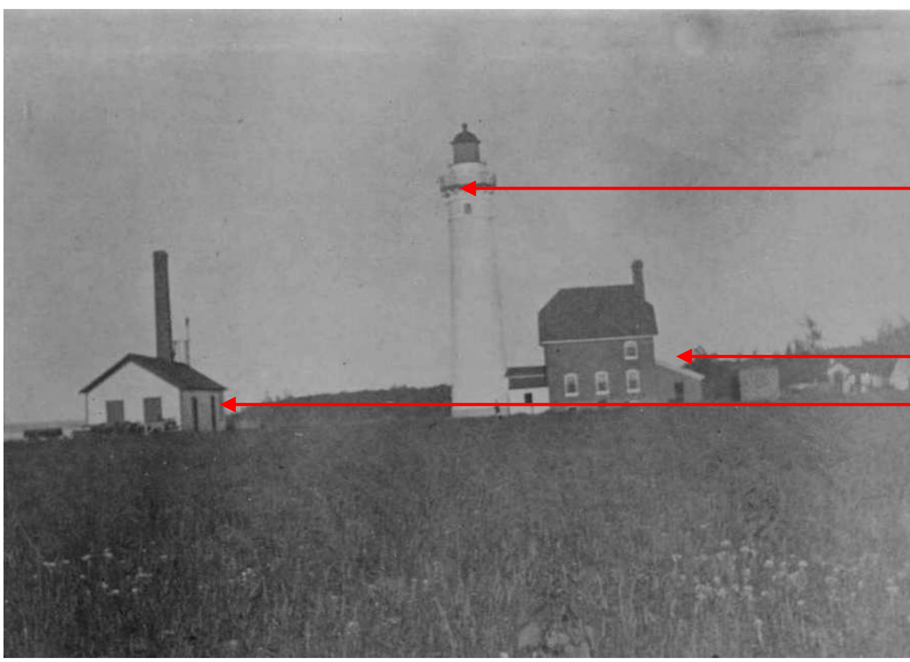


Historic Image OI-02: Northeast view of the Fog Signal Buildings, 1893 (Source: NPS APIS Archives)



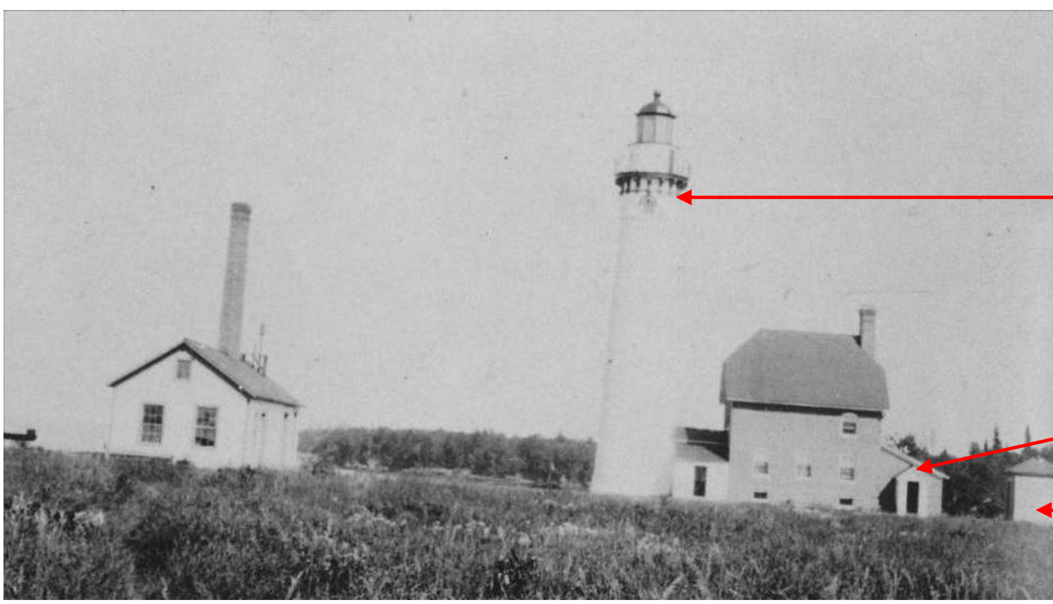
Historic Image OI-03: Southwest elevations of the Fog Signal Buildings, 1893 (Source: NPS APIS Archives)

Historic Image OI-04: South elevation of the Keepers Quarters, c. 1900 (Source: NPS APIS Archives)

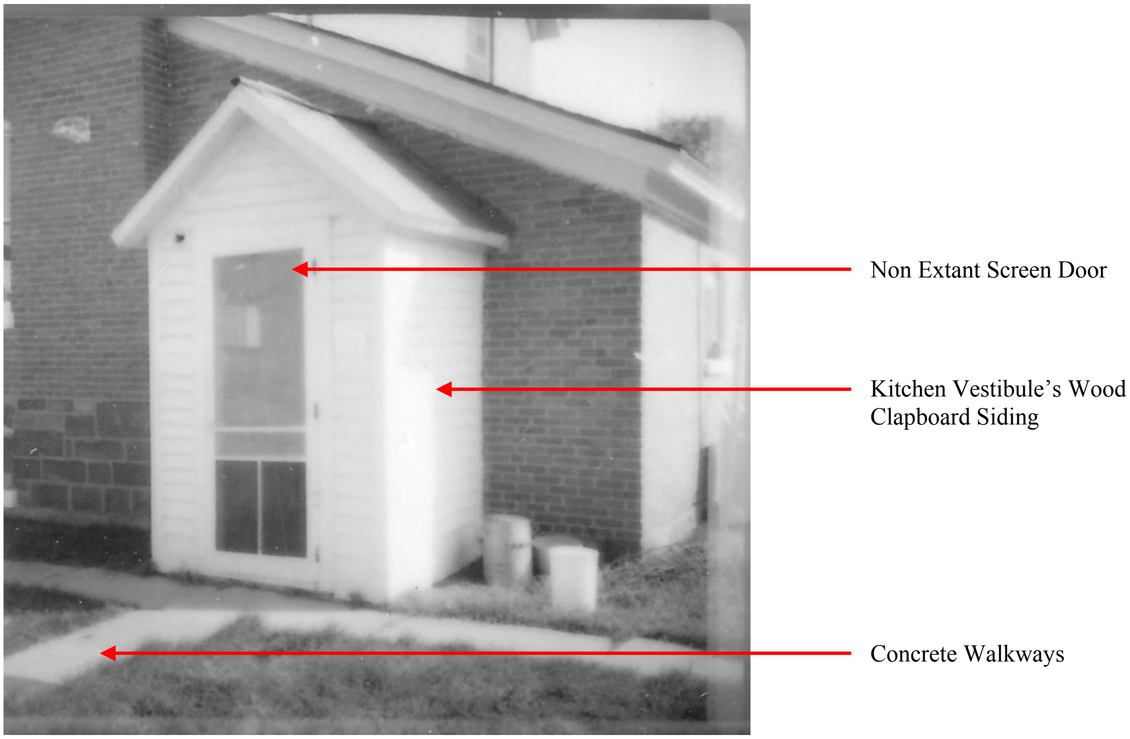


Historic Image OI-05: West elevation of the Fog Signal Building, Tower and Keepers Quarters, 1905 (Source: NPS APIS Archives)

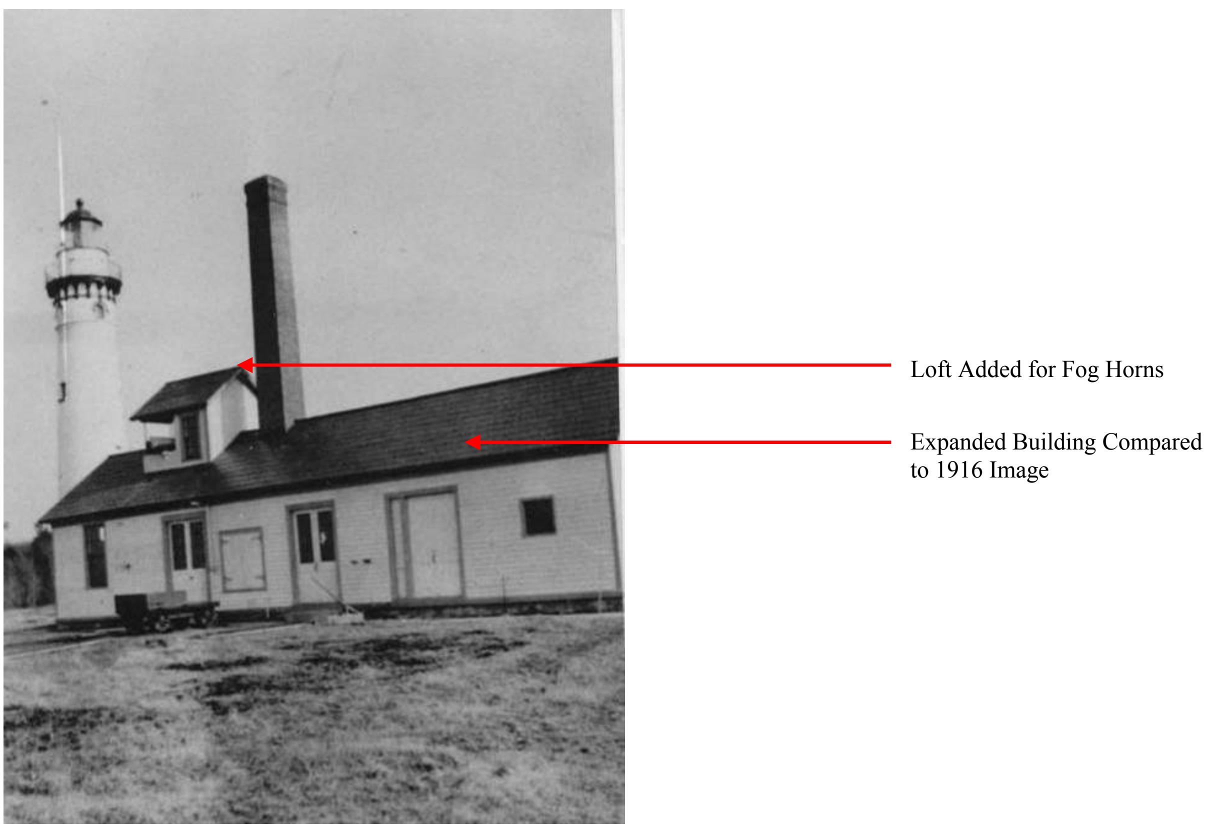
Historic Image OI-06: Northwest elevation of the Light Tower, 1916-1925 (Source: NPS APIS Archives)



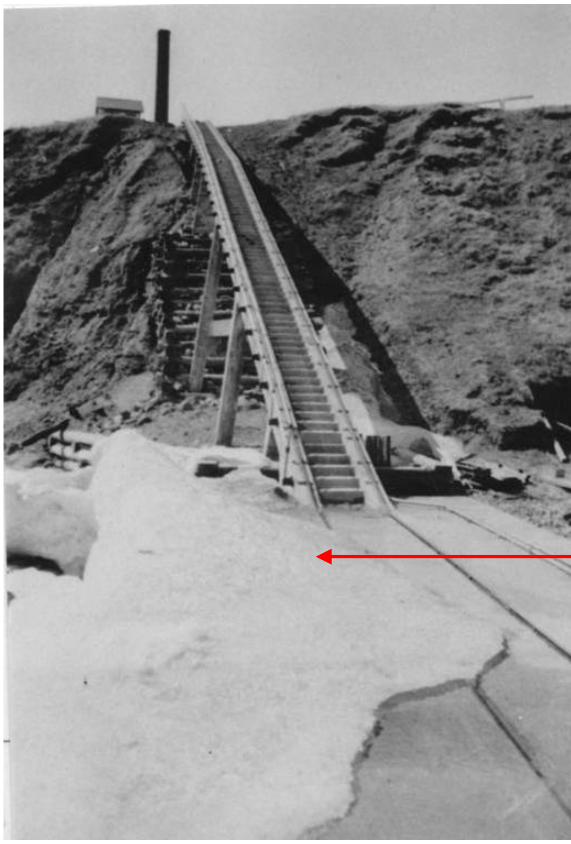
Historic Image OI-07: West elevation of the Keepers Quarters and kitchen vestibule, 1916 (Source: NPS APIS Archives)



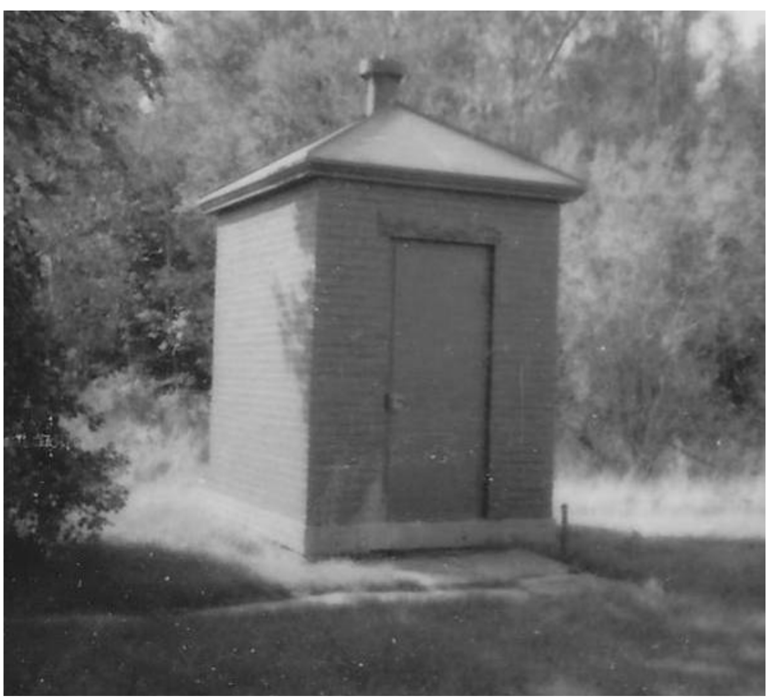
Historic Image OI-08: Kitchen vestibule's screen door, unknown date (Source: NPS APIS Archives)



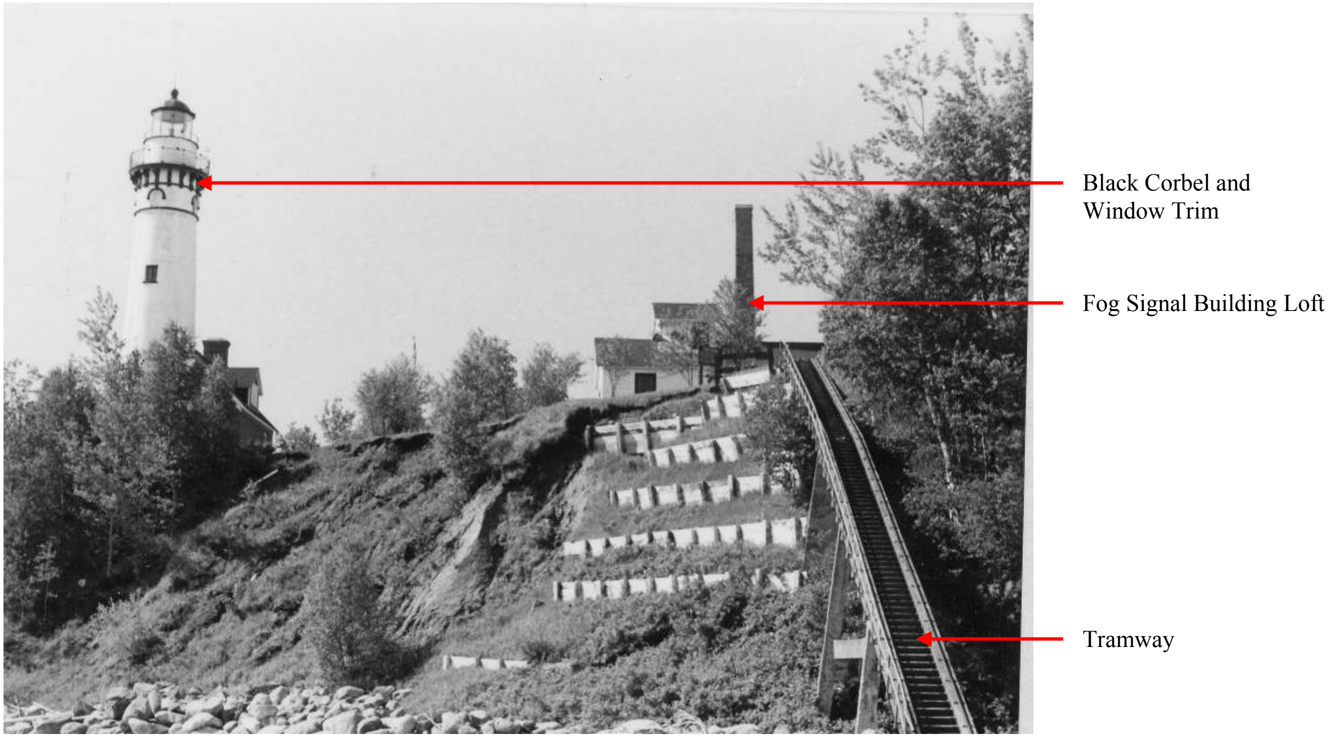
Historic Image OI-09: North elevation of the Fog Signal Building, 1937 (Source: NPS APIS Archives)



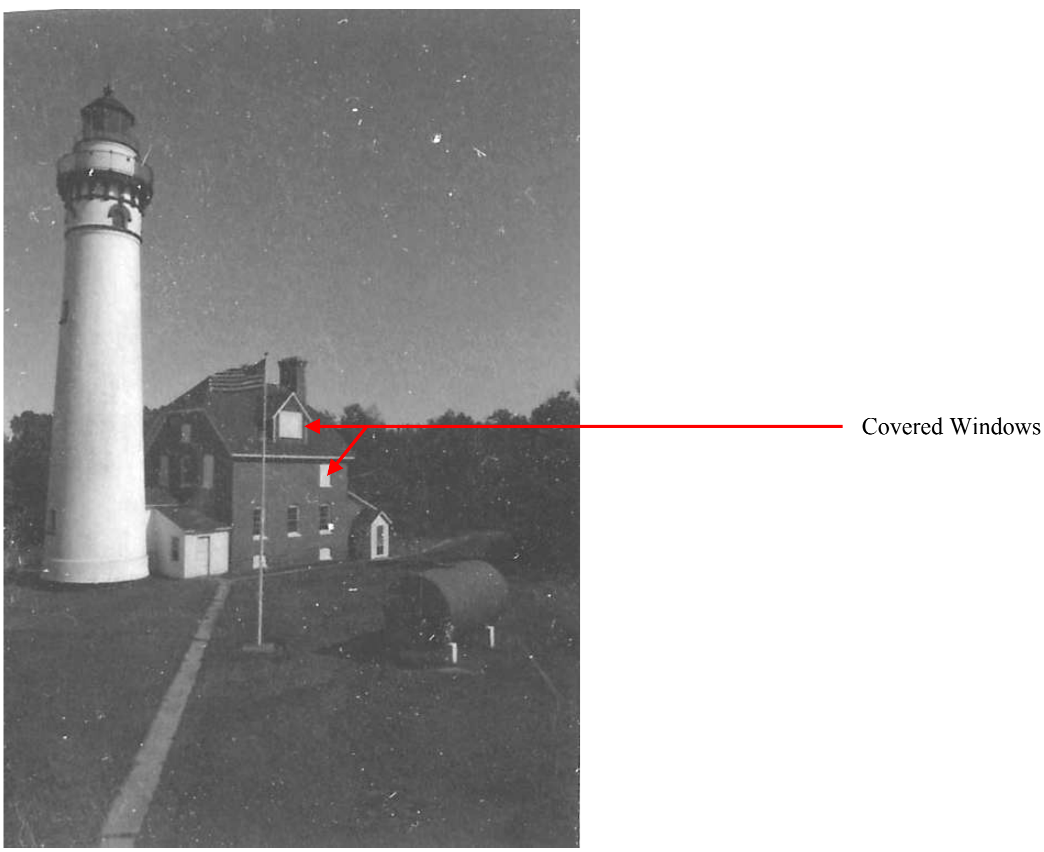
Historic Image OI-10: View of the boat ramp and Fog Signal stack, 1937 (Source: NPS APIS Archives)



Historic Image OI-11: North elevation of the Oil Storage, unknown date (Source: NPS APIS Archives)

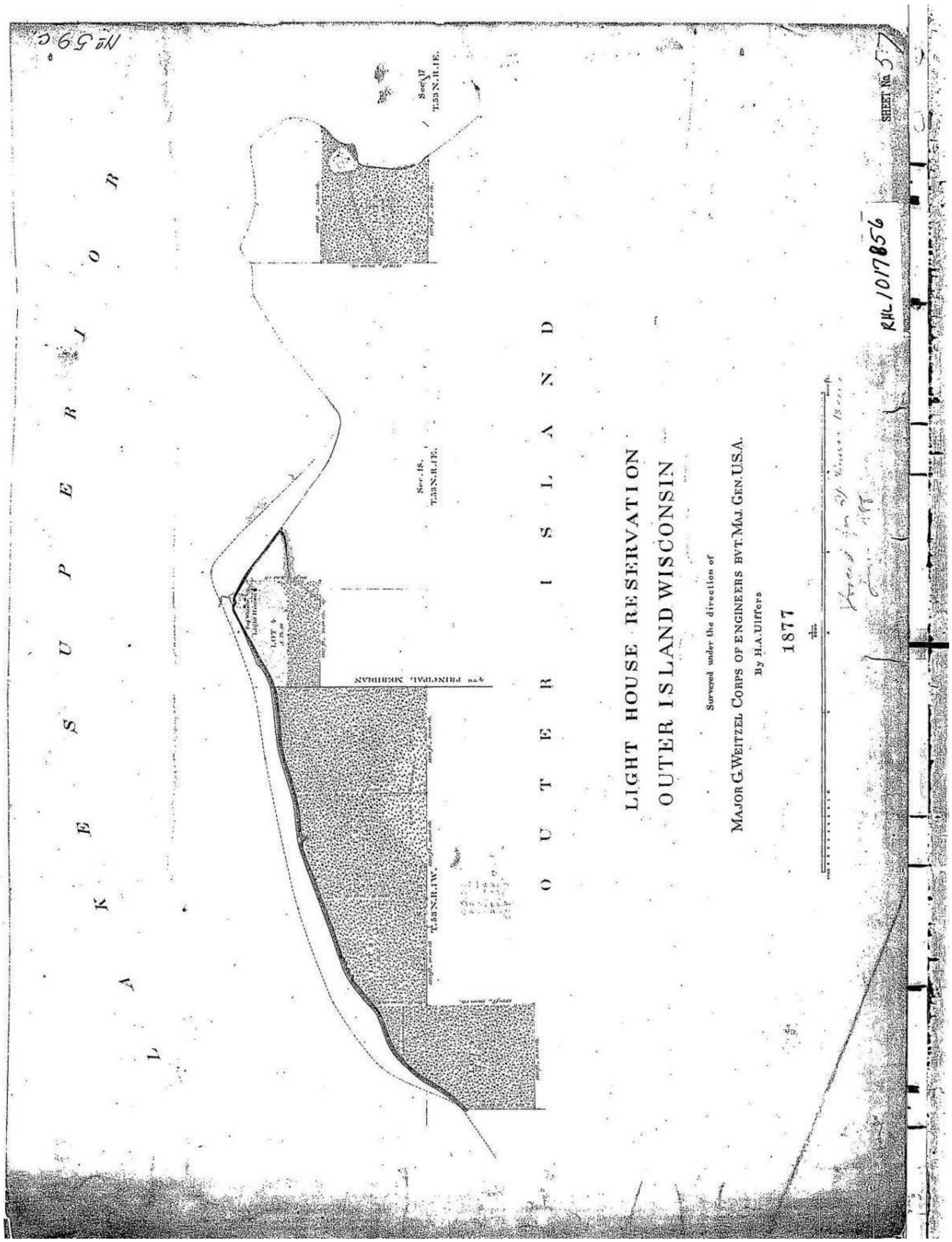


Historic Image OI-12: Shoreline stabilization work, c. 1980 (Source: NPS APIS Archives)

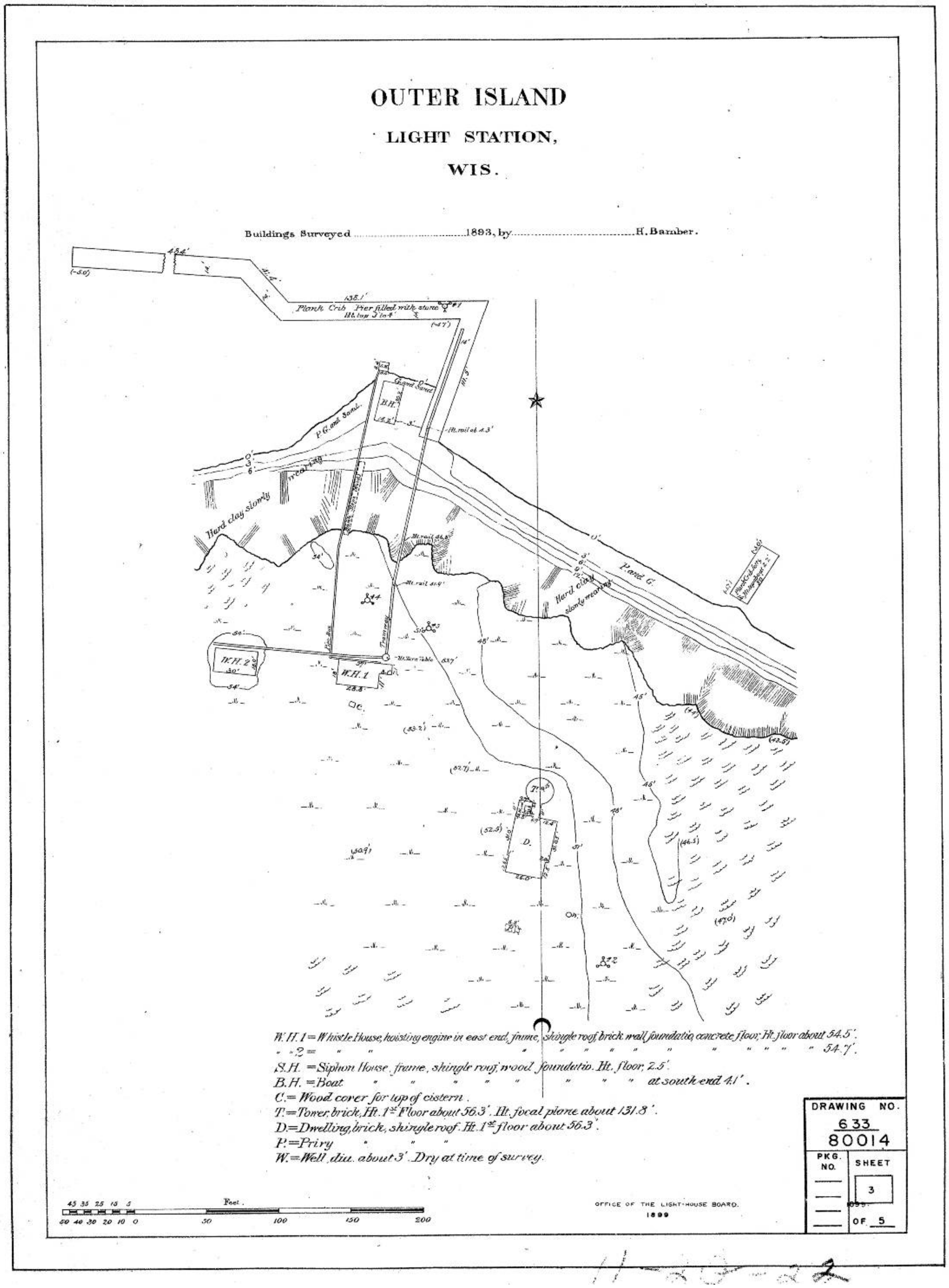


Historic Image OI-13: West elevation of the Keepers Quarters, 1981 (Source: NPS APIS Archives)

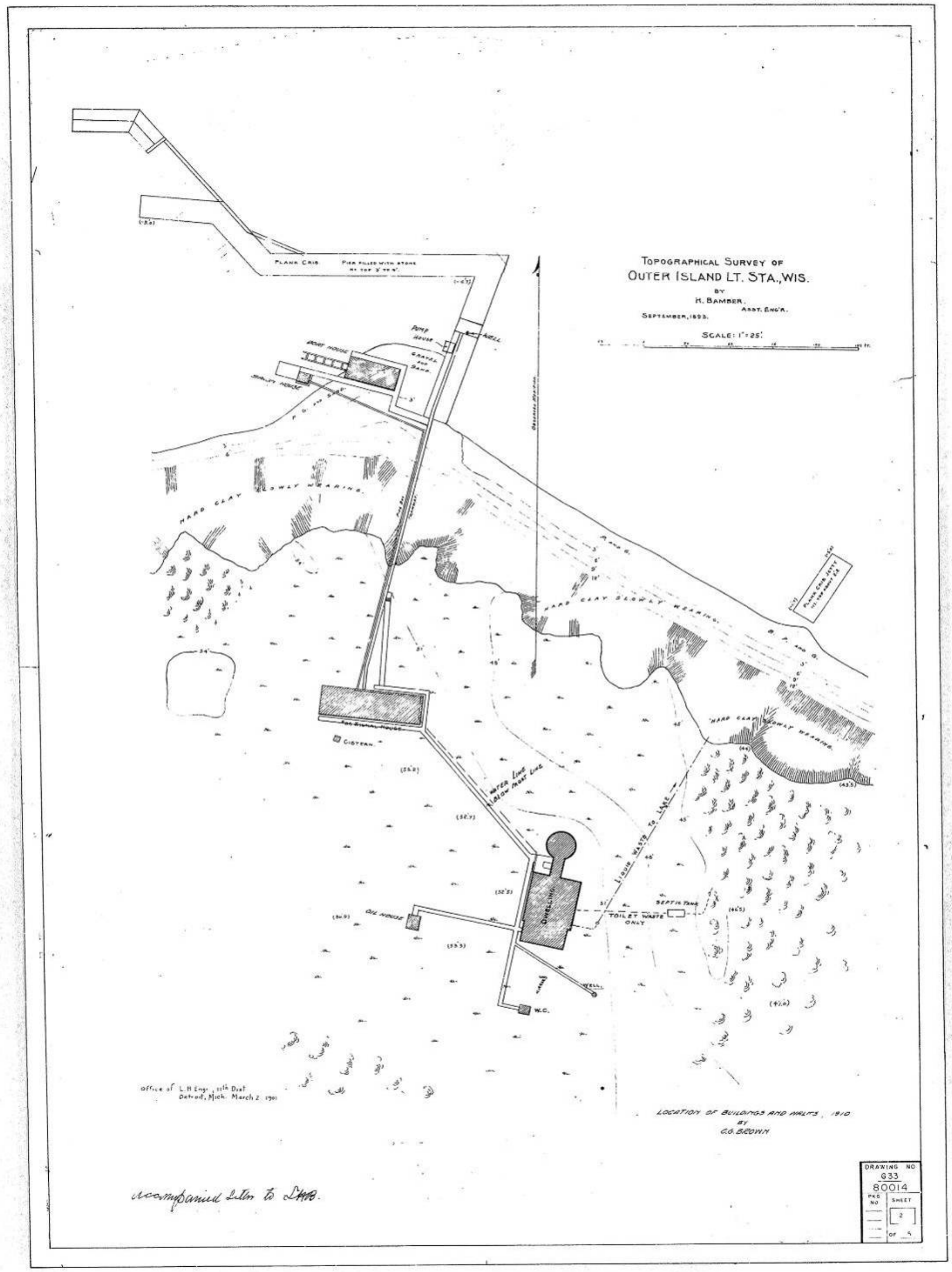
Historic Drawings



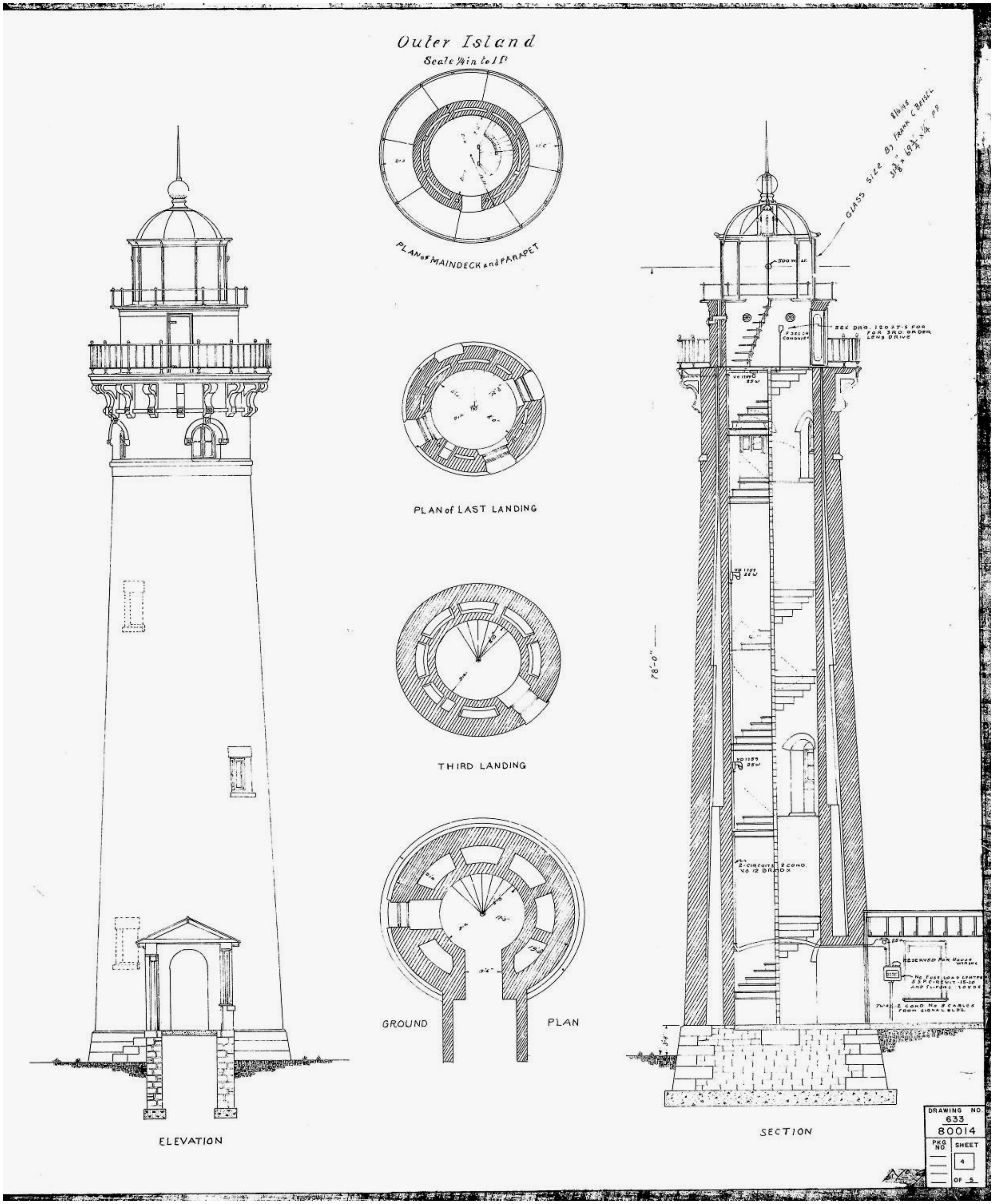
Historic Drawing OI-01: 1877 Site Plan



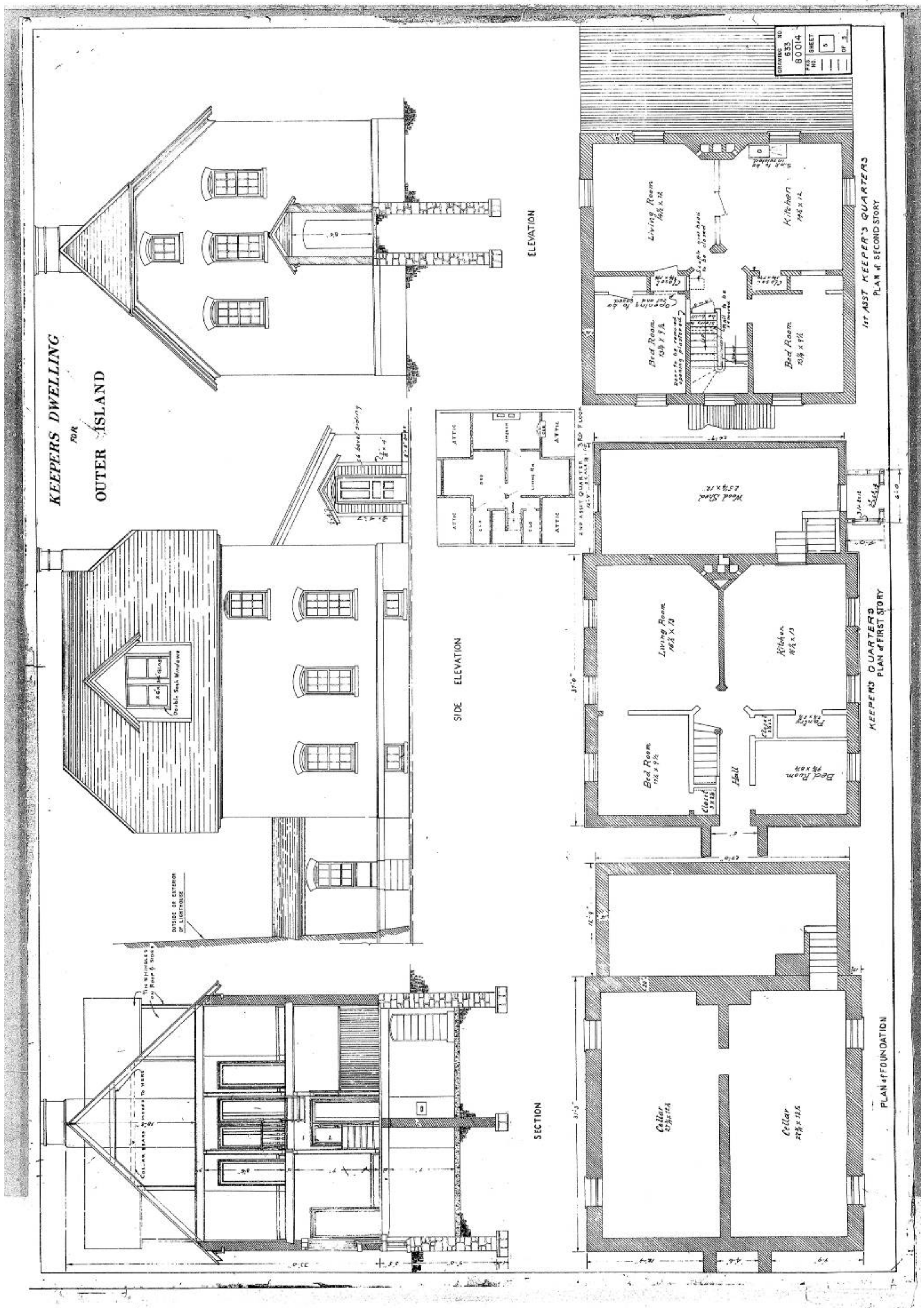
Historic Drawing OI-02: 1893 Survey by H. Bamber, published 1899



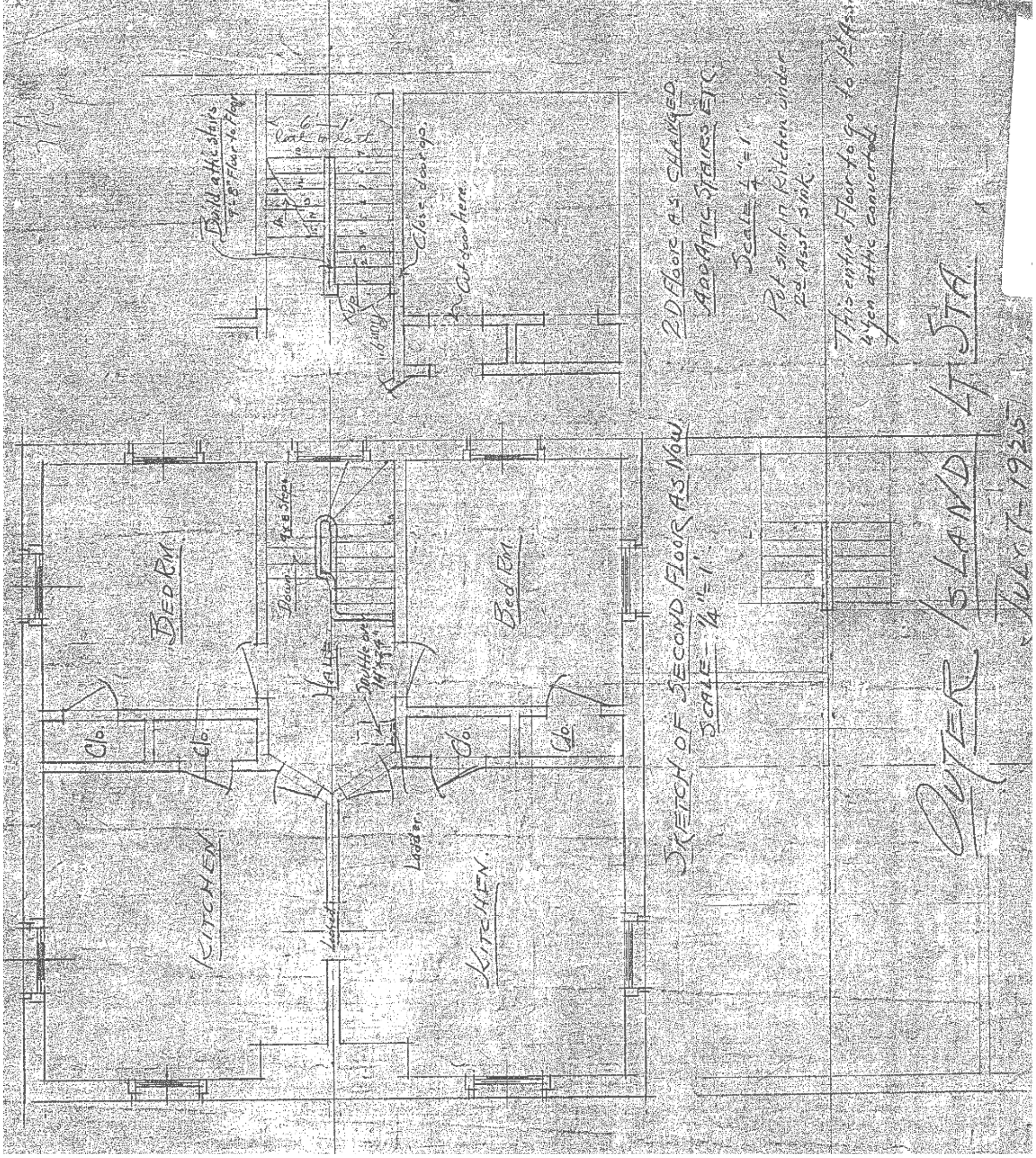
Historic Drawing OI-03: September, 1893 Survey by H. Bamber, revised 1901 and 1911



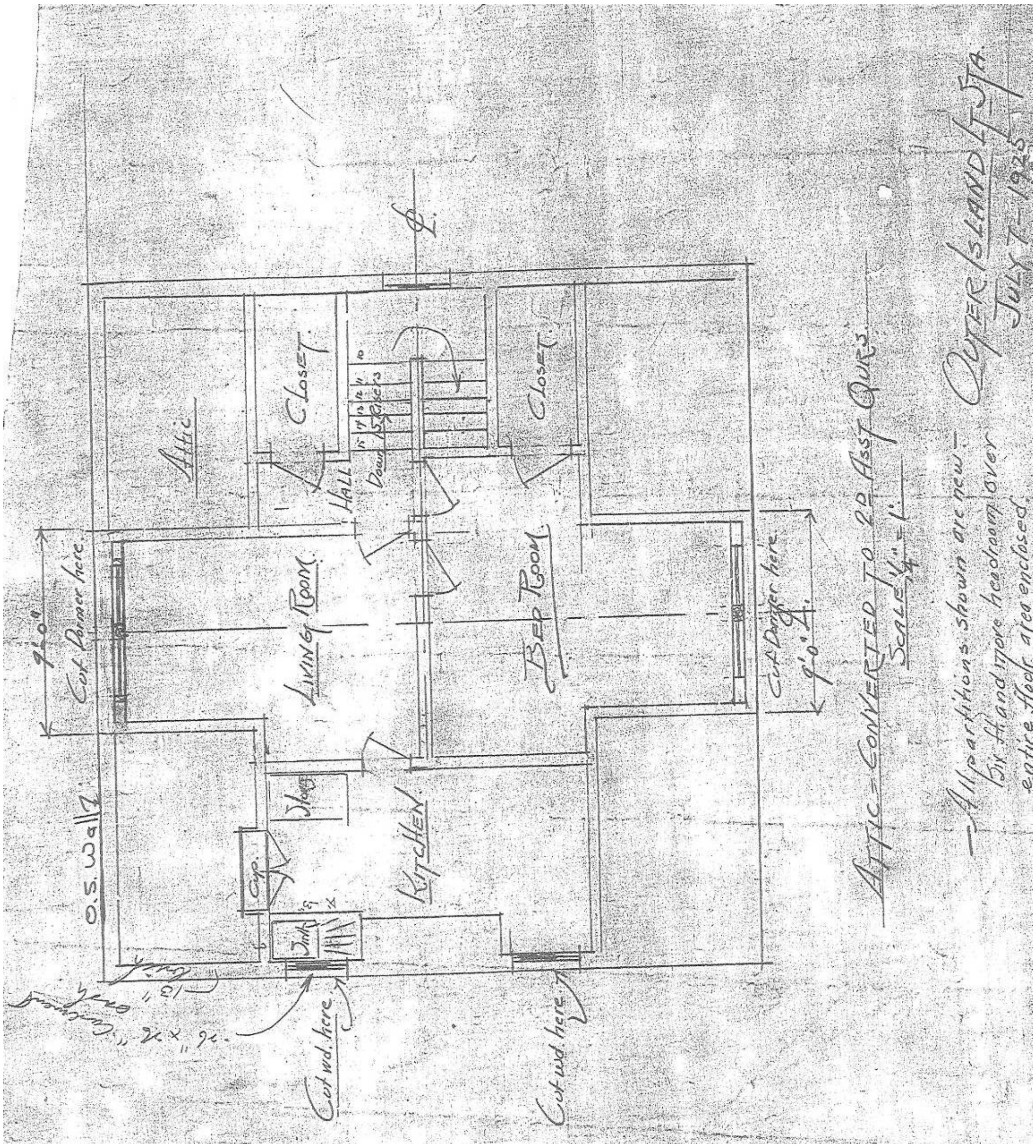
Historic Drawing OI-04: Undated plan and elevations of Tower



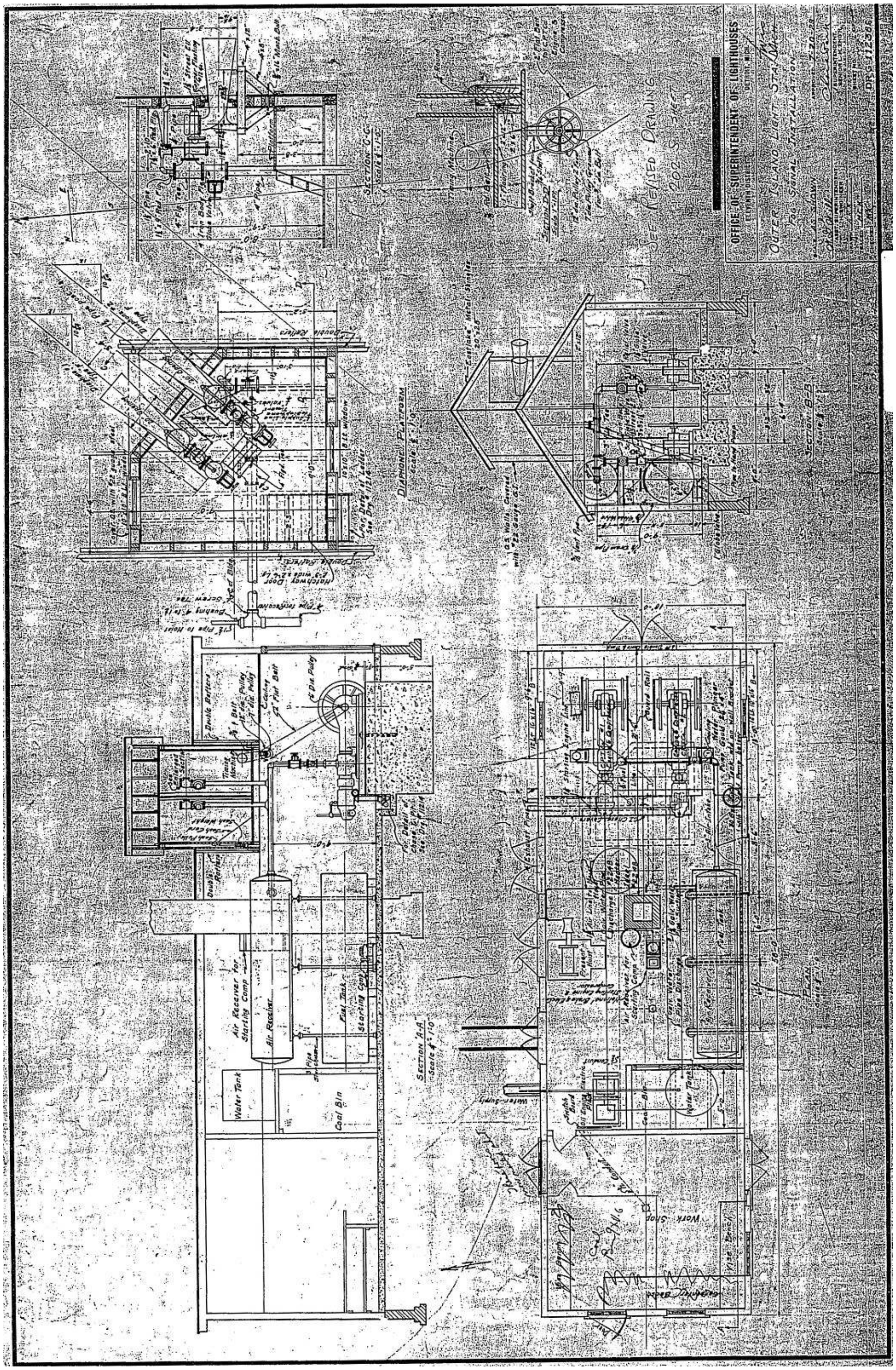
Historic Drawing OI-05: Plan of Keepers Quarters, undated (assumed original with 1925 additions overlaid)



Historic Drawing OI-06: 1925 Plan to convert second floor of Keepers Quarters into one living space for first assistant



Historic Drawing OI-07: 1925 Plan to convert attic of Keepers Quarters into living space for second assistant

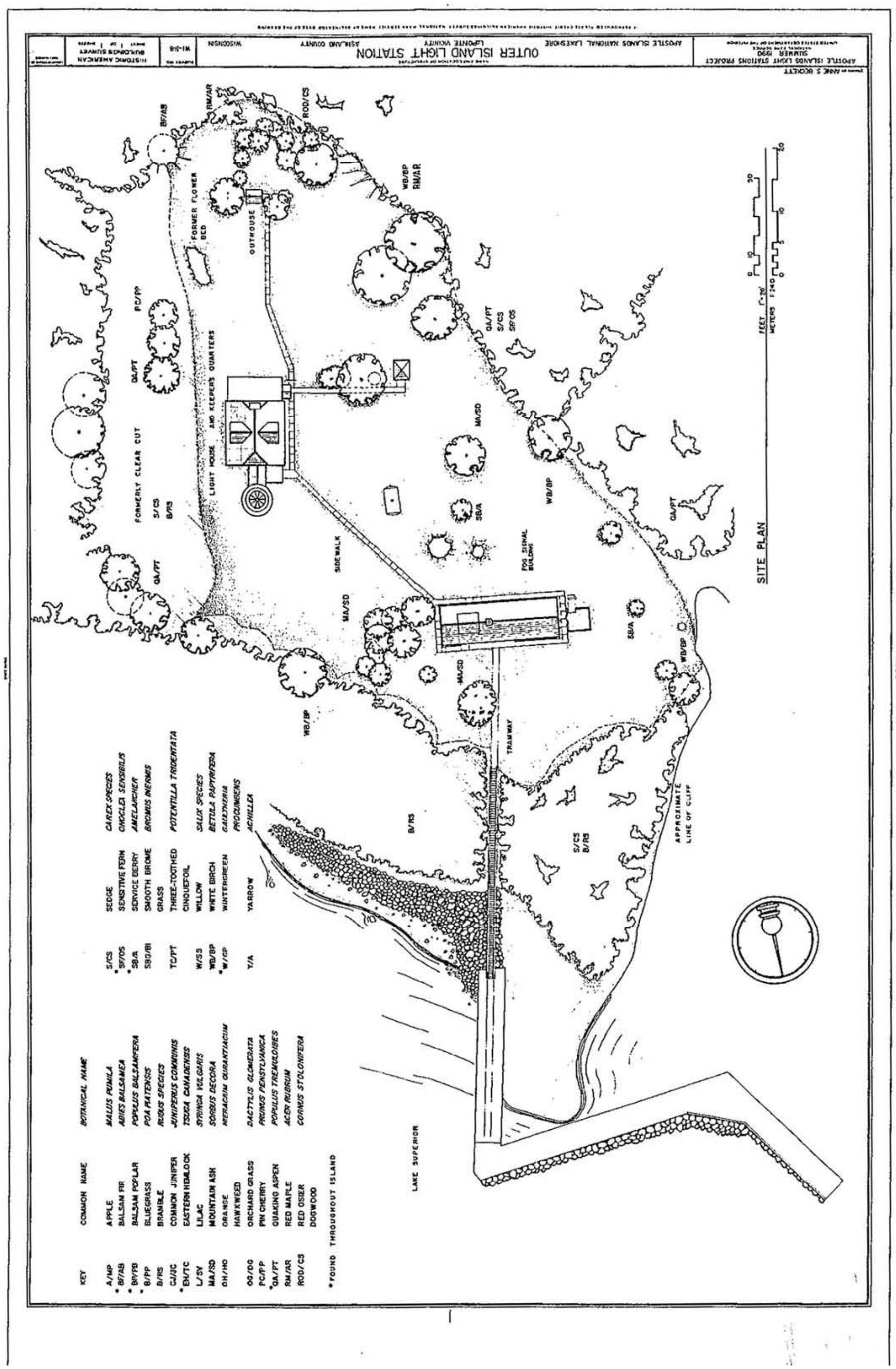


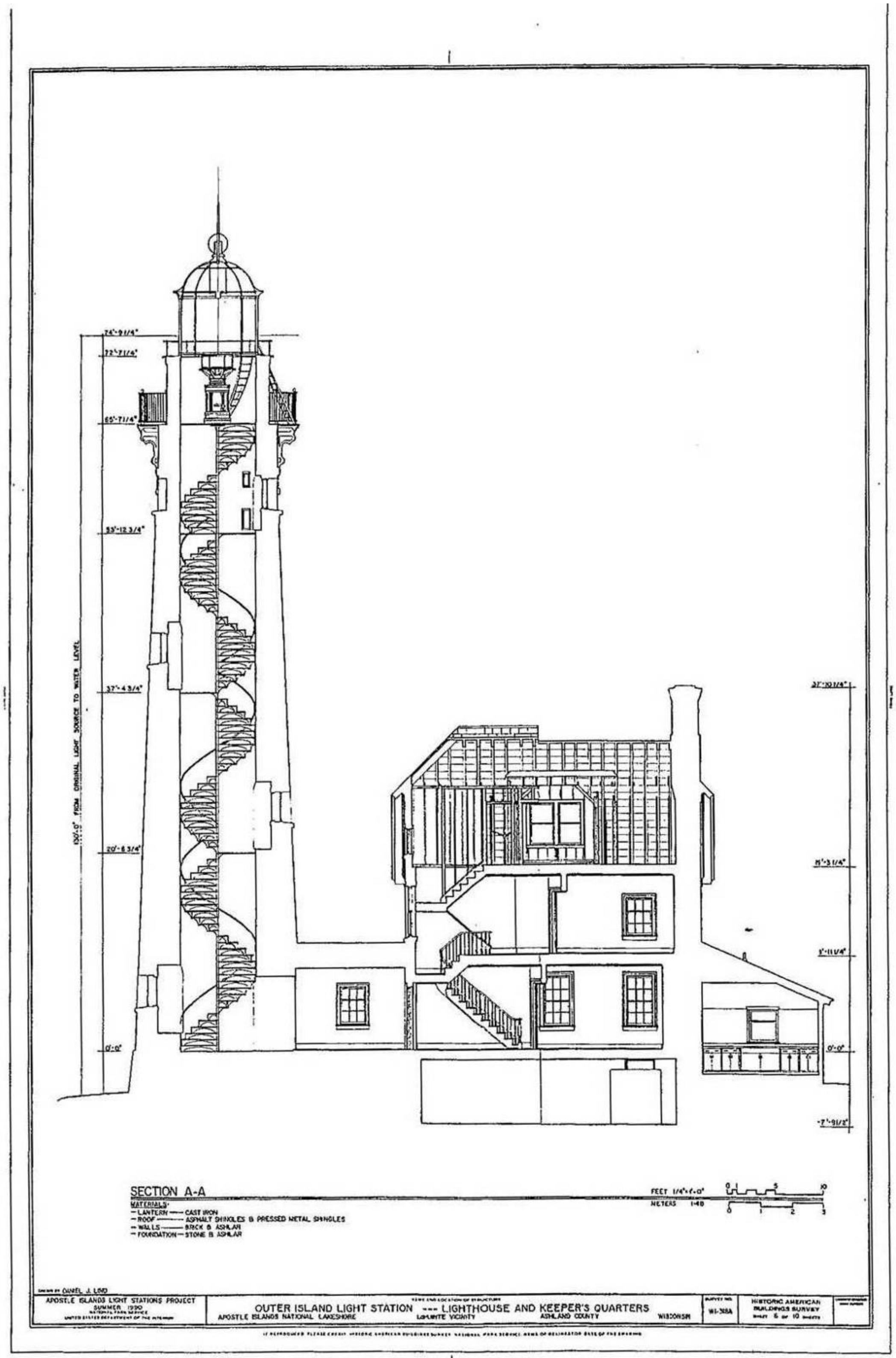
Historic Drawing OI-08: 1929 revised plans, elevations and details of Fog Signal Building

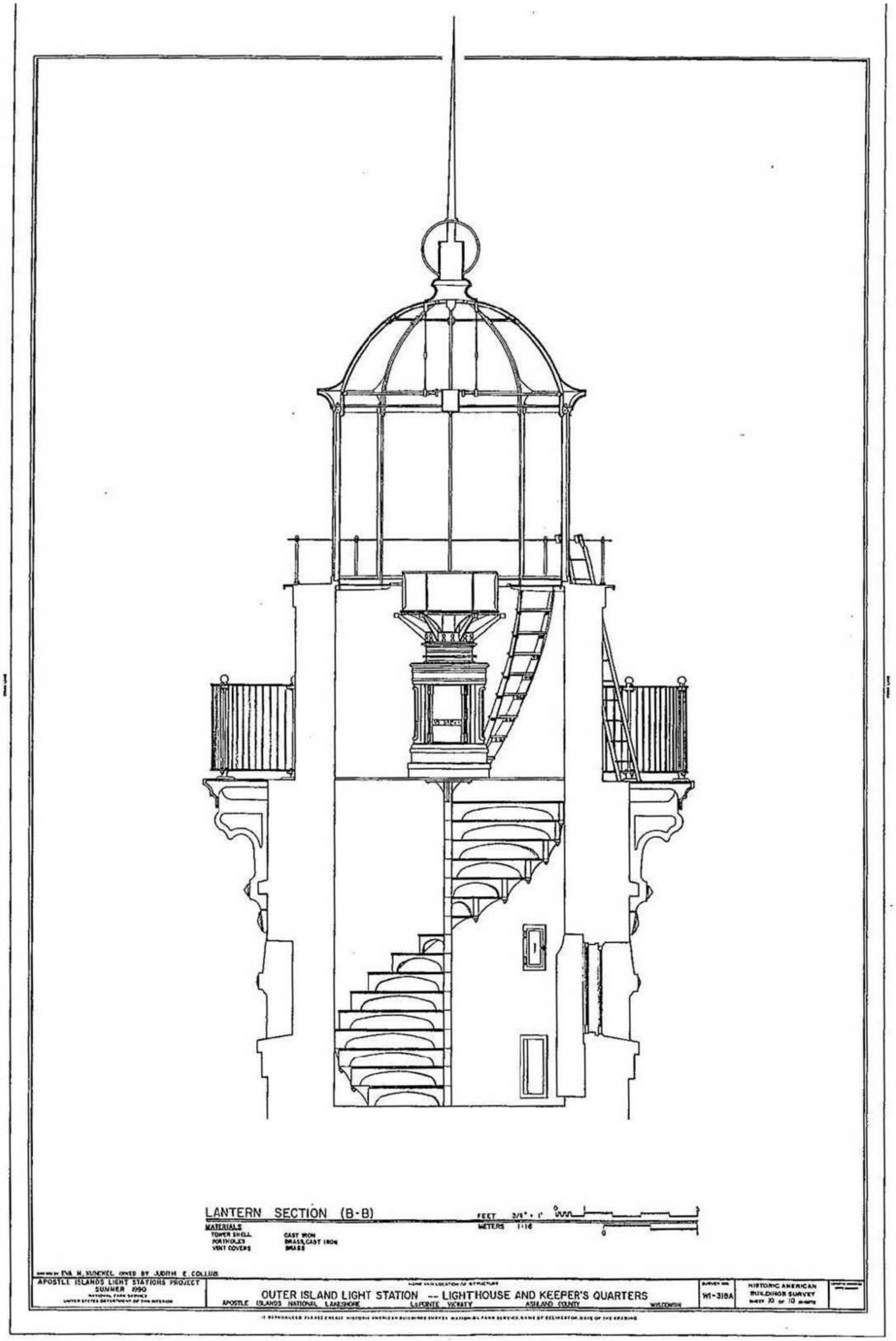
Existing Condition Drawings

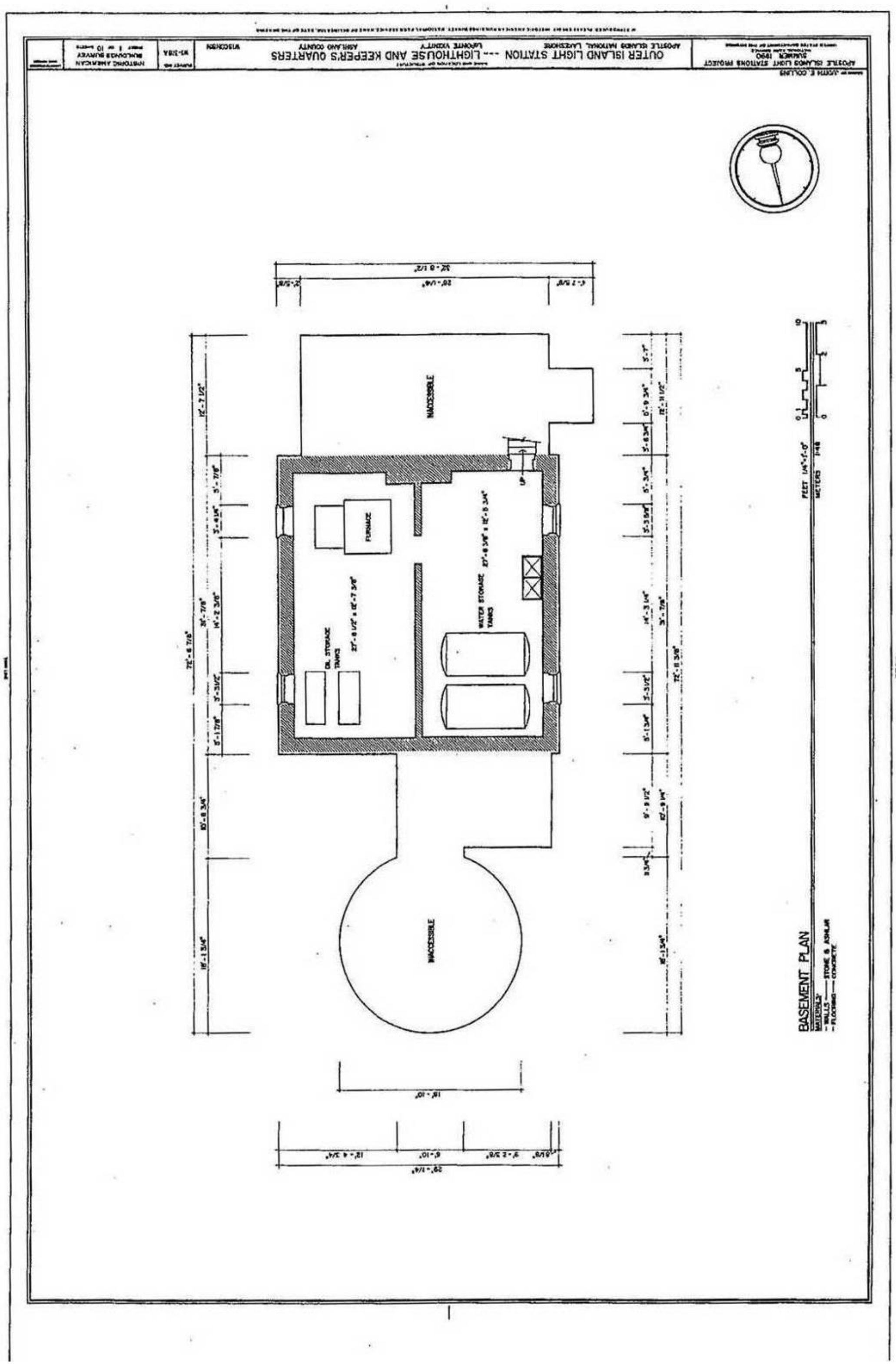
The primary and secondary buildings on Outer Island were documented in the summer of 1990 by a team from the Historic American Buildings Survey (HABS). Since 1933, multi-format surveys in cooperation with government agencies have recorded the built environment in the United States. Measured drawings, 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 eleven drawings contain the measured drawings produced by the HABS survey from 1990.

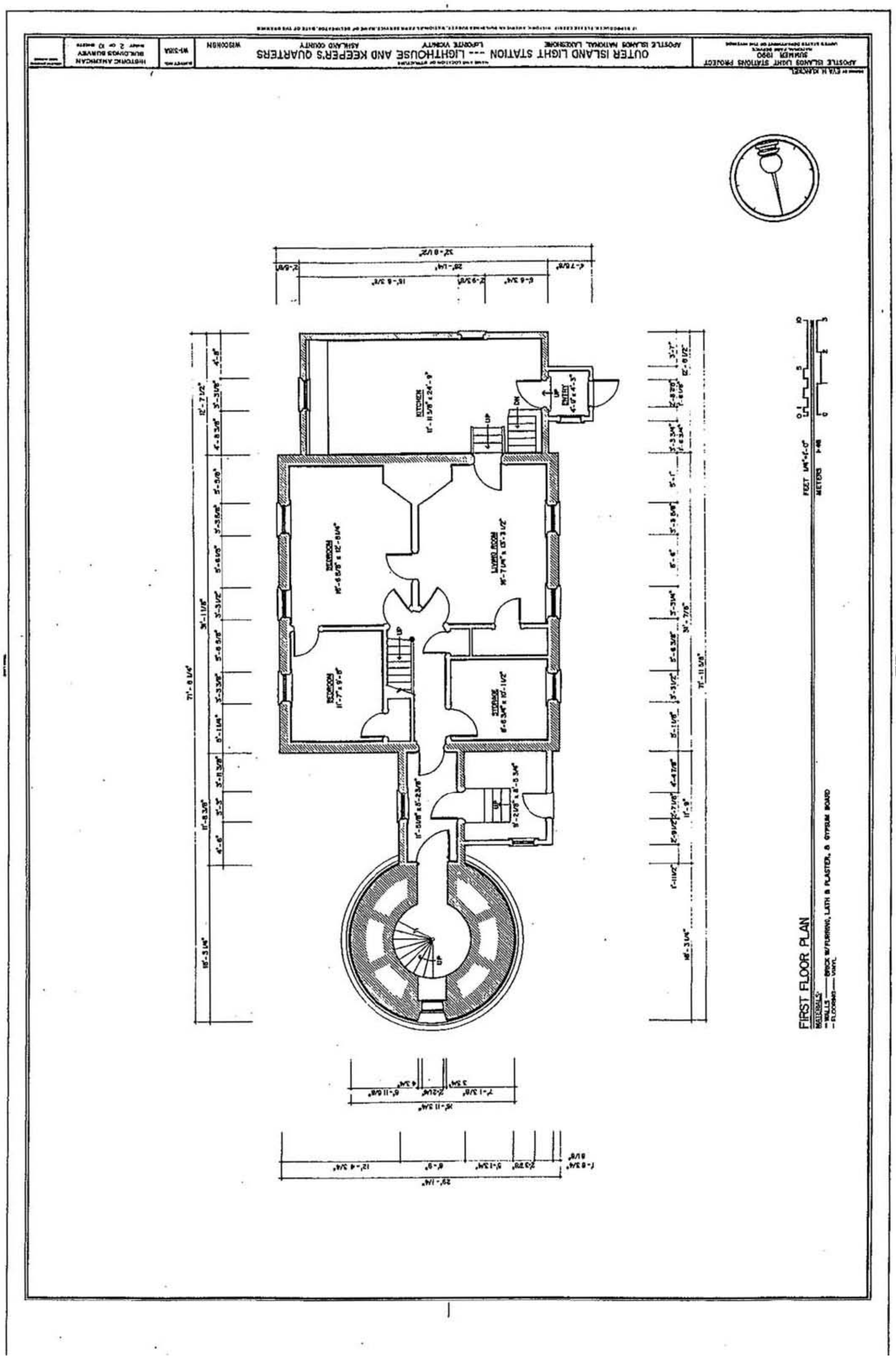
Typically, utilitarian buildings are not included in the HABS survey. In September of 2009, the architects and historic preservation specialists from Anderson Hallas Architects, PC surveyed the Oil Storage and Privy on Outer Island. These measured drawings have been included following the HABS drawings.

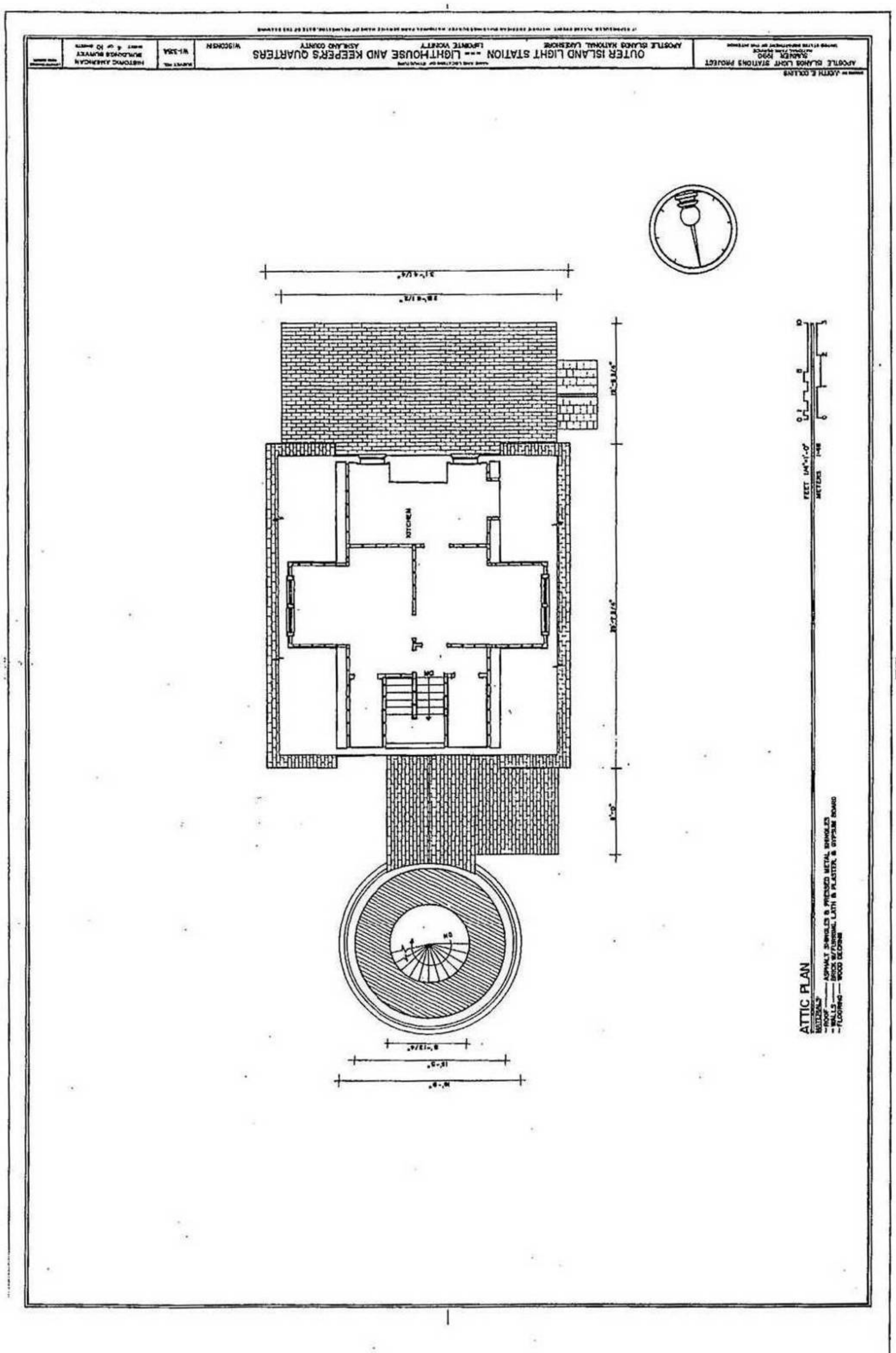

OUTER ISLAND LIGHT STATION
SITE PLAN
LAKE SUPERIOR
TRAMWAY
SIDEWALK
OUTHOUSE
FORMERLY CLEAR CUT
FOG SIGNAL BUILDING
APPROXIMATE LINE OF CLIFF

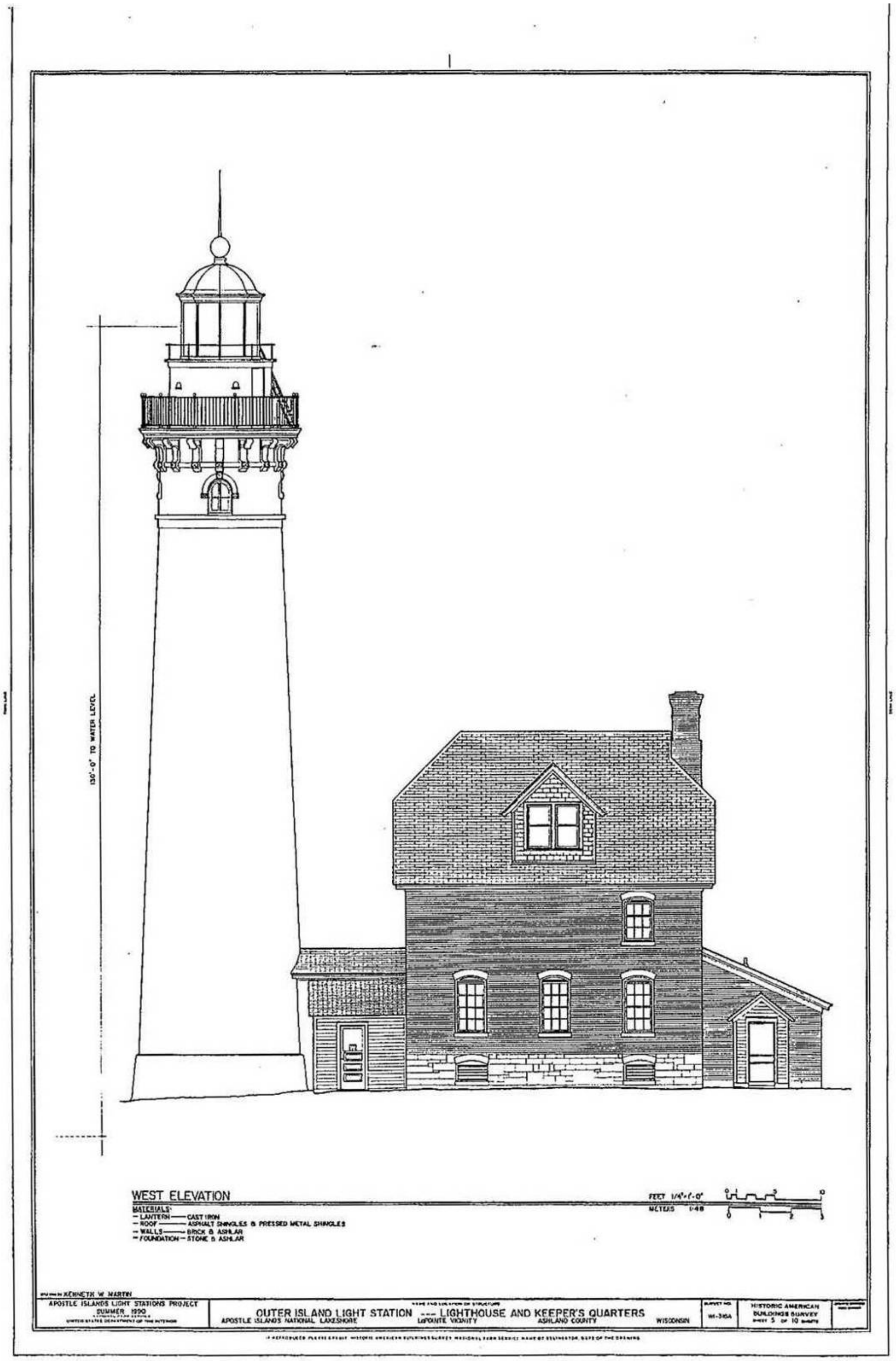

SECTION A-A
MATERIALS:
— LANTERN — CAST IRON
— ROOF — ASPHALT SHINGLES & PRESSED METAL SHINGLES
— WALLS — BRICK & ASHLAR
— FOUNDATION — STONE & ASHLAR
FEET 1/4"=1'-0"
METERS 1:48
DANIEL J. LIND
APOSTLE ISLANDS LIGHT STATIONS PROJECT
SUMMER 1990
OUTER ISLAND LIGHT STATION --- LIGHTHOUSE AND KEEPER'S QUARTERS
APOSTLE ISLANDS NATIONAL LAKESHORE
LAPOINTE VICINITY
ASHLAND COUNTY
WISCONSIN
WI-368A
HISTORIC AMERICAN BUILDINGS SURVEY
SHEET 6 OF 10 SHEETS

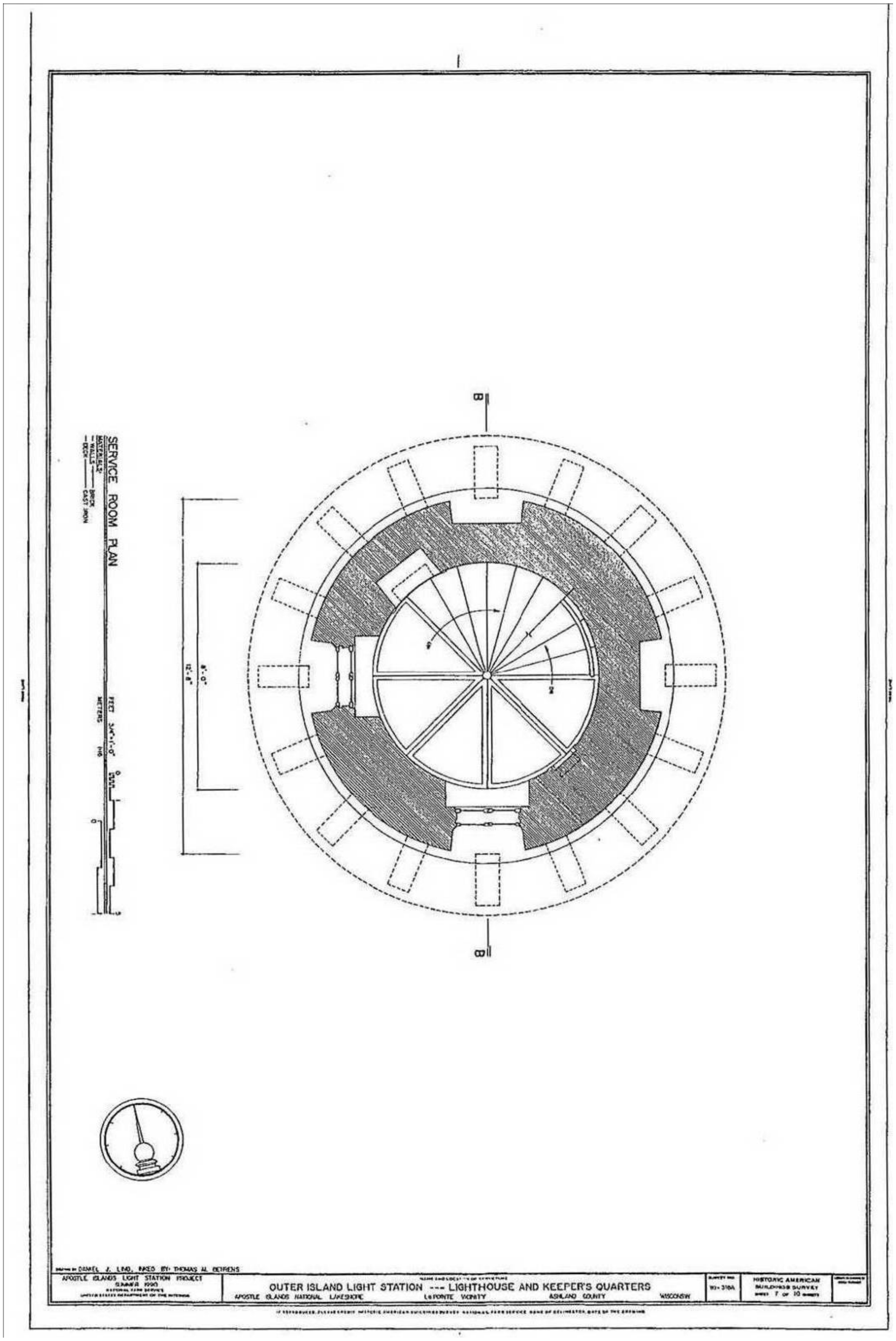

LANTERN SECTION (B-B)
FEET 3/4" = 1'
METERS 1:16
MATERIALS
TOWER SHELL CAST IRON
PORTHOLES BRASS, CAST IRON
VENT COVERS BRASS
EVA H. KUNCKEL CKED BY JUDITH E. COLLINS
APOSTLE ISLANDS LIGHT STATIONS PROJECT
SUMMER 1990
OUTER ISLAND LIGHT STATION -- LIGHTHOUSE AND KEEPER'S QUARTERS
APOSTLE ISLANDS NATIONAL LAKESHORE
LaPOINTE VICINITY
ASHLAND COUNTY
WISCONSIN
WI-318A
HISTORIC AMERICAN BUILDINGS SURVEY
SHEET 10 OF 10 SHEETS

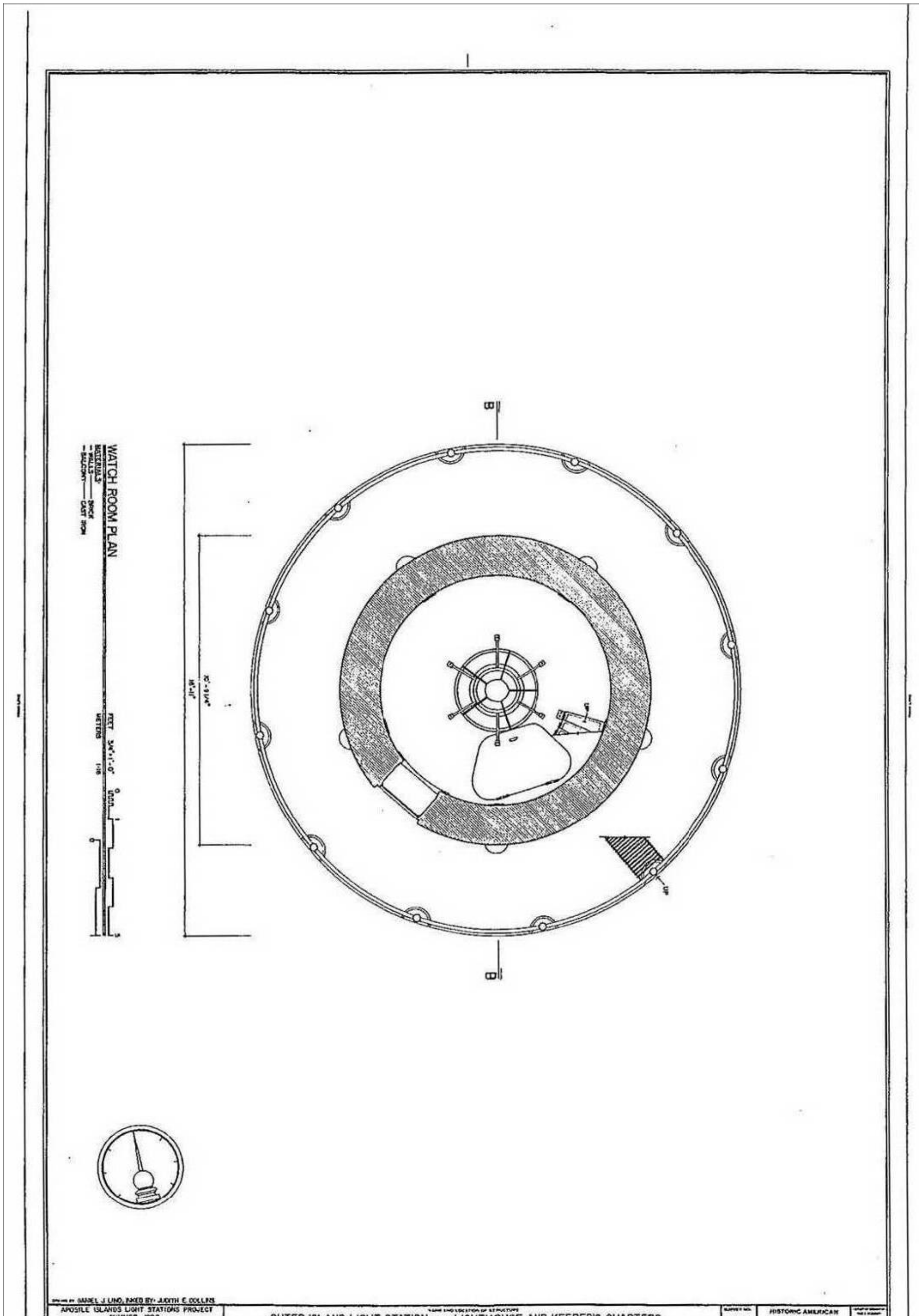


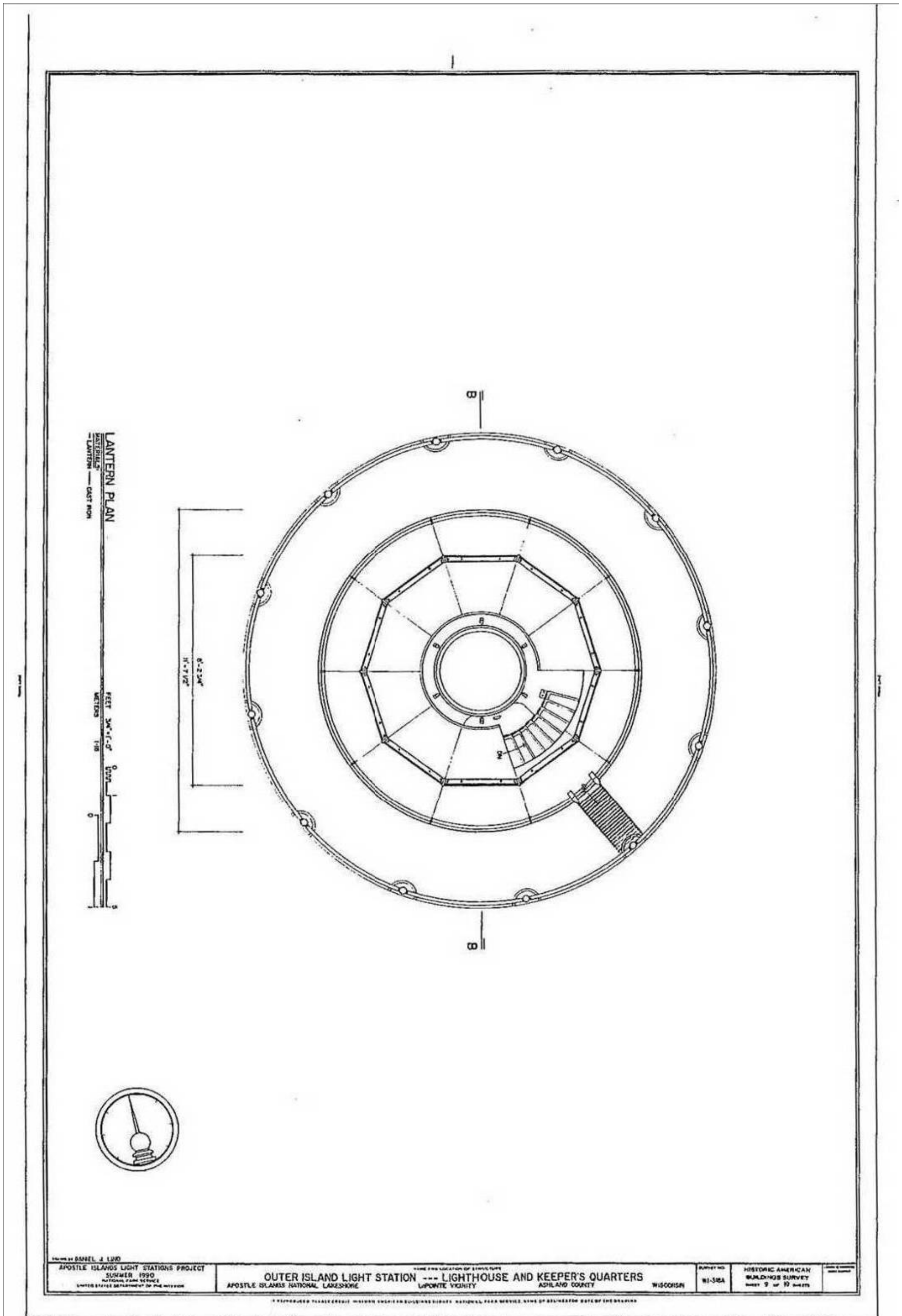

OUTER ISLAND LIGHT STATION --- LIGHTHOUSE AND KEEPER'S QUARTERS
FIRST FLOOR PLAN

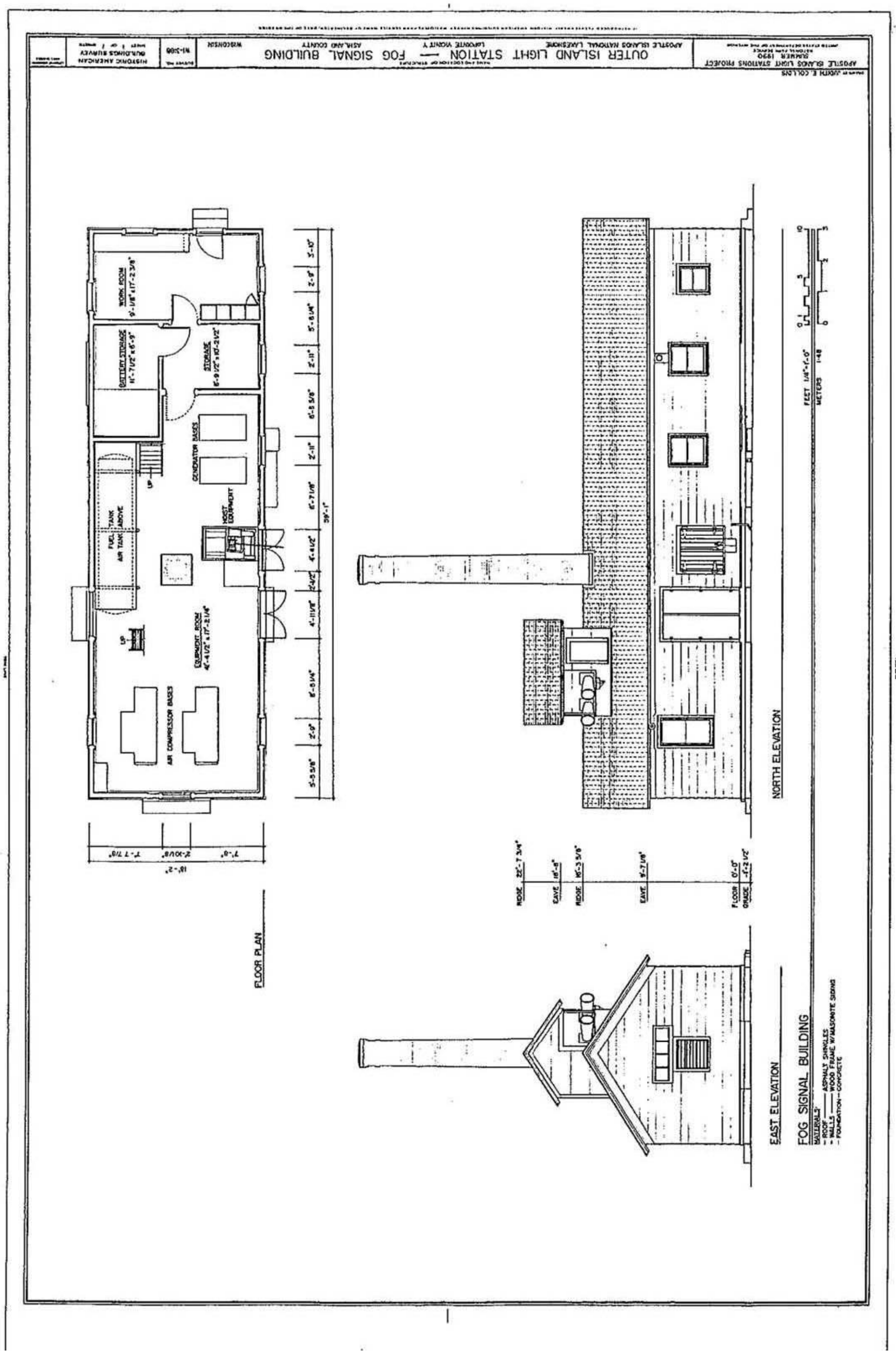

OUTER ISLAND LIGHT STATION --- LIGHTHOUSE AND KEEPER'S QUARTERS
APOSTLE ISLANDS NATIONAL LAKESHORE
LAPOINTE VICINITY
ASHLAND COUNTY
WISCONSIN
HISTORIC AMERICAN BUILDINGS SURVEY
APOSTLE ISLANDS LIGHT STATIONS PROJECT
KITCHEN
ATTIC PLAN

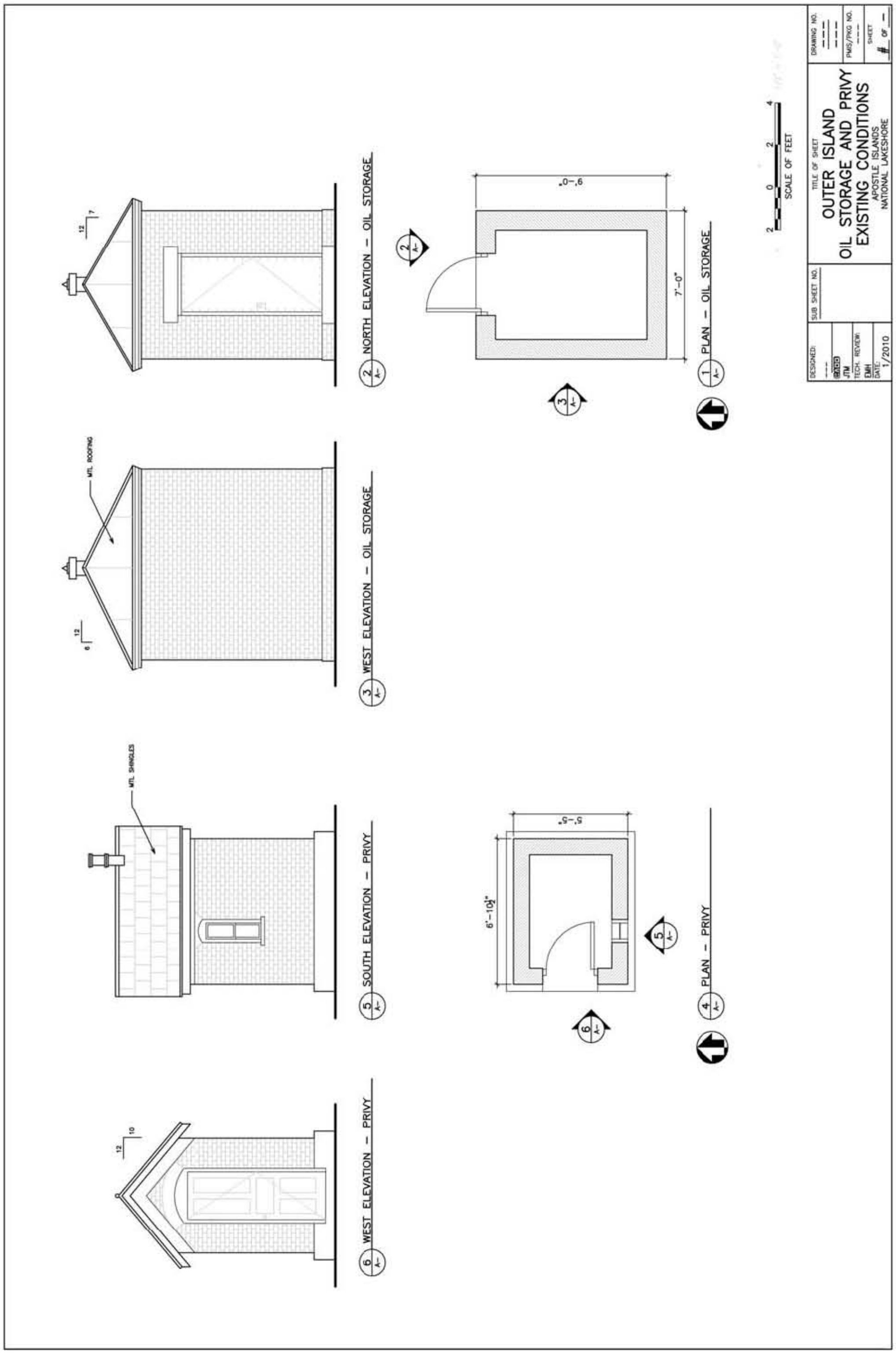

130'-0" TO WATER LEVEL
WEST ELEVATION
MATERIALS:
— LANTERN — CAST IRON
— ROOF — ASPHALT SHINGLES & PRESSED METAL SHINGLES
— WALLS — BRICK & ASHLAR
— FOUNDATION — STONE & ASHLAR
FEET 1/4"=1'-0"
METERS 1:48
KENNETH W. MARTIN
APOSTLE ISLANDS LIGHT STATIONS PROJECT
SUMMER 1990
OUTER ISLAND LIGHT STATION — LIGHTHOUSE AND KEEPER'S QUARTERS
APOSTLE ISLANDS NATIONAL LAKESHORE
LaPOINTE VICINITY
ASHLAND COUNTY
WISCONSIN
HISTORIC AMERICAN BUILDINGS SURVEY
SHEET 5 OF 10


SERVICE ROOM PLAN
OUTER ISLAND LIGHT STATION --- LIGHTHOUSE AND KEEPER'S QUARTERS
APOSTLE ISLANDS NATIONAL LAKESHORE
LAPOINTE VICINITY
ASHLAND COUNTY
WISCONSIN
APOSTLE ISLANDS LIGHT STATION PROJECT
HISTORIC AMERICAN BUILDINGS SURVEY


WATCH ROOM PLAN
APOSTLE ISLANDS LIGHT STATIONS PROJECT
SUMMER 1990
OUTER ISLAND LIGHT STATION
APOSTLE ISLANDS NATIONAL LAKESHORE
LIGHTHOUSE AND KEEPER'S QUARTERS
LAPOINTE VICINITY
ASHLAND COUNTY
WISCONSIN
HISTORIC AMERICAN BUILDINGS SURVEY


LANTERN PLAN
DANIEL J. LUND
APOSTLE ISLANDS LIGHT STATIONS PROJECT
SUMMER 1990
OUTER ISLAND LIGHT STATION --- LIGHTHOUSE AND KEEPER'S QUARTERS
APOSTLE ISLANDS NATIONAL LAKESHORE
LaPOINTE VICINITY
ASHLAND COUNTY
WISCONSIN
WI-316A
HISTORIC AMERICAN
BUILDINGS SURVEY




OUTER ISLAND
OIL STORAGE AND PRIVY
EXISTING CONDITIONS
APOSTLE ISLANDS
NATIONAL LAKESHORE
SCALE OF FEET
NORTH ELEVATION – OIL STORAGE
WEST ELEVATION – OIL STORAGE
PLAN – OIL STORAGE
SOUTH ELEVATION – PRIVY
WEST ELEVATION – PRIVY
PLAN – PRIVY
MTL. ROOFING
MTL. SHINGLES
7'-0"
9'-0"
5'-5"
6'-10½"
1/2010

OUTER ISLAND TOWER

Chronology of Alterations and Use

Original Construction

The Outer Island Tower was constructed in 1874 in the Italianate style, as influenced by District Engineer, Major Orlando M. Poe. The conical brick tower is over 80' tall, painted white, and once contained the most powerful light in the Apostle Islands.

The Tower originally had a third order Fresnel lens with a focal plane 130' above Lake Superior. By 1941, the Outer Island Light Station was converted to electricity and the original lens was replaced when the Station was automated in 1961. [34] An automated light with a plastic lens powered by a solar array preceded the optic installed in 2009: a SABIK LED beacon with a glass lens.[35]

Historic photos indicate little change to the Tower over time, other than paint accents. The 1893 images of the Tower indicate the exterior trim in a light shade. (Historic Image OI-01) By 1916 to 1925, the service level exterior trim is painted black but the lower level trim remains white. (Historic Image OI-06*)* By 1937, all of the Tower's exterior trim is painted black. (Historic Image OI-09)

A historic drawing from an unknown date shows the elevations and plans for the Tower. (Historic Drawing OI-04)

Significant Alterations / Current condition

The only significant alterations to the Outer Island Tower involved its lighting technology. In 1961, the light was automated, and 1992, a VEGA VRB-25 solar powered optic replaced the12 volt DC optic. In May of 2009, an LED-powered beacon was installed in the Tower.

The only mechanical components in the 1874 Tower are round, passive air vents near the top of the lantern.

No alternating current electrical service or utilization equipment exists within the Tower.

The Outer Island Tower is currently in good condition.

[34] 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.
[35] List of Classified Structures, National Park Service, 2009.

Summary of Documented Work on the Building

Date	Work Described	Source of Information
Annual Report of 1873	*"Outer Island, Lake Superior, Wisconsin*. – Under the appropriation made by act of March 3, 1873, the construction of the buildings required at this new station will be begun during the present season and pushed to completion as soon as possible."	"1873 Annual Report of the Lighthouse Board," Outer Island Light in annual reports 1850-1920
1880, October 16	"The cap on top of the chimney blowed off…The Tower swayed like the top of a tree; and the Lens, well, it is a wonder to me that a piece of it is left."	H.A. Kuchli, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I
1889, November 2	"A small chip chiped from the lens by accident November 2."	John Leonard, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I
1892	Lard oil lamp replaced by kerosene wick lamp	J. Busch, 2008
1909, August 16	"One of the plate glass frames cracked up in the Tower while we were polishing the Lens."	Otto Olson, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1910, August 2	"John W. Miller arrived with a carpenter …they come here to … put hand rail in Tower."	Otto Olson, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1912, November 20	"Brought new Vapor Light soap and Timemarker, and stove fittings."	Otto Olson, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1913, June 5	"Tryed out new Light. Lit it up at 7:45 PM. Worked fine. Had no trouble with it until Midnight when I went to put more pressure on the tank. It flashed up and smoked so bad that were compelled to put it out at 3 AM." Kerosene wick lamp replaced by incandescent oil vapor lamp July 5: "Had a serious fire in Tower Lantern between 1 and 2 AM. The heat was so intense that it cracked the four top prisms on the Lens and also one of the plate glass in Lantern."	Otto Olson, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1927, June 3	"Washed and ironed curtains for Watch Room."	Daniels, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1933, November	Nov 18: "Devils [boat] arrived with O. Joiner to install Winter Light." Nov 20: "Winter Light in commission."	Daniels, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1934, July 25	"…and give new door in Tower a coat of paint…" New Tower door installed	Daniels, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1936, May	May 14: "Red leaded inside of door in Tower." Red lead, or lead tetroxide, when used with linseed oil, would produce a thick, long-lasting anti-corrosive paint. Due to lead tetroxide's toxicity, it is no longer used as a paint.	A. G. Carpenter, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II

Date	Work Described	Source of Information
1937, April	April 22: "Mr. F. C. Biesel came out with us to work on engines and put in new Light." April 23: "Put in new Light…"	A. G. Carpenter, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1939, May	May 19: "Amaranth" arrives with supplies and "Mr. R.H. Robson came ashore at 6:45 A.M. to put [in] electric motor to drive Lens." May 24: "Raised Lens and put in new motor drive ball bearings under Lens, and lowered the Lens and tested it out. Working fine."	A. G. Carpenter, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1941, August 23	"Put glass in pedestal door in Tower."	V.T. Barningham, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1942, May	May 13: "Worked in Fog Signal and Tower. Wiring and putting partition in." May 15: "Put partition in…Turned Light on to electricity for the first time. Now is a full pledge [fledge] Coast Guard Station." Tower and Fog Signal electrified	V.T. Barningham, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1961	Light automated	J. Busch, 2008 and LCS, 2009
1992	VEGA VRB-25 solar powered optic replaced 12 volt DC optic	J. Busch, 2008 and LCS, 2009
2009, May	SABIK LED -powered beacon installed in the Tower	NPS Records, 2009

General Physical Description

The Light Tower is a load bearing conical brick structure with an outside diameter of 16' at the base and 12'8" at the service level. The lantern is ten-sided with a cast iron stair access. It is oriented closest to the bluff/lake. The Tower's Italianate stylistic features include hooded, arched windows between two bands of corbelled brick and heavy brackets immediately below the service level walkway.

Physical Description -- Architecture

Architecture – Roof
The roof consists of painted cast iron panels bolted together with an orb-shaped venting finial at the center. The roof system includes five 1" cast iron roof drains. (OI-T-15)

Architecture – Exterior Walls and Wall Finishes
Red brick was seen beneath peeling whitewash. Although obscured by the many layers of whitewash, the running bond, and concave-tooled joint construction can still be seen. The exterior and interior walls are original to the building. The ground level entry area has the original plaster over brick wall finish.

Architecture – Windows
Rectangular Window. There are three windows of this type located at various levels within the Tower. Each window is a two-leaf, two-lite casement, with a matching storm window. The window that is located

at the second-to-the-top landing does not have a storm set, but the other two windows of this type are complete. The interior trim for each window is simple wood 1x, painted. The dimension of each casement pair is 2’2” x 3’1 ½”. All windows are painted and original to the Tower. (OI-T-09)

Arched Window. This type of window is a two-leaf, two-lite casement, with an arched top, and a matching storm window. There are two of these windows located at the top landing. The interior trim for each window is the same simple 1x as the rectangular windows, but arched at the top, following the profile of the window opening. The dimensions of each casement pair is 2’4” x 3’1 ½”. Both windows are painted and are original to the Tower. (OI-T-08)

Architecture – Doors

There are no remaining doors in the interior of the Tower. There was originally a door at the service level where one hinge remains. The opening size is 1’9” wide x 5’6 ½” high. There is a door located at the Tower base between the hyphen to the Quarters and the Tower that is made of metal plate, painted, and is original to the building. The door has strap hinges and ceramic knobs. There is metal trim on both wall faces. The dimensions for the door are 3’0” x 7’9”. (OI-T-02)

Architecture – Exterior Trim

The exterior trim consists of banding detailing and arched window hood trim and the brackets; all located at the top of the Tower. These features are currently painted black.

Architecture – Walk and Railing

Lantern Level. The diamond plate cast iron deck walkway is 1’8" wide and continues to the interior of the lantern. A metal railing is 1’7” high and is supported by metal posts with ball finials. The metal rail is 5/8” rod. The deck has a 4” overhang beyond a trim ring surrounding the deck that is 9” tall x 1 ½” thick. All metal is original and is painted black.

Service Level. The diamond plate cast iron deck walkway is 3’1" wide. A metal railing is 3’4” high with 5/8” metal pickets located at 4 ¾” on center. Metal posts with ball finials are located after every ten pickets. The metal rails (one near base, one at top of pickets and rails) are 5/8” rod. There are four weep holes located beneath the decking in the brick walls. All metal is original and is painted black. There is a curved ladder from the service level to the lantern level, painted black.

Architecture – Lantern

The lantern is a decagonal glass and metal structure with diamond plate cast iron decking continued from the lantern level deck. The rectangular glazing is stamped “AGC 279J -1975 CFR 1201 CII 218U ASI 84.” (OI-T-11, 12 and 13)

Architecture – Ceiling Finishes

The ceiling finish for the lantern is the underside of the cast iron decagonal roof. The ceiling has painted metal cross-bracing and structural members along the roof line. (OI-T-14)

Architecture – Interior Trim

There are remnants of “trim” where the stairs meet the wall, at the floor-level, and at some of the window openings. The remnants have a blackish hue and a thick, paint-like texture. It can be assumed that these trim remains, and possibly even the stairs, were coated with coal tar. In the Outer Island Log Book for the

year 1885, the light keeper, John Armbruster, wrote on June 22nd, "Coaltared the Tower steps today." This entry is significant as it supports the assumption that the light keepers at one time used a form of tar to coat the stairs, window sills, and trim. Tar was used during the late 19th century as a water-proofing agent and as a sealant.

Architecture – Floor
The floor at the entry is made of concrete slabs with a concrete square slab in the center with a metal plate anchoring the spiral staircases center pole. (OI-T-03)

Architecture – Stairs
This spiral staircase is cast iron. There are 30 treads from the base to the first landing (1/2 of circle shape), 24 treads from the first landing to the second landing (1/2 of circle shape), another 24 treads from the second landing to the third landing (5/8 of circle shape), and finally 16 treads from the third landing to the top floor. The top floor has a hatch to the lantern level. The top of the stairs railing is 2'0" above the nosing and has a 2" diameter. There are no railings at the landings or leading to the hatch. The stair risers are 8", the tread overhang is ½", and the tread depth goes from 1 ½" to 12 ½" with a width of 3'10". (OI-T-04)

Architecture – Accessibility
This Tower is currently entered only from the interior of the Keepers Quarters. The entry door from the first floor interior is 3'0" clear with no elevation change. However, the Keepers Quarters is not accessible from grade.

Physical Description -- Structural

Structural – Foundation
The foundation system consists of stone masonry.

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

The floor of the lantern and the service level is constructed of cast iron plates that are bolted together. The plates are supported on the masonry walls of the Tower. The floors are accessed via a spiral cast iron stair.

Structural – Roof Framing
The roof 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 Tower are constructed of brick masonry.

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 building is provided by the exterior masonry walls.

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

Physical Description -- Mechanical

Mechanical – Plumbing Systems
None in the Tower.

Mechanical – HVAC
The only mechanical components in the 1874 Tower are the circular passive air vents in the lantern room.

Mechanical – Fire Suppression
None in the Tower.

Physical Description -- Electrical

Electrical – System Configuration
The only electrical equipment in the Tower is the USCG's Light Beacon system. This consists of three 12 volt dc batteries that feed power to an LED powered beacon. The system employs a photo-voltaic 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 for the Tower consists of one air terminal on the top of the Tower and a single down cable which connects the air terminal to an underground electrode system. The Tower lightning protection system is bonded to the Keepers Quarters lightning protection system via a cable connection.

Physical Description -- Hazardous Materials

Landmark Environmental collected ten bulk samples from a total of ten different types of suspected asbestos containing materials (ACMs) at Outer Island. Of the ten suspect ACMs that were sampled and analyzed, a total of one suspect ACM resulted in a concentration of greater than one percent (positive for asbestos).

Hazardous Materials – Asbestos
The following suspect ACMs were not sampled due to inaccessibility or park limitation regarding potential for damage to structures. Asbestos is assumed to be present in:

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 (Multiple varieties of miscellaneous adhesives were seen on around windows, doors and penetrations),
4. 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),
5. Caulk (Caulking was observed around window and door penetrations, which can also include gasket applications between the window assembly and the structure),
6. 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), and,
7. Roofing Materials.

The assumed ACMs were observed to be in fair condition.

Hazardous Materials – Lead Containing Paint (LCP)
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 sampling and laboratory analysis for conformation. The XRF inspection was conducted by the NPS Staff in 1993.The findings of this study are incorporated into this study by reference.

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

1. Window Sash (Metal and stone substrate with white paint), and,
2. Window Trims (Metal and stone substrate with white paint).

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

1. Interior Painted Surfaces (Based on testing of the interior window sash, trim, and top lighthouse entry LCP is assumed to be present throughout the structure), and,
2. Exterior Painted Surfaces (Based on testing of the exterior window sash and trim LCP is assumed to be present throughout the structure).

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 fair condition and the assumed LCP was observed to be in fair condition.

Loose/flaking LCP is identified on the exterior walls of the structure. Paint chip debris is noted on localized areas of surface soils.

Hazardous Materials – Lead Dust

Surface wipe-sampling for lead dust analysis was not conducted in the Tower because lead dust was assumed to be present 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. Preliminary lead-in-soil sampling was performed to assess whether these near-structure soils contain lead concentrations above applicable soil standards.

One three-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 116.5 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 the mold growth. Moisture testing in building materials was not performed nor was sampling of building materials performed for microbial analysis. Mold was visually identified in the Tower.

Character Defining Features

Mass/Form. A conical masonry tower painted white attached to the Keepers Quarters with a one-story gable/shed link.

Exterior Materials. Masonry painted white with black trim accents.

Openings. A mix of arched and rectangular pairs of wood two lite casements painted black.

Interior Materials. Painted plaster masonry walls and concrete floor.

General Condition Assessment

In general the Outer Island Tower is in good condition. The spiral, cast iron staircase is in good condition with some rusting and peeling paint. The brick interior walls are in fair condition with rust stains (from the stairway) and cracked and peeling paint.

Structurally, the Tower is in good condition, though due to the disparity of opinion between park personnel and the engineer, monitoring of the cracks would offer more data.

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: *Fair*
The roof appears to be in fair condition though small patches of rust are evident.

Architecture – Walls and Wall Finishes
Condition: *Fair to Poor*
The brick Tower's exterior walls are in fair condition. The wall finishes are in poor condition as there are many layers of paint peeling at various locations and severities. The interior wall finishes are in fair condition due to the same many-layered paint issue, rust stains, cracking around each vent opening, and cracks in the paint. (Park staff has reported concerns of the structure of the wall system. Refer to "Structural - Wall Framing" recommendations section.)

Architecture – Windows
Condition: *Good*
Rectangular Window. This type of window is in good condition except that one of the three windows has a missing storm window.

Arched Window. This type of window is in good condition.

Architecture – Doors
Condition: *Fair*
The Tower base door made of metal is in fair condition as it and its door frame have rust and badly peeling paint.

Architecture – Exterior Trim
<u>*Condition:*</u> *Good*
The exterior trim is in good condition, though the paint is peeling.

Architecture – Walk and Railing
<u>*Condition:*</u> *Good and Fair*
Lantern Level. This deck is overall in good condition.

Service Level. This deck has badly peeling paint and patches of rust. It is in fair condition overall.

Architecture – Lantern
<u>*Condition:*</u> *Poor*
The lantern has nonhistoric glazing with failing seals and frame system. The paint is peeling on the remainder of the interior elements.

Architecture – Ceiling Finish
<u>*Condition:*</u> *Fair*
The ceiling finish for the lantern is in fair condition as there is rusting and peeling paint.

Architecture – Interior Trim
<u>*Condition:*</u> *Fair*
The trim remnants, possibly made of coal tar, are in fair condition as they are peeling and disappearing.

Architecture – Floor
<u>*Condition:*</u> *Good*
The concrete floor is in good condition.

Architecture – Stairs
<u>*Condition:*</u> *Good*
This spiral staircase is in good condition with some rusting and peeling paint. The railings are also in good condition with some rusting. There are no railings at the landings or near the hatch door.

Architecture – Accessibility
<u>*Condition:*</u> *Poor*
The Tower is not accessible.

Condition Assessment -- Structural

Structural – Foundation
<u>*Condition:*</u> *Good*
The visible portion of the foundation is in good condition. Sub-vertical cracks in the masonry are not structural and may be due to brick growth, the tendency of fired clay bricks to expand as they age, or differential thermal movement between the brick and the stone (OI-T-16).

Structural – Floor Framing
<u>Condition:</u> *Good*
The floors are in good condition.

Structural – Roof Framing
<u>Condition:</u> *Good*
The roof is in good condition.

Structural – Wall Framing
<u>Condition:</u> *Good*
The masonry and cast iron walls are in good condition. Sub-vertical cracks at the base of the masonry walls are not structural and may be due to brick growth or differential thermal movement.

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 and Fire Suppression
<u>Condition:</u> *N/A*

Mechanical – HVAC
<u>Condition:</u> *Fair to Poor*
The passive air vents at the top of the Tower are in fair to poor condition, with the brass vent covers missing and do not provide adequate ventilation to prevent condensation in the tower.

Condition Assessment -- Electrical

Electrical – System Configuration, 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 to Poor*
Lightning protection systems for the Tower 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 -- Hazardous Materials

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

Ultimate Treatment and Use

The Outer Island Tower was constructed in 1874 as part of the lighthouse which included an attached keepers quarters. In 1961, the light was automated and a keeper was no longer needed to man the light.

The Tower is currently open to visitors on a limited basis and only by guided access. The proposed use for the building is to continue the current arrangement – providing limited/guided visitor access.

Rehabilitation is the proposed treatment for the Tower.

Requirements for Treatment

Compliance requirements for treatment currently include laws, regulations, and standards as outlined by the NPS 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: *Moderate*
Patch and prep areas of rust. Prime and repaint entire roof.

Architecture – Walls and Wall Finishes
Priority: *Moderate*
Strip existing coating, repair masonry and joints. Repaint with a proper coating allowing vapor permeability. Coordinate with overall ventilation enhancements. (Refer to “Structural – Wall Framing” section.)

Architecture – Windows
Priority: *Low*
Reconstruct the missing storm window from one of the rectangular windows to match the existing storms. Verify/provide operability to all lower sash to facilitate ventilation.

Architecture – Doors
Priority: *Moderate*
Remove existing paint and remove and patch rust areas and recoat. Coordinate with overall ventilation enhancements. Study effects of allowing door to remain open to promote ventilation from basement to the Tower. Investigate adding a security gate at the base of the stair or adjacent to the Tower door.

Architecture – Exterior Trim
Priority: *Low*
Scrape, sand and repaint. Coordinate with recoating of exterior walls.

Architecture – Walk and Railing
Priority: *Moderate*
Remove existing paint, remove and patch areas of rust and repaint at the service level deck. Investigate alternatives to discretely upgrade the existing railing to become a code compliant guardrail.

Architecture – Lantern
Priority: *Severe*
Remove the existing glass and failing seals. Reinstall glass with new seals. Scrape, prep and repaint.

Architecture – Ceiling Finish
Priority: *Low*
Remove existing paint, remove and patch areas of rust, prep and repaint.

Architecture – Interior Trim
Priority: *Low*
Preserve original coal tar trim as much as possible. Historically, coal tar was used as a slip-resistant material and water-proofing agent used in nautical applications.

Architecture – Floor
Priority: *Low*
No recommendations at this time.

Architecture – Stairs
Priority: *Low*
Remove existing paint, remove and patch areas of rust and repaint. Add code compliant handrails at the landings and near the hatch door that match existing railings.

Architecture – Passageway
Priority: *Low*
No recommendations at this time.

Architecture – Accessibility
Priority: *Low*
Provide program access through interpretive exhibits and waysides at the Visitor Center.

Treatment Recommendations -- Structural

Structural – Foundation
Priority: *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> *Low*
No recommendations at this time. (Architects' note: Due to the disparity of opinion of the condition of the walls between the Structural Engineer and APIS staff, it is suggested to install crack and vibration monitors to further assess the existing cracks to determine if they are active.)

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 lantern room do not provide sufficient ventilation to prevent condensation and moisture damage inside the tower. Additional passive ventilation is recommended.

Treatment Recommendations -- Electrical

Electrical – System Configuration, 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 plaster, caulking and adhesives.

Hazardous Materials – Lead-Containing Paint and Lead Dust
Priority: *Low*
Recommend stabilization or abatement of Lead-Containing Paint. Wipe sampling for lead dust is 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 action is recommended.

Hazardous Materials – Petroleum Hydrocarbons
Priority: *Low*
No action is recommended.

Alternatives for Treatment

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

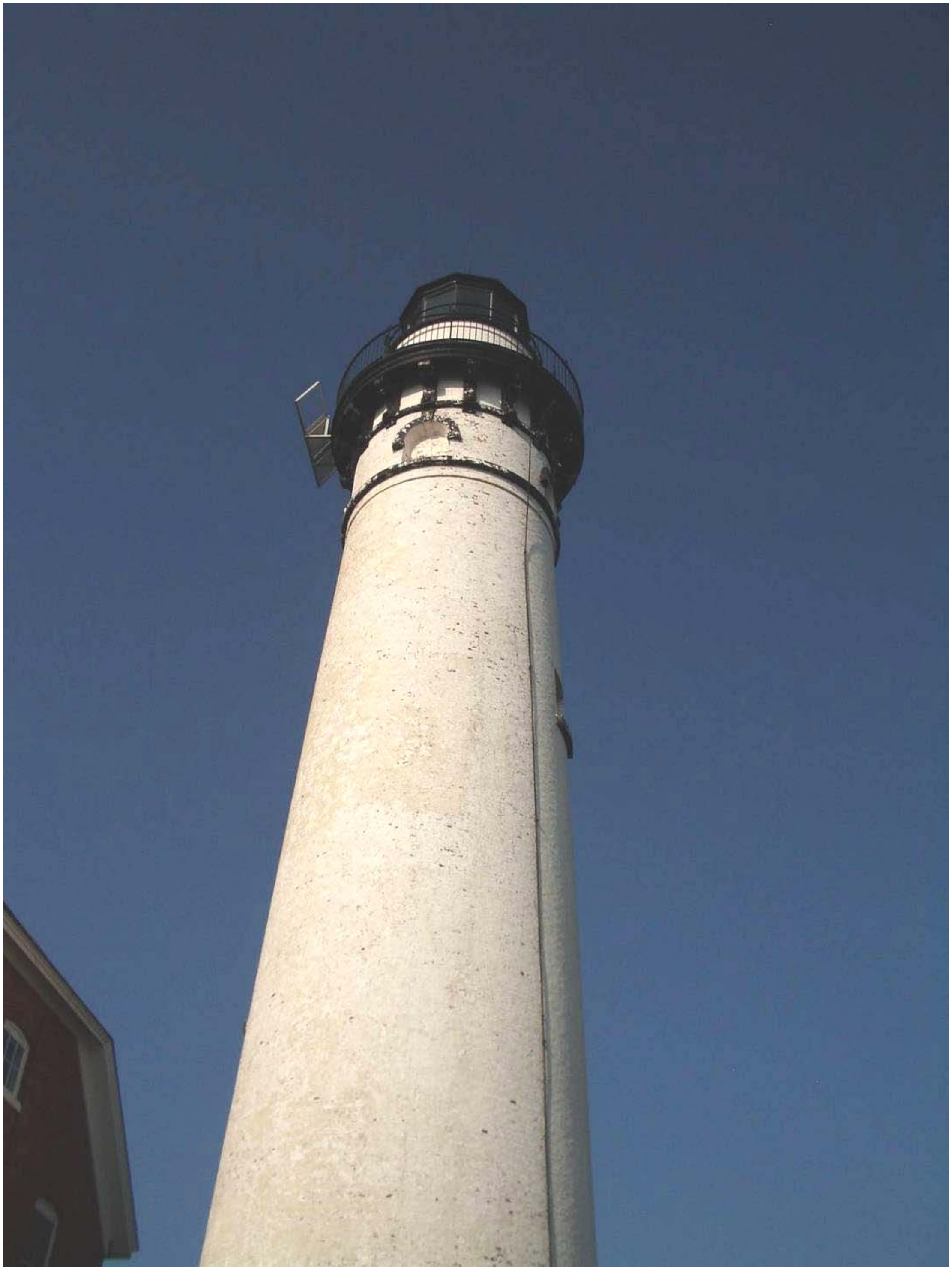
1. If it is decided to allow public access to the catwalk, careful study will be needed for introducing a code compliant guard rail at the Tower walk that will not be visually disruptive to the historic character nor be a long term maintenance burden for park staff.

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.	- Increased ventilation will aid in the preservation/longevity of the historic fabric
3. Interior: Add code compliant handrails at landings and near the hatch	The addition of the handrail adds a modern element to the historic fabric.	Design a handrail similar to the existing. Paint to match.	- Improves safety for visitors and staff

Outer Island Tower Photographs, 2009



OI-T-01: East view, 2009 (Source: AH IMGP3095)

OI-T-02: Door from quarters to Tower (Source: AH IMGP3236)

OI-T-03: Tower floor and stair base (Source: AH IMGP3234)

OI-T-04: Tower stairs and railing (Source: AH DSC01567)

OI-T-05: Tower metal framed access opening (Source: AH IMGP3228)

OI-T-06: Tower metal access detail of interior (Source: AH IMGP3229)

OI-T-07: Tower wood cabinet with missing door (Source: AH IMGP3230)

OI-T-08: Tower arched window (Source: AH IMGP3227)

OI-T-09: Tower rectangular window (Source: AH IMGP3232)

OI-T-10: Lantern south view, 2009 (Source: AH IMGP3101)

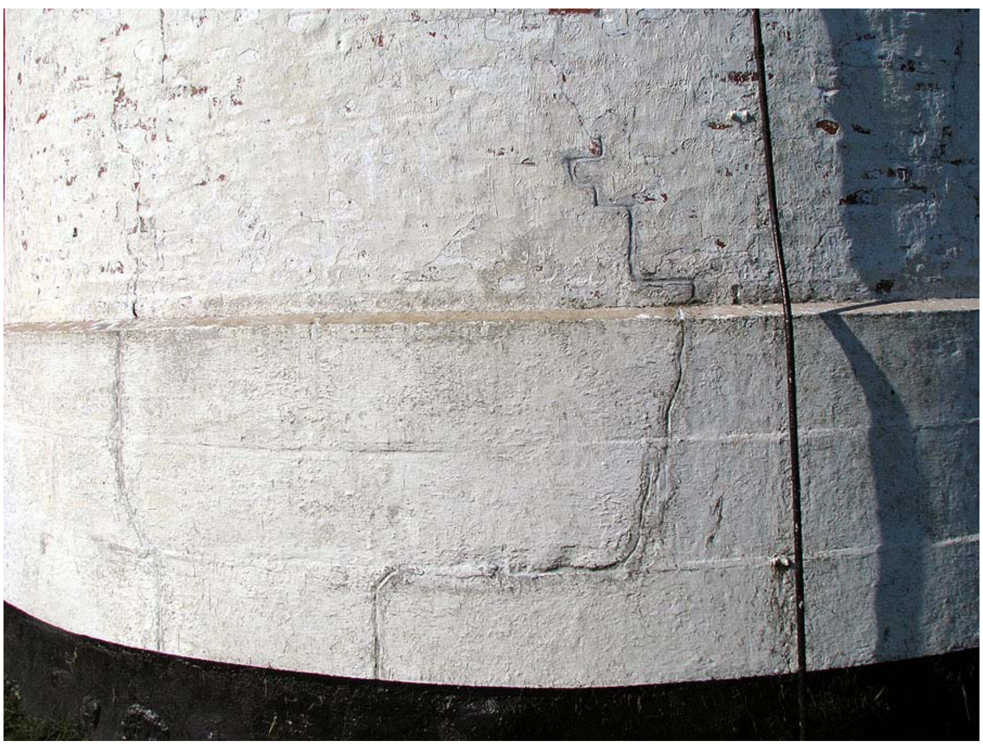
OI-T-11: Lantern with ladder to access lantern walkway (Source: AH IMGP3210)

OI-T-12: Lantern floor hatch and ladder (Source: AH IMGP3221)

OI-T-13: Lantern glazing and upper interior and exterior walkway and railing (Source: AH IMGP3214)

OI-T-14: Lantern ceiling (Source: AH IMGP3220)

OI-T-15: Lantern roof (Source: AH IMGP3200)



OI-T-16: Foundation and wall cracks (Source: Martin/Martin)

KEEPERS QUARTERS

Chronology of Alterations and Use

Original Construction

The Tower and its attached quarters were completed in October of 1874. The two-story brick residence is connected to the Tower by a short passageway. Although it retains much of its original exterior appearance, the Keepers Quarters underwent several, significant alteration regimens to accommodate its changing occupants and to address the effects of severe weather.

Significant Alterations / Current Condition

Significant alterations to the Outer Island Keepers Quarters consist primarily of interior remodels: the pre-1925 conversion of the second floor into two private spaces for the first and second Assistants; the 1925 conversion of the second floor into the first assistant's quarters; the installation of the staircase from the second floor to the attic; the attic conversion to the second assistant's quarters; and, the rehabilitation to its present and original configuration at some point after 1925.

Undated elevations and plans for the building illustrate a plan for the finished attic and the stairs from the second floor to the attic, suggesting it was drawn around 1925. (Historic Drawing OI-05) Other dated drawings indicate the 1925 conversion of the second floor into the first assistant's quarters and the conversion of the attic into the second assistant's quarters. (Historic Drawings OI-06 and 07) The plans detail the stairs from the second floor to the attic and show the configuration of the house prior to the 1925 alterations. The second floor was divided equally with each half including a kitchen on the south side (now reverted to bedrooms) and one bedroom on the north side. A locked door was indicated between the two kitchens, but currently there is no evidence of a door. A note on the drawing states: "This entire Floor to go to first Asst when attic converted."[36] The attic space was converted into separate living quarters with a kitchen at the south end (with a stove, sink, and cupboard indicated), a living room to the west, a bedroom to the east, and two closets flanking the stairs on the north wall. Two sets of dormers were added to the east and west walls during this same period. Few remnants of this conversion exist as the building now has a traditional, single-family house composition, with the second floor containing only bedrooms and a partially finished attic. There are signs of plaster and lath on the attic frame structure, linoleum flooring remnants, and an extant wood cabinet. The 1925 construction set calls for tin shingles on the roof and sides of the house and what is today the kitchen is labeled the "Wood Shed" (per the 1908 keeper's log, it appears the original shingles were probably wood). Other than the addition of the dormers, during the 1925 rehabilitation work, there were only minor alterations to the building's exterior.

An 1893 photo reveals painted wood shutters on all windows and a covered, painted wood well structure to the southeast of the kitchen (no longer extant). The site was connected by wood plank walkways that linked the well, Privy, and Keepers Quarters to each other. (Historic Image OI-01) In 1916, the western kitchen entry is visible (first historic photograph in present collection where entry appurtenance is seen). It's simple gable roof and wood clapboard siding, painted white appear the same today. (Historic Image OI-07)

From the 1970s to the 1990s, the building was used to house the NPS staff. A propane stove, refrigerator, heating units and solar lights for the kitchen were installed during this period.

Other work, between 1998 and 2009, was performed by the Historic Structure Preservation Team of the NPS including painting the exterior woodwork, repointing, rehabilitating the dormers, reglazing the

[36] 1925 Plan to Convert second Floor of Keepers Quarters Into One Living Space for first Assistant (Historic Drawing OI-06)

windows and replacing the broken glazing. The Keepers Quarters was re-roofed with three-tab asphalt shingles (brick red) by the Team in 2002.

Mechanical systems in the Keepers Quarters have been upgraded to allow for seasonal housing for park employees and volunteers. Little remains of the original 1880s water and heating systems. Some of the mechanical components installed in the 1952 remodel remain in place, although they are no longer functional.

There is no evidence that any electrical lighting or distribution equipment was installed at the time the Keepers Quarters was built. In 1928, the Keepers Quarters was electrified. That installation would have presumably been governed by the NEC (National Electrical Code) of 1928. Between 1941 and 1952 the building’s electrical system was upgraded for use by the USCG.

The Outer Island Keepers Quarters is in fair condition.

Summary of Documented Work on the Building

Date	Work Described	Source of Information
1875, August 4	"Brot the bricks for repairing chimney on dwelling."	O.K. Hall, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I
1877, October	Oct 1: "Mr. G.W. Bond finished work on the cistern….Mr. Jerome Sauzon is in charge of the building of the Signal and Light House now being constructed."	H.A. Kuchli, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I
1880, October 16	"The cap on top of the chimney blowed off…The Tower swayed like the top of a tree; and the Lens, well, it is a wonder to me that a piece of it is left."	H.A. Kuchli, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I
1893 (or before)	Shed at Tower entry (different than shed seen in 2009)	Historic Photo OI-01, 1893
1895, July 22	Steamer "Amaranth" brings "some shingles for the House and shed roof." "Shed roof" most likely refers to the kitchen shed roof.	John Leonard, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I
1907, July 29	"…repairing ruff on kitchen."	John Irvine, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1908	Re-shingled roof with metal shingles Aug 24: "…shingled all roofs with metallic shingles…"	Otto Olson, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1910	Aug 2: "John W. Miller arrived with a carpenter …they come here to … lay the hardwood floors..." Oct 12: "Repaired eve trough on West side of Dwelling." "Eve trough" is another terminology for the gutter.	Otto Olson, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1911	July 28: "Put on moldings around kitchen floor." Sept 20: "Put down ¼ round molding in Dwelling."	Otto Olson, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1912, July	July 1: "Keeper making cupboard for kitchen." July 10: "Put lock and hinges on kitchen cupboard."	Otto Olson, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1915, November	Nov 1: "Piling lumber on dock and bringing up lumber for storm house." Nov 2: "Seting up frame of storm house." Nov 5: "Got siding on storm house, also roof. Started to put on lining in side." Nov 6: "Working on storm house. Putting in window." Nov 16: "Fiting door on storm house." Assume this "storm house" is the west shed at the kitchen entry, seen in Historic Photo OI-08 from 1916	Otto Olson, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1919, October 20	"Put up new cook stove in First Assistant's part, and started to lay new floor and line water closet."	Daniels, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II

Date	Work Described	Source of Information
1922, November 7	"Made door for storm shed."	Daniels, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1925	Dormers added, attic converted into living quarters for second assistant keeper	Historic Drawings OI-05 and 06, 1925
1926	May 7: "Second Assistant moved up in his quarters. Put in window glass in hall window." June 2: "Second Assistant put down rubber mats on his steps."	Daniels, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1928, July 28	"Started to cut opening in Assistant's kitchen."	Daniels, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1929, May 16	"Put in post and looking glass for First Assistant so he can see Light from his quarters."	Daniels, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1930, October 29	"Piped shower bath." First mention of indoor plumbing.	Daniels, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1935	Oct 2: "Started to work on bedroom off the hall. Tore out stand and took up part of floor, and removed loose plaster on walls." Oct 3: "Laying floor in bedroom." Oct 4: "Made ¼ round to go around the floor in bedroom." Nov 15: "Laying floor in Assistant's quarters." Nov 20: "Run out of flooring; was 52 ' short of having enough to finish the kitchen."	A. G. Carpenter, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1936, May	May 15: "Laying new floor in First Assistant's Quarters, and painting in Second Assistant's quarters." May 18: "Fitting ¼ round on new floor in Assistant's quarters."	A. G. Carpenter, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1937, June 15	"Fitted rug to Keeper's kitchen floor. Put in a new cement thrush under door of storm porch to Keeper's quarters."	A. G. Carpenter, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1940, June 10	"Plastering chimney, and patching up wall in First Assistant's Quarters."	A. G. Carpenter, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1943, July 3	"Brought Mr. Miller and helper to shingle the dwelling and Fog Signal."	V.T. Barningham, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1945	May 4: "Installing hot water tank in kitchen." May 9: "Cutting doorway in upstairs quarters." May 14: "Working on entry to bedroom in second floor quarters." June and July: Laid linoleum throughout Quarters	V.T. Barningham, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1952	Remodel, including new heating system, two water storage tanks, bathtub, and electrical system	USCG Mechanical Plans
2002	Re-roofed with 3-tab asphalt shingles (brick red)	HSPT Reports, 2009

Notable Actions with Unknown Dates

Date Range	Work Described
Pre-1925	Converted second floor to two private apartments, each with their own kitchen and bedroom
Post-1925	Converted back to original configuration of single-family home
1970s-1990s	Propane stove, refrigerator, heating units and solar lights for the kitchen installed for the NPS staff habitation
1998-2009	Repointed
1998-2009	Painted exterior woodwork
1998-2009	Rehabilitated dormers
1998-2009	Reglazed windows and replaced broken glazing

General Physical Description

This building is a two-and-a-half story brick structure with a tooled brownstone foundation. It has a clipped gable roof with gable dormers centered on both sides of the ridge. Punched, arched openings in the masonry characterize window openings at each elevation. The dwelling is attached to the Tower at the north end via a single-story gabled passageway that includes a shed addition. There is a one-story masonry shed roof appendage on the south end. The first floor has four main rooms plus the kitchen. The second floor has four rooms and the third floor (attic) was remodeled to have three rooms at one time but is now an open area with exposed framing.

Physical Description -- Architecture

Architecture – Roof

The roofing is red asphalt shingle, 5”x12” exposure, with installed tie-off rings. The tie-off rings do not appear to comply with OSHA requirements. This roofing is not historic and the park records indicate its installation was in 2002. The original sheathing is 1x12 with 1” gaps, which suggest the original roofing was wood shingle, supported by historic photos of 1893. The dormer sheathing is 1x7 and is not spaced. There are metal shingles evident under the exposed newer dormer framing visible at the attic (circa 1925) as well as a layer of felt. The metal shingles predate the dormers (suggesting that the presumed original wood shingles were replaced by metal shingles sometime before 1925). (OI-KQ-09 and 25) The eave consists of a closed soffit on the rake extending approximately 1’2” at the main roof with a +/- 10” fascia and ogee trim. The top of masonry wall: soffit has a +/- 1’4” frieze board at the junction. All are wood members painted white.

The metal flashings are a mix of older, reused 4” step flashings at masonry and newer 8” step flashing. There is no drip-edge flashing evident at the newer asphalt shingle roof. There is valley flashing at the dormers. The roof flashing at the south addition appears to have been re-used. The southwest kitchen vestibule entry has the older metal shingles.

Architecture – Gutters and Downspouts

No gutter system exists on this building other than a small, 2” diameter gutter/diverter at the Tower entry door. (OI-KQ-08)

Architecture – Chimney
The red brick chimney has stepped (corbelled) coursing and banding detail. The top of the chimney has concrete flashing. Previous pointing work is evident due to the mortar color and tooling. (OI-KQ-06 and 07)

Architecture – Exterior Walls
The exterior walls are likely four and three-wythe red brick that steps to two-wythe at the attic level. The main house has a rowlock course every seventh course. Upon original observation, the one-story kitchen appeared to be an addition. However, due to the course alignment, the seventh course rowlock pattern, the matching sill heights, and similar sized brick it appears the kitchen was original, though it was noted as a "Wood Shed" on the 1925 remodel drawings. The wood-framed areas have wood clapboard siding with a 4 ½" exposure. The foundation is brownstone block and steps down at the south end and has parging along the south and east walls. The sills are also brownstone and are painted. The dormers have metal shingle panels at all three walls with each panel 26" wide and there are three shingles (vertically) per panel, intended to replicate chamfered wood wall shingles.

A mortar sample taken at the brownstone block foundation indicates that the composition is a large portion of Portland cement mixed with sand. The mortar is gray colored, and hard.

Four mortar samples were taken at the brick portions of the walls. The mortar ranged from relatively soft to moderately hard indicating both original mortar and contemporary re-pointing mortars.

Architecture – Windows
There are a variety of window types predominated by a six-over-six, double hung. All of the window openings in masonry walls are segmented arch with wood trim infill. The windows all appear to have been replaced with the possible exception of the kitchen's east window, which is three-over-three. Modern stops have been installed, the hardware varies, and no pulleys or ropes can be seen in the original openings. There are storm and screen sash affixed by exterior hook hardware. Some of the glass is distorted, though it does not appear to be original. At the exterior, the sills are painted, tooled, brownstone. On the interior the windows typically have a shaped, painted wood casing surround with a wood sill and apron trim.

Six-Over-Six, Double Hung. This window type has the upper sash fixed by blocks and has a variety of hardware. There are six of these windows on the first floor and five on the second floor. The general dimension for this window is 2'8 ½" x 5'10". (OI-KQ-20)

Six-Lite, Awning. This window is located in the attic at the north, clipped-gable end. There is hardware for a screen evident, but no screen. The dimension for this window is 3'1 ½" x 2'9 ½".

One-Over-One, Double-Hung. There are four of these windows in the attic, two at each dormer. They have roped pulleys and modern sweep locks. The general dimension for this type of window is 2'7 ½" x 5'0".

Single-Lite, Awning. There are two of these types of windows in the attic at the south, clipped-gable end. This window type has a casement and an interior screen. The general dimension for this window is 3' ½" x 2'5 ½".

Interior Awning. This window is located in the attic on the interior. The dimension for this window is 1'4" x 1'8".

Three-Over-Six, Double-Hung. This type of window is located on the first and second floors - one on the first floor and two on the second floor. The general dimension for this type of window is 2’11” x 2’9” (lower sash height) and 1’5” (upper sash height).

One-Over-One, Double-Hung. This window is located at the secondary entrance. The dimension is 2’3 ½” x 4’6”.

Single-Lite, Casement. This casement window is located in the kitchen. It has an exterior screen. The dimension is 2’4” x 1’11”.

Three-Over-Three, Double-Hung. This window is located in the kitchen and may be the only original window in the building. The dimension is 2’10 ½” x 2’1” (lower sash height) and 1’5” (upper sash height).

Three-Lite, Awning. This window is located in the kitchen vestibule. The dimension is 2’4” x 1’4”. The window casing is a simple 1x surround.

Three-Lite, Awning. The sash of these four windows (indicated on the original drawings as three-lite) have all been removed from the basement and replaced with wood slat vents. The general dimension for this type of window is 3’11” x 1’8”.

Architecture – Exterior Doors
The kitchen vestibule door is a half-lite over two horizontal panels, wood door. It is not original to the building. Its dimensions are 2’10” x 6’8” x 1 ¾”. (OI-KQ-10) The secondary entrance door is a half-lite over three horizontal panels, wood door. This door has ball-tipped hinges. Its dimensions are 2’8” x 6’8 ½” and the thickness could not be determined as the door was locked. (OI-KQ-21) The trim at the doors consists of simple 1x wood material painted.

Architecture – Exterior Trim
The exterior wood trim consists of corner boards, belly banding and window casing at the dormers and wood frame portions. All trim is simple 1x wood material, painted.

Architecture – Interior Doors
The doors vary within a general style of paneled door. Only two of the doors appear to be original (based on historic drawings and extant hardware). All of the hardware appears to be modern with the exception of the steeple tip hinge pins, where they exist. The trim at the doors is a shaped painted wood casing similar to the windows with the exception of several doors which have been altered (the attic door for example) have simple 1x casing, painted.

Attic Door. This door is the only remaining door in the attic. It is wood, has five panels, and has ball-tipped hinges. This door’s dimension is 2’4” and 2’5” x 6’7 ½” x 1 ¾”.There are several other doors stored in the attic all wood 5 panel and with ball-tipped hinges.

Second Floor Doors
Five Panel, NonOriginal. The doors to the bedrooms and closets (seven in-situ) are five panel, good replicas of the original doors. Their widths vary from 2’8” to 2’4”, their heights from 6’8” to 6’6”, and they all are 1 3/8” thick. (OI-KQ-26)

Two Panel. The door to the attic is different as it is a two panel door. This door has different trim and hardware than the other second floor doors as it appears to be from a later remodel. This door's dimensions are 2'-4" x 6'5"x 1 3/8". (OI-KQ-28)

First Floor Doors
Five Panel, NonOriginal. These seven doors are not original and are five panels. Their widths vary from 2'10" to 2'4", 2'8", their heights vary from 6'11" to 6'9", and they are all 1 3/8" thick.

Three Panel, NonOriginal. This door is located between the secondary hall and the main hall. It is three panels, with a lite located below the upper panel. It is not original. The door's dimensions are 2'7 ½" x 6'6 ¾" x 1 3/8". (OI-KQ-19)

Five Panel, Original. This type of door is original to the building and there are two existing, both in the living room. The door is a five, horizontal, raised panel: 2'8" x 6'4" and 6'8", and thicknesses of 1 1/8".

Basement Door, NonOriginal. This door is a nonoriginal, five panel wood door. Its dimensions are 2'9" x 5'11" x 1 ¾".

Architecture – Wall Finishes
Basement. Each room's exterior walls are painted, rubble stone, while their interior walls are painted brick.

Kitchen Vestibule. This room has 1 ½" wood board on the north, west, and south framed walls. The east wall is an exterior brick, painted white. The wall finish appears to be original to the kitchen entry (circa 1919). (OI-KQ-09)

Kitchen. The kitchen has exposed brick which was painted white at one time, though much of it has flaked or peeled off. (OI-KQ-16 and 17)

Living Room, Main Hall, and Associated Closets. These rooms have modern gypsum board finishes on furring strips (presumably added when the building was retrofitted with electrical service) over the original plaster and wood lath (interior frame walls) or plaster on masonry (exterior walls).

Storage/Bath. This room has plaster over lath walls with fiberglass reinforced plastic (frp) wainscot (except in the southeast corner), the same frp as in the baths at the Triplex on Long Island. The southeast corner has the original 3 ½" wide painted beadboard remaining. The frp wainscot is not original but the beadboard wainscot is. The plaster over lath wall finish is original to the building.

Secondary Entrance. This room has 1 ¾" beadboard lining the walls in a horizontal orientation, painted pink. At the corners, a simple base shoe wood trim was used. The beadboard appears to be original to the building.

Secondary Hall. The hall has original plaster over lath finish, painted. A material sample revealed that the plaster is most likely made of one part lime to three parts sand by volume, and the sand is very fine.

First Floor Bedrooms and Closets (Two Bedrooms, One Closet). These two bedrooms have a mix of original plaster over lath and modern gypsum board walls. The northeast bedroom's east wall has plaster over lath while the other walls are gypsum board. This room's closet was inaccessible at the time of the survey. The southeast bedroom's north and east walls are plaster while the south and west walls are gypsum board. There is no closet associated with this room.

Second Floor Hall. The hall has modern gypsum board on the west and the far east walls, while the north and east (stairwell area) walls are original plaster over lath.

Second Floor Bedrooms (Four Bedrooms, Three Closets). These rooms are a mix of modern gypsum board and original plaster over lath wall finishes, painted. The northeast bedroom has gypsum board over plaster and lath with a plaster over lath closet. (OI-KQ-24) The southeast bedroom has gypsum board over plaster and lath (no closet). The southwest bedroom has gypsum board painted pink with a closet that has plaster over lath. The northwest bedroom has plaster over lath in both the room and closet. A paint sample was taken at the vestibule between the northeast and southeast bedrooms which indicates that some of the later paint layers are early forms of latex paint.

Attic. The attic has the original stud framing exposed. There are remnants, however, of the circa 1925 historic plaster and lath on walls (since removed) that separated the finished rooms from the attic/eave spaces. (OI-KQ-29 and 30) The attic level was once used as an apartment for the second assistant and his family (Historic Drawings OI-05 and 06).

Architecture – Ceiling Finishes

Basement. Both the primary and the oil storage rooms have modern gypsum board ceiling finishes covering up the first floor framing system.

Kitchen Vestibule. This room has original 1 ½” wood board, painted white, as the ceiling finish.

Kitchen. The kitchen has a plaster over lath ceiling finish.

Living Room, Main Hall, and Associated Closets. The living room and main hall have modern ceiling tiles as the ceiling finishes. The living room’s closet has original plaster over lath ceiling finish, while the hall’s closet has a modern gypsum board ceiling.

Storage/Bath. This room has original plaster over lath ceiling finish.

Secondary Entrance. This room has original 1 ¾” beadboard lining the ceiling, painted pink.

Secondary Hall and First Floor Bedrooms (Two Bedrooms, One Closet). The secondary hall and bedrooms have modern ceiling tiles as their ceiling finishes. In the southeast bedroom, a missing tile reveals the original plaster and lath finish above the dropped ceiling tiles. The closet is inaccessible.

Second Floor Hall and Second Floor Bedrooms (Four Bedrooms, Three Closets). These rooms have modern ceiling tiles over original plaster and lath. (OI-KQ-27)

Attic. The attic has the exposed roof structure of joists, beams, and wood sheathing. However, there are nail holes on the joists and beams from where lath once was attached (there are stains from the plaster keys on the lath). (OI-KQ-30 and 31)

Architecture – Interior Trim

Kitchen Vestibule. This room has a simple wood 1x base trim, 4 3/8” tall, painted gray. The window casing is also a simple 1x surround.

Kitchen. The kitchen has a red painted-on base “trim”, 6 ½” tall, with a 1 ¼” simple wood base shoe, also painted red.

Living Room, Living Room Closet, and Main Hall Closet. These rooms have a simple base trim and base shoe, both painted white, 4 ½" tall including ¾" tall base shoe. This base trim is not original to the building. The living room also has cove molding whose profile matches that of the cove molding seen at the Long Island Triplex and the Sand Island Light Station Quarters. This molding is not original to the building but may be historic.

Main Hall, Secondary Hall, First Floor Bedrooms (Two), Second Floor Hall and Second Floor Bedrooms (Four). These rooms have portions of the historic 11 ½" tall wood base trim with an ogee profile at the top 1", including a 2 ¼" base shoe, which is also seen at the Sand Island Light Station Quarters (built 1881). At the main hall, the trim leads up the staircase; in the secondary hall, this type of trim is located on the west wall; in the first floor, northeast bedroom, the trim is on the south, west, and parts of the north walls; in the second floor hall, this trim style is on the staircase and continues into the hall a short distance; and, in the first floor southeast bedroom and the four second floor bedrooms the trim is on every wall. The other trim used in the rooms where only a portion of the room had the historic trim were nonhistoric base trims and base shoes. The second floor hall, the first floor bedrooms, and the second floor bedrooms also have the same cove molding as the living room. This molding is not original to the building but may be historic.

Storage/Bath. This room has an original simple wood base shoe, painted white, in the southeast corner at the base of the original beadboard wainscot. The rest of the room has a modern base trim with a base shoe included so that the trim is one piece of wood. This trim is painted black.

Secondary Entrance. This room has original 8" wood board, painted gray, as its base trim with no base shoe.

Second Floor Bedroom Closets (Three). These closets have a unique form of the historic base trim that their associated bedrooms have. The closets' trim is the same historic trim but with the top inch (the ogee profile portion) removed or possibly covered by a layer of plaster. Therefore, it appears to be a much simpler trim. The base trim also has the same base shoe as the more elaborate historic trim.

Architecture – Floor

Basement. The two rooms in the basement both have unfinished concrete slab floors that are original to the building.

Kitchen Vestibule. This room has weathered wood flooring, painted gray. This flooring is original.

Kitchen. The kitchen has modern 12x12 resilient flooring tiles over the original wood flooring (small portion visible).

Living Room, Main Hall Closet, Storage/Bath, Secondary Hall, First Floor Bedrooms (Two Bedrooms, One Closet). These rooms have modern resilient sheet flooring, over wood flooring (small portions visible). The main hall has a 2' x 1' hole in the floor cut-out for basement access. In the first floor northeast bedroom, the wood flooring underneath the resilient flooring is partially exposed.

Secondary Entrance. This room has an original concrete slab floor, with remnants of blue-gray paint.

Second Floor Hall and Second Floor Bedrooms (Four Bedrooms, Three Closets). These rooms have modern linoleum floors over the original wood flooring. The hall has a single layer of wood flooring, as seen by the step up between this room and the bedrooms. The northeast bedroom has visible double-layer wood flooring on the north end of the room. (OI-KQ-25)

Attic. This level’s resilient flooring is modern and covers the original 3 ½” wide board flooring with tongue-and-groove joints.

Architecture – Stairs

Basement to First Floor Stairs. These stairs are painted concrete. There are six risers at 9” high and the tread depth is 9” with no nosing overhang. The width of the stairs is 3’. They do not have a handrail. These stairs are original to the building. (OI-KQ-15)

Kitchen Stairs. These stairs are painted wood with rubber grips on the treads attached at nosing with a metal bar. The balusters, handrails, and newels are painted wood. There are four risers at 8” and the tread depth is about 10”. Both sides of the stairs have a newels, balusters, and handrails. The stairs and balustrades are original to the building. A paint sample taken from the nosing of the stair revealed the oldest layer of paint was a black, glossy varnish.

Secondary Entrance Stairs. These stairs are made of concrete painted blue-gray. There are five risers at 8” with treads that are 11” deep and 3’6” wide. The upper tread acts as a threshold to the door and is 9” deep to the door frame. There is no nosing overhang nor are there handrails. The stairs are original to the building. (OI-KQ-22)

First Floor to Second Floor Stairs. These stairs are painted wood with rubber grips on the treads attached at nosing with a metal bar. The balusters, handrail, and newels are painted wood. There are 15 risers at 8”. The tread depth is 10” and the width is 2’8”. The nosing overhang is 1”. From the nosing to the center of the handrail is 2’6”. The newel is 6” square with a height of 3’6”. The stairs and balustrade are original to the building. (OI-KQ-23)

Second Floor to Attic Stairs. These stairs are painted wood with rubber grips on the treads. There are 8 risers at 8” to the landing (5’3 ¼” deep, with a width of 3’2 ¼” on the second floor portion of the stairs, and a width of 2’11 ½” on the attic portion of the stairs), and six risers at 8” to the attic from the landing. The tread depth is 10 ½” and the width is 2’6 ½” on the second floor portion and 2’7” on the attic portion. The nosing overhang is 1”. There is no handrail, but the wall separating the two portions of stairs is 5 ½”. Per the attic remodel drawings, these stairs date to 1925. (OI-KQ-28)

Architecture – Casework

Basement. The primary room in the basement contains an historic, two-door, wood cabinet, painted blue-gray. The cabinet is 4’6” wide, 2’10” high, and 1’11” deep.

Kitchen. The kitchen has a free-standing, two-door, two-drawer, wood cabinet that is 3’7” wide, 2’10 ½” tall, and 1’6 ½” deep. It is painted blue-gray.

Living Room Closet. The closet in this room has four built-in wood shelves, painted white, along the east wall. Each shelves’ depth is 2’ ½”. These shelves may be historic (older than 50 years).

Main Hall’s Closet. This closet has four built-in wood shelves, painted blue-gray, that are the length and depth of the closet. These shelves may be historic (older than 50 years).

Second Floor Bedrooms’ Closets. The closets in each bedroom and the passageway between the northeast and southeast bedrooms have a set or series of 4” wood hook boards attached to the walls. The northwest bedroom’s closet has one remaining historic metal hook attached to the board. There is also partial wood shelving remaining in two of the second floor closets.

Attic. The attic has a historic wood cabinet in the east section. The cabinet is five-door (three on the bottom, two on the top), with historic hardware (cabinet latch and keeper), and is painted white. It is 4’9 ¾” wide, 6’ tall, base cabinet depth of 2’ and top cabinet depth of 1’. The cabinet was most likely previously located in the kitchen that existed in the attic when it was converted in 1925 to a second assistant’s quarters.

Architecture – Passageway
The passageway connects the Keepers Quarters to the Tower. The wall finish is plaster over brick, and the arched ceiling is also finished with plaster. The floor is concrete slab-on-grade. This small hall once had 3 ½” base trim but it is no longer extant.

Architecture – Accessibility
The building is currently not accessible. The kitchen vestibule door opening from the exterior is 2’8” clear with a grade to finished floor elevation change of 4 ½” with a wood sill. The entry door opening to the kitchen from the vestibule is 2’9” clear with a grade to finished floor elevation change of 6 ½” due to one step. The secondary entrance opening is 2’8” clear with a grade to finished floor elevation change of 3 ½” with a wood sill. Within the building, there have been no accessibility upgrades. The door widths vary and the multiple floor levels preclude accessibility.

Physical Description -- Structural

Structural – Foundation
The perimeter foundation system consists of stone masonry. The interior foundations are below an interior brick masonry wall and could not be observed.

Structural – Floor Framing
The kitchen floor framing was not accessible and could not be measured. The joists span approximately 12’. The joists are supported on the perimeter foundation.

The first floor framing was measured to be FS 2x10 spaced at about 16”. The joists span approximately 12.5’. The joists are supported on the perimeter foundation walls and an interior brick masonry wall. The floor is sheathed with diagonal solid wood subflooring.

The second floor framing was not accessible and could not be measured. The joists span approximately 13’. The joists are supported on wood-framed partition walls and the exterior masonry walls.

The attic floor framing was measured to be FS 2x8 spaced at about 16”. The joists span approximately 13’. The joists are supported on wood-framed partition walls and the exterior masonry walls. The joists are partially sheathed with solid wood subflooring.

Structural – Roof Framing
The main roof framing was measured to be FS 3x6 rafters spaced at about 17”. The rafters span approximately 8’. The rafters are supported on wood-framed partition walls and the exterior masonry walls. 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 dormer framing was measured to be FS 2x4 rafters spaced at about 16”. The rafters span approximately 4’. The rafters are supported on the main roof and interior partition walls. The rafters are sheathed with solid wood tongue and groove underlayment.

The kitchen roof framing was not accessible and could not be measured. The rafters span approximately 12’. The rafters are supported on the exterior masonry walls.

Structural – Ceiling Framing

The attic ceiling framing was measured to be rough-sawn RS 2x10 joists spaced at about 16”. The joists span approximately 14’. The ceiling joists are supported on wood-framed partition walls.

Structural – Wall Framing

The exterior walls are constructed of brick masonry. The framing of the interior walls, where it could be observed, was measured to be FS 2x4 studs spaced at approximately 16”.

Structural – Lateral System

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

Structural – Load Requirements

The required floor load capacity is 40 psf and the required roof snow load capacity is 45 psf. The required ceiling live load capacity is 10 psf (no storage is allowed).

Structural – Passageway

The floor is a concrete slab-on-grade. The roof framing was not accessible and could not be measured. The rafters span approximately 3’. The ceiling framing was not accessible and could not be measured. The joists span 5’6”. The walls are masonry. The lateral stability for the passageway is provided by the brick walls, Keepers Quarters and Tower. The required floor load capacity is 40 psf and the required roof snow load capacity is 45 psf. The required ceiling live load capacity is 10 psf (no storage is allowed).

Physical Description -- Mechanical

Mechanical – Plumbing Systems

A nonpotable domestic water supply enters the building below grade in the basement with galvanized steel distribution piping to the first floor kitchen and bath. The water is supplied from a tank in the Fog Signal Building. There is no hot water in the building. Two steel water storage tanks from the 1952 rehabilitation remain in the basement. These tanks have a capacity of approximately 1,000 gallons each. In addition, there is a covered metal stock tank in the basement that appears to have been used for water storage. These tanks are no longer connected to the domestic water system.

The building waste lines are mainly cast iron connecting to a 4” cast iron sewer main that exits the building in the basement on the east side. The building sewer runs to a septic tank and leach field located to the east of the building. The distribution box and leach field was installed in 1952 to the east of the existing septic tank. A 4” cast iron vent stack extends from the first floor up through the attic to the roof.

The plumbing fixtures consist of a stainless steel kitchen sink with single cold water faucet, a tank-type toilet on the first floor, and a laundry tub in the basement. There is no faucet for the basement laundry tub.

A bathtub installed in the 1952 remodel is no longer in place. Building plans indicate a kitchen located at the south end of the attic level. The fixtures and piping serving the Kitchen have been removed.

Mechanical – HVAC

The original heating for the building would likely have been coal burning stoves. All that remains from this era is a brick chimney stack from the basement up through the roof. The 1952 heating system consisted of a fuel oil-fired American Standard "Sunbeam" furnace in the basement. The furnace is still located in the basement, along with the distribution ductwork to the floors above. Many of the wall and floor grilles are still in place. Two steel fuel oil tanks remain on the east side of the basement adjacent to the furnace. The furnace is no longer operational. A new Empire 25,000 btuh (British thermal unit per hour) console type propane room heater has been installed in the first floor living room. A 4" aluminum flue pipe has been extended from the heater to the original chimney stack. Two propane tanks are located to the north of the Fog Signal Building. Copper propane piping enters the building on the south side with a pressure regulator on the exterior wall and copper distribution piping to the heater and kitchen stove.

Basement ventilation consists of four ground level 32"x24" wood slat louvers with wire mesh screen. Two on the east side of the building and two on west side of the building.

Mechanical – Fire Suppression

None in the building.

Physical Description -- Electrical

Electrical – System Configuration

Alternating current power to the building originally came from the Fog Signal Building generator system via an underground cable.

Direct current power for selected equipment in the Keepers Quarters was, at one time, provided by a photovoltaic system that utilizes a freestanding flat plate photovoltaic (PV) array and storage batteries. The PV collection array is approximately 60" x 42", and is located near the Keepers Quarters. At one time, the storage batteries were located in a fiberglass vault below the array; however they have been removed, rendering the PV system nonfunctional.

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.

Electrical – Conductor Insulation

Conductors and cable within the building are typical of the 1941 through1952 vintage, and are of three types. Exposed wiring in the basement is run in EMT (electro-metallic tubing) conduit and is of the thermoplastic insulated type. Flexible wiring in the basement is of the corrugated armor, rubber insulated construction, type "BX". The remainder of the wiring, where run in walls, is of the "Romex" construction with rubber insulated conductors in an overall sheath of braided cotton fiber. None of the wiring includes a separate ground conductor and receptacles within the building are of the two prong, nongrounded type.

Electrical – Overcurrent Protection
Overcurrent protection was originally via a four circuit screw-in fuse box located in the basement. Fuses are still in place, but the box and connections have been disconnected from the building's supply and branch circuits. There is no individual main disconnect for the building.

Electrical – Lighting Systems
Lighting systems inside of the building are incandescent lamp type consistent with the 1941 to 1952 construction. Lighting in utility areas is via porcelain keyless lamp holders. Lighting in living areas is a combination of glass drums, pendants and low profile ceiling mounted fixtures.

Electrical – Telecommunications
None in the building.

Electrical – Fire Alarm System
None in the 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 along the peaks of the roof, on the peaks of dormers, and on chimneys.

Physical Description -- Hazardous Materials

Landmark Environmental collected ten bulk samples from a total of ten different types of suspected asbestos containing materials (ACMs). Of the ten suspect ACMs that were sampled and analyzed, a total of one suspect ACM resulted in a concentration of greater than one percent (positive for asbestos).

Hazardous Materials – Asbestos
Asbestos is known to be present at the following homogenous materials/areas:

1. Floor Tile.

The following suspect ACMs were not sampled due to inaccessibility or park limitation regarding potential for damage to structures. Asbestos is assumed to be present in:

1. 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),
2. Plaster,
3. Caulk (Caulking was observed around window and door penetrations, which can also include gasket applications between the window assembly and the structure),
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.), and,
6. 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 ACMs were observed to be in fair condition except isolated areas of plaster in poor condition.

Hazardous Materials – Lead Containing Paint

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

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

1. Window Sash (Wood substrate various colors),
2. Window Trims (Wood substrate various colors),
3. Doors (Wood and metal substrate various colors),
4. Door Trims (Wood and metal substrate various colors),
5. Walls (Various substrates various colors), and,
6. Ceilings – Various substrates various colors.

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

1. Interior Painted Surfaces (Based on testing in the basement, kitchen, living room, bedrooms, and bathroom LCP is assumed to be present on painted surfaces throughout the structure), and,
2. Exterior Painted Surfaces (Based on testing of the window sash and trim LCP is assumed to be present throughout the 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 fair condition and the assumed LCP was observed to be in fair condition.

Loose/flaking LCP is identified on the exterior painted walls of the structure. Paint chip debris is not noted on the surface soils surrounding the structure.

Hazardous Materials – Lead Dust

Wipe sampling for lead dust was not conducted in the Keepers Quarters because lead dust was assumed to be present due to the poor condition of 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 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 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 794.3 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 the mold growth. Moisture testing in building materials was not performed nor was sampling of building materials performed for microbial analysis. Mold was visually identified in the Keepers Quarters.

Character Defining Features

Mass/Form. A simple two-and-a-half story clipped gable masonry structure with chimney and a one story shed roof appendage on the opposite end of the house from the one story gable/shed connection to the tower. Dormers were added on either side of the gable roof with metal panels replicating wood shingles at the walls. A simple one-story wood frame clapboard gable addition serves as an entry to the kitchen door.

Layout of Space. The 1926 remodel altered the original circulation by creating three distinct keeper's units. Generally, the rooms are small and accessed from minimal hall/stair space. Several of the bedrooms communicate with openings from one to another.

Exterior Materials. Red brick masonry with painted, tooled stone sills, painted white wood trim, painted white wood clapboard siding. (Red asphalt shingle roofing is not original to the building.)

Openings. Newer wood double-hung windows varying from one over one, to three over six, to six over six from the attic to first floor respectively. Doors consist of painted white wood doors, one each of a two-lite (covered) over three panel and a one-lite over two panel door.

Interior Materials. Exposed framing at the attic level, plaster walls and ceilings, painted wood trim and wood tongue and groove flooring typically covered with linoleum sheet flooring.

General Condition Assessment

In general, the Outer Island Keepers Quarters is in good condition on the exterior and fair condition on the interior. Most of the ceiling and floor finishes are covering up, or have replaced, the historic ceilings and floors, but what historic finishes are visible and remaining, are in poor condition due to moisture issues. The historic casework in the house is generally in fair condition as there are missing doors and drawers to cabinets, peeling paint, and scratched wood, but the basic shapes of the pieces remain.

Structurally, the Keepers Quarters is in good condition. The load paths for the framing around the roof dormers are unresolved.

Mechanically, the upgraded systems in the Keepers Quarters are generally in fair condition. The abandoned mechanical components from the 1952 remodel are in fair to poor condition.

Electrically, the existing wiring and equipment in the Keepers Quarters is nearly 60 to 70 years old and is past its useful life expectancy. Equipment in the building was installed under the National Electrical Code applicable in 1941 through 1952.

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: *Good*
The roof is overall in good condition. The southwest shed roof over the kitchen, however, is approaching poor condition with rust evident. There is also a portion of the southern eave of the kitchen that is in poor condition, possibly due to roof damage prior to the new roof. The tie offs on the roof should not be used for life safety anchors until they can be certified as meeting OSHA requirements.

The kitchen vestibule's metal shingles are in fair condition as they have peeling paint and rusted portions.

Architecture – Gutters and Downspouts
<u>Condition:</u> *Good*
No overall gutter system but the diverter over the Tower entry door is in good condition.

Architecture – Chimney
<u>Condition:</u> *Fair*
The chimney has several spalled bricks and is in fair condition.

Architecture – Exterior Walls
<u>Condition:</u> *Good*
Overall, the masonry walls appear to be in good condition. Some of the previous pointing is evident due to color and tooling of mortar. The mortar used appears to have been a harder mortar than the original mortar, which may put the masonry at risk. There are several small cracks that do translate through the brick and brownstone; there are three seen at the west wall near the window sill. The south kitchen wall indicates that the kitchen portion is pulling away from the main house about ¼" to ½", possibly due to moisture at the foundation of the kitchen where it is inaccessible.

The clapboard siding is in fair condition as the peeling paint has exposed weathered wood beneath. The foundation is in good condition with the exception of one brownstone member which has eroded significantly. The dormer shingles are in good condition.

Architecture – Windows
<u>Condition:</u> *Good*
Overall, the windows are in good condition. The glazing putty is brittle in areas and should be removed, replaced, and repainted as it appears to be nearing the end of its serviceable life. Also, the sill of the northwest entry window is rotting.

Architecture – Exterior Doors
<u>Condition:</u> *Good*
The doors are in good condition. The secondary entrance door's threshold is in fair condition as the north edge is getting soft where the bottom of the casing is rotting.

Architecture – Exterior Trim
<u>Condition:</u> *Good*
Overall, the trim is in good condition with mild to moderate peeling paint. However, the base at the southwest entry is in poor condition due to rotting conditions at grade.

Architecture – Interior Doors
<u>Condition:</u> *Fair*
The interior doors are in fair condition with separation of stile and rails.

Architecture – Wall Finishes
<u>Condition:</u> *Fair to Poor (Original Plaster in State of Failure)*
The basement's primary room has wall finishes that are in good condition with minor spalling around the base of the east wall and loss of paint and stains around windows and at base. The oil storage room has the same damage pattern as the primary room and is also in generally good condition.

The kitchen vestibule's wall finishes are in good condition; the paint is fading on the walls with beadboard. The kitchen's brick wall finish is in fair condition as the paint is badly peeling, brick is spalling at southeast corner, and there is a stress crack at the northeast corner. The living room and its closet's gypsum board are in good condition, while the main hall's gypsum board over plaster is in deteriorated condition. The hall's east wall gypsum board and plaster are missing, revealing the lath. The frp wainscot in the storage/bath is in good condition while the original beadboard wainscot is in fair condition with separating boards. The plaster over lath wall finish is in poor condition, especially at the northeast corner and north wall where the paint is flaking off to reveal the cracked plaster. The secondary entrance's beadboard wall finish is in good condition with minor peeling paint in the southwest corner. The plaster over lath in the secondary hall is in deteriorated condition as there are large sections of plaster missing on all walls and the lath anchor points are pulling away from the brick wall. Under the boarded-up east window, the condition is especially poor as the lath is damaged and the exterior brick is exposed. The northeast first floor bedroom's east wall, which has plaster, is in poor condition as there are large cracks around the door and window frames, while the gypsum board walls are in good condition. The southeast first floor bedroom's plaster and gypsum walls are in poor condition, especially around the door and windows. There is a horizontal crack between the two windows on the south wall.

The wall finishes of plaster and gypsum board in the second floor hall are in fair condition as there are obvious unsuccessful attempts at patching and cracked and peeling paint. The stairwell walls are in poor condition as the plaster is cracked and separating around the base trim. The northeast second floor bedroom and closet walls' are in poor condition as there is a hole in the bedroom wall (where plaster and lath are visible beneath the gypsum), cracks in the plaster in the closet, and cracks and separation between the walls and base trim. The southeast second floor bedroom is in fair condition as the northeast corner is the only example of water issues apparent on the wall finish. The southwest second floor bedroom's gypsum board is in good condition while its closet's plaster is in poor condition (cracks and missing plaster).The northwest second floor bedroom's plaster is in poor condition as there are cracks in the plaster throughout and peeling paint. The closet associated with the northwest bedroom has plaster in fair condition with paint peeling.

The attic's stud framing is in good condition. The remaining bits of plaster over lath are in poor condition. The original lath and plaster is in poor condition as some areas have the lath anchor points pulling away from the brick exterior walls, which could result in wall finish failure.

Architecture – Ceiling Finishes
<u>Condition:</u> *Good to Fair to Poor*
The basement's primary room has a gypsum board finish that is in fair condition with some sagging around joints and overlaps between fiberboards. The oil storage's fiberboard ceiling is in poor condition as the north section is deteriorated by water damage.

The kitchen vestibule's wood board ceiling finish is in good condition. The kitchen's plaster is in fair condition as there is a hole near the east wall and cracks and peeling paint along the south side. The living room's and main hall's ceiling tiles are in good condition. The living room closet's plaster is in poor condition as over 60% of the surface is covered by cardboard and the uncovered area looks as if the plaster is about to fail. The hall closet's gypsum board ceiling is in good condition. The storage/bath's plaster ceiling finish is in fair condition as the northeast corner has peeling paint and there is a crack running north-

south in the center of the ceiling. The secondary entrance's beadboard ceiling is in fair condition with minor separation of boards and minor deflection occurring. The secondary hall and first floor bedrooms (two bedrooms, one closet) have ceiling tiles in fair condition as there are water stains on some of the tiles and a missing tile in the southeast first floor bedroom. The missing tile reveals the original plaster and lath finish to be in poor condition as it is cracked and deflected (e.g. has probably lost the integrity of its keying).

The second floor hall's ceiling tiles are in good condition, while the northeast second floor bedroom's ceiling tiles are in fair condition as there are water stains and one tile is missing, revealing plaster in poor condition. This bedroom's closet has water stains, deflection, and rust around the existing light fixture. The southeast second floor bedroom's tiles are in good condition. The southwest second floor bedroom's tiles, however, are in poor condition as there are missing and loose tiles at the northwest corner and water stains along the east section. (OI-KQ-27) The missing tiles reveal damaged and missing plaster and visible lath that has water damage. The closet for the southwest bedroom has ceiling tiles in good condition. The northwest second floor bedroom's tiles are in poor condition as there are stains and deflection around the pipe. This bedroom's closet has ceiling tiles in good condition.

Architecture – Interior Trim
<u>*Condition:*</u> *Good to Fair*
The kitchen vestibule's simple board trim is in good condition but has faded paint. The kitchen's base trim is in poor condition as the paint is badly peeling in certain areas and the base shoe is detached from the wall along the southwest wall. The living room, living room closet, and main hall closet's simple base trim and base shoe are generally in fair condition. The living room's cove molding is in good condition. The main hall's, secondary hall's and the first floor northeast bedroom's portions of the historic trim are in fair condition as there are instances of separation of base trim from walls and peeling paint. The first floor southeast bedroom's historic trim is in fair condition as some of the trim is misaligned, separating from the walls, and there are horizontal cracks where the base trim ends and the wall begins. The cove molding in the first floor bedrooms is in good condition. The storage/bath's original wood base shoe at the base of the wood wainscot is in good condition. The modern, one-piece base trim and shoe in this room is generally in good condition. The overall condition of the base trim in the storage/bath, however, is fair as there are segments missing and the two styles of modern and historic are not visually compatible. The secondary entrance's simple wood base trim is also in good condition but its paint is badly peeling.

The second floor hall's historic trim is in fair condition as there are instances of separation of the base trim from the walls and peeling paint. The four second floor bedrooms' historic trim are in fair condition as some of the trim is misaligned, separating from the walls, and there are horizontal cracks where the base trim ends and the wall begins. (OI-KQ-25) The cove molding in the second floor hall and the second floor bedrooms is in good condition. The condition of the second floor closets' (three) simplified historic trim is generally in worse condition than their bedrooms' trim. This trim has more joint separation, more horizontal damaged areas around wall junctures, and the northeast bedroom closet's trim is missing its base shoe.

Architecture – Floor
<u>*Condition:*</u> *Good to Fair*
The basement's two concrete slab floors are in good condition.

The kitchen vestibule's wood flooring is in good condition but its paint is peeling and there is missing caulking around the entry step. The resilient flooring in the kitchen is in good condition but the original wood flooring's condition cannot be determined as it is not visible. The resilient flooring in the living room, main hall closet, storage/bath, secondary hall, first floor bedrooms (two bedrooms, one closet) is in

good condition with minor seam separation. The wood flooring visible in the first floor northeast bedroom has water stains and appears to be damaged. The secondary entrance's concrete slab floor is in good condition but the once-painted floor has only small patches of paint remaining.

The resilient flooring in the second floor hall and second floor bedrooms (four bedrooms, three closets) is in fair condition as there are water stains and obvious patches in the resilient flooring. The visible wood in the northeast bedroom is in poor condition as there are water stains on the boards and what appears to be water damage at the northwest corner. (OI-KQ-25)

The attic's resilient flooring is in poor condition as it is heavily water stained and warped. The small area of the wood flooring visible is in fair condition as it has water stains and the original finish has worn away.

Architecture – Stairs
<u>Condition:</u> *Good to Fair*
First Floor to Basement Stairs. These stairs are painted concrete. They do not have handrails and paint is badly peeling. Overall, the treads are in good condition.

Kitchen Stairs. These stairs have peeling paint and two rubber grips with pieces missing. The balustrades also have minor peeling paint. Overall, these stairs and balustrades are in good condition.

Secondary Entrance Stairs. These concrete stairs have badly peeling paint and no handrails. Overall, the stairs are in fair condition. (OI-KQ-22)

First Floor to Second Floor Stairs. These wood stairs have peeling paint, chipped wood nosings, and worn and cockeyed rubber grips. The balustrade also has peeling paint and chips in the balusters. Overall, the stairs and balustrades are in fair condition. (OI-KQ-23)

Second Floor to Attic Stairs. These wood stairs have peeling paint and missing, worn, and skewed rubber grips. The landing is worn, has peeling paint, and unpainted portions. Also, there is no handrail for these stairs. Overall, the stairs are in fair condition. (OI-KQ-28)

Architecture – Casework
<u>Condition:</u> *Good to Fair to Poor*
The wood cabinet in the basement is in poor condition as the door on the right is in pieces, the door on the left has scratched and gouged wood, and the paint is peeling. The kitchen's wood cabinet is in poor condition as its drawers are missing and it has badly peeling paint. The shelves in the living room closet are in good condition. The main hall's closet shelves are in good condition but the blue-gray paint has mostly disappeared. The second floor closets' wood hook boards are generally in fair condition as they have missing hooks, peeling paint, and misaligned joints. The remaining wood shelving in two of the closets are in poor condition as there are only partial shelves and supports existing. The wood cabinet in the attic is in poor condition as one of the base doors is missing and the paint is peeling badly.

Architecture – Passageway
<u>Condition:</u> *Good to Fair*
The passageway between the Tower and Keepers Quarters has a hole in the plaster near the base of the southeast wall. There are rust stains on the walls as well. The ceiling is in good condition as is the floor, though it shows some wear near the entry from the residence into the Tower. The missing base trim has left adhesive marks and areas of missing plaster at the base of the walls.

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

Condition Assessment -- Structural

Structural – Foundation
<u>Condition:</u> *Good*
The foundations are in good condition. Hairline to 1/8" wide cracks were observed in the north and east walls at the northeast corner and in the west wall. The cracks were not recent and could be due to temperature fluctuations.

Structural – Floor Framing
<u>Condition:</u> *Fair*
The floor framing in the kitchen, first and second floors could not be observed, thus their conditions are unknown. No obvious signs of distress or damage were observed. The accessible attic floor framing is in good condition. The balance of the attic 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 main roof framing is in good condition. The load paths for the framing around the dormers are unresolved and require further investigation (OI-KQ-31 and 32). The kitchen roof framing could not be measured, thus its condition is unknown. No obvious signs of distress or damage were observed.

Structural – Ceiling Framing
<u>Condition:</u> *Good*
The attic ceiling framing is in good condition.

Structural – Wall Framing
<u>Condition:</u> *Good*
The exterior masonry walls are in good condition. The east wall of the kitchen has separated up to 1/4" from the south wall of the Keepers Quarters. This separation could be the result of differential foundation movement. The interior brick masonry walls are in fair condition. The brick and mortar were deteriorating just above the basement floor level (OI-KQ-33). The accessible framing of the interior walls is in good condition. The balance of the interior wall framing could not be observed, thus its condition is unknown. No obvious signs of distress or damage were observed.

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

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

Structural – Passageway
<u>*Condition:*</u> *Good and Unknown*
The roof and ceiling framing could not be observed, thus their conditions are unknown. No obvious signs of distress or damage were observed. The masonry walls and lateral stability are in good condition. The slab-on-grade has adequate capacity. The roof and ceiling framing could not be observed, thus their capacity is unknown.

Condition Assessment -- Mechanical

Mechanical – Plumbing Systems
<u>*Condition:*</u> *Fair*
The nonpotable domestic water piping to the first floor kitchen and bath is galvanized steel and is in fair to poor condition. The two 1,000 gallon water storage tanks located in the basement are in fair condition. The covered metal stock tank in the basement is also in fair condition. These tanks are no longer connected to the domestic water system.

The building waste lines and 4” cast iron sewer main are in fair condition. The condition of the buried sewer main and septic tank could not be determined.

The stainless steel kitchen sink and faucet are in good condition. The first floor tank-type toilet is in fair condition. The basement laundry tub is in poor condition.

Mechanical – HVAC
<u>*Condition:*</u> *Fair*
The 1952 furnace located in the basement is in poor condition with rust damage. The furnace distribution ductwork to the floors above is in fair condition. The wall and floor grilles still in place are in fair condition. The two fuel oil tanks in the basement are also in fair condition. The new propane heater and associated flue vent are in good condition. The propane building entry, pressure regulator on the exterior wall, and copper distribution piping through the basement up to the first floor are also in good condition.

The basement ventilation louvers are in fair condition. The total square footage of the louvers openings meets code requirements for non-mechanical basement ventilation.

Mechanical – Fire Suppression
<u>*Condition:*</u> *N/A*

Condition Assessment -- Electrical

Electrical – System Configuration
<u>*Condition:*</u> *Poor and Good*
The underground service cable from the Fog Signal Building to the Keepers Quarters has been in place for a minimum of 60 years. It is well beyond its expected serviceable life and should not be counted on to perform in the future.

The photovoltaic power system for selected fixtures in the building is nonfunctional. Batteries have been removed from the underground battery vault. Aside from this, the general condition of the photovoltaic system collectors and wiring is good.

Electrical – Wiring Devices
<u>*Condition:*</u> *Poor*
Wiring devices originally installed for alternating current systems are in poor condition.

Electrical – Conductor Insulation
<u>*Condition:*</u> *Poor*
Conductors and cable within the building are in poor condition and are well past their serviceable life.

Branch circuit wiring in the attic has been removed along with all receptacles and lighting. The space has been stripped of all electrical equipment. Conductors from the floor below remain in place, coiled between studs.

Electrical – Overcurrent Protection
<u>*Condition:*</u> *Poor*
The existing service fuse box is in poor condition, is badly corroded and is currently disconnected. Fuses remain in place, but the entire service is nonfunctional.

Electrical – Lighting Systems
<u>*Condition:*</u> *Poor*
Lighting fixtures inside of the building are in poor condition and do not meet current underwriters codes. Most of the fixtures have been fully or partially removed and have not been replaced.

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

Electrical – Lightning Protection
<u>*Condition:*</u> *Fair to Poor*
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 -- Hazardous Materials

Refer to ‘Physical Description -- Hazardous Materials’ for detailed descriptions of locations and conditions of hazardous materials.

Ultimate Treatment and Use

The Keepers Quarters was constructed in 1874 as part of the lighthouse which included an attached tower. In 1961, the light was automated and the keeper and assistant(s) were no longer required for lighthouse operations.

The Keepers Quarters is currently open to visitors on a limited/guided basis and provides limited shelter housing to the NPS staff and volunteers. The proposed use for the building is for shelter housing for staff (NPS) offering only basic amenities.

Rehabilitation is the recommended treatment.

Requirements for Treatment

Compliance requirements for treatment currently include laws, regulations, and standards as outlined by the NPS 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: *Moderate*
Verify/provide proper blocking for roof tie offs at main roof. Repair and repaint metal shingles at the southwest shed roof and kitchen vestibule as possible or replace in kind with a prefinished shingle. Scrape, sand and repaint the fascia, frieze, soffit and trim.

Architecture – Gutters and Downspouts
Priority: *Low*
No recommendations at this time.

Architecture – Chimney
Priority: *Low*
Replace spalling bricks and repoint with mortar to match existing in composition, color and tooling.

Architecture – Exterior Walls
Priority: *Moderate*
Repoint areas of failing mortar and/or incompatible mortar (i.e. too hard) and where cracks are evident in the masonry walls. Scrape, sand and repaint the clapboard siding. Monitor the south kitchen wall which shows indications that the kitchen portion is pulling away from the main house about ¼” to ½”, possibly due to moisture at the foundation of the kitchen where it is inaccessible.

Architecture – Windows
<u>*Priority:*</u> *Moderate*
Remove, replace, and repaint the glazing putty in areas. Replace the rotting window sill at the northwest entry.

Architecture – Exterior Doors
<u>*Priority:*</u> *Low*
Epoxy stabilize the secondary entrance door's frame where the bottom of the casing is rotting.

Architecture – Exterior Trim
<u>*Priority:*</u> *Low*
Epoxy stabilize the base at the southwest entry where it is rotting. Investigate alternative for drainage away from the wall. Scrape, sand and repaint all trim.

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

Architecture – Wall Finishes
<u>*Priority:*</u> *Moderate*
Enhance overall building ventilation. Remove/replace damaged plaster. Repaint all wall finishes using the paint analysis to guide the color selection.

Architecture – Ceiling Finishes
<u>*Priority:*</u> *Moderate*
Repair damaged plaster and repaint using the paint analysis to guide the color selection. Remove the modern ceiling tiles and repair or replace damaged plaster above. Document and monitor areas of previous water damage to verify these are not current leaks.

Architecture – Interior Trim
<u>*Priority:*</u> *Low*
Repair/infill sections of base trim where separating from the wall and from joints. Scrape, sand and repaint interior trim.

Architecture – Floor
<u>*Priority:*</u> *Moderate*
Remove modern resilient flooring, repair where necessary and refinish original wood flooring. Repaint kitchen wood flooring.

Architecture – Stairs
<u>*Priority:*</u> *Moderate*
Add code compliant wood handrails where no handrails exist. Repair chipped nosings and scrape, sand and repaint wood stairs.

Architecture – Casework
Priority: *Low*
Scrape, sand and repaint wood casework. Repair damaged sections where necessary.

Architecture – Accessibility
Priority: *Low*
Provide program access through interpretive exhibits and waysides at the Visitor Center.

Treatment Recommendations -- Structural

Structural – Foundation
Priority: *Low*
No recommendations at this time.

Structural – Floor Framing
Priority: *Low*
No recommendations at this time.

Structural – Roof Framing
Priority: *Low*
The load paths for the framing around the dormers are unresolved and require further investigation.

Structural – Ceiling Framing
Priority: *Low*
No recommendations at this time.

Structural – Wall Framing
Priority: *Low*
No recommendations at this time.

Structural – Lateral System
Priority: *Low*
No recommendations at this time.

Treatment Recommendations -- Mechanical

Mechanical – Plumbing Systems
Priority: *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
Priority: *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 if the propane heater is to remain.

While the total square footage of the existing basement ventilation louvers meets code requirements, additional passive ventilation is recommended to prevent condensation and high humidity levels in the basement.

It is recommended that all unused propane piping be removed.

Mechanical – Fire Suppression
Priority: *N/A*

Treatment Recommendations -- Electrical

Electrical – System Configuration
Priority: *Moderate*
Electrical devices, lighting and wiring 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. Existing PV array and storage battery system is no longer functional. PV storage batteries have been removed. It is recommended to expand the existing system with new array, batteries and wiring to provide power for staff radio units, new ventilation systems, new refrigerator, and new stove. All new electrical equipment and wiring shall be in accordance with the National Electrical Code.

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: *Low*
No Recommendations at this time.

Electrical **-** *Fire Alarm System*
Priority: *Moderate*
It is recommended that battery operated smoke detectors be installed in bedrooms and corridors along with battery operated CO sensors.

Electrical – Telecommunications
Priority: *N/A*

Treatment Recommendations -- Hazardous Materials

Hazardous Materials – Asbestos
Priority: *Moderate*
Recommend sampling of suspect asbestos containing materials, including brick and block filler, flooring, plaster, caulking, asbestos cement, adhesives, and TSI should be sampled.

Hazardous Materials – Lead-Containing Paint and Lead Dust
Priority: *Moderate*
Recommend stabilization or abatement of Lead-Containing Paint.

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

Hazardous Materials – Mold/Biological
Priority: *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. One alternative would be to retain the attic level in its exposed framing state. The framing offers a story of how the space was finished. Installing new lath and plaster and other finishes would be a reconstruction and not in keeping with the overall rehabilitation treatment of the building. There would also be a net savings to the park on reduced rehabilitation costs.
2. An alternative that was considered was the restoration of this island as it is listed as one of the three islands targeted in the GMP. However, due to the low visitation numbers and the remoteness of the island, it was deemed as a lower priority at this time compared to Michigan and Sand.

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 former residence	Change in Use: Upgrades for code and safety may be required and may alter the historic fabric.	Integrate upgrades to minimize damage to historic fabric.	- Allows visitors to experience the cultural resource first hand - Improves safety for visitors and staff
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. Structural repair of dormers	Additional (new) framing members may be needed to be introduced.	Evaluate all alternatives to determine which will be least disruptive to the historic fabric both at the attic and possibly below to track the load paths.	- Improves safety for visitors and staff
4. Possible replacement of shed roof shingles	Replacement would require removal of the old (not original) building material.	There is an available material currently which matches the existing in size, material and color.	- Replacement shingles at the shed roof will likely be a longer lasting alternative than repainting the existing and thereby reduce future maintenance costs

Keepers Quarters Photographs, 2009

OI-KQ-01: Aerial from Tower, south view, 2009 (Source: AH DSC01514)

OI-KQ-02: West elevation, 2009 (Source: AH IMGP3090)

OI-KQ-03: South elevation, 2009 (Source: AH IMGP3091)

OI-KQ-04: East elevation, 2009 (Source: AH IMGP3093)

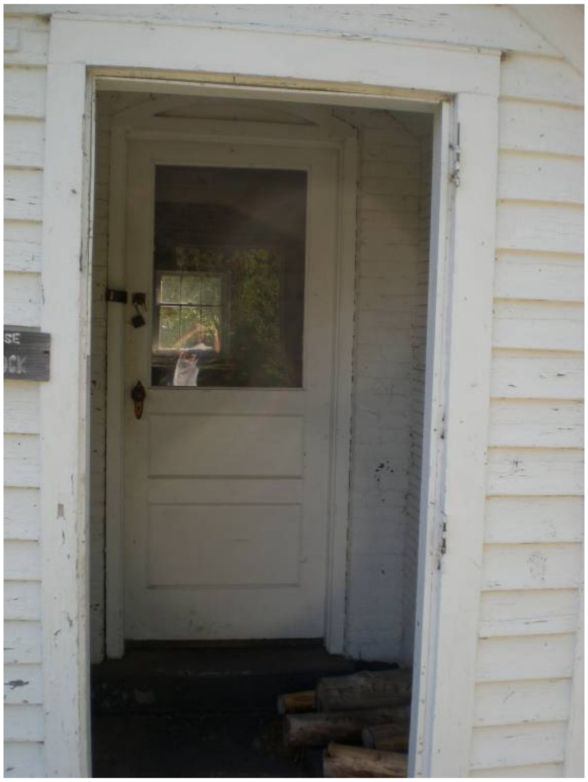
OI-KQ-05: North elevation, 2009 (Source: AH IMGP3097)

OI-KQ-06: Chimney detail, south elevation (Source: AH IMGP3100)

OI-KQ-07: Chimney detail, south aerial view (Source: AH IMGP3225)

OI-KQ-08: Secondary entrance diverter and trim detail, west elevation (Source: AH IMGP3142)

OI-KQ-09: Kitchen vestibule, roof and trim detail, south elevation (Source: AH IMGP3135)



OI-KQ-10: Kitchen vestibule, west elevation (Source: AH CIMG4450)

OI-KQ-11: Primary basement room, looking north (Source: AH CIMG4472)

OI-KQ-12: Basement oil storage room, looking northeast (Source: AH CIMG4483)

OI-KQ-13: Basement oil storage room, looking south (Source: AH CIMG4487)

OI-KQ-14: Basement oil storage room furnace detail, south view (Source: AH CIMG4488)

OI-KQ-15: Stair from basement to kitchen, looking west (Source: AH DSC01520)

OI-KQ-16: Kitchen, east elevation (Source: AH CIMG4458)

OI-KQ-17: Kitchen and stair to living room, west elevation (Source: AH CIMG4462)

OI-KQ-18: Living room, looking southeast (Source: AH CIMG4499)

OI-KQ-19: First floor main hall, north elevation (Source: AH CIMG4509)

OI-KQ-20: Storage/bath, west elevation (Source: AH CIMG4518)

OI-KQ-21: Secondary entrance, west elevation (Source: AH CIMG4530)

OI-KQ-22: Secondary entrance, looking east (Source: AH CIMG4535)

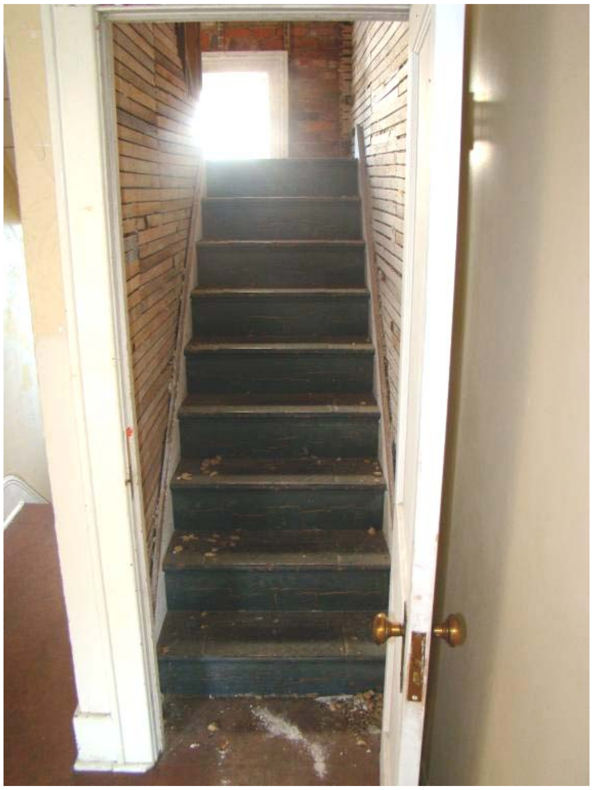
OI-KQ-23: Stair to second floor hall, looking north (Source: AH DSC01550)

OI-KQ-24: Northeast second floor bedroom (Source: AH CIMG4589)

OI-KQ-25: Northeast second floor bedroom floor and base trim (Source: AH CIMG4598)

OI-KQ-26: Southeast second floor bedroom door and frame (Source: AH CIMG4617)

OI-KQ-27: Southwest second floor bedroom ceiling (Source: AH CIMG4630)



OI-KQ-28: Second floor stair to attic, north elevation (Source: AH DSC01535)

OI-KQ-29: South view of attic space (Source: AH CIMG4661)

OI-KQ-30: Northwest view of attic space (Source: AH CIMG4656)

OI-KQ-31: Dormer framing in attic (Source: Martin/Martin)

OI-KQ-32: Dormer framing in attic (Source: Martin/Martin)

OI-KQ-33: Deteriorated masonry wall in basement (Source: Martin/Martin)

FOG SIGNAL BUILDING

Chronology of Alterations and Use

Original Construction

The Outer Island Fog Signal Building was constructed in 1875 to house the first fog signal in the Apostle Islands. A steam locomotive whistle was used as the fog signal.[37] The building was also used to house the hoisting winch for the tramway.[38]

Significant Alterations / Current condition

By 1877, two small buildings appear on a site plan, later labeled Whistle Buildings 1 and 2 on the 1893 site plan. (Historic Drawing OI-01 and 02) The two buildings were wood frame with lap siding. The eastern building had a wood shed structure attached, which must have been added later in 1893, with its own double doors and window with shutters. (Historic Images OI-02 and 03) The eastern building had the hoisting mechanism in front of its main entrance. (Historic Image OI-03) By 1900, as visible in historic photos and a site plan, the western whistle building had been removed from the site, and the eastern building was expanded, branching out to the west. (Historic Image OI-05 and Historic Drawing OI-03) In 1934, the new tram and hoist system were installed. By 1937, the building appears to be in the configuration and appearance that it is today. (Historic Image OI-09*)* In 1977, the building was re-roofed.

The historic construction drawings from 1929 for the diaphone platform addition show a building that appears to have changed little between the time of its expansion around 1900 and present day. (Historic Drawing OI-08)

Recent alterations to the building consist of replacing broken and missing siding, repointing of the chimney and foundation, painting the exterior and the adjacent oil tank, reglazing the windows, replacing the broken glazing, and rebuilding the tram cart. These alterations occurred between 1998 and 2009 and were completed by the Historic Structure Preservation Team of the NPS. The Fog Signal Building was also re-roofed with three-tab asphalt shingles (brick red) by the Team in 2002.

With regards to the mechanical systems, the original steam whistle fog signal equipment was removed while much of the diesel-powered air diaphone system installed in 1929 remains, along with the associated tanks and compressors.

The Fog Signal Building was originally electrified in 1928 when diesel air compressors were installed to power the fog horns. In 1937, the building's electrical systems were remodeled to accommodate new radio equipment. In 1942 under the USCG, the facility was remodeled and new radio systems and supporting electrical equipment were installed. In 1948, new diesel driven air compressors were installed. In 1985, two Kohler engine generators were removed and a single Onan engine generator was installed by the NPS. No major modifications have occurred since.

The Outer Island Fog Signal Building is in fair to good condition.

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[37] 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.
[38] List of Classified Structures, National Park Service, 2009.

Summary of Documented Work on the Building

Date	Work Described	Source of Information
1874	Oct 30: "The bank around the fog whistle has caved in very much on the Lake side. The sea has washed it away within 6 or 8 feet of the building." Nov 14: "Got up steam and blowed till 6 PM when the bank on the land side gave way and carring the ladder with great force against the building. The earth nearly covered the building to the roof. We thought the whole side was coming in…We was obliged to draw the fire and give up running and clime the bank the best we could."	O.K. Hall, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I
1875, July	July 8: "The fog whistle completed today so that we was able to get up steam and sound the alarm."	O.K. Hall, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I
1877, Oct 1	"Mr. G.W. Bond finished work on the cistern….Mr. Jerome Sauzon is in charge of the building of the Signal and Light House now being constructed."	H.A. Kuchli, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I
1878, June 27	"Government boat 'Warrenton' arrived at 6 AM; left material for a dublicate [sp] Fog Signal, lumber for building, and all the machinery; unloaded by means of a scow." Duplicate Fog Signal built	H.A. Kuchli, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I
1894	New brick foundations for separate fog signal buildings	*Ashland Daily Press*, 1958
1897, June 10	"Marigold" brings supplies, including "1 Fog Signal replacement"	John F. P. Jacobi, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I
1898, July	July 25: "Took down Smoke Stack on No. 2, put up new one." July 26: "Getting new Smoke [Stack] fisced in place, and derrick down."	John Irvine, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I
1900, July	July 23: "… helping to raise Signal House No. 2." July 25: "… helping to move Signal House." Western building removed and materials reused in expanding the eastern building to the west	John Irvine, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I
1908	Shingled all roofing with metal shingles	August 24, 1908 Keepers Log Entry
1915, August 2	"Putting up frame for partition in Fog Signal."	Otto Olson, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1925, October 23	"Making new platform for whistles."	Daniels, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1928	Diesel air compressors installed to power fog horns	Electrical Plan
1929	Diaphone monitor built Sept 5: "Repair [crew] making concrete sill under Signal." Oct 1: "Painted new siding on Signal." Oct 31: "Air signal in commission."	1929 Plan (Historic Drawing OI-08); Daniels, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1932, June 16	"Put up some curtains [on] Signal windows."	Daniels, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1934	Aug 22: "Put window in shop." Oct 10: "Installed new radio." Oct 12: "Bolted stand on balcony for Winter Light."	Daniels, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1935	June 12: "… nailing on siding on work shop." Sept 17: "White leaded around flashing of chimney on Signal … and repaired two leaks."	A. G. Carpenter, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1936, July 1	"Painted the black on No. 2 Engine, and painted aluminum on pipes on No. 2..."	A. G. Carpenter, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1937	Electrical systems remodeled for new radio equipment May 10: "Repaired floor in attic of Signal." May 27: "Hoisted gravel and made a cement cap on the chimney."	Electrical Plan; A. G. Carpenter, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II

Date	Work Described	Source of Information
	June 17: "Put in a pane of glass in Signal window."	
1938, April 25	April 25: "Put in a window glass in Signal…" July 9: "…started to enamel Signal floors." Aug 26: "Moving furnice [furnace] in Signal so it will be away from the hoisting engine. The carborator [carburetor] on the hoist got on fire from the furnice door. Moved furnice to one side and patched the hole in the chimney."	A. G. Carpenter, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1938, September	Sept 2: "Put in frame for iron door in chimney..." Sept 15: "Finished on furnice, and made new hole in chimney for furnice pipe." Sept 26: "Working on the coal bin in Signal. Took off siding and took out old wall and inside sheeting. Hoisted up gravel to put in the new wall." Sept 30: "Made cement steps to coal bin, and painted up wall, and put siding back on the coal bin."	A. G. Carpenter, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1941, June 26	"Built screen door for Fog Signal…"	V.T. Barningham, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1942	Remodel by USCG, including new radio system and electrical support May 13: "Worked in Fog Signal and Tower. Wiring and putting partition in." May 15: "Put partition in…Turned Light on to electricity for the first time. Now is a full pledge [fledge] Coast Guard Station." June 16: "Worked on ceiling in Fog Signal. Took forms off from basement and filled in the holes." June 19: "Worked on oil tank. Replaced it." June 27: "Removed cement step to work shop. Dug trench for oil pipe." July 31: "Built stairs in Fog Signal." Oct 29: "Worked on radio equipment; installing the same. Went on the air at 7 P.M. this date; all working good." Nov 24: "Replacing broken glass in Signal."	USCG Electrical Plan; V.T. Barningham, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1943	May 25: "Put in new petition [partition] between batteries room and work shop." July 3: "Brought Mr. Miller and helper to shingle the dwelling and Fog Signal." July 5: "Mr. Miller working on shingling Fog Signal roof."	V.T. Barningham, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol II
1948	Diesel-driven air compressors installed	Electrical Plan
1985	Two Kohler engine generators removed and a single Onan engine generator installed by the NPS	N. Howk, 2010
2002	Exterior repainted	HSPT Reports, 2009
2002	Re-roofed with 3-tab asphalt shingles (brick red)	HSPT Reports, 2009

Notable Actions with Unknown Dates

Date Range	Work Described
Pre-1998	Asbestos siding shingles installed
1998-2009	Repointed chimney and foundation
1998-2009	Replaced broken and missing siding
1998-2009	Rebuilt tram cart
1998-2009	Reglazed windows and replaced broken glazing
+/- 2007	David Brunsvold, APIS Staff, noticed rotting perimeter sill plate

General Physical Description

This building is one-story, utilitarian, wood frame structure with a rectangular footprint. It has a gable roof and a monitor for the fog signal. The main portion of the building has asbestos siding. It has a brick foundation and chimney. The building consists of a series of four main rooms.

Physical Description -- Architecture

Architecture – Roof
The roof is modern red asphalt shingle (CertainTeed brand, Maple Red Blend) with tie-off rings installed, though they do not appear to comply with OSHA requirements. It appears that no drip edge flashing was installed; rather, the new roof was installed over a previous sheet metal panel layer of roofing. The sheathing, where visible at the western end of the attic, was originally spaced, indicating that the original roof material was wood shingles; however metal shingles were installed by 1908. The eave consists of a closed, raked soffit of painted wood extending +/- 1'-2" and a +/- 10" wood painted frieze board.

Architecture – Chimney
The red brick chimney has corbelled coursing at the top and concrete flaunching. A sheet metal cap has been installed and there is evidence of past repointing work. A mortar sample taken from the interior indicates that the composition of the mortar is a small part lime mixed with sand and the sand is fine. The mortar is tan colored and very soft. (OI-FSB-08)

Architecture – Exterior Walls
The exterior walls are wood frame with asbestos shingles at the main portion of the building (the exposed area of a shingle is 10 ½" wide by 24" long), there are sheet metal panels at the fog monitor area, and there is parging over the brick foundation.

A mortar sample was taken at the brick foundation that indicates the mixture is composed of Portland cement and sand. The mortar has a gray color, is hard and brittle, and has moderate coarseness sand.

Architecture – Windows
The windows have no existing hardware. All first floor windows have retrofitted tracks and only the fog monitor north window has a sash cord and pulley in-situ. The windows have painted wood 1x casing with sill and drip trim at the header on the exterior and simple shaped 1x casing on the interior with sill and apron trim.

First Floor Windows, One-Over-One, Double-Hung. These windows are all double-hung, one-over-one. They have aluminum tracks from the Michigan Molding Company, Detroit, MI. The primary window size is 3'11" x 2'11". There is one window each of the sizes 2'8 ½" x 5'6" and 2'9" x 3'4".

Fog Monitor North Window, Four-Over-Four, Double-Hung. This window is a four-over-four double-hung that retains the original sash cord and pulley system. It does not have hardware like the rest of the windows in this building. It is 2' x 3'10". There is an in-filled opening on the south wall that has the same dimensions as the north wall's window.

Architecture – Exterior Doors

There are four original exterior doors that have been in-filled; one on the east wall, one on the south wall, and two on the north wall. The only open exterior door is the door on the west wall, which is a wood, five panel door. The door has three ball-tip hinges. The door is 2'9 ¾" x 6'11" x 1 ¾". (OI-FSB-06) The north wall's main door that is infilled is a double door that has door dimensions of 2'5" x 7'11". The transom at the north elevation's former door opening is a four-lite and is 1'8" x 5'11 ½". The north wall's hoist engine door is also a double door with each door measuring 2'2" x 4'6". This door is constructed of tongue and groove boards. The exterior doors have painted wood 1x casing.

Architecture – Exterior Trim
Exterior trim is covered elsewhere.

Architecture – Interior Doors
The existing interior doors are located at the battery storage room and the work room. The battery storage room door is a three panel wood door with a half lite and simple wood board trim. The door is 3'x 7'x1 ¾". The work room door is a five panel wood door that is 2'8" x 6'8" x 1 3/8" with the same simple wood board trim as the battery storage room. This door has a historic lockset and appears to be original to the expanded building. The interior doors have simple painted wood 1x casing.

Architecture – Wall Finishes
Equipment Room and Battery Storage. These rooms' wall finishes are sheet metal over wood boards (5 ½" wide), painted gray and white. The west wall in the equipment room has 5 ½" beadboard siding above the sheet metal. Both the sheet metal and the beadboard are original to the building. The equipment room's paint sample indicated that beneath the oldest layer of white paint a thin layer of black and dark maroon which may be a ferrous metal substrate exists.

Work Room and Fog Signal Room (Second Floor). These rooms have 5 ½" wide wood boards, painted gray and green. The wood appears to be original to the expanded building. (OI-FSB-15)

Storage Room. This room has gypsum board as its wall finish, painted in various shades of blue. The gypsum board is not original to the building and is modern.

Architecture – Ceiling Finishes
Equipment Room. This room's ceiling finish is sheet metal over lath and plaster, painted white. Along the south sloped ceiling, the finish is the same beadboard seen on the west wall, painted white. This sheet metal and beadboard ceiling is historic, while the plaster and lath beneath the sheet metal is most likely original to the expanded building.

Battery Storage, Work Room, Storage Room, and Fog Signal Room. These rooms have original wood board ceiling finishes (5 ½" wide boards), painted white or gray. The battery storage room has modern plywood over the eastern half of the ceiling.

Architecture – Interior Trim
Equipment Room. This room has a painted base trim (a strip of red paint 5" high from the floor). The base is a concrete curb, 2" wide by 2" high.

Battery Storage. On the west and portions of the south wall, there is a simple wood board base trim, 5 ½" tall, painted gray. On the north wall, the same concrete curb as the equipment room exists.

Work Room. This room has the same concrete curb as the equipment room and battery storage, except the east wall does not have a curb.

Storage Room. This room has a simple wood board base trim, 5 ½” tall trim, painted gray, and the concrete curb that the other rooms also have, along its north wall.

Architecture – Floor

Equipment Room, Battery Storage, Work Room, and Storage Room. These four rooms all have slab-on-grade concrete floors. In the equipment room, the platform on the west end has wood plank flooring 7 ¼” wide, painted blue-gray. The concrete and the wood floor appear to be original to the expanded building.

Fog Signal Room. This room has wood board flooring, 5 ½” wide, painted blue-gray. The floor is most likely original to the expanded building.

Architecture – Stairs

Exterior West Elevation Stairs. These stairs are concrete, painted blue-gray. There are three risers with beveled corners (top riser 5 ½” high, other risers 8 ¼” high), and the tread depth is 12” with a width of 3’8”. There are no handrails and the stairs appear to be original to the expanded building.

Exterior North (Northwest) Elevation Stairs. These stairs are concrete, painted blue-gray. There are two risers (top riser 7” high, bottom riser 8 ¼” high) with beveled corners and a tread depth of 10 ¾” and a width of 5’7”. There is no handrail. These stairs are most likely original to the expanded building but the associated, former entrance has been locked and is no longer in use. (OI-FSB-07)

Exterior North (Northeast) Elevation Stairs. These stairs are concrete, painted blue-gray. There are two risers (top riser 8” high, bottom riser 8 ½” high) with beveled corners and a tread depth of 1’2” and a width of 5’1”. There is no handrail. These stairs appear to be original to the expanded building but the associated, former entrance has been covered over by the exterior asbestos shingle siding. (OI-FSB-07)

Exterior East Elevation Stairs. These stairs are concrete, painted blue-gray. There are two risers at 7 ½” high with beveled corners, a tread depth of 1’3” and a width of 7’¾” .There is no handrail. These stairs are original to the building but the associated, former entrance has been covered over by the exterior asbestos shingle siding.

Exterior South Elevation Stairs. These stairs are concrete, painted blue-gray. There are two risers at 8” high with beveled corners and a tread depth of 1’8” and a width of 5’6 ½”. There is no handrail. These stairs are original to the building but the associated, former entrance has been boarded up.

Interior Stairs in Equipment Room. These stairs are wood, ladder-like (open riser), painted blue-gray, with a partial handrail. There are eight risers to the platform, then five more risers to the attic access. The risers are 10 ½” high and the treads are 10 3/8” deep, 2’wide, with a 2” nosing overhang. The stringers on either side of the stairs are 2x8s.The partial wood railing is actually the railing of the platform. It is comprised of two 2x4s forming a simple railing, painted blue-gray. The distance between the two sections of stairs on the platform is 2’7 ½”. (OI-FSB-09)

Metal Stairs (Ladder) to Fog Signal Room. This metal ladder is painted black with handrails beginning half-way up on each side of the ladder. There are eleven risers at 11 ½” high and the treads are two ½” steel

bars with a 1” gap between them. The treads are 2’ wide. The stringers are 2 5/8” x 4 1/8” steel bars. The railings are 1 ½” diameter steel pipes that are 7 ½” from the rails to the top of the stringers. (OI-FSB-10)

Wood Stairs to Fog Horns. This small stair is painted wood, ladder-like (open riser), with no handrail. There are three risers at 8” high and the treads are 7 ½” deep with a 2 ½” nosing overhang. The wood stringers are 2x6s. (OI-FSB-11)

Architecture – Accessibility
This building is currently not accessible. The west entry door opening is 2’8” clear with a grade to finished floor elevation change of 7 ½” due to one step. The north entry (main) double door opening is 5’7” clear with a grade to finished floor elevation change of 8 ¼” due to one step. This set of doors is boarded over. The east entry door opening is 2’9 ¾” clear with a grade to finished floor elevation change of 1’10” with three steps. The south entry door opening is about 5’6” clear with a grade to finished floor elevation change of 1’4” with two steps. This door is boarded over. Once inside the building there appears to be adequate single level floor elevation and clearances, but there have been no accessibility upgrades.

Physical Description -- Structural

Structural – Foundation
The perimeter foundation system consists of brick masonry walls.

Structural – Floor Framing
The main level floor is a concrete slab-on-grade. The floor framing for the room with the fog horns was not accessible and could not be measured.

Structural – Roof Framing
The roof framing for the original western portion of the building was measured to be FS 2x4 rafters spaced at about 20”. The rafters span approximately 9’. The rafters are supported on the exterior wood-framed walls. 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 for the added, eastern portion of the building could not be observed.

Structural – Ceiling Framing
The ceiling framing above the work and storage rooms was measured to be FS 2x6 joists spaced at about 40”. The joists span approximately 17.5’. The joists are supported on the exterior walls. The coffered ceiling framing above the equipment room was measured to be FS 2x6 joists spaced at about 20”. The joists span approximately 14.5’. The joists are supported on the roof joists.

Structural – Wall Framing
The exterior wall framing was not accessible and could not be measured. The interior wall framing was also not accessible and could not be measured.

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 125 psf for light storage on the slab-on-grade and 80 psf for the fog signal room. The required ceiling live load capacity is 10 psf (no storage is allowed). The required roof snow load capacity is 36 psf.

Physical Description -- Mechanical

Mechanical – Plumbing Systems
The original domestic water system has been replaced with a plastic water storage tank (approximately 200 gallon capacity), water filtration system, pump, and copper piping that connects to buried galvanized steel piping and currently serves the Keepers Quarters with nonpotable water. Domestic water piping to the sink in the work room has been disconnected. A 4,500 gallon stone cistern is located just to the south of the building and still contains water. The cistern was installed after the steam water source well ran dry in 1876. A steam powered injector was installed in 1886 to provide lake water to the Fog Signal Building and the Keepers Quarters. This system is no longer in place.

The sanitary sewer drain piping from the work room sink has been disconnected. There are no other functional sewer connections in the building.

The counter-mounted work room sink remains in place at the west end of the building, although no longer connected to the plumbing system.

Mechanical – HVAC
The original heating for the building was a centrally located coal burning heater. The heater has been removed, but the brick chimney stack with flue vent opening still remains at the center of the building.

Ventilation for the building consists of a 36”x42” metal louver through the east wall near the fog signal generators and a 20”x24” metal louver through the south wall of the battery room.

Mechanical – Fire Suppression
None in the building.

Mechanical – Other
The majority of the 1929 diesel-powered air diaphone fog signal system is still in place. This includes two Ingersoll Rand (125 cubic foot per minute) diesel-powered air compressors, a large steel air receiver tank, and fuel tank, twin type “F” diaphones, 4” iron body globe valves, and 4” steel compressed air piping between the compressors and the fog signal diaphones. The two original generators have been removed. The current generator and fuel tank are located adjacent to the hoist with the generator mounted on one of the original concrete generator pads. The steam powered tram hoist installed in 1900 is no longer in place.

Physical Description -- Electrical

Electrical – System Configuration
At present, alternating current power for the Fog Signal Building is provided from a diesel engine generator located in the Fog Signal Building. Power for the tram hoist and for lighting and receptacles in the building comes from a 15 kW (18.75kVA), 120/240 volt three phase diesel engine generator. For this equipment to

function, the engine generator must be manually started. This 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.

Direct current power for small pumps and equipment within the building was provided by the photovoltaic system located near the Keepers Quarters. Because the photovoltaic system is nonfunctional, this power system is nonfunctional as well.

Electrical – Wiring Devices
Wiring Devices including receptacles and toggle switches generally date back to the 1940's. Some newer devices exist. In general, wiring devices are mounted in outlet boxes in walls, or are surface mounted. Most wiring devices are of the two prong type and do not include a ground connection.

Electrical – Conductor Insulation
Original branch circuits consist of thermoplastic wire in EMT (electro-metallic tubing) conduit.

Electrical – Overcurrent Protection
Overcurrent protection for the engine generator system is via engine control panel mounted 50 amp three pole circuit breaker which feeds the facility panel board. The facility panel board is rated 150 amps and contains 18 spaces and nine circuit breakers for circuits in the building. One three pole breaker space for the tram hoist winch is empty as the circuit breaker has been removed.

Electrical – Lighting Systems
Lighting systems inside of the building are incandescent lamp type. Fixtures are open porcelain keyless type or RLM (industrial stem mounted reflector) type.

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 ten bulk samples from a total of ten different types of suspected asbestos containing materials (ACMs). Of the ten suspect ACMs that were sampled and analyzed, a total of one suspect ACM resulted in a concentration of greater than one percent (positive for asbestos).

Hazardous Materials – Asbestos

The following suspect ACMs were not sampled due to inaccessibility or park limitation regarding potential for damage to structures. Asbestos is assumed to be present in:

1. Adhesives (Miscellaneous adhesives were seen at pipe/wall interfaces, between ducting, and on heater components),
2. Roofing Materials,
3. Brick and Block Filler (The interior of the structure is brick and has the potential to have a block filler or grout that is potentially asbestos containing),
4. Caulk (Caulking was observed around window and door penetrations, which can also include gasket applications between the window assembly and the structure), and,
5. Asbestos cement (Siding was observed to be asbestos cement).

The assumed ACMs were observed to be in fair condition.

Hazardous Materials – Lead Containing Paint

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

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

1. Interior Painted Surfaces (Based on testing of the generator and entry LCP is assumed to be present throughout the structure), 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 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 Fog Signal Building.

Hazardous Materials – Lead Dust

Surface wipe-sampling for lead dust was not conducted in the Fog Signal Building because it is a noninhabited 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 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 not performed to assess whether these near-structure soils contain lead concentrations above applicable soil standards.

Soil Sampling was not conducted around the Fog Signal Building.

Hazardous Materials – Mold

Inspections of the structure were performed to identify the readily ascertainable visual extent of the 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 in the Fog Signal Building.

Hazardous Materials – Petroleum Hydrocarbons
Localized areas of staining were observed on concrete floors in the Fog Signal Building. Stained areas are likely associated with fuel oil, diesel or other petroleum hydrocarbons. Tank and piping systems may also contain petroleum hydrocarbons.

Character Defining Features

Mass/Form. A simple utilitarian gable structure with a red brick chimney and a monitor flanking the gable roof.

Exterior Materials. Painted white asbestos siding; some trim elements painted black, red asphalt roof shingles.

Openings. Wood double hung windows, one over one, painted black and various types of wood five panel doors, painted white.

Interior Materials. A mix of painted wood board paneling, metal sheets and gypsum board and exposed concrete floor.

General Condition Assessment

In general, the Outer Island Fog Signal Building is in fair condition.

Structurally, the Fog Signal Building is in good condition.

Mechanically, while some of the building's systems have been removed or are in poor condition, the 1929 diesel powered air diaphone and associated components remain in place and are in generally fair to good condition.

Electrically, equipment in the Fog Signal Building is generally in poor condition. Most of the equipment was installed in the 1940's or 1950's and is beyond its expected life. Notable exceptions are the Onan engine generator and some of the newer distribution equipment. This equipment is still viable and could continue to be used if needed.

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: *Good*
This roof is in good condition. The fascia, soffit and frieze are all in good condition, though with peeling paint. The tie offs on the roof should not be used for life safety anchors until they can be certified as meeting OSHA requirements.

Architecture – Chimney
Condition: *Good*
This chimney appears to be in good condition.

Architecture – Exterior Walls
<u>*Condition:*</u> *Good*
The exterior walls are overall in good condition. There are a few shingles chipped.

Architecture – Windows
<u>*Condition:*</u> *Fair*
The windows are in fair condition as previous glazing patches are evident.

Architecture – Exterior Doors
<u>*Condition:*</u> *Fair to Poor*
The existing door on the west wall is in fair condition as it has splitting wood on the panels. Also, its base on the interior has chipped and damaged wood. The north wall's main door is also in fair condition with some damage at the bottom of the eastern door. The north wall's hoisting engine door, however, is in poor condition as there is a large hole in the wood of the western door.

Architecture – Exterior Trim
<u>*Condition:*</u> *N/A*

Architecture – Interior Doors
<u>*Condition:*</u> *Fair*
The battery storage room door is in fair condition as the door has badly peeling paint, mismatched and nonhistoric hardware and badly peeling paint on the simple wood board trim. The work room door is also in fair condition as it has badly peeling paint and a rusty lockset.

Architecture – Wall Finishes
<u>*Condition:*</u> *Fair*
The equipment room and battery storage's sheet metal walls are in fair condition with badly peeling paint. In some areas, the sheet metal walls bulge near the bottom, suggesting that the interior wood framing is deteriorating. The wood bead board siding in the equipment room is in good condition. The battery storage room has a burn scar on the east wall. The work room's wood board wall finish is in fair condition as there are some signs of damage beneath the north window and the paint is badly peeling. The Fog Signal Room's wall finish is also in fair condition as there are possible moisture issues in the room and the paint is badly peeling. The storage room's fiberboard finish is in fair condition as there are areas where the paint has fallen off to reveal the fiberboard interior.

Architecture – Ceiling Finishes
<u>*Condition:*</u> *Fair*
The equipment room's ceiling finishes – the sheet metal and the bead board - are in fair condition as there is badly peeling paint on the metal surfaces and above the west wall where the metal has rusted away exposing the plaster beneath. The battery storage, work room, storage room, and fog signal room's wood board ceiling finishes are in fair condition. The work room's ceiling has a slight deflection, specifically around the wood joints. The storage room has a stress crack running north-south on the southern portion of the ceiling. The fog signal room has some separation of the wood boards.

Architecture – Interior Trim
<u>*Condition:*</u> *Good to Fair*
The equipment room's paint trim and concrete curb are in fair condition as some of the paint is peeling and the curb is separating from the wall along the north side. The wood base trim and concrete curb in the battery storage are in good condition. The work room's concrete curb is in fair condition as there is some separation of the curb from the wall along the west side of the room. The storage room's wood base trim and the concrete curb are in good condition.

Architecture – Floor
<u>*Condition:*</u> *Good to Fair*
The poured concrete floors in the equipment room, battery storage, work room, and storage room are in good condition with usual wear and stains attributed to storage buildings. The wood board flooring on the platform in the equipment room is also in good condition. The fog signal room's wood board flooring in this room is in good condition, with some paint peeling.

Architecture – Stairs
<u>*Condition:*</u> *Good to Fair*
Exterior West Elevation Stairs. These stairs are in good condition as there are only minor cracks on the bottom riser and there is minimal paint peeling.

Exterior North (Northwest) Elevation Stairs. These stairs are in good condition. There is a large gap, with vegetation growth, between the bottom step and the top step/door threshold. These stairs are no longer in use.

Exterior North (Northeast) Elevation Stairs. These stairs are in fair condition. There is a large gap, with vegetation growth, between the bottom step and the top step/door threshold. The bottom riser has a ventilation pipe encased in the concrete and the bottom tread is well-worn with peeling paint. These stairs are no longer in use.

Exterior East Elevation Stairs. These stairs are in fair condition as the top riser and tread has serious cracks. These stairs are no longer in use.

Exterior South Elevation Stairs. These stairs are in good condition. There is a large gap, with vegetation growth, between the bottom step and the top step/door threshold. These stairs are no longer in use.

Interior Stairs in Equipment Room. These stairs are in good condition, but there is only a partial handrail (with wood deterioration at the juncture with the wood post), and there is some peeling paint.

Metal Stairs (Ladder) to Fog Signal Room. This metal ladder and railings are in good condition. There is some peeling paint.

Wood Stairs to Fog Horns. The stairs are in good condition but there are no handrails and paint is peeling.

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

Condition Assessment -- Structural

Structural – Foundation
<u>*Condition:*</u> *Good*
The visible portion of the foundation system appears to be in good condition. No obvious signs of distress or damage were observed.
Structural – Floor Framing
<u>*Condition:*</u> *Fair*
The concrete slab-on-grade is in good condition. The floor framing for the room with the fog signals could not be observed and its condition is unknown. No obvious signs of distress or damage were observed.

Structural – Roof Framing
<u>*Condition:*</u> *Good*
The roof framing over the western portion of the building is in good condition. The roof framing over the eastern portion of the building could not be observed and its condition is unknown. No obvious signs of distress or damage were observed.

Structural – Ceiling Framing
<u>*Condition:*</u> *Good*
The ceiling framing is in good condition.

Structural – Wall Framing
<u>*Condition:*</u> *Good*
The interior and exterior wall framing could not be observed, thus their condition is unknown. No obvious signs of distress or damage were observed.

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

Structural – Load Requirements
<u>*Condition:*</u> *Good*
The ceiling framing in the equipment and storage rooms and the roof framing over the western portion of the building have adequate capacity to support the required loads. The ceiling framing above the work room does not have adequate capacity and should be strengthened. The floor framing for the floor of the fog signal room and the roof framing over the eastern portion of the building could not be observed, thus the capacity of the framing is unknown.

Condition Assessment -- Mechanical

Mechanical – Plumbing Systems
<u>*Condition:*</u> *Good*
The 200 gallon plastic nonpotable water storage tank is in good condition. The associated pump, water filter station, and copper piping that connects to the buried galvanized steel water piping to the Keepers Quarters is also in good condition. The galvanized steel domestic water piping to the sink in the work shop has been disconnected. The brick cistern located just to the south of the building is in fair condition and still contains water.

The sanitary sewer drain piping from the work shop sink has been disconnected. There are no other functional sewer connections in the building.

The counter mounted work shop sink is in poor condition and is no longer connected to the plumbing system.

Mechanical – HVAC
<u>Condition:</u> *Fair*
The original heating systems have been removed from the building.

The metal ventilation louvers through the east and south wall of the building are in fair condition.

Mechanical – Fire Suppression
<u>Condition:</u> *N/A*

Mechanical – Other
<u>Condition:</u> *Good to Fair*
The two Ingersoll Rand diesel powered air compressors for the fog signal system are in fair condition. The air receiver tank and fuel tank are also in fair condition. The twin type "F" diaphones, valves, and steel compressed air piping between the compressors and the fog signal diaphones are in good condition with the exception of some cracked and peeling paint on the piping. (OI-FSB-16) The current generator and fuel tank are in good condition.

Condition Assessment -- Electrical

Electrical – System Configuration
<u>Condition:</u> *Good*
The existing diesel engine generator is in good condition. Contactor equipment for the existing winch is in good condition.

The tram winch motor (OI-FSB-17) and clutch has been disassembled and is awaiting parts and is therefore nonfunctional at this time. Parts for the winch system are becoming increasingly difficult to obtain. As modifications are made to the apparatus to keep it in service, safety issues result.

Electrical – Wiring Devices
<u>Condition:</u> *Poor to Good*
Wiring Devices installed in the 1940S are generally in poor condition. Wiring Devices installed later are in good condition.

Electrical – Conductor Insulation
<u>Condition:</u> *Poor*
Original branch circuit wiring is 60 to 70 years old, is in poor condition, and should not be counted on for future use.

Electrical – Overcurrent Protection
<u>*Condition:*</u> *Poor*
Building distribution equipment is 60 to 70 years old, is in poor condition, and should not be counted on for future use.

Electrical – Lighting Systems
<u>*Condition:*</u> *Poor*
Lighting systems inside of the building are in poor condition, do not meet current codes, and are beyond their expected life.

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 a fog signal building from 1875 until 1937 when radio equipment was installed. The building has continuously housed mechanical and electrical systems for the entire light station.

Currently used for the NPS storage, the building is not accessible to the public. The proposed use for the building is interpretive - to provide limited visitor access to the interior (possibly visual only).

Rehabilitation is the recommended treatment.

Requirements for Treatment

Compliance requirements for treatment currently include laws, regulations, and standards as outlined by the NPS 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*
Verify/provide proper blocking for roof tie offs. Scrape, sand and repaint the fascia, soffit and frieze boards.

Architecture – Chimney
Priority: *Low*
No recommendations at this time.

Architecture – Exterior Walls
Priority: *Low*
Replace chipped shingles. (Existing shingles are asbestos; replacements shall be obtained from current attic stock or with new material to match existing in exposure, texture, and dimension and painted to match existing.)

Architecture – Windows
Priority: *Moderate*
Replace missing hardware in kind. Scrape, sand and repaint all sash, frames and trim at the interior and exterior.

Architecture – Exterior Doors
Priority: *Moderate*
Repair any split, chipped or damaged wood on the doors, frames and trim. Repair the large hole in the north wall’s (west) hoisting engine door. Scrape, sand and repaint.

Architecture – Exterior Trim
Priority: *N/A*

Architecture – Interior Doors
Priority: *Low*
Scrape, sand and repaint interior doors. Where required, repair or replace existing hardware in-kind to match original and to allow smooth operation.

Architecture – Wall Finishes
Priority: *Low*
Scrape, sand and repaint sheet metal and wood board walls using the paint analysis to guide the color selection. Repaint fiberboard wall finishes.

Architecture – Ceiling Finishes
Priority: *Low*
Scrape, sand and repaint sheet metal, wood board and beadboard ceilings. Monitor the stress crack in the storage room as well as the work room's slight deflection. If any changes occur, investigate conditions further.

Architecture – Interior Trim
Priority: *Low*
No recommendations at this time.

Architecture – Floor
Priority: *Low*
Scrape, sand and repaint the fog signal room's wood board flooring.

Architecture – Stairs
Priority: *Low*
Repaint metal and concrete stairs where peeling paint is evident. Add code compliant handrails where needed.

Architecture – Accessibility
Priority: *Low*
Provide program access through interpretive exhibits and waysides at the Visitor Center.

Treatment Recommendations -- Structural

Structural – Foundation
Priority: *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 – Ceiling Framing
<u>*Priority:*</u> *Low*
The ceiling framing above the work room is over-stressed. The framing should be investigated further to determine the necessary strengthening or additional supports. The calculated capacity is 4 psf and the required capacity is 10 psf.

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*
Cap or remove all unused plumbing piping.

Mechanical – HVAC
<u>*Priority:*</u> *Low*
No recommendations at this time.

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

Mechanical – Other
<u>*Priority:*</u> *Moderate*
The existing tram hoist is beyond its useful life and replacement parts are no longer available. Recommend replacing with self-contained diesel powered winch.

While the fog signal is no longer functional, the system is in generally good condition. It is recommended that the fog signal components be cleaned and repainted for purposes of historical preservation.

Treatment Recommendations -- Electrical

Electrical – System Configuration
<u>Priority:</u> *Moderate*
Electrical devices, lighting and wiring are no longer connected to a source of power. These items should remain in place for historical context. Exiting 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.

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

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

Electrical – Overcurrent Protection
<u>Priority:</u> *Moderate*
Overcurrent protection for removed generator set and associated electrical equipment should be removed. Overcurrent protection for removed hoist contactors should be removed.

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

Electrical Telecommunications, Fire Alarm System, and Lightning Protection
<u>Priority:</u> *N/A*

Treatment Recommendations -- Hazardous materials

Hazardous Materials – Asbestos
<u>Priority:</u> *Moderate*
Recommend sampling of suspect asbestos containing materials, including brick and block filler, adhesives, roofing materials, caulking, and asbestos cement should be sampled.

Hazardous Materials – Lead-Containing Paint and Lead Dust
<u>Priority:</u> *Low*
Recommend stabilization or abatement of Lead Containing Paint.

Hazardous Materials – Lead In Soils
<u>*Priority:*</u> *Low*
Recommend 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

One alternative treatment for the Fog Signal Building would be for the park to maintain its current use as park storage and solely rehabilitate the exterior for interpretive use.

Consider removal of asbestos shingles to prevent long term hazardous materials issue due to continued chipping and difficulty of finding a similar sized replacement shingle.

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. Change in use from utility to interpretive	Change in Use: Upgrades for code and safety may be required and may alter the historic fabric.	Integrate upgrades to minimize damage to historic fabric.	- Allows visitors to experience the cultural resource first hand - Improves safety for visitors and staff
3. Potential strengthening of ceiling framing	Supplemental support may be required.	Study various alternatives (sistering of existing, adding a post, etc.) to determine which will be the least disruptive to the historic fabric.	- Improves safety for visitors and staff - Supplemental (vs. replacement) support methods will allow historic fabric to remain

Fog Signal Building Photographs, 2009

OI-FSB-01: Aerial, 2009 (Source: AH DSC01512)

OI-FSB-02: North elevation, 2009 (Source: AH DSC01420)

OI-FSB-03: West elevation, 2009 (Source: AH DSC01418)

OI-FSB-04: South elevation, 2009 (Source: AH DSC01417)

OI-FSB-05: East elevation, 2009 (Source: AH DSC01421)

OI-FSB-06: West entry door and stair (Source: AH DSC01476)

OI-FSB-07: North elevation steps and foundation details (Source: AH DSC01478)

OI-FSB-08: Equipment room, east elevation (Source: AH CIMG4400)

OI-FSB-09: Equipment room and loft, looking west (Source: AH DSC01485)

OI-FSB-10: Equipment room ladder to fog signal room, south elevation (Source: AH DSC01490)

OI-FSB-11: Fog signal room, north elevation (Source: AH DSC01498)

OI-FSB-12: Fog signal room, equipment detail and window, looking northwest (Source: AH DSC01399)

OI-FSB-13: Battery storage room, looking southeast (Source: AH CIMG4414)

OI-FSB-14: Storage room, west elevation into work room (Source: AH CIMG4438)

OI-FSB-15: Work room, looking southwest (Source: AH CIMG4425)

OI-FSB-16: Fog signal valves (Source: RMH)

OI-FSB-17: Tram hoist winch, clutch is disassembled and awaiting parts (Source: RMH)

OIL STORAGE

Chronology of Alterations and Use

Original Construction

The Outer Island Oil Storage was built in 1895 to provide a safe storage area for the kerosene needed to fuel the lamps. [39]

On file is an undated historic photo that depicts the building in a similar condition to its current appearance. (Historic Image OI-11)

There are no available historic drawings of this building.

Significant Alterations / Current condition

There have been no significant alterations to the Oil Storage. It currently contains an empty steel kerosene storage tank and shelves for general storage.

There have never been electrical or mechanical systems in this building, except for the gravity vent located in the roof.

The Outer Island Oil Storage is in good condition.

[39] "1895 Annual Report of the Lighthouse Board," Outer Island Light in annual reports 1850-1920

Summary of Documented Work on the Building

Date	Work Described	Source of Information
1894, August 7	Steamer "Amaranth" brings brick "for an Oil House."	John Leonard, OI Log, Sept 17, 1874 – Dec 10, 1947, Vol I
Annual Report of 1895 Fiscal Year	"Outer Island, Apostle Group, Lake Superior, Wisconsin. – A brick oil house was erected, with iron roof, door, and shelving, located 60' southwest of the dwelling. *1324. Outer Island, Wisconsin.* - This 10-inch steam whistle was in operation some 478 hours, and consumed about 26 tons of coal."	"1895 Annual Report of the Lighthouse Board," Outer Island Light in annual reports 1850-1920

General Physical Description

This building is a small, one-story, one room, rectangular utilitarian structure with brick bearing walls and foundation, and a sheet metal hipped roof. It has a circular metal vent in the center of the roof and a metal door on the north elevation.

Physical Description -- Architecture

Architecture – Roof
The roofing is sheet metal painted red, with eave molding, and a central vent.

Architecture – Exterior Walls
The exterior walls are three-wythe brick painted. There is stepped brick coursing at the foundation and a brownstone sill at the door. A mortar sample taken indicates that the mortar was composed mostly of sand with minimum lime, the sand was originally dirty, and is extremely fine. The mortar is tan and very soft.

Architecture – Exterior Door
The exterior door is made of steel, has an original lockset, and has two strap hinges. It is 2'7" x 6'10 ½" and is original to the building. (OI-OS-05) There is a painted stone sill at the door.

Architecture – Wall Finish
The wall finish for this building is the original common bond brick painted gray and yellow.

Architecture – Ceiling Finish
There is no ceiling finish as the ceiling is the underside of the original metal roof. It is sheet metal painted yellow.

Architecture – Floor
The floor is concrete slab-on-grade that is painted blue-gray.

Architecture – Casework
There is a metal shelving unit along the entirety of the west wall, painted blue-gray. There is also a wood platform supporting the kerosene tank. It is 4’6” wide, 1’1” tall, and 2’1 ½” deep. Neither shelving unit is historic. (OI-OS-06)

Architecture – Accessibility
This building is currently not accessible. The entry door opening is 2’7” clear with a grade to finished floor elevation change of 7 ½” due to a sill/threshold. The door hardware is not ADA compliant.

Physical Description -- Structural

Structural – Foundation
The perimeter foundation system consists of brick masonry walls with stepped coursing.

Structural – Floor Framing
The floor is a concrete slab-on-grade.

Structural – Roof Framing
The roof framing is made up of metal angles that were not accessible and could not be measured. The angles are covered by metal roof sheathing.

Structural – Wall Framing
The exterior walls are constructed of brick masonry.

Structural – Lateral System
Lateral stability for the building is provided by the brick masonry walls.

Structural – Load Requirements
The required floor load capacity is 125 psf and the required roof snow load capacity is 40 psf.

Physical Description -- Mechanical

Mechanical – Plumbing Systems
There are no plumbing systems in the Oil Storage.

Mechanical – HVAC
The original circular metal gravity vent remains on the roof. A roof cap has been put in place above the storage area rendering the vent inoperable.

Mechanical – Fire Suppression
None in the building.

Physical Description -- Electrical

Electrical – System Configuration
None in the building.

Electrical – Wiring Devices
None in the building.

Electrical – Conductor Insulation
None in the building.

Electrical – Overcurrent Protection
None in the building.

Electrical – Lighting Systems
None in building.

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 ten bulk samples from a total of ten different types of suspected asbestos containing materials (ACMs) at Outer Island. Of the ten suspect ACMs that were sampled and analyzed, a total of one suspect ACM resulted in a concentration of greater than one percent (positive for asbestos).

Hazardous Materials – Asbestos
The following suspect ACMs were not sampled due to inaccessibility or park limitation regarding potential for damage to structures. Asbestos is assumed to be present in:

1. Wall and Ceiling Interiors,
2. Adhesives,
3. 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), and,
4. 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 ACMs were observed to be in good 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 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 Oil Storage Building.

Hazardous Materials – Lead Dust
Surface wipe-sampling for lead dust was not conducted in the Oil Storage Building because it in a noninhabited 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 Oil Storage Building.

Hazardous Materials – Mold
Inspections of the structure were performed to identify the readily ascertainable visual extent of the 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 in the Oil Storage Building.

Hazardous Materials – Petroleum Hydrocarbons
Localized areas of staining were observed on concrete floors in the Oil Storage Building. Stained areas are likely associated with fuel oil, diesel or other petroleum hydrocarbons. Tank and piping systems may also contain petroleum hydrocarbons.

Character Defining Features

Mass/Form. A simple utilitarian masonry hipped roof structure.

Exterior Materials. Painted white wood clapboard siding; metal roof shingles painted red.

Openings. One painted metal door painted red to match the painted brick.

Interior Materials. Exposed masonry, concrete floor and galvanized panels at the ceiling.

General Condition Assessment

In general, the Outer Island Oil Storage is in good condition. The original brick walls, concrete floor, and steel door are in good condition.

Structurally, the Oil Storage is in good condition.

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: *Good*
This roof is in good condition.

Architecture – Exterior Walls
Condition: *Fair*
The exterior walls are in fair condition, as the walls need repointing and the brick foundation is exposed and weathering at the southwest corner. The paint is peeling severely.

Architecture – Exterior Door
Condition: *Good*
This steel door is in good condition as there is only minor paint peeling. The sill is cracked.

Architecture – Wall Finish
Condition: *Poor*
The wall finish for this building is in poor condition. The paint is peeling badly and an older layer of white paint is visible.

Architecture – Ceiling Finish
Condition: *Good*
The underside of the roof is in good condition.

Architecture – Floor
<u>*Condition:*</u> *Good to Fair*
The concrete floor is in good condition but the blue-gray paint is deteriorated. The concrete is intact. The front stoop, however, is in fair condition as it is cracked.

Architecture – Casework
<u>*Condition:*</u> *Fair*
The metal shelving unit is in good condition with some peeling paint and deflected shelves. The wood platform shelf is in fair condition as it is also deflected and there stains on the wood.

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

Condition Assessment -- Structural

Structural – Foundation
<u>*Condition:*</u> *Good*
The visible portion of the foundation system appears to be in good condition. No obvious signs of distress or damage were observed.

Structural – Floor Framing
<u>*Condition:*</u> *Good*
The concrete slab-on-grade is in good condition.

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.

Structural – Wall Framing
<u>*Condition:*</u> *Good*
The 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 slab-on-grade has adequate capacity. The roof framing could not be observed, thus its capacity is unknown.

Condition Assessment -- Mechanical

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

Mechanical – HVAC
<u>*Condition:*</u> *Good*
The original circular metal gravity vent is in good condition, but a roof cap has been put in place above the storage area rendering the vent inoperable.

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 was constructed in 1895 and served as an oil storage building. Currently, the building is used for secure NPS storage. The proposed use for the Oil Storage is to maintain its existing function as storage with no visitor access.

Preservation, focusing on the exterior, is the recommended treatment for the building.

Requirements for Treatment

Compliance requirements for treatment currently include laws, regulations, and standards as outlined by the NPS 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: *Low*
No recommendations at this time.

Architecture – Exterior Walls
Priority: *Low*
Strip the existing paint using the gentlest means possible and performing test patches. Repair masonry, repoint as needed and recoat with a proper vapor permeable coating.

Architecture – Exterior Door
Priority: *Low*
Repaint steel door. Epoxy repair the crack at the sill.

Architecture – Wall Finish
Priority: *Low*
Scrape, sand and repaint using the paint analysis to guide the color selection.

Architecture – Ceiling Finish
Priority: *Low*
No recommendations at this time.

Architecture – Floor
Priority: *Low*
Repaint the concrete floor to match existing color.

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

Architecture – Accessibility
<u>*Priority:*</u> *Low*
Provide program access through interpretive exhibits and waysides at the Visitor Center.

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> *Low*
No recommendations at this time.

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> *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 brick and block filler, adhesives, wall and ceiling interiors, and asbestos cement should be sampled.

Hazardous Materials – Lead-Containing Paint and Lead Dust
<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*
No recommendations at this time.

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

One alternative treatment for consideration could be for the use by the park to include this building for interpretive use on the interior as opposed to continued use as park storage. However, due to the limited options for the necessary maintenance functions' storage at this remote site, retaining the storage use on the interior is deemed appropriate.

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

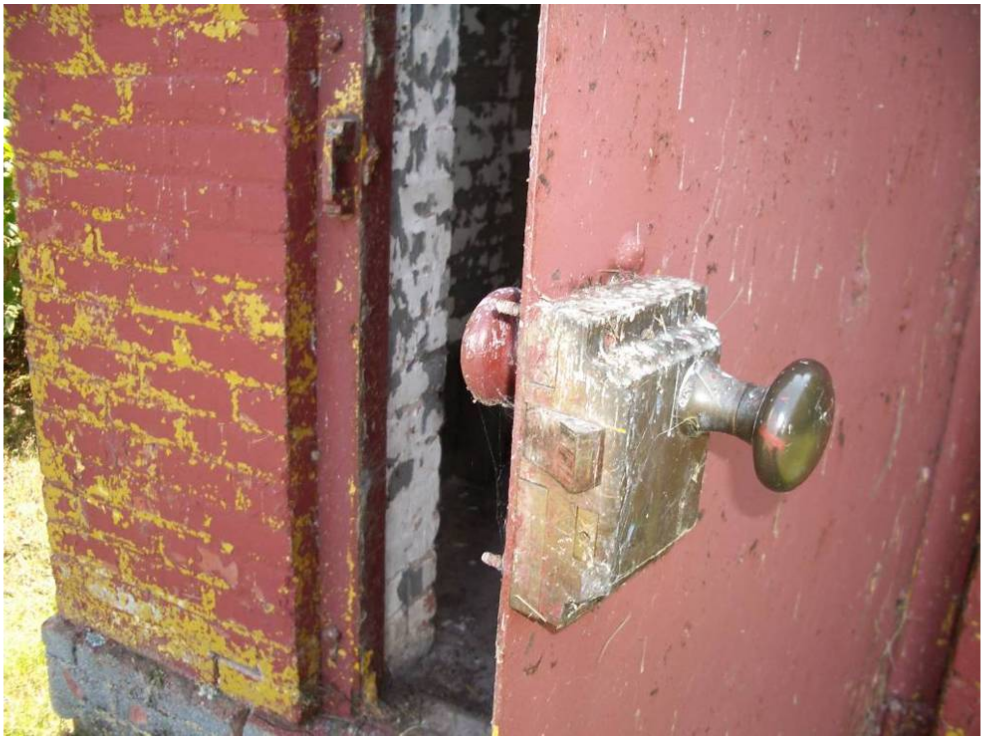
Oil Storage Photographs, 2009

OI-OS-01: North elevation, 2009 (Source: AH DSC01362)

OI-OS-02: East elevation, 2009 (Source: AH DSC01364)

OI-OS-03: South elevation, 2009 (Source: AH DSC01363)

OI-OS-04: North and west elevations, 2009 (Source: AH IMGP3167)



OI-OS-05: North entry door hardware (Source: AH IMGP3169)

OI-OS-06: Interior, looking south (Source: AH DSC01355-A)

PRIVY

Chronology of Alterations and Use

Original Construction

The Outer Island Privy was built in 1874, the same year as the Tower.[40]

A photo of the Privy around 1900 roughly illustrates painted brick on the lower half, and unpainted brick on the upper half of the building. (Historic Image OI-04) Today, the Privy is painted.

There are no available historic drawings of this building.

Significant Alterations / Current condition

There have been no significant alterations to the Privy.

There have never been electrical or mechanical systems in this building, except for the gravity vent located in the roof.

The Outer Island Privy is in fair to good condition.

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

General Physical Description

This building is a small, one-story, one room, rectangular utilitarian structure with brick bearing walls and foundation. It has a simple gable roof with boxed rafter tails and a square wood vent. The casement window has an arched opening and the door is located on the west elevation.

At the time of this survey, this building was inaccessible. Interior notes were garnered from looking in the window and therefore the overall condition of interior finishes could not be determined from the partial view.

Physical Description -- Architecture

Architecture – Roof
The roofing is metal shingle, painted red, and is original to the building. (OI-P-06) There is a wood fascia, frieze board, and a vent. The eave consists of a closed raked soffit extending approximately 9”. All of the wood is painted and is original to the building. (OI-P-07)

Architecture – Exterior Walls
The exterior walls are made of two-wythe red brick with rowlocks every seventh course (same as the Keepers Quarters – the buildings were built the same year). The foundation is brownstone. A mortar sample from the brick mortar indicates that it was composed of sand and lime, with course sand, tan colored, and very soft.

Architecture – Window
The window is a two-lite (one-over-one) casement or awning with a painted wood frame. There is a painted wood surround and sill. The window is 1’1” x 2’8” and is original to the building. A paint sample taken of the exterior window trim indicated that the original layer was whitewash and the subsequent white layer was impervious to acid, meaning it was a later white paint, not a whitewash. Currently, the trim is painted green.

Architecture – Exterior Door
The door is a five panel wood door, similar to the doors in the house, with original exterior knob (interior inaccessible). The door is 2’4” x 6’7”.

Architecture – Exterior Trim
There is no exterior trim other than the roof elements.

Architecture – Wall Finish
The interior of this building was inaccessible (observations were made through the window). The wall finish for this building appears to be horizontal beadboard, painted, most likely 3 ½” wide.

Architecture – Ceiling Finish
The interior of this building was inaccessible (observations were made through the window). The ceiling finish was not visible from this location.

Architecture – Floor
The interior of this building was inaccessible (observations were made through the window). The floor is concrete.

Architecture – Casework
The interior of this building was inaccessible (observations were made through the window). The Privy contains two adult and one child privy seats, made of wood, painted blue.

Architecture – Accessibility
This building is currently not accessible. The main entry door opening is 2'3" clear with a grade to finished floor elevation change of 5 ½" due to the masonry sill/threshold. There is not an adequate 5' diameter space within. No accessibility upgrades have been made.

Physical Description -- Structural

Structural – Foundation
The foundation of the Privy appears to be concrete but was not accessible.

Structural – Floor Framing
The floor is concrete slab-on-grade.

Structural – Roof Framing
The roof framing could not be observed but is believed to be wood framing. The rafters span approximately 3'. 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 brick masonry.

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

Structural – Load Requirements
The required floor and roof snow load capacities are 40 psf.

Physical Description -- Mechanical

Mechanical – Plumbing Systems
There are no plumbing systems in the Privy.

Mechanical – HVAC
The original decorative gravity vent for the Privy remains through the roof.

Mechanical – Fire Suppression
None in the building.

Physical Description -- Electrical

Electrical – System Configuration
None in the building.

Electrical – Wiring Devices
None in the building.

Electrical – Conductor Insulation
None in the building.

Electrical – Overcurrent Protection
None in the building.

Electrical – Lighting Systems
None in the building.

Electrical – Telecommunications
None in the building.

Electrical – Fire Alarm System
None in the building.

Electrical – Lightning Protection
None in the building.

Physical Description -- Hazardous Materials

Landmark Environmental collected ten bulk samples from a total of ten different types of suspected asbestos containing materials (ACMs) at Outer Island. Of the ten suspect ACMs that were sampled and analyzed, a total of one suspect ACM resulted in a concentration of greater than one percent (positive for asbestos).

Hazardous Materials – Asbestos
The following suspect ACMs were not sampled due to inaccessibility or park limitation regarding potential for damage to structures. Asbestos is assumed to be present in:

1. Adhesives,
2. Wall Interiors,
3. Brick and Block Filler (Wall interiors may be composed of brick or block and have the potential to have a block filler or grout that is potentially asbestos containing), and,

4. 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 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 assumed to be present throughout the structure. The assumed LCP was observed to be in poor condition.

Loose/Flaking LCP is identified on the exterior painted surfaces of the structure. Paint chip debris was not seen on the ground surface.

Hazardous Materials – Lead Dust

Surface wipe-sampling for lead dust was not conducted in the Privy 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 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 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 the 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 in the Privy.

Character Defining Features

Mass/Form. A simple small utilitarian masonry gable roof structure with a decorative wood vent painted red.

Exterior Materials. White painted brick with dark grey accents, a metal shingle roof painted red and wood trim painted grey.

Openings. One wood two-lite casement and one five panel door both painted dark green.

Interior Materials. Unknown – no access.

General Condition Assessment

In general, the Outer Island Privy is in good condition on the exterior and the interior condition could not be determined as it was inaccessible. It is a three-seater privy for two adults and one child.

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: *Fair and Poor*
The roof is in fair condition as there is missing trim at the ridge cap and the peeling paint has revealed rust on the metal shingles. The wood elements are in fair condition as they have badly peeling paint. The wood vent with peeling paint shows deteriorated wood.

Architecture – Exterior Walls
Condition: *Fair*
The exterior walls are in fair condition as they have peeling paint and spalling brick, especially on the east and north elevations.

Architecture – Window
Condition: *Fair and Unknown*
This window is in fair condition as the wood frame, surround, and sill have badly peeling paint. The interior condition of the window is unknown.

Architecture – Exterior Door
Condition: *Fair and Unknown*
The door is in fair condition with splitting wood at the panels and separation of stiles and rails. The condition of the interior face of the door is unknown.

Architecture – Exterior Trim
Condition: *N/A*
Refer to roof.

Architecture – Wall Finish
<u>*Condition:*</u> *Unknown*
The wall finish for this building appears to be horizontal bead board siding, most likely 3 ½" wide. Surveyor was unable to determine the overall condition.

Architecture – Ceiling Finish
<u>*Condition:*</u> *Unknown*
The ceiling finish could not be identified.

Architecture – Floor
<u>*Condition:*</u> *Unknown*
The floor is concrete. Surveyor was unable to determine the overall condition.

Architecture – Casework
<u>*Condition:*</u> *Unknown*
This privy contains two adult and one child privy seats, made of wood, painted blue. Surveyor was unable to determine the overall condition.

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

Condition Assessment -- Structural

Structural – Foundation
<u>*Condition:*</u> *Good*
The visible portion of the foundation appeared to be in good condition. No obvious signs of distress or damage were observed.

Structural – Floor Framing
<u>*Condition:*</u> *Good*
The concrete slab-on-grade is in good condition.

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.

Structural – Wall Framing
<u>*Condition:*</u> *Good*
The 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 slab-on-grade has adequate capacity. The roof framing could not be observed, thus its capacity is unknown.

Condition Assessment -- Mechanical

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

Mechanical – HVAC
<u>*Condition:*</u> *Poor*
The original decorative gravity vent on the roof is in poor condition as it needs conservation work.

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 constructed in 1874 and most likely was the primary sanitary facility until 1930 when indoor plumbing was installed in the Keepers Quarters. The building is currently vacant and not accessible to the public. The proposed use for the Privy is to retain the structure as an integral component of the site's cultural landscape while precluding public access to its interior.

Preservation, focusing on the exterior, is the recommended treatment for the building.

Requirements for Treatment

Compliance requirements for treatment currently include laws, regulations, and standards as outlined by the NPS 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: *Moderate*
Replace the missing trim at the ridge cap and any rusted metal shingles in-kind. Scrape, sand and repaint metal shingles and wood elements at eave and rake. Scrape and sand the vent. Epoxy stabilize the wood members and prep and repaint.

Architecture – Exterior Walls
Priority: *Low*
Strip existing paint at brick. Repair spalling brick by flipping the bricks or by replacing in kind. Repaint the exterior walls with a proper coating allowing vapor permeability.

Architecture – Window
Priority: *Low*
Scrape, sand and repaint the exterior window frame, sash and trim. The interior condition of the window is unknown.

Architecture – Exterior Door
Priority: *Low*
Scrape and sand the door and frame. Epoxy stabilize the split wood in the door panels and repair the stiles and rails that are separating from the door face. Paint the door and frame. The condition of the interior face of the door is unknown.

Architecture – Exterior Trim
Priority: *N/A*
Refer to roof.

Architecture – Wall Finish
<u>Priority:</u> *Unknown*
The interior condition of the building is unknown.

Architecture – Ceiling Finish
<u>Priority:</u> *Unknown*
The interior condition of the ceiling finish is unknown.

Architecture – Floor
<u>Priority:</u> *Unknown*
The interior condition of the concrete floor is unknown.

Architecture – Casework
<u>Priority:</u> *Unknown*
The interior condition of the wood privy seats is unknown.

Architecture – Accessibility
<u>Priority:</u> *Low*
Provide program access through interpretive exhibits and waysides at the Visitor Center.

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> *Low*
No recommendations at this time.

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

Treatment Recommendations -- Mechanical

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

Mechanical – HVAC
Priority: *Low*
No recommendations at this time.

Treatment Recommendations -- Electrical

N/A

Treatment Recommendations -- Hazardous Materials

Hazardous Materials – Asbestos
Priority: *Low*
Recommend sampling of suspect asbestos containing materials, including brick and block filler, adhesives, wall and interiors, and asbestos cement should be sampled.

Hazardous Materials – Lead-Containing Paint and Lead Dust
Priority: *Low*
Recommend stabilization or abatement of Lead Containing Paint. Lead dust wipe sampling not recommended.

Hazardous Materials – Lead In Soils
Priority: *Low*
No recommendations at this time.

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

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. An alternative at the exterior walls could be to leave the masonry exposed (if the quality of the brick allowed) or alter the paint pattern vs. what is in situ. The finish of the Privy appeared to have several iterations including that seen in historic photo OI – 04.
2. Another alternative could be, similar to other islands utilitarian structures, allowing a view panel for visitors to experience the interior of the Privy. Given the low visitorship of this island, this is not the currently the recommended treatment.

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

Privy Photographs, 2009

OI-P-01: Aerial, 2009 (Source: AH DSC01510)

OI-P-02: West elevation, 2009 (Source: AH IMGP3159)

OI-P-03: North elevation, 2009 (Source: AH DSC01374)

OI-P-04: East elevation, 2009 (Source: AH DSC01377)

OI-P-05: South elevation, 2009 (Source: AH DSC01376)

OI-P-06: Roof and vent details, south elevation (Source: AH IMGP3163)

OI-P-07: Trim detail, west elevation (Source: AH IMGP3164)

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 y 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 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

Source: **Letter from Regional Director of the Midwest Region to Superintendent of Apostle Islands National Lakeshore, June 16, 1977, located at APIS/NPS Business Office File # D3423-Outer**

Paint (cheap, fences, etc.) Whitewash	1/2	1/4	1/8	1/16
1 bushel* unslaked lime or Hydrated lime	½ (2 peck)	¼ (1 peck)	1/8 (1 gal)	1/16 (1/2 gal)
20 lbs Spanish Whiting	10 lbs	5 lbs	2 ½ lbs	1 ¼ lbs
17 lbs Rock Salt	8 ½ lbs	4 ¼ lbs	2 1/8 lbs	1 1/16 lbs
12 lbs Brown Sugar	6 lbs	3 lbs	1 ½ lbs	¾ lbs
Slake lime w/ 40 gallons water	20 gals	10 gals	5 gals	2 ½ gals

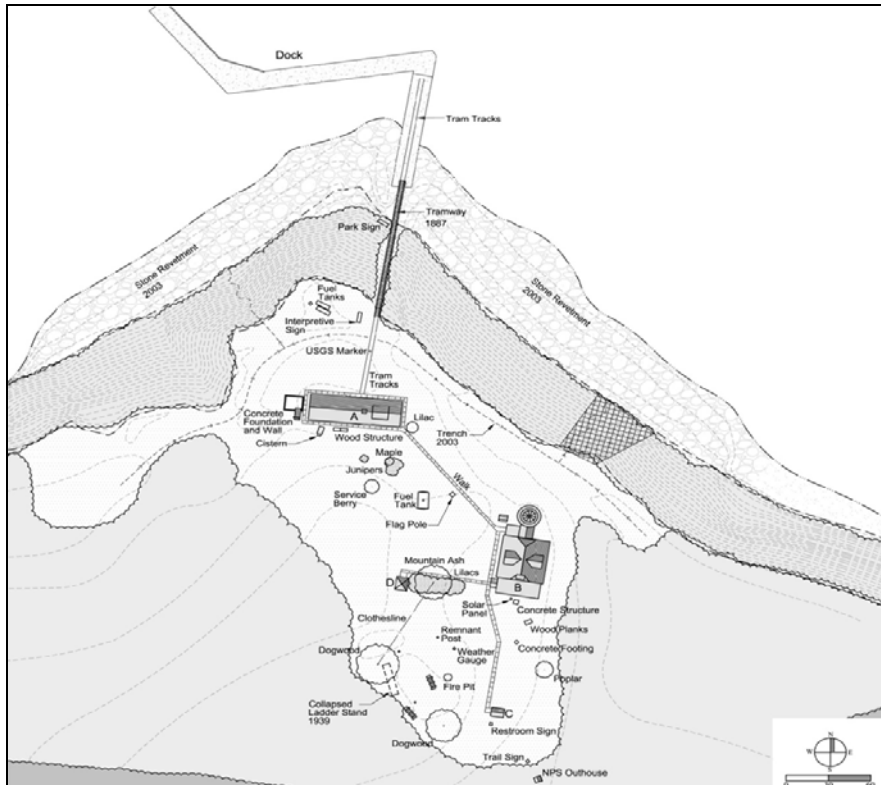
Apply two coats to wood

Apply three coats to stone or brick

*Bushel = 17 ¾" x 15" x 8" deep = 1 bushel - 4 pecks or 2130 cubic inches
14 1/3" x 10" x 7 ½" = ½ bushel – 2 pecks

Boxes = 8" x 8" x 8 5/12" deep = 1 peck – 2 gallons (8 qts.)
7" x 8" x 4 1/8" = 1 gallon

APPENDIX A: MATRIX OF TREATMENT ALTERNATIVE



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: 1874 - 1961

Please refer to the proposed treatments below.

	Tower	Keepers Quarters	Fog Signal Building	Oil Storage	Privy
Proposed Use of Building	Rehabilitate; guided visitor access.	Rehabilitate as shelter for staff (no utilities).	Rehabilitate for limited visitor access to interior; possibly visual only.	Preserve and maintain current use as NPS storage.	Preserve and maintain current use as vacant.
Architecture	Increase tower ventilation; investigate replacing a window sash with a secure louver; repair cracks at masonry; repair rust patches; repaint exterior and interior complete; repaint metal door at base; replace missing access door at walk; replace broken glass and glazing at Lantern; seal all joints	Increase tower: basement ventilation; add gutter and downspout system; reroof the north shed and southwest entry vestibule with materials in kind; repair the rotted siding at the base of the SW entry and paint all siding and exterior trim; repair windows and all doors, repaint; repair masonry walls and chimney; remove non historic ceiling tiles; remove damaged areas of plaster at walls and ceilings, repair in kind and paint; paint all interior trim; repair existing flooring in situ; add handrail at basement stair	Paint fascia, soffit and frieze; repair windows and paint; repair all doors and paint; repair exterior walls and chipped siding; paint interior complete	Repoint masonry at southwest corner; strip paint from brick walls; repaint with permeable coating; repaint door	Replace missing ridge cap pieces, repaint existing metal shingles and soffit/fascia; strip paint from brick walls; repaint with permeable coating; repair window and door and paint
Structural	Monitor existing cracks to verify non-structural	Repoint masonry cracks, repair east framed wall in connection to tower, strengthen roof to properly support dormers	Strengthen ceiling framing over work room	No action at this time	No action at this time
Mechanical	Increase ventilation for moisture control.	Increase ventilation for moisture control. Install chimney liner for heater flue vent. Clean, inspect, and test sewer/septic system. Perform repairs as needed for operational septic system. Remove propane piping to refrigerator and stove.	Replace tram hoist. Clean and repaint fog signal components, piping, and tanks.	No action at this time.	No action at this time.
Electrical	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 replace with new system. Rehabilitate and expand existing PV Array and storage battery system to permit charging of staff radio units and accommodate new ventilation.	Replace broken lighting fixtures and rehabilitate wiring systems. Replace existing tram hoist with new as required.	No action at this time.	No action at this time.
HazMat	Soil characterization (lead); asbestos sampling of materials to be preserved/stabilized; remove/stabilize lead paint	Water intrusion mitigation; soil characterization (lead); asbestos sampling of materials to be preserved/stabilized; remove/stabilize lead paint	Asbestos sampling of materials to be preserved/stabilized; abatement of a few pieces of deteriorating asbestos cement siding; remove/stabilize lead paint	Remove/stabilize lead paint	Remove/stabilize lead paint
Accessibility	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

OUTER ISLAND TOWER

Building Number	LCS ID 006376
Building Name	Outer Island Tower
>1% Asbestos Confirmed	
Asbestos Assumed[41]	Adhesives, Plaster, Brick/Block Filler, Caulk, Transite and Roofing
Detectable Lead in Paint Confirmed	Window Sashes and Window Trims
Detectable Lead in Paint Assumed	Interior and Exterior Painted Surfaces
Lead Dust on Floors >40 µg/SF Confirmed [42]	
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[43]	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

[41] Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment
[42] 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.
[43] 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 101140
Building Name	Outer Island Keepers Quarters
>1% Asbestos Confirmed	Floor Tile
Asbestos Assumed[44]	Adhesives, Plaster, Brick/Block Filler, Caulk, Transite and Wall Interiors
Detectable Lead in Paint Confirmed	Window Sashes and Trims, Doors and Trims, Walls and Ceilings
Detectable Lead in Paint Assumed	Interior and Exterior Painted Surfaces
Lead Dust on Floors >40 µg/SF Confirmed [45]	
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[46]	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

[44] Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment
[45] 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.
[46] 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.

FOG SIGNAL BUILDING

Building Number	LCS ID 006378
Building Name	Outer Island Fog Signal Building
>1% Asbestos Confirmed	
Asbestos Assumed[47]	Adhesives, Brick/Block Filler, Caulk, Transite and Wall Interiors
Detectable Lead in Paint Confirmed	Window Sashes and Trims, Doors and Trims, and Generators
Detectable Lead in Paint Assumed	Interior and Exterior Painted Surfaces
Lead Dust on Floors >40 µg/SF Confirmed [48]	
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[49]	
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

[47] Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment
[48] 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.
[49] 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.

OIL STORAGE

Building Number	LCS ID 006379
Building Name	Outer Island Oil Storage
>1% Asbestos Confirmed	
Asbestos Assumed[50]	Adhesives, Brick/Block Filler, Caulk, Transite and Wall Interiors
Detectable Lead in Paint Confirmed	
Detectable Lead in Paint Assumed	Interior and Exterior Painted Surfaces
Lead Dust on Floors >40 µg/SF Confirmed [51]	
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[52]	
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

[50] Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment
[51] 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.
[52] 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 006380
Building Name	Outer Island Privy
>1% Asbestos Confirmed	
Asbestos Assumed[53]	Adhesives, Brick/Block Filler, Caulk, Transite and Wall Interiors
Detectable Lead in Paint Confirmed	
Detectable Lead in Paint Assumed	Interior and Exterior Painted Surfaces
Lead Dust on Floors >40 µg/SF Confirmed [54]	
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[55]	
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

[53] Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment
[54] 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.
[55] 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, OUTER ISLAND

OUTER ISLAND ACM SAMPLE CHART

Sample #	Sample Date	API ID	Sample Location	Material Description	Laboratory Result
B-OIKQ-FT1-01	9/14/2009	26768	Keepers Quarters - Second Floor	Brown with black and white steaks floor tile with brown mastic	Trace Chrysotile in Brown mastic, 10% Chrysotile in Brown tile
B-OIKQ-BF1-01	9/14/2009	26768	Keepers Quarters - First Floor	Orange/white plaster block filler	ND
B-OIKQ-BF2-02	9/14/2009	26768	Keepers Quarters - First Floor	White chalky plaster block filler	ND
B-OIKQ-SF1-01	9/14/2009	26768	Keepers Quarters - First Floor	Orange/brown pattern sheet flooring	ND
B-OIKQ-SF2-01	9/14/2009	26768	Keepers Quarters - First Floor	Blue sheet flooring w/ black/tan fibrous backing and White leveler	ND
B-OIKQ-SF3-01	9/14/2009	26768	Keepers Quarters - First Floor	Red sheet flooring w/ black fibrous backing and Tan leveler	ND
B-OIKQ-SF4-01	9/14/2009	26768	Keepers Quarters - First Floor	Green marble sheet flooring with black backing and white leveling compound	ND
B-OIKQ-WT1-01	9/14/2009	26768	Keepers Quarters - First Floor	Thick applied white granular wall texture	ND
B-OIKQ-DW1-01	9/14/2009	26768	Keepers Quarters - First Floor	Pink granular drywall	ND
B-OIKQ-WP-01	9/14/2009	26768	Keepers Quarters - First Floor	Wall plaster patching material	ND

ND=None Detected
TR=Trace, <1% Visual Estimate

OUTER ISLAND LEAD SAMPLE CHART

Sample ID	Sample Type	API ID	Sample Location	Sample Date	Reporting Limit (ug/sq ft)	Lead Concentration (ug/sq ft)
S-OILH-01	Soil Composite	26768	Outer Island Tower dripline	9/14/2009	16.9	116.5
S-OIKQ-01	Soil Composite	26768	Keepers Quarters dripline	9/14/2009	16.9	794.3

APPENDIX D: FABRIC ANALYSIS

Fabric Analysis
Outer 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 two sets which are contained within this report were from the Outer Island Lighthouse Complex. There were 30 samples in the first set, of which 21 were paint samples and nine were of plaster and mortar (nos. 4, 8, 17, 22, and 24 – 28) and there were 25 samples in the second set of which one (no. 45) was a plaster sample.

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 21, using the same procedures employed for the samples from the previous seven sets from the other lighthouse complexes. Numbering of the samples commenced with one and ended with 55. 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:

Oil House

Sample 1	**Munsell**
Dark maroon	7.5R 3/6
Dark maroon	7.5R 3/6
Yellow	2.5Y 8/4
Dark green	5G 4/4
Dark green	5G 4/4
Dark green	5G 4/4
Dark green	5G 4/4
Green	5GY 6/2
Dark maroon	7.5R 3/6
Dark maroon	7.5R 3/6

The first sample was collected from the brick of the oil house exterior. Its analysis revealed a relatively large number of paint layers. Most of the pieces did not reveal the oldest pair of dark maroon layers, but they remained semi-detached on one of the pieces. There was no substrate attached to any of the pieces.

Oil House

Sample 2	**Munsell**
Brown	10YR 6.5/8
Brown	10YR 6.5/8

Brown	10YR 6.5/8
Whitewash	N 9.5/
Whitewash	N 9.5/
Whitewash	N 9.5/

The second sample came from the oil house interior. Its top layer was quite glossy. Beneath the brown layers a minimum of three layers of whitewash were observed.

Oil House

Sample 3	**Munsell**
Green	10G 5.5/1.5
Green	10G 5/2
Light gray-green	10G 8/1
Dark green	10G 4/2
Whitewash	N 9.5/

The third sample was removed from the oil house exterior. Beneath a set of four varying shades of dull green were multiple layers of whitewash as evidenced by its dissolution in hydrochloric acid.

As noted in the introduction above there were nine plaster and mortar samples in the first set of samples from the Outer Island Lighthouse complex. The fourth sample was the first of these samples. It was analyzed on Thursday, October 22 utilizing the standard testing procedure developed by E. Blaine Cliver, Regional Historical Architect of the North Atlantic Region of the National Park Service. The sample was from the mortar of the oil house. It was tan in color and was very soft in consistency. The resultant reaction displaced a minimum amount of water. That fact, coupled with the softness of the sample and its very rapid filtering time leads to the conclusions that it was probably composed of sand and a minimum amount of lime. There were an extremely large proportion of fines in the sample indicating that the sand was originally quite dirty. The sand sieve analysis revealed bits of red brick which were trapped in the two largest sieves. The largest sieve contained only brick bits and the second largest sieve also contain some sand as well. Taking that into account, the sand was extremely fine. At least 42% passed all of the sieves and at least 36% was trapped in the finest sieve.

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No.____ 4 ____
Building:____ Oil House, Outer Apostle Islands NL ____
Location:____ Mortar ____
Sample Description:____ Tan, very soft, small reaction, rapid filtering time ____
____

Test No. 1 – Soluble Fraction

Data:

1. ___185.5___Container A weight	8.___No___Hair or fiber______type
2. ___193.2___Container A and sample	9.___3.8___Fines and paper weight
3.___760.22___Barometric pressure	10.___3.0___Filter paper weight

4. 23 Temperature
5. 0.03 Liters of water displaced
6. Champagne Filtrate color
7. Tan Fines color
11. 190.5 Sand and Container A weight
12. 3.8 cc. of sand
13. 33.8 Weight of graduated cylinder and sand
14. 28.8 Weight of graduated cylinder

Computations:
15. 7.7 Starting weight of sample: No. 2 – No. 1
16. 0.8 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. 1.9 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.0012321 Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 0 12 Gram weight of CaCO3: 100 x No. 20
22. 1.78 Gram weight of Ca(OH)2: No. 19 – No. 21
23. .024 Mols. of Ca(OH)2: No. 22 divided by 74
24. 1.87 Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25. 0.05 Gram weight CO2: No. 20 x 44
26. 1.11 Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27. 4.5 %CO2 gain: No. 25 divided by No. 26

Conclusions:

28.	7.65	Gram weight of sample:	No. 15 – No. 25
29.	10.46	Fine parts/volume:	No. 16 divided by No. 28
30.	49.67	Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
31.	26.89	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	106.7	0.3	6
No. 20	106.6	106.4	0.2	4
No. 30	99.4	99.3	0.1	2
No. 40	101.2	100.7	0.5	10
No. 50	95.0	93.2	1.8	36
Base	73.3	71.2	2.1	42

Outhouse

Sample 5	**Munsell**
Whitewash	N 9.5/

The fifth sample continued the paint series and was from the brick exterior wall of the outhouse. Its relatively thick coating of whitewash layers entirely disappeared in hydrochloric acid.

Outhouse

Sample 6	**Munsell**
Green	10G 5.5/1.5
Dark gray-green	10G 4/1
Gray-green	5G 5/1
White	N 9.5/
Whitewash	N 9.5/

The sixth sample was found on the trim of the outhouse exterior. Interestingly, it retained a stark white paint layer above a set of whitewash layers. The paint was impervious to the acid as opposed to the whitewash which completely dissolved in the acid.

Outhouse

Sample 7	**Munsell**
Green	5G 4.5/4
Dark gray	5Y 4/1
Dark gray	5Y 4/1

The seventh sample was collected from the exterior side of the outhouse door. Its analysis revealed only three paint layers with dark gray being the oldest.

The eighth sample continued the series of mortar and plaster samples. It was collected from the outhouse mortar. It was tan in color and was very soft with large, visible sand grains. It had a fast and bubbly reaction with a relatively small water displacement. That, along with a rapid filtering time indicated a composition of sand and lime. There were a relatively small proportion of fines, indicating a level of care initially taken to clean the sand. As anticipated, the sand sieve analysis revealed coarse sand. Over 5% failed to pass any of the sieves, which was a large amount than that which passed all but the finest sieve and all of the sieves, combined. Almost 2/3 was trapped in the second largest sieve.

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 8
Building: Outhouse, Outer Island, Apostle Islands NL
Location: Mortar
Sample Description: Tan, very soft, large sand grains, fast and bubbly reaction, rapid filtering time

Test No. 1 – Soluble Fraction

Data:

1. 188.9 Container A weight
2. 203.8 Container A and sample
3. 760.22 Barometric pressure
4. 23 Temperature
5. 0.18 Liters of water displaced
6. Clear Filtrate color
8. No Hair or fiber ______ type
9. 3.3 Fines and paper weight
10. 3.0 Filter paper weight
11. 199.8 Sand and Container A weight
12. 6.9 cc. of sand
13. 39.7 Weight of graduated cylinder and sand

7.____Tan______Fines color 14._28.8_Weight of graduated cylinder

Computations:

15.	14.9	Starting weight of sample: No. 2 – No. 1
16.	0.3	Weight of fines: No. 9 – No. 10
17	10.9	Weight of sand: No. 11 – No. 1
18.	.633	Sand density: No. 12 divided by (No. 13 – No. 14)
19.	3.7	Weight of soluble content: No. 15 – (No. 16 + No. 17)
20.	0.0073925	Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21.	0 74	Gram weight of CaCO3: 100 x No. 20
22.	2.96	Gram weight of Ca(OH)2: No. 19 – No. 21
23.	.04	Mols. of Ca(OH)2: No. 22 divided by 74
24.	3.51	Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25.	0.33	Gram weight CO2: No. 20 x 44
26.	2.09	Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27.	15.79	%CO2 gain: No. 25 divided by No. 26

Conclusions:

28.	14.57	Gram weight of sample:	No. 15 – No. 25
29.	2.06	Fine parts/volume:	No. 16 divided by No. 28
30.	47.36	Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
31.	26.50	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	107.4	106.8	0.6	5.55
No. 20	113.4	106.4	7.0	64.81
No. 30	101.1	99.3	1.8	16.67
No. 40	101.4	100.7	0.7	6.48
No. 50	93.5	93.2	0.3	2.78
Base	71.6	71.2	0.4	3.70

Fog Signal

Sample 9	**Munsell**
Black	N 0.5/
Dark gray	N 2.0/
Black	N 0.5/
Gray-green	10 G 6/1
Dark gray	N 4.0/
Dark gray-green	10G 4/1
White	N 9.5/

The ninth sample was collected from the fog signal exterior. Its analysis revealed a set of gray and greenish gray layers. The oldest white layer appeared on only one end of one of the pieces.

Fog Signal

Sample 10	**Munsell**
Light green	7.5G 7/2

The tenth sample came from the workroom wall of the fog signal. It consisted on a single layer of light green paint without any substrate.

Fog Signal

Sample 11	**Munsell**
White	N 9.5/
White	N 9.5/
White	N 9.5/
Tan	2.5Y 6/5
Tan	2.5Y 7/4
Tan	2.5Y 7/4
Tan	2.5Y 7/4
Tan	2.5Y 7/4
Gray-tan	2.5Y 7/2

The eleventh sample was removed from the workroom ceiling of the fog signal. Beneath a set of three stark white layers was a relatively consistent set of tan layers with the oldest being somewhat grayer than the others. No substrate remained.

Fog Signal

Sample 12	**Munsell**
Gray	N 6.0/
White	5Y 9/1

The twelfth sample was from the workroom trim of the fog signal. The white layer on its wood surface was extremely thin and probably served as a prime coat for the gray finish coat.

Fog Signal

Sample 13	**Munsell**
Light green	7.5G 7/2
Cream	2.5Y 8.5/2
Light brown	10YR 6/4
Light brown	10YR 6/4
Light brown	10YR 6/4
Light brown	10YR 6/4
Black	N o.5/

The thirteenth sample was found on the storage wall of the fog signal. The substrate was a thick paper. On its surface was a very glossy, flaky, black substance which readily delaminated from the light brown paint on its surface. It is unlikely that the black layer was an applied finish.

Fog Signal

Sample 14	**Munsell**
White	N 9.5/
White	N 9.5/
White	N 9.5/
White	N 9.5/

The fourteenth sample was collected from the interior trim of the storage of the fog signal. Its top layer was a stark white, high-gloss paint. All of the layers were extremely thin and evenly applied.

Fog Signal

Sample 15	**Munsell**
Dark maroon	2.5R 3/4
Gray	5Y 7/1
Light green	7.5G 7/2
Light gray	5Y 8/1
Gray	5Y 6/1
Dark gray	5Y 4/1
White	5Y 9/1

The fifteenth sample came from the battery storage wall of the fog signal. It was in excellent condition, clearly revealing a set of evenly applied, thin layers with white being the oldest color. The sample was detached from its substrate.

Fog Signal

Sample 16	**Munsell**
Dark maroon	2.5R 3/4
Dark maroon	2.5R 3/4
Gray	5Y 6/1
Gray	5Y 6.5/1
Gray	5Y 6/1
Light gray	5Y 8/1
Green	5G 4/4
Charcoal	5Y 3/1
Light gray	5Y 8/1
Gray	5Y 7/1
Gray	5Y 7/1
Gray	5Y 7/1
White	5Y 9/1
Gray	5Y 6.5/1
Charcoal	5Y 3/1
Gray	5Y 5/1
White	5Y 9/1
White	5Y 9/1

The sixteenth sample was removed from the equipment room wall of the fog signal. It was truly outstanding in its quality, revealing a very large set of evenly-applied paint layers, but without attached substrate. The oldest pair of white layers was relatively thick indicating that they were probably not prime coats, but were finish coats.

The seventeenth sample continued the plaster and mortar samples. It came from the equipment room chimney mortar of the fog signal. It was tan in color and was very soft. With a very fast reaction and a small water displacement it was evident that this was composed of a relatively small part of lime in relation to its sand content. The sand sieve analysis revealed fine sand of which well over one-fifth passed all of the sieves and almost one-third was trapped in the finest sieve.

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 17
Building: Fog Signal, Outer Island, Apostle Islands NL
Location: Equipment Room Chimney Mortar
Sample Description: Tan, very soft, speedy reaction, extremely fast filtering time

Test No. 1 – Soluble Fraction

Data:

1. 185.1 Container A weight
2. 201.0 Container A and sample
3. 760.22 Barometric pressure
4. 23 Temperature
5. 0.05 Liters of water displaced
6. Champagne Filtrate color
7. Brown Fines color
8. No Hair or fiber ______ type
9. 3.6 Fines and paper weight
10. 3.0 Filter paper weight
11. 197.9 Sand and Container A weight
12. 7.6 cc. of sand
13. 41.6 Weight of graduated cylinder and sand
14. 28.87 Weight of graduated cylinder

Computations:

15. 15.5 Starting weight of sample: No. 2 – No. 1
16. 0.6 Weight of fines: No. 9 – No. 10
17. 12.8 Weight of sand: No. 11 – No. 1
18. .59375 Sand density: No. 12 divided by (No. 13 – No. 14)
19. 2.1 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.0020535 Mols. Of CO_2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 0 20 Gram weight of $CaCO_3$: 100 x No. 20
22. 1.9 Gram weight of $Ca(OH)_2$: No. 19 – No. 21
23. .0256 Mols. of $Ca(OH)_2$: No. 22 divided by 74
24. 1.74 Gram total weight of $Ca(OH)_2$: 74 x (No. 20 + No. 23)
25. 0.09 Gram weight CO_2: No. 20 x 44
26. 1.04 Gram weight total possible CO_2: 44 x (No. 20 + No. 23)
27. 8.65 %CO_2 gain: No. 25 divided by No. 26

Conclusions:

28. 15.41 Gram weight of sample: No. 15 – No. 25
29. 3.89 Fine parts/volume: No. 16 divided by No. 28
30. 49.32 Sand parts/volume: (No. 17 divided by No. 28) x No. 18
31. 12.42 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	3.97
No. 20	107.3	106.4	0.9	7.14
No. 30	100.3	99.3	1.0	7.94
No. 40	104.3	100.8	3.5	27.78
No. 50	97.2	93.2	4.0	31.75
Base	73.9	71.2	2.7	21.43

Fog Signal

Sample 18	**Munsell**
Gray	N 7.0/
Dark gray	N 5.5/
Gray	N 7.0/
Light gray	N 8.0/
Gray	N 7.0/
Gray	N 6.5/

The eighteenth sample resumed the paint analysis. The sample was from the second floor wall of the fog signal. It consisted of a palette of layers in varying shades of gray.

Fog Signal

Sample 19	**Munsell**
White	5Y 9/1
White	5Y 9/1
Light gray	5Y 8/1
Gray	5Y 6/1
Dark gray	5Y 4/1
Gray	5Y 6/1
Off-white	5Y 8.5/1
Dark gray	5Y 4/1
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1

The nineteenth sample was found on the second floor trim of the fog signal. It began with a pair of white layers and ended with a pair of white layers with a set of varying gray layers between them.

Fog Signal

Sample 20	**Munsell**
Red	7.5R 3/12
Gray	N 6.5/
Gray	N 6.5/

Charcoal	N 1.5/
Dark gray	N 4.0/
Dark gray	N 4.0/
Gray	N 7.0/
Dark gray	N 5.0/
Dark gray	N 5.0/
Gray	N 6.5/
Gray	N 6.5/
Gray	N 6.5/
Light gray	N 8.0/
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1

The twentieth sample was collected from the equipment room of the fog signal. It was in excellent condition with numerous layers beneath a bright red top layer of paint. At the base of the sample, beneath the oldest white layer, was a thin layer of black and dark maroon which may have been a ferrous metal substrate. It did not appear to be an applied paint.

Fog Signal

Sample 21	**Munsell**
Gray	N 7.0/
Dark gray	N 5.5/
Gray	N 7.0/
Light gray	N 8.0/
Gray	N 7.0/
Gray	N 6.5/

Sample 21 came from the exterior baseboard trim of the fog signal. It retained a set of varying shades of gray paint.

Sample 22 resumed the mortar and plaster sample analysis. It was from the exterior mortar of the fog signal. Its attributes of color (gray), hardness, brittleness, very small water displacement, and lengthy filtering time pointing toward a mixture of Portland cement and sand. The sand sieve analysis revealed very moderate sand of which virtually passed the largest sieve and less than 3% pass all of the sieves. Almost half was trapped in sieve #40 and almost 30% was trapped in sieve #30.

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 22
Building: Fog Signal, Outer, Island, Apostle Islands NL
Location: Exterior brick mortar
Sample Description: Gray, hard and brittle, small reaction followed by prolonged reaction, slow filtering time

Test No. 1 – Soluble Fraction

Data:

1. 187.8	Container A weight	8. No	Hair or fiber ____ type
2. 227.2	Container A and sample	9. 4.1	Fines and paper weight
3. 760.22	Barometric pressure	10. 3.1	Filter paper weight
4. 23	Temperature	11. 216.6	Sand and Container A weight
5. 0.08	Liters of water displaced	12. 19.3	cc. of sand
6. Yellow-green	Filtrate color	13. 57.5	Weight of graduated cylinder and sand
7. Brown	Fines color	14. 28.7	Weight of graduated cylinder

Computations:

15. 39.4 Starting weight of sample: No. 2 – No. 1
16. 1.0 Weight of fines: No. 9 – No. 10
17. 28.8 Weight of sand: No. 11 – No. 1
18. .67 Sand density: No. 12 divided by (No. 13 – No. 14)
19. 9.6 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.0032856 Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 0 33 Gram weight of CaCO3: 100 x No. 20
22. 9.27 Gram weight of Ca(OH)2: No. 19 – No. 21
23. .1253 Mols. of Ca(OH)2: No. 22 divided by 74
24. 9.51 Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25. 0.14 Gram weight CO2: No. 20 x 44
26. 5.66 Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27. 2.47 %CO2 gain: No. 25 divided by No. 26

Conclusions:

28. 39.26	Gram weight of sample:	No. 15 – No. 25
29. 2.55	Fine parts/volume:	No. 16 divided by No. 28
30. 49.15	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. 1.99	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	106.7	0.2	0.70
No. 20	109.0	106.4	2.6	9.12
No. 30	107.8	99.3	8.5	29.82
No. 40	114.6	100.7	13.9	48.77
No. 50	95.7	93.2	2.5	8.77
Base	72.0	71.2	0.8	2.81

Lighthouse

Sample 23	**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/
White	N 9.5/
White	N 9.5/

Sample 23 continued the paint layers. It was removed from the exterior siding of the lighthouse. Its analysis revealed eight layers of stark white paint.

Sample 24 continued the mortar and plaster sample analysis. The sample was collected from the exterior block mortar of the lighthouse. It proved to be a classic Portland cement and sand mortar. It was gray and hard. It had a very low water displacement. Its filtering was a matter of almost two days time. It produced gelatinous byproducts with the reaction which dried to a very large quantity of fines. There is no doubt that a large proportion of Portland cement was used in the mortar in relation to the sand content. The sand sieve analysis was unusually interesting in that the sand proved to be virtually identical to that analyzed from the kitchen plaster (sample 22) from the Michigan Island Light. All of it easily passed the largest sieve and almost 10% passed all of the sieves. One-third was trapped in the finest sieve, #50, and over 42% was trapped in the next finest sieve, #40.

Analysis of sample 25 and the subsequent four other plaster and mortar samples were undertaken on Friday, October 23. The sample 25 came from the exterior brick mortar of the lighthouse. It was tan in color and was moderately soft. With a very low water displacement and a relatively large amount of fines it appears that the mortar consisted of sand and cement. With its color (tan) this was probably natural cement and not Portland cement, which is typically gray. The relatively small sample size probably accounts for the fairly fast filtering time. Cement samples normally filter slowly. 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 a 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 fine sand which easily passed the largest sieve. Well over one-quarter of it passed all of the sieves and well over one-third was trapped in the finest sieve, #50.

Sample 26 was removed from the brick mortar patch of the lighthouse. It was brown in color and was moderately hard. It had a very modest water displacement. Its hardness and water displacement coupled with a slow filtering time and a relatively large proportion of fines points toward a mixture of sand and cement. The brown color of the sample points toward a natural cement rather than a Portland cement, which is typically gray. The sand sieve analysis was quite interesting. It revealed moderately coarse sand. Identical amounts were trapped in sieves #40 and #50 (both over 25%) and in the base and in sieve #20 (both almost 15%). The sand in sieve #30 was almost the same in weight as the latter two from the base and sieve #20.

Sample 27 was from the brick mortar patch of the lighthouse. It was gray in color and was relatively soft. That softness, coupled with a fast and bubbly reaction, a fair amount of water displacement, as well as a rapid filtering time points toward a mixture of approximately five parts of sand to two parts of lime, by

volume. The sand sieve analysis produced a moderate sand which easily passed the largest sieve, but less than 7% passed all of the sieves. Almost one-fifth was trapped in the finest sieve, #50, and well over 58% was trapped in the next finest sieve, #40.

Sample 28 was taken from the mortar of the lighthouse. It was tan in color and moderately soft. Its minimal reaction is typical of a lime and cement mortar. The speed of the reaction coupled with its foaminess, in addition to the relatively large proportion of fines indicates a high probability that the cement was not Portland cement, but natural cement. In addition, natural cement yields a tan color whereas most Portland cement is gray in color. The sand sieve analysis revealed very moderate sand. Over 18% of it passed all of the sieves whereas only slightly over 1% was trapped in the largest sieve. In a curious turn of events equal portions were trapped in sieves #20 and #30 (both 13%) and in #40 and #50 (both over 27%). This was extremely similar to the sand of sample 25 above.

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 24
Building: Lighthouse, Outer Island, Apostle Islands NL
Location: Exterior block mortar
Sample Description: Gray, very hard, small reaction followed by prolonged reaction, gelatinous by-products, extremely slow filtering time

Test No. 1 – Soluble Fraction

Data:

1. 192.0 Container A weight
2. 208.6 Container A and sample
3. 760.22 Barometric pressure
4. 23 Temperature
5. 0.05 Liters of water displaced
6. Off-white Filtrate color
7. Gray Fines color
8. No Hair or fiber ______ type
9. 8.8 Fines and paper weight
10. 3.4 Filter paper weight
11. 200.3 Sand and Container A weight
12. 6.0 cc. of sand
13. 37.1 Weight of graduated cylinder and sand
14. 28.8 Weight of graduated cylinder

Computations:

15. 16.6 Starting weight of sample: No. 2 – No. 1
16. 5.4 Weight of fines: No. 9 – No. 10
17. 8.3 Weight of sand: No. 11 – No. 1
18. .7229 Sand density: No. 12 divided by (No. 13 – No. 14)
19. 2.9 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.002 Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 0 20 Gram weight of CaCO3: 100 x No. 20
22. 2.7 Gram weight of Ca(OH)2: No. 19 – No. 21
23. .0364 Mols. of Ca(OH)2: No. 22 divided by 74
24. 2.84 Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25. 0.09 Gram weight CO2: No. 20 x 44
26. 1.69 Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27. 5.33 %CO2 gain: No. 25 divided by No. 26

Conclusions:

28.	16.51	Gram weight of sample:	No. 15 – No. 25
29.	32.71	Fine parts/volume:	No. 16 divided by No. 28
30.	36.34	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.	25 51	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	3.61
No. 30	100.2	99.3	0.9	10.84
No. 40	104.3	100.8	3.5	42.17
No. 50	96.0	93.2	2.8	33.73
Base	72.0	71.2	0.8	9.64

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 25
Building: Lighthouse, Outer Island, Apostle Islands NL
Location: Exterior brick mortar
Sample Description: Tan, moderately soft, fast and bubbly reaction, rapid filtering time

Test No. 1 – Soluble Fraction

Data:

1.	185.5	Container A weight	8.	No	Hair or fiber ______ type
2.	193.8	Container A and sample	9.	3.7	Fines and paper weight
3.	763.02	Barometric pressure	10.	2.9	Filter paper weight
4.	23	Temperature	11.	190.7	Sand and Container A weight
5.	0.08	Liters of water displaced	12.	3.4	cc. of sand
6.	Yellow-green	Filtrate color	13.	34.0	Weight of graduated cylinder and sand
7.	Light brown	Fines color	14.	28.8	Weight of graduated cylinder

Computations:

15.	8.3	Starting weight of sample: No. 2 – No. 1
16.	0.8	Weight of fines: No. 9 – No. 10
17.	5.2	Weight of sand: No. 11 – No. 1
18.	.653846	Sand density: No. 12 divided by (No. 13 – No. 14)
19.	2.3	Weight of soluble content: No. 15 – (No. 16 + No. 17)
20.	0.0032977	Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21.	0 33	Gram weight of CaCO3: 100 x No. 20

22. 1.97 Gram weight of Ca(OH)2: No. 19 – No. 21
23. .0266 Mols. of Ca(OH)2: No. 22 divided by 74
24. 4.41 Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25. 0.15 Gram weight CO2: No. 20 x 44
26. 2.62 Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27. 5.73 %CO2 gain: No. 25 divided by No. 26

Conclusions:

28.	8.15	Gram weight of sample:	No. 15 – No. 25
29.	9.81	Fine parts/volume:	No. 16 divided by No. 28
30.	41.72	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.	8.44	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	106.7	0.3	5,56
No. 20	107.2	106.4	0.8	14.81
No. 30	99.9	99.2	0.7	12.96
No. 40	102.1	100.7	1.4	25.93
No. 50	94.6	93.2	1.4	25.93
Base	72.0	71.2	0.8	14.81

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 26
Building: Lighthouse, Outer Island, Apostle Islands NL
Location: Brick mortar patch
Sample Description: Brown, moderately hard, fast and bubbly reaction, slow filtering time

Test No. 1 – Soluble Fraction

Data:

1. 188.9 Container A weight
2. 199.4 Container A and sample
3. 763.02 Barometric pressure
4. 23 Temperature
5. 0.08 Liters of water displaced
6. Yellow-green Filtrate color
7. Tan Fines color
8. No Hair or fiber ______ type
9. 3.8 Fines and paper weight
10. 3.1 Filter paper weight
11. 193.8 Sand and Container A weight
12. 3.1 cc. of sand
13. 33.7 Weight of graduated cylinder and sand
14. 28.8 Weight of graduated cylinder

Computations:
15.___10.5___Starting weight of sample: No. 2 – No. 1
16.___0.7___Weight of fines: No. 9 – No. 10
17.___4.9___Weight of sand: No. 11 – No. 1
18.___.632653___Sand density: No. 12 divided by (No. 13 – No. 14)
19.___4.9___Weight of soluble content: No. 15 – (No. 16 + No. 17)
20.___0.0033___Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21.___0 33___Gram weight of CaCO3: 100 x No. 20
22.___4.57___Gram weight of Ca(OH)2: No. 19 – No. 21
23.___.0618___Mols. of Ca(OH)2: No. 22 divided by 74
24.___4.81___Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25.___0.15___Gram weight CO2: No. 20 x 44
26.___2.86___Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27.___5.24___%CO2 gain: No. 25 divided by No. 26

Conclusions:

28.___10.35___	Gram weight of sample:	No. 15 – No. 25
29.___6.76___	Fine parts/volume:	No. 16 divided by No. 28
30.___29.95___	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.___5.82___	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	6.12
No. 30	99.7	99.3	0.4	8.16
No. 40	101.9	100.8	1.1	22.45
No. 50	94.9	93.2	1.7	34.69
Base	72.6	71.2	1.4	28.57

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No.___27
Building:___Lighthouse, Outer Island, Apostle Islands NL
Location:___Brick mortar patch
Sample Description:___Gray, soft, fast and bubbly reaction, rapid filtering time

Test No. 1 – Soluble Fraction

Data:

1. 185.1 Container A weight
2. 203.1 Container A and sample
3. 763.02 Barometric pressure
4. 23 Temperature
5. 0.12 Liters of water displaced
6. Yellow-green Filtrate color
7. Off-white Fines color
8. No Hair or fiber ______ type
9. 3.7 Fines and paper weight
10. 3.1 Filter paper weight
11. 199.0 Sand and Container A weight
12. 8.4 cc. of sand
13. 42.7 Weight of graduated cylinder and sand
14. 28.8 Weight of graduated cylinder

Computations:

15. 18.0 Starting weight of sample: No. 2 – No. 1
16. 0.6 Weight of fines: No. 9 – No. 10
17. 13.9 Weight of sand: No. 11 – No. 1
18. .6043 Sand density: No. 12 divided by (No. 13 – No. 14)
19. 3.5 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.0049466 Mols. Of CO_2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 0 49 Gram weight of $CaCO_3$: 100 x No. 20
22. 3.01 Gram weight of $Ca(OH)_2$: No. 19 – No. 21
23. .0406 Mols. of $Ca(OH)_2$: No. 22 divided by 74
24. 3.37 Gram total weight of $Ca(OH)_2$: 74 x (No. 20 + No. 23)
25. 0.22 Gram weight CO_2: No. 20 x 44
26. 2.00 Gram weight total possible CO_2: 44 x (No. 20 + No. 23)
27. 11 %CO_2 gain: No. 25 divided by No. 26

Conclusions:

28.	17.78	Gram weight of sample:	No. 15 – No. 25
29.	3.37	Fine parts/volume:	No. 16 divided by No. 28
30.	47.24	Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
31.	20.85	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	106.6	106.4	0.2	1.44
No. 30	101.4	99.3	2.1	15.11
No. 40	108.7	100.7	8.0	57.55
No. 50	95.9	93.2	2.7	19.42
Base	72.1	71.2	0.9	6.47

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 28
Building: Lighthouse, Outer, Island, Apostle Islands NL
Location: Brick mortar
Sample Description: Tan, moderately soft, fast and foamy reaction, slow filtering time

Test No. 1 – Soluble Fraction

Data:
1. 187.8 Container A weight
2. 201.4 Container A and sample
3. 763.02 Barometric pressure
4. 23 Temperature
5. 0.03 Liters of water displaced
6. Yellow-green Filtrate color
7. Tan Fines color
8. No Hair or fiber ______ type
9. 4.1 Fines and paper weight
10. 3.0 Filter paper weight
11. 195.6 Sand and Container A weight
12. 5.9 cc. of sand
13. 36.5 Weight of graduated cylinder and sand
14. 28.7 Weight of graduated cylinder

Computations:
15. 13.9 Starting weight of sample: No. 2 – No. 1
16. 1.1 Weight of fines: No. 9 – No. 10
17. 7.8 Weight of sand: No. 11 – No. 1
18. .7564 Sand density: No. 12 divided by (No. 13 – No. 14)
19. 4.0 Weight of soluble content: No. 15 – (No. 16 + No. 17)
20. 0.0012366 Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21. 0 12 Gram weight of CaCO3: 100 x No. 20
22. 3.88 Gram weight of Ca(OH)2: No. 19 – No. 21
23. .0524 Mols. of Ca(OH)2: No. 22 divided by 74
24. 3.97 Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25. 0.05 Gram weight CO2: No. 20 x 44
26. 2.36 Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27. 2.12 %CO2 gain: No. 25 divided by No. 26

Conclusions:
28. 13.86 Gram weight of sample: No. 15 – No. 25
29. 7.94 Fine parts/volume: No. 16 divided by No. 28
30. 42.60 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. 6.83 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	1.23

No. 20	107.4	106.4	1.0	12.99
No. 30	100.3	99.3	1.0	12.99
No. 40	102.9	100.7	2.1	27.27
No. 50	95.3	93.2	2.1	27.27
Base	72.6	71.2	1.4	18.18

Lighthouse

Sample 29	**Munsell**
White	N 9.5/
White	N 9.5/

Sample 29 resumed the paint layers and was from the lighthouse exterior trim. It retained only a pair of stark white paint layers.

Lighthouse

Sample 30	**Munsell**
Off-white	N 8.5/
Cream	2.5Y 8/3
White	N 9.5/
Tan	2.5Y 7/5
Tan	2.5Y 7/5
Tan	2.5Y 7/5
Tan	2.5Y 7/4
Tan	2.5Y 7/4
Tan	2.5Y 7/4
Tan	2.5Y 7/5
Light brown	10YR 6/4
Cream	2.5Y 8/2
Cream	2.5Y 8/2

Sample 30 was found on the entry wall of the lighthouse. A set of tan-colored paint layers represented a consistent history of that color. However, the oldest cream layers were lighter and grayer than the tan layers.

Lighthouse

Sample 31	**Munsell**
Yellow	2.5Y 8/8
White	N 9.5/
White	N 9.5/
Light brown	10YR 7.5/5
Blue-green	5G 8/1
Blue-green	5G 8/1
Gray	5Y 6/1
Very dark brown	2.5Y 3/2
Gray	5Y 6/1
Gray	5Y 7/1
Very dark green	5G 3/4
Gray	5Y 7/1

Whitewash	N 9.5/

Sample 31 commenced the second set of samples from the Outer Island Light Complex. Analysis of this set commenced on Monday, October 27, 2009. Sample 31 was collected from the kitchen of the lighthouse. It was in excellent condition. Beneath a set of a dozen paint layers was a relatively thick set of ill-defined whitewash layers.

Lighthouse

Sample 32	**Munsell**
Green	5G 6.5/3
Dark brown	.5YR 4/4
White	5Y 9/1
Pastel blue-green	5BG 9/1
Peach	10YR 8/5

Sample 32 came from the living room wall of the lighthouse. There was a complete cleavage between the peach and the pastel blue-green layer. The peach-colored paint was firmly adhered to its paper substrate. The cleavage may indicate that the peach layer was incompatible with the pastel blue-green layer or that a thin film of dirt had built up over time resulting in the weak adhesion between the layers

Lighthouse

Sample 33	**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
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1
Gray	5Y 6/1
Black	N 1.5/
Dark gray	5Y 4/1
Gray	N 6.75/
Gray	5Y 5/1
Gray	5Y 6/1
Gray	5Y 5/1
Gray	5Y 6/1
Gray	5Y 5/1
Cream	2.5Y 8/2
Dark brown	7.5YR 4/2
Gray	5Y 7/1

Sample 33 was removed from the interior door trim of the lighthouse. Its quality was quite excellent with clearly observable paint layers. Despite a very lengthy history of white paint the older layers were primarily gray with a few exceptions. The oldest layer was gray.

Lighthouse Sample 34	Munsell
Pastel blue-green	5BG 9/1
Whitewash	N 9.5/
Light blue-green	5BG 8/1
Peach	7.5YR 7/4
Peach	7.5YR 7/4
Peach	7.5YR 7/4
Blue-green	5BG 8/1
Blue-green	5BG 7.5/1
Blue-green	5BG 8/1
Brown	7.5YR 5.5/4
Blue-green	5BG 6/1
Blue-green	5BG 6/1
Blue-green	5BG 7/2
White	5Y 9/1

Sample 34 was from the wall of bedroom 1 in the lighthouse. Its quality was excellent, revealing a large array of paint layers. The oldest white layer was extremely thin and probably served as a prime coat for an original finish coat of blue-green paint.

Lighthouse Sample 35	Munsell
White	5Y 9/1
Brown	7.5YR 4/4
Brown	7.5YR 5/4
Blue-green	5BG 5/2
Blue-green	5BG 5/2
Blue-green	5BG 5/2
White	N 9.5/

Sample 35 was found on the wall of bedroom 1 of the lighthouse. Its paint layers were extremely thin and evenly applied. The oldest white layer was exceptionally thin and probably served as a prime coat for an original finish layer of blue-green.

Lighthouse Sample 36	Munsell
White	N 9.5/
Whitewash	N 9.5/
Tan	10YR 8/4
Blue-green	5BG 5/2
Peach	10YR 8/5
White	5Y 9/1
Rose	10R 7/5
Tan	10YR 8/4
Blue-green	5BG 6/2
Blue-green	5BG 6/2
Gray	5Y 6.5/1

Sample 36 was collected from the wall of bedroom 2 of the lighthouse. Its analysis revealed a set of paint layers beneath a relatively thick layering of whitewash with a white paint layer on their surface. The oldest surviving paint layer was gray which may have served as a prime coat for a finish layer of blue-green.

Lighthouse

Sample 37	**Munsell**
Light yellow	5Y 8.5/4
Light rose	5YR 8/4

Sample 37 was collected from the wall of the first floor hallway of the lighthouse. It retained only two layers of paint on its paper substrate.

Lighthouse

Sample 38	**Munsell**
White	5Y 9/1
Warm gray	5Y 8/2
Light yellow	5Y 8.5/4
Light green	2.5G 7/2
Green	2.5G 5/4

Sample 38 came from the first floor main stair of the lighthouse. It revealed five paint layers on its paper substrate.

Lighthouse

Sample 39	**Munsell**
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1
Tan	10YR 7/4
Tan	10YR 7/4
Tan	10YR 7/4

Sample 39 was removed from the wall of the first floor storage room of the lighthouse. Beneath the oldest tan layer was a translucent (roughly off-white – 5Y 8.5/1) layer which may have been a sizing or a glue probably used for wallpaper. The layers were quite thin and no substrate remained.

Lighthouse

Sample 40	**Munsell**
White	5Y 9/1
Tan	10YR 8/4
Tan	10YR 8/3
Tan	10YR 8/3
Tan	10YR 8/3
Gray	5Y 7/1
Light blue-green	5BG 8/2
Light blue-green	5BG 8/2
Rose	10R 6/4
Rose	10R 6/2

Light rose	10R 7/2
Light blue-green	5BG 8/1
Light blue-green	5BG 8/1
Light blue-green	5BG 8/1
Dark gray	5Y 4/1
Blue-green	5BG 5/4
Blue-green	5BG 5/4

Sample 40 was from the wall of the hall of the lighthouse. It was excellent in quality, revealing a large array of paint layers with blue-green being the oldest observed color on the plaster substrate.

Lighthouse

Sample 41	**Munsell**
Dark gray	N 4.0/
Gray	N 5.0/
Dark gray	N 4.0/
Gray	N 5.0/
Dark gray	N 4.0/
Dark gray	N 4.0/
Dark gray	N 4.0/
Whitewash	N 9.5/

Sample 41 was collected from the entry stair of the lighthouse. Beneath a set of dark gray and gray paint layers was a relatively thick set of ill-defined whitewash layers.

Lighthouse

Sample 42	**Munsell**
Red	5R 4/14
Cream	2.5Y 8.5/3
Cream	2.5Y 8.5/3
Cream	2.5Y 8.5/3
Cream	2.5Y 8.5/3

Sample 42 was collected from the wall of the entry of the lighthouse. Between a striking red surface layer of paint and the wood substrate were four layers of cream-colored paint.

Lighthouse

Sample 43	**Munsell**
Black	N 0.5/
White	5Y 9/1
Off-white	5Y 8.5/1

Sample 43 came from the window trim of the lighthouse tower. There were but three paint layers on the wood substrate of white the oldest off-white layer was extraordinarily thin and probably served as a prime coat for the white layer.

Lighthouse

Sample 44	**Munsell**

Brown	2.5YR 4/6
Gray	N 6.0/
Black	N 0.5/
Gray	N 6.0/
White	5Y 9/1
Gray	5Y 6/1
Dark gray	N 4.0/
Gray	5Y 5/1
Dark gray	N 4.5/
Gray	N 5.5/
Light gray	N 7.5/
Gray	N 5.5/
Dark gray	N 4.5/
Dark gray	N 4.5/
Gray	N 5.5/
Dark gray	N 4.5/
Black, glossy varnish	---------

Sample 44 was removed from the kitchen stair of the lighthouse. It proved to be particularly challenging, although it did reveal a large number of finish layers on its wood substrate. The oldest layer was a very glossy, very dark varnish.

Sample 45 was from the hall plaster of the lighthouse. It was warm gray in color and was very soft. It gave every evidence of having been composed of lime and sand with an approximate ratio of one part of lime to three parts of sand, by volume. The sand sieve analysis revealed very fine sand. 22 ½% passed all of the sieves whereas only 1% was trapped in the largest sieve. Moreover 46 ½% was trapped in the finest sieve.

Mortar/Plaster/Stucco Analysis Test Sheet

Sample No. 45
Building: Lighthouse, Outer Island, Apostle Islands NL
Location: Hall plaster
Sample Description: Warm gray, very soft, fast and fizzy reaction, extremely slow filtering time

Test No. 1 – Soluble Fraction

Data:

1. 187.5 Container A weight
2. 212.1 Container A and sample
3. 763.02 Barometric pressure
4. 23 Temperature
5. 0.25 Liters of water displaced
6. Off-white Filtrate color
7. Warm gray Fines color
8. No Hair or fiber ______ type
9. 3.4 Fines and paper weight
10. 3.0 Filter paper weight
11. 207.8 Sand and Container A weight
12. 12.2 cc. of sand
13. 49.1 Weight of graduated cylinder and sand
14. 28.8 Weight of graduated cylinder

Computations:

15.	24.6	Starting weight of sample: No. 2 – No. 1
16.	0.4	Weight of fines: No. 9 – No. 10
17.	20.3	Weight of sand: No. 11 – No. 1
18.	.60	Sand density: No. 12 divided by (No. 13 – No. 14)
19.	3.9	Weight of soluble content: No. 15 – (No. 16 + No. 17)
20.	0.0103	Mols. Of CO2: No. 5 x No. 3. x 0.016 divided by (No. 4 + 273.16 C.)
21.	1 03	Gram weight of CaCO3: 100 x No. 20
22.	2.87	Gram weight of Ca(OH)2: No. 19 – No. 21
23.	0.0387763	Mols. of Ca(OH)2: No. 22 divided by 74
24.	3.63	Gram total weight of Ca(OH)2: 74 x (No. 20 + No. 23)
25.	0.45	Gram weight CO2: No. 20 x 44
26.	2.16	Gram weight total possible CO2: 44 x (No. 20 + No. 23)
27.	20.83	%CO2 gain: No. 25 divided by No. 26

Conclusions:

28.	24.15	Gram weight of sample:	No. 15 – No. 25
29.	1.66	Fine parts/volume:	No. 16 divided by No. 28
30.	50.43	Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
31.	16.53	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	0.2	1.0
No. 20	107.2	106.4	0.8	4.0
No. 30	100.6	99.3	1.3	6.5
No. 40	104.7	100.8	3.9	19.5
No. 50	102.5	93.2	9.3	46.5
Base	75.7	71.2	4.5	22.5

Lighthouse

Sample 46	**Munsell**
Dark gray	N 4.5/
Gray	5Y 5/1
Dark gray	N 4.5/
Gray	5Y 5/1
Light gray	N 7.5/
Gray	N 5.0/
Gray	N 5.0/
Charcoal	5Y 3/1
Tan	7.5YR 7/2
Gray	N 6.5/
Gray	N 6.5/
Dark gray	5Y 4/1
Light gray	5Y 8/1

Dark gray	5Y 4/1
Dark green	5G 4/4
Whitewash	N 9.5/

Sample 46 resumed the paint analysis. The sample was from the basement stair wall of the lighthouse. It was excellent in its quality. Beneath a very large number of paint layers was a thick accumulation of whitewash layers of which at least six layers were visible.

Lighthouse

Sample 47	**Munsell**
White	N 9.5/
Whitewash	N 9.5/

Sample 47 was found on the basement wall of the lighthouse. Beneath a layer of white paint was a very thick set of whitewash layers which were virtually indistinguishable from each other.

Lighthouse

Sample 48	**Munsell**
Pastel blue-green	5G 9/1
Dark green	5G 3/4
Gray	5Y 7/1
Pastel peach	5YR 9/2
Pastel peach	5YR 9/2
Light peach	7.5YR 8/3
Pastel peach	5YR 9/2
Light peach	7.5YR 8/3
Off-white	5Y 8.5/1
Gray	5Y 5/1
Green	10GY 7.5/4
Pale green	2.5G 9/3

Sample 48 was collected from the wall of bedroom 3 of the second floor of the lighthouse. Its quality was excellent. The oldest pale green layer may have served as a prime coat for a finish coat of green.

Lighthouse

Sample 49	**Munsell**
Blue-green	5BG 5,5/2
White	N 9.5/
Tan	7.5YR 7/2
Light green	10G 7/2
Light green	10G 7/2
Light green	10G 7/2
Dark green	10G 3/4

Sample 49 came from the wall of the closet of bedroom 3 on the second floor of the lighthouse. It retained a relatively large number of paint layers considering its location with dark green being the oldest observed layer on its white plaster substrate.

Lighthouse	
Sample 50	**Munsell**
White	5Y 9/1

Sample 50 was removed from the trim of bedroom 4 of the second floor of the lighthouse. It retained a single layer of dirty white paint on its wood substrate.

Lighthouse	
Sample 51	**Munsell**
Light blue-green	5BG 8/1
White	N 9.5/
Tan	7.5YR 7/3
Tan	7.5YR 7/3
Tan	7.5YR 7/3
Light green	10G 7/2
Light green	10G 7/2
Gray	10YR 7/1
Gray	5Y 7/1
Dark gray	5Y 3/1
Dark green	10G 3/4

Sample 51 was from the wall of the closet of bedroom 4 of the second floor of the lighthouse. Like its counterpart, sample 49, it revealed a surprisingly large number of paint layers in light of its location. The oldest apparent finish layer was dark green.

Lighthouse	
Sample 52	**Munsell**
Light green	7.5GY 7.5/2
White	N 9.5/
Warm gray	5Y 7/2
Warm gray	5Y 7/2
Warm gray	5Y 7/2
Warm gray	5Y 7/2
Tan	10YR 8/5
Tan	10YR 8/2
Tan	10YR 8/2
Tan	10YR 8/2
Tan	10YR 8/2
Tan	10YR 8/2
Tan	10YR 8/2
Tan	10YR 8/2
Blue-green	5BG 6/1
Blue-green	5BG 6/1
Light blue-green	5BG 8/1
Dark green	10G 3/4

Sample 52 was found on the wall between bedrooms 1 an 2 on the second floor of the lighthouse. The white and warm gray layers were quite thick and filled with microbubbles, which is typical of some early forms of latex paint. The oldest dark green layer was firmly adhered to its plaster substrate.

Lighthouse	
Sample 53	**Munsell**
Pastel blue-green	5G 9/1

Sample 53 was collected from the wall of bedroom 1 of the second floor of the lighthouse. It revealed a single layer of pastel blue-green paint on its very brittle paper substrate.

Lighthouse	
Sample 54	**Munsell**
Brown	5YR 6/4
Brown	5YR 6/4
Brown	5YR 6/4
Brown	5YR 6/4
Brown	5YR 6/4
Warm gray	5Y 7/2

Sample 54 came from the wall of the third floor stair of the lighthouse. It was challenging as the paint beneath the four brown layers appeared unevenly with only warm gray as the layer that could be exactly identified.

Lighthouse	
Sample 55	**Munsell**
Brown	5YR 6/4
Brown	5YR 6/4
Brown	5YR 6/4
Brown	5YR 6/4
Brown	5YR 6/4
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1
White	5Y 9/1
Tan	10YR 8/3
Blue-green	5BG 6.5/1
Blue-green	5BG 6.5/1
Dark gray	5Y 4/1
Blue-green	5BG 6.5/1
Blue-green	5BG 6.5/1
Blue-green	5BG 6.5/1
Blue-green	5BG 5/1
Blue-green	5BG 6.5/1
Dark blue-green	5BG 4/1

Sample 55 was removed from the trim of the third floor of the lighthouse. It was excellent in its quality. Beneath the same five layers of brown paint seen in the previous sample was a large array of additional paint layers with dark blue-green as the oldest observed color.

A number of conclusions can be drawn from the analysis, as follow:

1. There was a relatively high degree of consistency between the samples so that comparisons could easily be made between the samples.

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.

    c. The element itself had been replaced or is of recent date.

    d. Other coverings such as wallpaper may have preceded the paint and were removed prior to painting. Wallpaper was a popular covering, especially for damaged plaster.

3. There is no doubt that several of the buildings had various elements which were whitewashed as their probable original finish.

4. Many of the samples revealed lengthy sequences of layers so that positive conclusions can be reached for those samples and other samples can be evaluated in relation to them

5. When it is states "sample detached from substrate" (sample #15 for example) there is not necessarily an implication that can be directly drawn. It simply means that there was no substrate or indication of a substrate beneath the oldest layer. There may be any number of reasons for this, as follow:

    a. The substrate may have been hard and impervious such as metal or stone so that it was impossible to remove the substrate with the sample.

    b. There may have been a natural cleavage between the substrate and the oldest finish layer. This is typical found when linseed oil was used as a prime coat on wood or when calcimine paint remains on the surface of plaster.

    c. There may have been cleavage between layers so that only those layers above that cleavage survived the sampling process.

    It does mean that it is impossible to identify a prime coat so that one is left to speculate as to the relative age of the oldest layer. It also means that older finish layers may have been left behind in the sampling process.

6. 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.

7. 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.

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