Boathouse

1 **BOATHOUSE**

2 Chronology of Alterations and Use

3 *Original Construction* 4

The Devils Island Boathouse was constructed in 1891, the same year that the Fresnel lens was installed in
 the temporary wood tower and put into service.³⁵

8 The Boathouse's dock was rehabilitated in 1978 as it appears the planking was lost or damaged and needed
9 to be restored. The cribs and timber structure of the dock are visible in the 1978 image. (Historic Image DI20)

12 There are no available historic drawings for this building.

13

14

20

22

15 Significant Alterations / Current condition 16

One alteration to the Devils Island Boathouse is the cedar shingle reroofing that occurred in 2006. This was completed by the Historic Structure Preservation Team of the NPS. The spaced sheathing indicates the original roofing was wood shingle.

21 The Boathouse has never contained mechanical or electrical systems.

There is currently a large boulder underwater that is directly in the path of the boat ramp, preventing access into the building and corresponding boat storage (the primary function of the building). If the Boathouse is to be rehabilitated so as to be functional again, the boulder must be removed.

26

¹¹

³⁵ List of Classified Structures, National Park Service, 2009.

1 Summary of Documented Work on the Building

Date	Work Described	Source of Information
Annual Report of 1898	"Devils Island, Lake Superior, Wisconsin A crib for extension to the boat landing was built, sunk in place, and filled with ballast stone and a superstructure was built above the water line. Some 36 feet of the old landing that was out of level were raised 26 inches on the west side and 8 inches on the east side and refilled with ballast stone. The center truss of the boathouse was repaired and the roof was painted."	"1898 Annual Report of the Lighthouse Board," Devils Island listings in Lighthouse Establishment Annual Reports 1890-1914
1952, October 10	"Built anchor for hoist in top of boat house."	USCG Log, summarized by Bob
		Mackreth, 2004
1953, June 2	"New hoist for boathouse."	USCG Log, summarized by Bob
1052 0 1 01		
1953, October 21	"Repaired rotted deck in S end of boathouse.	USCG Log, summarized by Bob
	Parts of foundation found to be rotted and should	Mackreth, 2004
	be repaired; letter will be sent."	
1955, September	Monthly report – "Boathouse badly needs new	USCG Log, summarized by Bob
	roof. Wood shingles are rotten and patching is	Mackreth, 2004
	little help. Should be reroofed next year."	
1978-1979	Reroofed with asphalt shingles and exterior	Historic Image DI-22 and APIS/NPS
	battens repaired and painted	Business Office File # D3423 –
	* *	Devils)
2006	Reroofed with cedar shingles	HSPT Reports, 2009

2 3

4 General Physical Description

5 This building is a one-story, one room, rectangular, utilitarian wood frame structure with a timber 6 foundation. It has a simple gable roof with boxed rafter tails and board and batten siding. There is a boat

7 door on the south elevation and a beadboard main door on the north elevation.

- 8
- 9

10 *Physical Description -- Architecture*

11 Architecture – Roof

The Boathouse was reroofed in 2006 with 5" exposure cedar shingles. The current roof has a prefinished red metal drip edge flashing at the starter course that extends 7" up the roof. The sheathing is spaced. Tie-

14 off rings were installed at the ridge, though they do not appear to meet OSHA requirements, and there is a

15 wood ridge cap. There is 1x6 frieze board and 1 x 4 $\frac{1}{2}$ " fascia at the gables and eaves. (DI-BH-15)

- 16
- 17
- 18 Architecture Exterior Walls
- The exterior walls are wood frame with board and batten siding. The battens are shaped and have an ogeeprofile.
- 21
- 22

23 Architecture – Window

24 The window in this building is a two- over two-lite, fixed sash, original to the building. It is located on the

25 west side of the building. The sash is painted on both the interior and exterior faces. The exterior trim is 1

- 1/8" x 4 $\frac{1}{2}$ ". The window is 2'1" x 3'1". A paint sample taken at the exterior window trim indicates nine
- 27 layers of paint, either dark green or white, with extremely weathered wood beneath. (DI-BH-11)

1 Architecture – Exterior Doors Entry Door. This door is made of vertical tongue and groove wood planks, 3 1/2" wide with bead, and is 2 3 original to the building. The door has two strap hinges and a spring-loaded handle. There is a wood sill and the exterior trim is 1 1/8" x 4 1/2", painted. The door is 2'7 1/2" x 6'8" x 3/4". A paint sample taken at the 4 exterior door trim shows an impressive number of paint layers, especially for an exterior sample. The oldest 5 layer of paint is gray and the wood beneath is heavily weathered. A sample from the eave trim indicates 6 7 that its oldest layer of paint was the same shade of gray. (DI-BH-09 and 13) 8 9 **Boat Doors.** This set of two doors are made of vertical tongue and groove wood planks, ³/₄" x 5 ¹/₄", and are original to the building. The door has no drip edge trim at the header but has a 1x4 base trim. The doors 10 each have three strap hinges and they are currently barred and roped shut. The exterior trim is ³/₄" x 3 ¹/₂" 11 12 painted wood. Each door is 4'3" x 7'3" x ³/₄". (DI-BH-14) 13 14 15 Architecture – Exterior Trim 16 The exterior trim consists of the base trim (has no slope) and the 1x4 corner boards. All the trim is wood 17 and is painted. (DI-BH-08) 18 19 20 Architecture – Wall Finishes 21 There are no finished wall surfaces inside the Boathouse, but the unfinished rough framing and back sides 22 of the vertical boards that side the exterior of the building are visible. 23 24 25 Architecture – Ceiling Finishes 26 There is no ceiling finish as the wood rafters, joists, sheathing, and roofing planks are exposed. This roof 27 structure is original to the building. 28 29 30 Architecture – Interior Trim 31 There is no interior trim in this building. The wall framing is exposed. 32 33 34 Architecture – Floor 35 The floor is made of wood planks varying in size from $5\frac{1}{2}$ to 1' wide. There is a boat ramp in the center of the floor that is 4'3" wide and angles up the length of the building to end at the hoisting mechanism 36 37 located along the north wall. The floor and boat ramp are original to the building. 38 39 40 Architecture – Stairs 41 Exterior Stairs to Entry Door. These stairs are wood and unpainted. The stairs are recessed into the hillside and also help to act as a small retaining wall around the door area. There is one triangular tread 42 43 (1'7" wide, 3" thick) attached to a wood frame structure that forms a triangle with the door. The distance 44 from the ground to the top of the tread is 8 $\frac{1}{2}$ ". The distance from the top of the tread to the top of the wood frame is 5". The distance between the door's threshold and the edge of the tread is 1'5". These stairs are not 45 original to the building. (DI-BH-10) 46 47 48 49 *Architecture – Accessibility* 50 The building is currently not accessible. The north entry door opening is $2'7 \frac{1}{2}$ clear with a grade to 51 finished floor elevation change of $1'1 \frac{1}{2}''$. 52

1	Physical Description Structural
2 3 4	<i>Structural – Foundation</i> The floor framing of the Boathouse is supported by wood beams that rest directly on the ground or are supported by wood timbers placed on the ground. The beams are not accessible and could not be measured.
5 6 7 8 9	<i>Structural – Floor Framing</i> The floor framing was not accessible and could not be measured. The floor is sheathed with FS 2x12 planks.
10 11	
12 13 14 15 16	<i>Structural – Roof Framing</i> The roof framing consists of FS 2x4 rafters spaced at about 24". The rafters span approximately seven feet. The rafters are supported on the exterior wood-framed walls. The rafters are sheathed with spaced solid wood underlayment.
17 18 19 20 21 22	<i>Structural – Wall Framing</i> The walls are constructed of FS 4x4 posts spaced at anywhere from three feet to nine feet. A FS 4x4 girt spans across the top of the posts. FS 4x4 girts span between the posts at mid-height and at the floor. The walls are sheathed with vertical FS 1x solid wood siding.
23 24 25 26	Structural – Lateral System Lateral stability for the building is provided by the exterior wood-framed walls.
27 28 29 30 31	Structural – Load Requirements The required floor load capacity for the boathouse is 125 psf if it used for light storage. The required roof snow load capacity is 36 psf.
32 33	Physical Description Mechanical
34 35 36 37	Mechanical – Plumbing Systems None in the building.
38 39 40 41	<i>Mechanical – HVAC</i> None in the building.
42 43 44 45	Mechanical – Fire Suppression None in the building.
46 47 48 49 50	<i>Mechanical – Other</i> The Boathouse contains a cast iron hand operated gear winch at the north end of the building that would have been used to pull boats up a ramp into the Boathouse.

1	Physical Description Electrical
2	Electrical – System Configuration
3	None in the building.
4	
5	
6	Electrical – Conductor Insulation
7	None in the building.
8	
9	
10	Electrical – Overcurrent Protection
11	None in the building.
12	
13	
14	Electrical – Lighting Systems
15	None in the building.
16	
17	
18	Electrical – Telecommunications
19	None in the building.
20	
21	
22	Electrical – Fire Alarm System
23	None in the building.
24	
25	
26	Electrical – Lightning Protection
27	None on the building.
28	
29	
30	Physical Description Hazardous Materials
31	The Boathouse was not accessed or observed during the September 2009 Site Inspections by Landmark
32	Environmental.
33	
24	

1	Character Defining Features
2	Mass/Form. A simple utilitarian gable roof structure on the water's edge.
3 4 5	Exterior Materials. Wood board and batten siding painted white, exterior trim painted green and wood shingles at the roof.
6 7 8	Openings. One fixed four-lite sash painted green; one pair of doors at the launch and one entry door all constructed out of tongue and groove boards and painted green.
9 10 11	Interior Materials. Exposed wood framing at walls and roof and wood boards at the floor.
12 13	General Condition Assessment
14 15	In general, the Devils Island Boathouse is in fair condition due to the effects of the exposed location and the consistently moist condition on the wood doors, window and floor boards.
10 17 18	Mechanically, there are no systems in the Boathouse except a hand-operated metal winch.
19 20	Electrically, there are no systems in the Boathouse.
20 21 22 23	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.
24 25	Condition Assessment Architecture
26 27 28 29 30	<i>Architecture – Roof</i> <u><i>Condition:</i></u> Good This roof is in good condition. However, the tie offs on the roof should not be used for life safety anchors until they can be certified as meeting OSHA requirements.
31 32 33 34 35 36 37 28	Architecture – Exterior Walls <u>Condition:</u> Good to Fair The exterior walls are in good condition. The batten is split over the west window. Some battens and trim at the base of the wall are rotting due to moisture wicking from level top of base trim (refer to structural assessment for wall framing issues).
38 39 40 41 42 42	<i>Architecture – Window</i> <u><i>Condition: Fair</i></u> The window is in fair condition as the glazing compound is brittle and failing and the sill is weathered.
43 44 45 46 47 48	 Architecture – Exterior Doors <u>Condition:</u> Poor Entry Door. The base of the door panel is rotting away and the base of the exterior trim is rotted and split off. Overall, the door is in poor condition.

Boathouse

Boat Doors. This set of doors has badly peeling paint and the bases of the doors are weathering. These 1 2 doors are also in poor condition. 3 4 5 Architecture – Exterior Trim 6 Condition: Good 7 The trim is in good condition. 8 9 10 Architecture – Floor 11 Condition: Fair 12 The wood floor is in fair condition as the northeast section of flooring has some rotting planks. 13 14 15 Architecture – Stairs 16 *Condition:* Poor 17 Exterior Stairs to Entry Door. These stairs, while in good condition, do not meet code/functional needs 18 without a wider landing. 19 20 21 Architecture – Accessibility 22 Condition: Poor 23 This building is not accessible. 24 25 26 **Condition Assessment -- Structural** Structural – Foundation 27 Good and Unknown 28 Condition: 29 The visible portions of the wood timbers supporting the first floor at the water line are in good condition. 30 The balance of the floor framing appears to rest directly on the ground but was not accessible, thus its 31 condition is not known. 32 33 34 Structural – Floor Framing 35 Condition: Unknown The floor framing could not be observed, thus its condition is unknown. No obvious signs of distress or 36 37 damage were observed. The floor sheathing is in fair condition. The sheathing in the northeast corner was 38 deteriorated. 39 40 41 Structural – Roof Framing 42 Condition: Fair 43 The roof framing is in fair condition. There did not appear to be enough collar ties to keep the walls from 44 spreading out. 45 46 47 Structural – Wall Framing 48 Condition: Good 49 The walls are in good condition. 50 51

1	Structural – Lateral System
2	<u>Condition:</u> Fair
3	Lateral stability of the building is fair. The capacity of the exterior wood-framed walls is questionable.
4	
5	
6	Structural – Load Requirements
7	<u>Condition:</u> Good
8	The roof framing has adequate capacity to support the required loads. The floor framing could not be
9	observed, thus its condition is unknown.
10	
11	
12	Condition Assessment Mechanical
13	Mechanical – Plumbing Systems, HVAC, and Fire Suppression
14	Condition: N/A
15	
16	
17	Mechanical – Other
18	Condition: Poor
19	The cast iron hand operated gear winch at the north end of the building is in poor condition with
20	considerable rust damage.
21	
22	
23	Condition Assessment Electrical
24	N/A
25	
26	
27	Condition Assessment Hazardous Materials
28	The Boathouse was not accessed or observed during the September 2009 Site Inspections by Landmark
29	Environmental.
30	
31	
32	

1 Ultimate Treatment and Use

The Boathouse was originally built in 1891 to provide access to the site for construction crews. It has
served as a boathouse and docking area since then, and has undergone many restorations and repairs due to
the severe weather conditions that characterize its location.

- 6 Currently, the Boathouse's water entrance is blocked due to rocks in the way of the ramp. It is used by the 7 NPS for storage. The proposed use for the Boathouse is to preserve its historic character and maintain its 8 current use as a storage facility.
- 9

5

- 10 Preservation is the recommended treatment for the building.
- 11 12

13 **Requirements for Treatment**

14 Compliance requirements for treatment currently include laws, regulations, and standards as outlined by the 15 NPS and listed in Volume I, Administrative Data section of this report.

16

17 The recommended treatments are tailored to the Preferred Alternative as the outcome of the Value

18 Analysis/CBA for the project. As individual buildings are rehabilitated, specific alternatives will present

19 themselves during design and construction. The following section is a discipline-by-discipline, component-

20 by-component description of the treatments proposed for the preservation (stabilization) of the building.

21 Refer to Volume I, Chapter 2: Methodology for the priority rating definitions.

22 23

24 Treatment Recommendations -- Architecture

- 25 Architecture – Roof 26 Priority: Low 27 Verify/provide proper blocking for roof tie offs. Scrape, sand and repaint fascia, soffit and frieze board. 28 29 30 Architecture – Exterior Walls 31 Priority: Low 32 Coordinate exterior wall repair with foundation and wall framing work. Once walls are stabilized, repair 33 damaged boards and battens. Scrape, sand and repaint. 34 35 Architecture – Window 36 37 Priority: Moderate 38 Epoxy stabilize the sill. Remove the glazing compound and replace. Scrape, sand and paint. 39 40 41 Architecture – Exterior Doors 42 Moderate Priority: 43 Epoxy stabilize the bases of the doors. Scrape, sand and paint. 44 45 46 Architecture – Exterior Trim 47 Priority: Low 48 Scrape, sand and paint.
- 48 Scrape, sand and 49

1	Architecture – Wall Finish
2	<u>Priority:</u> Low
3	No recommendations at this time other than the wall framing mitigation.
4	
5	
6	Architecture – Ceiling Finish
7	Priority: Low
8	No recommendations at this time.
9	
10	
11	Architecture – Interior Trim
12	Priority: Low
12	No recommendations at this time
13	
14	
15	Auchitecture Eleca
10	Architecture – Floor
1/	Priority: Low Devlage retting floor plants in hind
18	Replace rouing floor planks in-kind.
19	
20	
21	Architecture – Stairs
22	<u>Priority:</u> Low
23	Excavate a code compliant landing and build a new wood stair of treated lumber.
24	
25	
26	Architecture – Accessibility
27	<u>Priority:</u> Low
28	Provide program access through interpretive exhibits and waysides at the Visitor Center.
29	
30	
31	Treatment Recommendations Structural
32	Structural – Foundation
33	Priority: Low
34	The foundation of the Boathouse should be replaced with construction that will meet IBC and NPS
35	requirements
36	requirements.
37	
38	Structural – Floor Framina
30	Driarity Low
<i>4</i> 0	<u>The floor framing of the Bosthouse should be investigated further and if needed replaced with construction</u>
40	that will meet IEBC and NPS requirements. The deteriorated floor sheathing should be replaced
41	that will meet hebe and NFS requirements. The deteriorated noor sheatining should be replaced.
42	
43 11	Structural Poof Engine
44 15	Siruciurai – Kooj Framing Deienieu
43 46	<u><i>rriorily:</i></u> LOW
40	The root maining of the Boathouse should be investigated further and if needed, upgraded to meet IEBC
4/	and INPS requirements.
48	
49	

1	Structural – Wall Framing
2	<u>Priority:</u> Low
3	The wall framing of the Boathouse should be investigated further and if needed, replaced with construction
4	that will meet IBC and NPS requirements.
5	
6	
7	Structural – Lateral System
8	<u>Priority:</u> Low
9	Lateral load resisting system of the building should be investigated further and if needed, replaced with
10	construction that will meet IBC and NPS requirements.
11	
12	
13	Treatment Recommendations Mechanical
14	Mechanical – Plumbing Systems, HVAC, and Fire Suppression
15	<u>Priority:</u> N/A
16	
17	
18	Mechanical – Other
19	<u>Priority:</u> Low
20	No recommendations at this time.
21	
22	
23	Treatment Recommendations Electrical
24	N/A
25	
26	
27	Treatment Recommendations Hazardous Materials
28	The Boathouse was not accessed or observed during the September 2009 Site Inspections by Landmark
29	Environmental.
30	
31	

1 Alternatives for Treatment

2 Reconsider altering the stair/landing due to preservation/stabilization only of this structure.

3 4

5 Assessment of Effects for Recommended Treatments

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

- 7 Compliance:
- 8

Recommended Treatment	Potential Effects	Mitigating Measures	Beneficial Effects
1. Installation of a new	A new foundation could	A new foundation will	- Improves safety for
foundation	affect the relationship to	need to be evaluated for its	visitors and staff
	grade and water level. A	benefit and implemented	- New foundation will aid
	new foundation would	sensitively to minimize	in the preservation of the
	require removal of	damage to the resource	structure
	existing base materials.	and its environment.	
	-	Archeological monitoring	
		with the excavations will	
		be required. A foundation	
		design, which, when	
		completed, has the	
		elevations of the sills,	
		thresholds, etc. to match	
		existing should be	
		provided.	

1 Boathouse Photographs, 2009



Volume IV – Devils Island 100% DRAFT March 2011 DI-BH-01: Approach from the west, 2009 (Source: A&A IMGP2944)











Apostle Islands National Lakeshore CLR/HSR

Boathouse



DI-BH-07: Stone retaining wall, looking northeast (Source: A&A DSC01076)



4 5

DI-BH-08: North elevation trim and roof detail (Source: A&A IMGP2951)







5 DI-BH-10: Entry door stair detail (Source: A&A DSC01062)

Boathouse







DI-BH-12: Entry door and hoisting mechanism, north elevation (Source: A&A DSC01053)







5 DI-BH-14: Boathouse door, interior (Source: A&A DSC01046)



1

GLOSSARY OF TERMS

2	PRIMARY TREATMENT APPROACH – PRESERVATION
3	Preservation standards include measures necessary to sustain the existing form, integrity, and materials of a
4	historic property. Work, including preliminary measures to protect and stabilize the property, generally
5	focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive
6	replacement and new construction. Preservation requires the retention of the greatest amount of historic
7	fabric, including the landscape's historic form, features, and details as they have evolved over time.
8	Limited and sensitive upgrading of mechanical, electrical and plumbing systems and other code-required
9	work is permitted.
10	•
11	
12	HOW TERMINOLOGY IS USED IN THE PRESERVATION APPROACH
13	
14	Maintain – are those standard maintenance practices that are necessary to retain the features of a property
15	as a contributing resource. Maintenance activities are usually not classified as repair, however minor repair
16	such as replacement of posts or railings or segments of paving are included. Limited and sensitive
17	upgrading of building systems (mechanical, electrical, plumbing) and other code related work is
18	appropriate.
19	
20	Plant – the removal and replanting of landscape plantings and vegetation as part of maintenance activities
21	
22	Protect – short term and minimal measures used to stabilize and protect features, such as fencing around
23	landscape features
24	
25	Relocate – the removal and resetting of noncontributing features
26	
27	Remove – the removal of nonhistoric features
28	
29	Repair – features, components of features and materials that require additional work. These may include
30	declining building features (e.g., roofing, foundation, mechanical systems) structures, small-scale features
31	(e.g., repair of a railing) or landscape plantings (e.g., repair mass planting by adding infill plantings).
32	Features that are repaired will match the old in design, color, texture, and if possible, material. Distinctive
33	features that are repaired will match the old in design, color, texture, and if possible, material.
34	
35	Retain – are those actions that are necessary to allow for a feature (contributing or noncontributing) to
36	remain in place in its contributing current configuration and condition.
37	
38	Stabilize – immediate measures (more than standard maintenance practices) are needed to prevent
39	deterioration, failure, or loss of features.
40	
41	
42	PRIMARY TREATMENT APPROACH – REHABILITATION
43	Renabilitation in intended to return a property to a state of utility, through repair or alteration, which makes
44	possible an efficient contemporary use while preserving those portions and features of the property which
43 16	are significant to its historic, architectural, and cultural values. Kenabilitation allows for repairs, alterations,
40 47	the portions or features which convey the historical cultural or exclutional values are property as long as
4/ 18	and sensitive ungrading of mechanical electrical and plumbing systems and other code required work is
40 40	and sensitive upgrading of mechanical, electrical and plumoing systems and other code-required work is
49	permuea.

1 2	HOW TERMINOLOGY IS USED IN THE REHABILITATION APPROACH
3 4	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
5 6 7 8	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.
9 10	Plant – the removal and replanting of landscape plantings and vegetation as part of maintenance activities or the restoration of missing features.
11	
12 13 14	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.
15 16 17	Relocate – remove and reset noncontributing features
18 19	Remove – removal of nonhistoric features
20	Repair – features, components of features and materials that require additional work. These may include
21	declining building features (e.g., roofing, foundation, mechanical systems) structures, small-scale features
22	(e.g., repair of a railing) or landscape plantings (e.g., repair mass planting by adding infill plantings).
23	Features that are repaired will match the old in design, color, texture, and if possible, material. Distinctive
24 25	features that are repaired will match the old in design, color, texture, and if possible, material.
26	Restore – are those measures necessary to depict a feature or area as it occurred historically. Restoration
27	may include repair of a feature so that it appears as it did historically or it may include replacement of
28	missing features or qualities.
29	
30	Retain – are those actions that are necessary to allow for a feature (contributing or noncontributing) to
31	remain in place in its contributing current configuration and condition.
32 33	Stabilize immediate more extensive measures (more than standard maintenance practices) are needed to
34	prevent deterioration failure or loss of features
35	prevent deterioration, fundre, or foss of federles.
36	
37	PRIMARY TREATMENT APPROACH – RESTORATION
38	Restoration standards allow for the accurate depiction of a property as it appeared at a particular time in its
39	history by means of the removal of features from other periods in its history and reconstruction of missing
40	features from the period of significance. The limited and sensitive upgrading of systems (mechanical,
41	electrical, plumbing) and other code related work is appropriate.
42	
43	
44	HOW TERMINOLOGY IS USED IN THE RESTORATION APPROACH
45	
46	Maintain – are those standard maintenance practices that are necessary to retain the features of a property
47 18	as a contributing resource. Maintenance activities are usually not classified as repair, nowever minor repair such as replacement of posts or railings or segments of paying are included. Limited and consistive
40 40	ungrading of huilding systems (mechanical electrical plumbing) and other code related work is
	appropriate
51	appropriate.

Plant – the removal and replanting of landscape plantings and vegetation as part of maintenance activities 1 2 or the restoration of missing features

- 4 **Relocate** – remove and reset noncontributing features
- 6 **Remove** – removal of nonhistoric features

8 **Reestablish** – are those measures necessary to depict a landscape feature as it occurred historically.

9 Reestablishment may include the replacement of missing landscape features such as views, planting 10 patterns, spatial relationships, or small scale features.

11

17

3

5

7

12 **Repair** – features, components of features and materials that require additional work. These may include 13 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). 14 Features that are repaired will match the old in design, color, texture, and if possible, material. Distinctive 15 features that are repaired will match the old in design, color, texture, and if possible, material. 16

- 18 **Restore** – are those measures necessary to depict a feature or area as it occurred historically. Restoration 19 may include repair of a feature so that it appears as it did historically or it may include replacement of 20 missing features or qualities. 21
- 22 **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. 23

24

- 25 Stabilize - immediate, more extensive measures (more than standard maintenance practices) are needed to 26 prevent deterioration, failure, or loss of features.
- 27 28

32

29 CONDITION ASSESSMENT DESCRIPTION LEVELS

- 30 Feature Condition Definitions
- 31 (Note: These terms are also applied to the overall structure/building.)
- 33 The feature is intact, structurally sound and performing its intended purpose. The feature GOOD 34 needs no repair or rehabilitation, but only routine or preventive maintenance.
- 35 FAIR The feature is in fair condition if either of the following conditions is present: 36 37 There are early signs of wear, failure or deterioration though the feature is generally structurally sound and performing its intended purpose - or -38 39 There is failure of a portion of the feature. 40
- 41 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 – 42 43
 - 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.
- 47 **UNKNOWN** Not enough information is available to make an evaluation.
- 48 49

44

45 46

50 **RATINGS OF TREATMENT SEVERITY**

An impact is a detectable result of an agent or series of agents having a negative effect on the significant 51

characteristics or integrity of a structure and for which some form of mitigation or preventative action is 52

GLOSSARY OF TERMS

possible. The assessment should include only those impacts likely to affect the structure within the next
 five years.
 3

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.

7 8 9	SEVERE	 The structure/feature will be significantly damaged or irretrievably lost if action is not taken within two (2) years. There is an immediate and severe threat to visitor or staff safety. 	
10 11 12 13 14	MODERATE	 The structure/feature will be significantly damaged or irretrievably lost if action is not taken within five (5) years. The situation caused y the impact is potentially threatening to visitor or staff safety. 	
15 16 17 18	LOW	 The continuing effect of the impact is known and will not result in significant damage to the structure/feature. The impact and its effects are not a direct threat to visitor or staff safety. 	
19 20 21	UNKNOWN	Not enough information is available to make an evaluation.	
22 23 24	DEFINITIONS OF	TERMS	
25 25	A		
26 27 28	AAS: Atomic Absorp	ntion Spectroscopy	
29 30	<i>AC:</i> 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.		
31 32 32	ACM: Asbestos Cont	aining Material	
33 34 35 36 37 38 39 40 41 42 43 44 45	<i>Accessibility:</i> 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).		
46 47	AES-ICP: Atomic Emission Spectroscopy – Inductively Coupled Plasma		
48 49	AIHA: American Ind	ustrial Hygiene Association	
50 51	Air Terminal: A rod	that extends above a surface to attract lightning strikes.	
52	AL: Action Level		

<u>B</u>
Beam : a structural member, usually horizontal, with a main function to carry loads cross-ways to its ongitudinal 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.
<u>C</u>
<i>Cantilever</i> : refers to the part of a member that extends freely over a beam or wall, which is not supported at ts end.
<i>Cast Iron</i> : 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.
<i>Column</i> : a main vertical member that carries axial loads from beams or girders to the foundation parallel to ts longitudinal axis.
<u>D</u>
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
$\underline{\mathbf{E}}$
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.
FP4. Environmental Protection Agency

1	<u>F</u>
2 3 4	Flue Vent: A duct or pipe conveying combustion by-products from a heater or furnace.
5	Fluorescent: A source of light that emits light radiation at longer wavelengths and lower energy.
7 8 9	<i>Footing</i> : 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.
10	Foundation: supports a building or structure.
12	FRP: Fiberglass reinforced plastic
13 14 15 16	Full Sawn (FS): Lumber cut, in the rough, to its full nominal size.
10 17 18	<u>G</u>
19 20	Gable: located above the elevation of the eave line of a double-sloped roof.
20 21 22	Galvanized Steel: Steel coated with zinc carbonate to resist corrosion.
22 23 24	GPM: Gallon per minute; a standard unit of volumetric liquid flow rate.
24 25 26	<i>Grade</i> : the ground elevation of the soil.
20 27 28	Gravity Vent: Openings in a roof intended to vent hot air by the action of convection.
20 29 20	Gray Water: Wastewater generated from domestic washing activities and not containing human waste.
30 31 32	GRO: Gasoline Range Organics
33 34 35	H
35 36 37	Header: a member that carries joists, rafters or beams and is placed between other joists, rafters or beams.
38 30	<i>Hip Roof:</i> a roof sloping from all four sides of a building.
40 41	HUD: Housing and Urban Development
42 43	HVAC: Heating, Ventilation, and Air Conditioning.
44 45 46	Ī
40 47 48	IAQ: Indoor Air Quality
40 49 50	IEUBK: Integrated Exposure Uptake Biokinetic
51 52	<i>Incandescent:</i> A source of light that works by incandescence, or works by a heat-driven light emission through black-body radiation.

In	<i>verter:</i> A device that converts electrical direct current (DC) to electrical alternating current (AC).
<u>J</u>	
_	
Jo	ist: a horizontal structural load-carrying member which supports floors and ceilings.
<u>K</u>	
kV in	'A: Kilovolt-ampere equal to 1,000 volt-amperes. kVA is a unit to express the apparent power consuman electrical circuit or electrical device.
kИ lar	<i>V</i> : Kilowatt equal to 1,000 watts. A kilowatt is typically used to express the output power consumption ge devices or electrical systems.
<u>L</u>	
LE	3P: Lead-Based Paint
LC	CP: Lead-Containing Paint
LC	CS: Lead-Contaminated Soils
Le sep	<i>ach Field:</i> A drain field used to remove contaminants and impurities from liquid that emerges from a ptic tank.
<i>LE</i> bri	<i>D</i> : Light emitting diode; a semiconductor light source that can emit light in various colors and ghtness.
Li	<i>ve Load</i> : nonpermanent loads on a structure created by the use of the structure.
Lo	ad: an outside force that affects the structure or its members.
Lo	uver: An opening with horizontal slats angled to allow passage of air while keeping out rain and snow
M	
M	g/kg: Milligrams per Kilogram
<u>N</u>	
N	EC: National Electric Code.
N	ESHAP: National Emission Standards for Hazardous Air Pollutants
No	onpotable Water: Water that has not been approved for safe human consumption.
N	<i>VLAP:</i> National Voluntary Laboratory Accreditation Program

1	$\underline{\mathbf{O}}$
2 3	OSHA: Occupational Safety and Health Administration
4 5 6 7	Overcurrent Protection: A fuse, circuit breaker or relay that will open the electrical circuit when the downstream electrical current exceeds the stated current rating.
8 9 10	<u>P</u>
10 11 12	Passive Ventilation: Ventilation of a building without the use of a fan or other mechanical system.
12 13 14	<i>Pitch</i> : the slope of a member defined as the ratio of the total rise to the total run.
14 15 16	PLM: Polarized Light Microscopy
10 17 18	PV: Photovoltaic; An array of solar modules or cells that collect solar energy and convert the energy into direct current electricity.
19 20 21 22	PVC: Polyvinyl Chloride; A biologically and chemically resistant plastic widely used for household sewage pipe.
23 24 25	<u>R</u>
26 27	<i>Rafter</i> : a sloped structural load-carrying member which supports the roof.
28 29	RBM: Regulated/Hazardous Material
30 31	<i>Reaction</i> : the force or moment developed at the points of a support.
32 32	RLM: Industrial stem mounted reflector.
33 34 35 26	<i>Romex:</i> Wiring with rubber insulated conductors in an overall sheath of braided cotton fiber.
30 37 38	<u>S</u>
39 40	Seismic Load: loads produced during the seismic movements of an earthquake.
40 41 42 43	<i>Septic Tank:</i> A sewage tank containing anaerobic bacteria which decomposed waste discharged into the tank.
44 45 46	<i>Shear</i> : forces resulting in two touching parts of a material to slide in opposite directions parallel to their plane of contact.
47 48	Snow Load: loads produced from the accumulation of snow.
49 50	<i>Span</i> : the distance between supports.
51 52	<i>Step-down Transformer:</i> A device that converts a high voltage down to a lower voltage through a series of winding coils.

1 2 3	<i>Structural Steel</i> : an iron alloy with a carbon content of 0.16% to 0.29%. Steel is malleable, and easily welded.
5 4 5	Strut: a structural brace that resists axial forces.
6 7	<i>Stud</i> : a vertical wall member used to construct partitions and walls.
8 9 10	<u>T</u>
10 11 12	<i>Thermal Expansion Tank:</i> A tank used in a closed water heating system to absorb excess water pressure caused by thermal expansion.
13 14	TSI: Thermal System Insulation
15 16 17	Turbine Vent: Vents utilizing rotating wind vanes to create air flow.
18 19 20	<u>V</u>
20 21 22	<i>Vent Stack:</i> A vertical pipe proving ventilation.
23 24 25	W
25 26 27	WAC: Wisconsin Administrative Code
28 29	WDNR: Wisconsin Department of Natural Resources
30 31 32	<i>Wrought Iron</i> : an iron alloy with very low carbon content, in comparison to steel. Wrought iron is tough, malleable, ductile, and easily welded.
33 34 35	X
36 37 28	<i>XRF:</i> X-ray fluorescence analyzer
30 39 40	Other
41 42	<i>30 μg/m3:</i> 30 micrograms per cubic meter
43 44	<i>µg/SF</i> : Micrograms of Lead Dust per Square Foot of Floor Space
45 46	<i>Ix:</i> Piece of dimensional lumber 1" (nominal) / ³ / ₄ " (actual) thick

GLOSSARY OF TERMS

1 APPENDIX A: MATRIX OF TREATMENT ALTERNATIVE

APPENDIX A
Landscape	Accessibility	HazMat	Electrical	Mechanical	Structural	Architecture	Proposed Use of Building	Existing Conditions Site Pla	The second
 Obar reas: between Keepers Quarters and Tower. Nanitain as low trush weres to the light station hong storeline to open weres to the light station hong storeline to Maintain as low Voush Maintain as low Voush Tower and Keepers Quarters. Maintain as low bush bush and clearing south of Light Tower 5. Maintain allawn areas 6. Clear tress along tram tack 6. Clear tress along tram tack 6. Clear tress to bush 30' from Tramway Engine Building 	Program access through interpretive wayside exhibits. Septial Organization/Views and Visitas/ Clearing/	Soil characterization (lead): feld screen of tank storage area for hydrocarbon characterization	Provide additoral PV power to facilitate running of new ventilation equipment. Engage an LPI (Lightning protection institute) cartified inspection of the Lightning protection system and provide findings and recommendations in accordance with LPI- 175.	Increase ventilation for moisture control.	Investigate structural significance of concrete (oundation cracking	Increase ventilation; Repair/replace the lantem glazing and glass; repair/replace troken/missing multides; repairt setter/or complete; repair (operality or windows; investigate repairt); no esaft with a socure to lower; investigate repaird; no esaft with a socure to lower; for a pairt, threstigate firming visitor access to Fresene lars and enhancing visitor viewing of lens from the exterior.	Rehabilitate for guided visitor use.	n - (or reference only Tower	we w
 Maintain (soopath and corridor to Boat House (10 with) Maintain cleared footpaths at Light Station Maintain trant tracks (envoir vegetation and loodress with grave) Maintain concrete walks (leveling: weed control) 	Program access through interpretive wayside exhibits.	Soil characterization (lead); asbestos sampling of materials to be preserved/stabilized; remove lead paint	Provide new power wing, receptacles and lighting for visitor areas and staff housing areas and for new prefigeration and store. Provide required file safety systems including single station file alarm and CO sensors. Leave eaking the alarm system in place to maintain historic context. Verify that eaking PP system including invetor and power distribution system is suitably sized and fully operational, and eaked system to building expirent. 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.	Increase venitation for moisture control. Clean, inspect, and test sever/septic system. Perform repairs as needed for operational septic system. Replace or refurbish historic radiators. Remove propane piping to refrigerator and store.	Repair first floor framing at cut beam, repair porch joists and decking, properly support first floor joists at windows and cistem, repair damaged first floor joists	Replace south entry roof shingles: install guiter and downspout system (7): (repair windows and doors and repair, add handrail to proch; ney tabsement hatch: repair interior doors; retain and repair modern and historic wall, ceiling and floor finishes.	Rehabilitate for guided visitor use 1st floor; staff housing 2nd floor and 1st kitchen/bath.	Keepers Quarters	Bandaria
 New concrete corner markers showing location of non-exant Assistant Keepers Quarters Maintain pump house Maintain punch touse Maintain punch touse New NPS accessible privy (location TBD by NPS) Next NPS accessible privy (location TBD by NPS) Next NPS accessible privy (location TBD by NPS) Baat Dock Area Taspair boat dock (decking/structure) Maintain store wall (ponting) Maintain store wall (ponting) Maintain store wall (contistructure) Maintain store wall (contistructure) Maintain store wall (contistructure) 	Program access through interpretive wayside exhibits.	Soil characterization (lead); asbestos sampling of materials to be preserved/stabilized; remove/stabilize lead paint	Provide additional PV power to facilitate running of new worklation equipment. Replace broken or missing lighting fixtures and receptaces with period thrutes and receptacles. If requires, provide building power distribution and wring and connect building to see PV system. Engage an LP (Lighting) Protection Institute) protection system and provide fundings and recommendations in accordance with LP+175.	Increase ventation for moisture control Clean historic radiators as interpretative props. Remove or reinstall unatatened plumbing flutures. Cap or remove open plumbing piping.	Repair porch joists and decking, properly support first floor joists at windows, repair damaged first floor joists, repairs stair posts in basement, repoint cracked masonry	Ad guter and downsput to porch: repoint masonry (minimal): repair porch floor; repaint wal shingles and tim repair windows and doors and repaint; replace insising interior tim, doors and flatures in kind; patch and repair damaged plaster at wals and calling; terbain word the casework and wood flooring; repair resilient flooring.	Rehabilitate for self guided visitor use.	Assistant Keeners Quarters	Provide the second seco
Stabilize denick footings (prevent from Iding nu whet) Repair stone tam teminal (remove vegetation, point masonny) Remove facting at Fog Signal Building Maintain Beacon Maintain Beacon Maintain Beacon Maintain telepacen and footings south of Oil House 1 Maintain veltagede (paint) Maintain veltagede (paint)	Program access through interpretive wayside exhibits.	Sol characterization (lead); abbestos sampling of materials to be preserved/stabilized; abatement of damaged abbestos siding; remove lead paint (interior of structure)	Replace broken lighting fixtures and rehabilitate wring systems.	No action at this time.	Replace south addition, strengthen ceiling joists and root rafters of west addition	Install missing eave closure timr, repair framing at south sted: repoint chimrey and sposed brick foundation; repair chipped siding singles: repair windows and doal and repairt repaint extent tim, repair interior doors, wals and cealing finishes; paint interior complete; and handrallo stairt, rask the original og signal equipment interinded to be operational.	Rehabilitate for self guided visitor use.	Foo Sional Building	
1. Maintain landscape plantings at Oil House 2 2. Maintain lawr obaring areas 3. Maintain llac west of Keepers Quarters	Program access through interpretive wayside exhibits.	Remove/stabilize lead paint	No action at this time.	We action at this time.	No action at this time	Repair door. Repoint masony.	Preserve and maintain current use as NPS storage.	Oli House #1	General Description: This treatment alternative proposes reha of the archipelago. This treatment will re significance of the system. Additions the convey the historical, cultural, or architec Period of Significance: 1892 - 1978 Please refer to the proposed treatments
	Program access through interpretive wayside exhibits.	Remove/ablize lead paint	No action at this time.	No action at this time.	No action at this time	Provide naw roof shingles to match existing. Repaint door, Install, bety-panel system(operable) to allow visitors to see Coast Guard era equipment but maintain security and weather tight closure.	Preserve and add a plexi panel at door for visitor visual access.	OI House #2	bilitating each island's cultural landscape to ch island (and each light station) conveys sive weal this continuum by restoring missing his trural values are preserved.
	Program	Asbestos remove/s	No action	No action	Monitor s	Repaint s cap; repa hardware	Preserve access.	Tramwa	best p se of th

Program access through interpretive wayside exhibits.	access through interpretive wayside exhibits.
Remove/stabilize lead paint	samping of materials to be preserved/stabilized; abilize lead paint
No action at this time.	at this time.
No action at this time.	at this time.
Construct a concrete foundation, repair and strengthen first floor joists and deck, strengthen or reframe walls, strengthen or reframe roof	ress crack at southeast.
Preserve and maintain current use as NPS storage. Address roofing and siding as needed after structural mitigation is complete, repair doors, window and sit repaint exterior complete.	and maintain current use as vacant, no visitor offa and overhangs: repoint chimney and repair r sills and glazing at windows: replace missing at door and repaint.
Boathouse	Engine Building
history that characterizes the Apostle heriods of development in the navigation others to convey the full historical d as long as portions or features that	rtray the continuum of navigational haracteristics related to particular p atures, and by repairing or attering slight stations or islands are allowe
A NAVIGATIONAL CONTINUU	
DEVILS ISLANI ALTERNATIVE: REHABILITATION	PREFERRED

APPENDIX B: SUMMARY OF HAZARDOUS MATERIAL FINDINGS

2

APPENDIX B

LIGHT STATION TOWER 2

1

Building Number	LCS ID 017081
Building Name	Devils Island Light Station Tower
>1% Asbestos Confirmed	
Asbestos Assumed ³⁶	Adhesives, Insulation, and Caulking
Detectable Lead in Paint Confirmed	
Detectable Lead in Paint Assumed	*
Lead Dust on Floors >40 μ g/SF Confirmed ³⁷	
Lead Dust on Floors >40 μ g/SF Assumed ²	Yes
Lead Dust on Floors <40 μ g/SF Confirmed ²	
Visual Mold	
Lead in Soils $>50 \text{ mg/kg}^{38}$	Roof Dripline and 5'-0" Out from Roof Dripline
Lead in Soils <50 mg/kg	
Lead in Soils Assumed	

3 4

< = Less Than

³⁷ 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. ³⁸ In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment

< = Greater Than

 $[\]mu$ g/SF = Micrograms of Lead Dust per Square Foot of Floor Space

mg/kg = Milligrams of Lead per Kilogram of Soil

³⁶ Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment

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.

^{*} Apostle Islands National Lakeshore Staff reported that abatement of lead containing paint on the Devils Island Tower occurred in 2003. Testing to confirm the absence of lead paint was not conducted during the September 15, 2009 site assessment.

APPENDIX B

1 KEEPERS QUARTERS

2

Building Number	LCS ID 017082
Building Name	Devils Island Keepers Quarters
>1% Asbestos Confirmed	Floor Tile
Asbestos Assumed ³⁹	Plaster, Brick/Block Filler, Drywall, Adhesives, Insulation, Lay-in Ceiling Panels, Tar and Tar Paper and Caulking
Detectable Lead in Paint Confirmed	Walls, Ceilings, Doors, Door Trims, Window Trims and Window Sashes
Detectable Lead in Paint Assumed	Interior Painted Surfaces and Exterior Painted Surfaces
Lead Dust on Floors >40 μ g/SF Confirmed ⁴⁰	
Lead Dust on Floors >40 μ g/SF Assumed ²	
Lead Dust on Floors <40 μ g/SF Confirmed ²	Floors
Visual Mold	
Lead in Soils >50 mg/kg ⁴¹	
Lead in Soils <50 mg/kg	
Lead in Soils Assumed	Yes

< = Greater Than

< = Less Than

 $[\]mu$ g/SF = Micrograms of Lead Dust per Square Foot of Floor Space

mg/kg = Milligrams of Lead per Kilogram of Soil

³⁹ Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment

 ⁴⁰ 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.
 ⁴¹ In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment

⁴¹ 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.

1 2

ASSISTANT KEEPERS QUARTERS

Building Number	LCS ID 017083		
Building Name	Devils Island Assistant Keepers Quarters		
>1% Asbestos Confirmed			
Asbestos Assumed ⁴²	Plaster, Brick/Block Filler, Drywall, Adhesives, Insulation, Sheet Flooring, Tar and Tar Paper and Caulking		
Detectable Lead in Paint Confirmed			
Detectable Lead in Paint Assumed	Interior Painted Surfaces and Exterior Painted Surfaces		
Lead Dust on Floors >40 μ g/SF Confirmed ⁴³			
Lead Dust on Floors >40 μ g/SF Assumed ²	Yes		
Lead Dust on Floors <40 μ g/SF Confirmed ²			
Visual Mold	Yes		
Lead in Soils >50 mg/kg ⁴⁴			
Lead in Soils <50 mg/kg			
Lead in Soils Assumed	Yes		

3 4

< = Less Than

< = Greater Than

 $[\]mu$ g/SF = Micrograms of Lead Dust per Square Foot of Floor Space

mg/kg = Milligrams of Lead per Kilogram of Soil

⁴² Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment

 ⁴³ 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.
 ⁴⁴ In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment

⁴⁴ 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 B

1 FOG SIGNAL BUILDING

2

Building Number	LCS ID 017084		
Building Name	Devils Island Fog Signal Building		
>1% Asbestos Confirmed			
Asbestos Assumed ⁴⁵	Transite, Caulk and Adhesives		
Detectable Lead in Paint Confirmed			
Detectable Lead in Paint Assumed	Interior Painted Surfaces and Exterior Painted Surfaces		
Lead Dust on Floors >40 μ g/SF Confirmed ⁴⁶			
Lead Dust on Floors >40 μ g/SF Assumed ²	Yes		
Lead Dust on Floors <40 µg/SF Confirmed ²			
Visual Mold			
Lead in Soils >50 mg/kg ⁴⁷			
Lead in Soils <50 mg/kg			
Lead in Soils Assumed	Yes		

< = Greater Than

< = Less Than

 $[\]mu$ g/SF = Micrograms of Lead Dust per Square Foot of Floor Space

mg/kg = Milligrams of Lead per Kilogram of Soil

⁴⁵ Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment

 ⁴⁶ 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.
 ⁴⁷ In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment

⁴⁷ 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.

1 OIL HOUSE #1

2
1
_

Building Number
Building Name
>10/ Ashastas Confirmed

Building Name	Devils Island Oil House #1		
>1% Asbestos Confirmed			
Asbestos Assumed ⁴⁸			
Detectable Lead in Paint Confirmed			
Detectable Lead in Paint Assumed	Interior Painted Surfaces and Exterior Painted Surfaces		
Lead Dust on Floors >40 μ g/SF Confirmed ⁴⁹			
Lead Dust on Floors >40 μ g/SF Assumed ²	Yes		
Lead Dust on Floors <40 μ g/SF Confirmed ²			
Visual Mold			
Lead in Soils >50 mg/kg ⁵⁰			
Lead in Soils <50 mg/kg			
Lead in Soils Assumed	Yes		

LCS ID 017085

< = Greater Than

< = Less Than

 $[\]mu$ g/SF = Micrograms of Lead Dust per Square Foot of Floor Space

mg/kg = Milligrams of Lead per Kilogram of Soil

⁴⁸ Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment

 ⁴⁹ 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.
 ⁵⁰ In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment

⁵⁰ 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 B

OIL HOUSE #2

1 2

Building Number	LCS ID 017086		
Building Name	Devils Island Oil House #2		
>1% Asbestos Confirmed			
Asbestos Assumed ⁵¹			
Detectable Lead in Paint Confirmed			
Detectable Lead in Paint Assumed	Interior Painted Surfaces and Exterior Painted Surfaces		
Lead Dust on Floors >40 μ g/SF Confirmed ⁵²			
Lead Dust on Floors >40 μ g/SF Assumed ²	Yes		
Lead Dust on Floors <40 µg/SF Confirmed ²			
Visual Mold			
Lead in Soils >50 mg/kg ⁵³			
Lead in Soils <50 mg/kg			
Lead in Soils Assumed	Yes		

< = Greater Than

< = Less Than

 $[\]mu$ g/SF = Micrograms of Lead Dust per Square Foot of Floor Space

mg/kg = Milligrams of Lead per Kilogram of Soil

⁵¹ Materials listed are those identified or assumed to be present during the September 15, 2009 site assessment

 ⁵² 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.
 ⁵³ In accordance with NR720, WIS. Adm Code; 50 milligrams per kilogram, is the conservative acceptable residual containment

⁵³ 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, DEVILS ISLAND

2

APPENDIX C

1 2

DEVILS ISLAND ACM SAMPLE CHART

Sample #	Sample Date	API ID	Sample Location	Material Description	Laboratory Result
B-DIAKQ-WP1- 01	9/15/2009	25192	Assistant Keepers Quarters	White granular plaster w/ white paint	ND
B-DIAKQ- DW1-01	9/15/2009	25192	Assistant Keepers Quarters	White granular plaster w/ white paint	ND
B-DIAKQ-WT1- 01	9/15/2009	25192	Assistant Keepers Quarters	White/multi-colored paint and White plaster	ND
B-DIAKQ-SF1- 01	9/15/2009	25192	Assistant Keepers Quarters	Tan/multi-colored sheet vinyl and Tan fibrous woven backing	ND
B-DIFSB-FT1- 01	9/15/2009	25196	Fog Signal Building	Tan tile w/ yellow adhesive and Gray leveling compound	ND
B-DIKQ-FT1-01	9/15/2009	25191	Keepers Quarters	Black Tile	12% Chrysotile
B-DIKQ-FT2-01	9/15/2009	25191	Keepers Quarters-First floor bedroom	White tile and Yellow mastic	ND
B-DIKQ-FT3-01	9/15/2009	25191	Keepers Quarters- Kitchen	White tile and Amber mastic	ND
B-DIKQ-FT4-01	9/15/2009	25191	Keepers Quarters- Second Floor	Green tile and Yellow mastic	4% Chrysotile in Green tile
B-DIKQ-FT5-01	9/15/2009	25191	Keepers Quarters- Second Floor	Brown/tan tile and Black mastic	Trace Chrysotile in Black mastic, 7% chrysotile in Brown/tan tile
B-DIKQ-FT6-01	9/15/2009	25191	Keepers Quarters	Green sheet vinyl w/ black fibrous backing	ND
B-DIKQ-WT1- 01	9/15/2009	25191	Keepers Quarters-First floor bedroom	White/multi-colored paint and White plaster	ND

3 ND=None Detected

TR=Trace, <1% Visual Estimate

APPENDIX C

Sample ID	Sample Type	API ID	Sample Location	Sample Date	Sample Area (sq ft)	Lead (ug)	Reporting Limit (ug/sq ft)	Lead Concentration (ug/sq ft)
W-091509- DIKQ-01	Composite Wipe	25191	Keepers Quarters	9/15/2009	0.33	5	15	16

APPENDIX D: FABRIC ANALYSIS

1		Fabric . Devils Island	Analysis Light Set #1	
2		A postlo Island N	Light Set #1	
5 1		Apostic Island No	12 2000	
- -		October	12, 2007	
5	On Tuesday, October 6	2000 David Arbogast archited	tural conservator of Davenport Jowa r	acaivad a larga
0 7	box containing paint and	mortar samples from Elizabet	n Hallas, AIA, LEED AP. Senior Associ	ate of Andrews
8	& Anderson Architects, H	PC of Golden, Colorado. She is	in the process of preparing Historic Str	uctures Reports
9	for the historic lighthouse	e complexes of the Apostle Isla	inds National Lakeshore, headquartered	in Bayfield,
10	Wisconsin. As part of the	HSRs paint and mortar/plaste	r analysis is required in an attempt to as	certain historic
11	finishes, mortars, and pla	sters for the subject structures	The samples were divided into sets con	tained within
12	large manila mailing enve	elopes. The analysis follows th	e order in which the large envelopes hav	ve been
13	arranged. The fourth and	fifth sets which are contained	within this report were from the first and	1 second sets of
14	samples collected from the	ne complex at the Devils Island	Light. There were 27 samples in the fin	st of these two
15	sets (nos. 64 – 90), of wh	ich 24 were paint samples and	three (nos. 82, 84, and 85) were of plast	er and mortar.
16	The second set (nos. 91 –	119) contained 29 samples, o	f which 23 were paint samples and six (1	105. 100, 101,
17	102, 103, 104, and 106) v	vere of plaster and mortar.		
18				
19	During the preceding twe	enty or more years Mr. Arboga	st has performed paint analyses for vario	ous structures at
20	the Apostles Islands. Tho	se samples and his reports are	in the archives at the headquarters in Ba	lyfield and may
21	be examined in relation to	o the findings from this analys	IS.	
22	The first set of a sint source		Mandara Ostaban 12 and Transdara Ost	- h 12
23 24	utilizing the same presed	ples was visually examined on	Monday, October 12 and Tuesday, Octo)Der 13,
24 25	established with the first	three sets beginning with 64 s	nd ending with 90. The following result	s were obtained
25 26	from the analysis:	three sets, beginning with 04 a	nd chang with 90. The following result	s were obtailied
20 27	from the analysis.			
$\frac{2}{28}$				
29		Keeper's	Ouarters	
30		Sample 64	Munsell	
31		Dark gray	N 5.0/	
32		White	5Y 9/1	
33				
34	Sample 64 was collected	from the exterior handrail of t	he keeper's quarters. It retained only two) layers of paint
35	of which the older was w	hite.		
36				
37				
38		Keeper's	Quarters	
39		Sample 65	Munsell	
40		Dark green	2.5G 4/4	
41		Gray	5Y 7/1	
42		White	5 Y 9/1	
43 11	Sample 65 same from the	autorior window trim of the l	concr's quarters. Its enalysis revealed th	raa lawara of
44 45	naint with white being th	e oldest of the three. The subst	rate was extremely weathered wood	ice layers of
46	paint with white being the	e ordest of the three. The subst	rate was extremely weathered wood.	
47				
48		Keeper's	Quarters	
49		Sample 66	Munsell	
50		Dark green	2.5G 4/4	
51		Gray	5Y 7/1	
52		Gray	5Y 6/1	
53		White	5Y 9/1	

1	Gray	5Y 7/1
2	Gray	5Y 6/1
3	Charcoal	5Y 3/1
4	Gray	5Y 7/1
5		
6	Sample 66 was removed from the exterior doc	or trim of the keeper's quarters. It retained eight paint layers of
7	which the oldest was a standard gray color see	en in many other samples.
8		
9		
10]	Keeper's Quarters
11	Sample 67	Munsell
12	Dark green	n 2.5G 4/4
13	White	5Y 9/1
14	White	5Y 9/1
15	White	5Y 9/1
16	White	5Y 9/1
17	White	5Y 9/1
18	White	5Y 9/1
19	White	5Y 9/1
20	Black	N 1.0/
21	White	5Y 9/1
22	White	5Y 9/1
23	White	5Y 9/1
24	White	5Y 9/1
25	White	5Y 9/1
26	White	5Y 9/1
27	White	5Y 9/1
28	Charcoal	5Y 3/1
29	Charcoal	5Y 3/1
30	Charcoal	5Y 3/1
31	White	5Y 9/1
32		
33	Sample 67 was from the exterior vent trim of t	the keeper's quarters. Its analysis revealed an extremely large
34	number of fine, evenly applied paint layers of	which the oldest was white.
35		
36		
37]	Keeper's Quarters
38	Sample 68	Munsell
39	Yellow	2.5Y 8.5/6
40	Off-white	5Y 8.5/1
41	White	5Y 9/1
42	White	5Y 9/1
43	White	5Y 9/1
44	White	5Y 9/1
45	Dark grav-g	green 5GY 4/1
46	White	5Y 9/1
47	Dark grav-g	green 5GY 4/1
48	Light grav-s	green 5GY 8/1
49	Grav-green	5GY 7/1
50	White	5Y 9/1
51	Golden varr	nish
52	Golden varr	nish
53		

Sample 68 was found on the entry wall. Its quality was truly outstanding, with the upper set of white layers clearly demarcated by thin dirt layers. The large number of layers was also most impressive. Of greatest interest were the two golden varnish layers which appeared as remnants beneath the oldest white layer.

5		
6	Keeper's Q	Juarters
7	Sample 69	Munsell
8	White	5Y 9/1
9	White	5Y 9/1
10	White	5Y 9/1
11	White	5Y 9/1
12	White	5Y 9/1
13	White	5Y 9/1
14	White	5Y 9/1
15	White	5Y 9/1
16	White	5Y 9/1
17	Gray-green	5GY 6/1
18	Gray-green	5GY 6/1
19	White	5Y 9/1
20	Golden varnish	
21	Golden varnish	
22		

Sample 69 was collected from the entry door. Its oldest layers were comparable with those of its predecessor, sample 68, with remnants of a pair of golden varnish layers underneath a layer of white paint.

Keeper's Q	Juarters
Sample 70	Munsell
Peach	10YR 8/4
Peach	10YR 8/4
Peach	10YR 8/4
White	5Y 9/1
Tan	2.5Y 7/2
Tan	2.5Y 7/2
Tan	2.5Y 7/2

Sample 70 was collected from the kitchen wall. The oldest trio of tan layers was relatively coarse and thick and
 filled with microbubbles. They reacted with hydrochloric acid, giving clear indication that they were probably
 calcimine paint.

42	Keeper's (Quarters
43	Sample 71	Munsell
44	Gray	N 6.0/
45	White	5Y 9/1
46	White	5Y 9/1
47	White	5Y 9/1
48	White	5Y 9/1
49		

50 Sample 71 was from the exit wall. Its oldest set of four layers were similar to the tan layers of sample 70, being

51 relatively thick and coarse with a violent reaction with hydrochloric acid indicating in this case probable 52 whitewash.

1			
2		Keeper's Quarters	
3		Sample 72	Munsell
4		Yellow	2.5Y 8.5/6
5		White	5Y 9/1
6		White	5Y 9/1
7		White	5Y 9/1
8		White	5Y 9/1
9			
10	Sample 72 was removed from the	exit wall. It varied from its counter	erpart, sample 71 only in its most recent
11	layer which was yellow rather that	n gray. In this case the oldest four	layers matched the apparent whitewash of
12	sample 71.		5 11
13	1		
14			
15		Keeper's Quarters	
16		Sample 73	Munsell
17		White	5Y 9/1
18		Vellow	2 5V 8 5/6
19		White	5V 9/1
20		White	5V 0/1
20		White	51 9/1 5V 0/1
21		Light hlug	51 9/1 5D 8/2
22			JD 8/2
23	Samula 72 was taken from the off	ing wall/agiling Dangeth lawang of	Surplite and wellow maint was a set of three
24	Sample 73 was taken from the off	ice wan/cening. Beneath layers of	white and yenow paint was a set of three
25	apparent layers of whitewash with	a light blue calcimine layer at the	e bottom.
20			
27			
28		Keeper's Quarters	
29		Sample 74	Munsell
30		White	5Y 9/1
31		White	5Y 9/1
32		White	5Y 9/1
33		White	5Y 9/1
34		Dark gray-green	5GY 4/1
35		Gray-green	5GY 5/1
36		White	5Y 9/1
37		White	5Y 9/1
38		Gray	5Y 7/1
39		Light blue	5BG 8/2
40		White	5Y 9/1
41		Golden varnish	
42		Golden varnish	
43			
44	Sample 74 was collected from the	office trim/baseboard It was exc	ellent in its quality with crisp layers
45	delaminating from each other in n	hany cases. As was the case with s	amples 58 and 69 there were remnants of a
46	pair of golden varnish coats benea	th the oldest layer of white paint	amples so and sy affer were remains of a
47	puil of golden variable could bened	an the ordest rayer of white paint.	
48			
<u>40</u>		Keener's Auertars	
		Somple 75	Muncell
51		Dastal nink	2 5VD 0/2
51		Light blue	2.3 I 7/2 5BC 8/2
52 53		White	5V 0/1
55			J 1 7/ 1

White	5Y 9/1
Paper	

Sample 75 came from the first floor bedroom wall. Above a substrate of paper was a set of four paint layers with pastel pink being the most recent.

	Keeper's Quarters
Sample 76	Munsell
White	5Y 9/1
Paper	

Sample 76 was removed from the first floor bathroom wall/ceiling. Above a substrate of paper was a set of four calcimine layers with four off-white paint layers above it. There were also black spots on the paint layers, which may be mold or mildew.

25	Keeper's Qua	arters
26	Sample 77	Munsell
27	Pastel peach	10YR 9/2
28	White	5Y 9/1
29	White	5Y 9/1
30	Pastel peach	10YR 8/2
31	Dark gray-green	5GY 4/1
32	Gray-green	5GY 6/1
33	White	5Y 9/1
34	White	5Y 9/1
35	White	5Y 9/1
36	Golden varnish	
37	Golden varnish	
38		

Sample 77 was from the second floor hall door trim. The top layer of pastel peach was unusually shiny. Beneath a relatively large number of paint layers was a pair of golden varnish layers.

6

43	Keeper's Quarters		
44	Sample 78	Munsell	
45	Light green	5GY 7.5/2	
46	White	5Y 9/1	
47	White	5Y 9/1	
48	White	5Y 9/1	
49	White	5Y 9/1	
50	White	5Y 9/1	
51	White	5Y 9/1	
52	White	5Y 9/1	
53	White	5Y 9/1	

1		Paper		
2	Samula 76 was found on	the well of bedream #2. The base	laver of non-range datashed from the point la	
3	Sample /6 was found on	the wall of bedroom $\#2$. The base	layer of paper was detached from the paint la	yers
4	above it, of which the of	uest tour white layers were whitev	ash of calching paint.	
6				
7		Keener's Oi	arters	
8		Sample 79	Munsell	
9		White	N 9 5/	
10		Light green	5GY 7.5/2	
11		Paper		
12		1		
13	Sample 79 was taken fro	om the wall of bedroom #1 of the s	econd floor. There were two very thin paint la	yers
14	firmly bonded to the pap	er substrate.		
15				
16				
17		Keeper's Qu	larters	
18		Sample 80	Munsell	
19		Yellow	2.5Y 8.5/6	
20		Tan	2.5Y 7/4	
21		Light green	5GY 7.5/2	
22		Gray-green	5GY 6/1	
23	Comula 90 year collected	from the second floor closet. Den	anth form maint larrang was a stanly white subst	ata
24 25	Sample 80 was collected	I from the second floor closet. Ben	eath four paint layers was a stark white substr	ate
23 26	tested positively for lime	ck. This may have been the skill c	bat of plaster of multiple coals of whitewash.	11
20	tested positively for mild	content.		
28				
29		Keeper's Oi	arters	
30		Sample 81	Munsell	
31		Blue	5B 6/7	
32		White	5Y 9/1	
33		White	5Y 9/1	
34		White	5Y 9/1	
35		White	5Y 9/1	
36		Golden varnish		
37		Golden varnish		
38				
39	Sample 81 came from th	e first floor bedroom door of the k	eeper's quarters. The top layer was a thin laye	r of
40	bright blue paint beneath	which was four layers of white pa	aint. At the bottom was a uniform pair of gold	en
41	varnish layers.			
42				
43	G. 1.0 2			14
44	Sample 82 was the first of	of the plaster and mortar samples (of the set. It was analyzed on Tuesday, Octobe	er 14,
45	Atlantia Degion of the N	g procedure developed by E. Blain	e Cliver, Regional Historical Architect of the	North
40	keeper's quarters. It was	off white in color and consisted o	f small hits of plaster and a small amount of h	air
47	There was a nonmeasura	ble reaction with the hydrochloric	acid indicating a mixture of gypsum and san	an. das
49	opposed to lime and san	d The sand sieve analysis revealed	l relatively fine sand All of it passed the large	u us est
50	sieve and almost 11% na	issed all of the sieves	relation of the same. The of it pussed the large	50
51		losed an of the steves.		
52				
53				

	Mortar	Plaster/Stucco	Analysis Test Sl	ieet
Sample No	82			
Sample No.	<u> </u>	are Davile Islan	d Anostle Island	n NI
Location:	Second floor cl	oset plaster	a, Apostie Island	5 NL
Sample Descrir	tion: Off-white soft	miniscule reacti	on extremely fag	at filtering time
Sample Desemp		miniseure reacti	on, extremely las	
Test No. 1 – So	luble Fraction			
Data:				
1. 185.5	Container A weight	8. Y	es Hair or fiber	tvpe
2. 202.4	Container A and sample	9. 2.9	Fines and pa	per weight
3. 771.65	Barometric pressure	10. 2.8	Filter paper	weight
4. 23	Temperature	11. 19	8.5Sand and Con	tainer A weight
5. 0.00	Liters of water displace	d 12. 9.	9 cc. of sand	
6. Off-white	Filtrate color	13. 4	1.7 Weight of gra	duated cylinder and sand
7. Gray	Fines color	14. 28	8.7 Weight of gra	duated cylinder
			_ 0 0	2
Computations:				
15. 16.9	Starting weight of samp	le: No. 2 – No. 1		
16. 0.1	Weight of fines: No. 9 -	- No. 10		
17. 13.0	Weight of sand: No. 11	– No. 1		
1876154	Sand density: No. 12 div	ided by (No. 13 -	– No. 14)	
19. 6.9	Weight of soluble conte	nt: No. 15 – (No	. 16 + No. 17)	
20. 0.00	Mols. Of CO2: No. 5 x	No. 3. x 0.016 di	vided by (No. 4 -	+ 273.16 C.)
21. 0.00	Gram weight of CaCO3	: 100 x No. 20	•	,
22. 6.9	_Gram weight of Ca(OH)2: No. 19 – No.	21	
230932	_Mols. of Ca(OH)2: No.	22 divided by 74	ļ	
24. <u>6.9</u>	_Gram total weight of Ca	(OH)2: 74 x (No	o. 20 + No. 23)	
25. <u>0.00</u>	_Gram weight CO2: No.	20 x 44		
26. <u>4.10</u>	_Gram weight total possi	ble CO2: 44 x (N	No. 20 + No. 23)	
27	_%CO2 gain: No. 25 div	ided by No. 26		
Conclusions				
$\frac{1600}{28} = 1600$	Gram weight of sample		No 15 No 3	25
20. <u>10.90</u> 20. <u>10.90</u>	Fine narts/volume		No. 16 divided	 Lby No. 28
27. <u>0.37</u> 30 58.58	Sand narts/volume:		(No 17 divide	d by No. 28) y No. 18
30. <u> </u>			(No 24 divide	$d by No. 20) \times 10$
				u 0y 110. 20) A 1.1
Cement (if pres	ent)			
32	_Portland cement parts/v	olume:	(No. 16 divide	d by No. 28) x 0.78
33	Natural cement parts/vo	lume:	(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 – Sa	nd Sieve Analysis			
.	a	0		
Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
NO. 10	106.8	106.8	0.0	<u> </u>

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APPENDIX D 1 No. 30 102.5 99.3 3.2 25.00 2 No. 40 104 9 100 7 42 32.81 3 No. 50 96.2 93.2 3.0 23.44 4 Base 72.6 71.2 1.4 10.94 5 6 7 8 **Keeper's Quarters** 9 Sample 83 Munsell 10 2.5Y 8/5 Tan 11 12 Sample 83 continued the paint samples and was found on the basement stair wall of the keeper's guarters. 13 Beneath a layer of tan paint was a stark white substrate which was relatively thick. This may have been the 14 skim coat of plaster or multiple coats of whitewash. It tested positively for lime content. 15 16 17 Sample 84 was a mortar sample taken from the masonry of the keeper's guarters. Its analysis revealed a 18 composition of approximately two parts of sand to each part of lime by volume. Its sand sieve analysis 19 revealed moderately fine sand of which all passed the largest sieve and almost 9% passed all of the sieves. 20 21 22 Sample 85 was of the mortar patch from the keeper's quarters. It differed significantly from its counterpart, 23 sample 84. Rather than being composed of lime and sand it gave strong evidence of being composed of Portland cement in addition to the lime and sand. This is a typical late twentieth century mortar formula for 24 25 restoration. The sand sieve analysis revealed an extraordinarily fine sand of which all easily passed the two 26 largest sieves. Well over a third of it pass all of the sieves and well over half of it was trapped in the finest 27 sieve. 28 29 30 31 Mortar/Plaster/Stucco Analysis Test Sheet 32 33 34 Sample No. 84 35 Building: Keeper's Quarters, Devils Island, Apostle Islands NL Location: 36 Masonry mortar Tan, soft, fast and bubbly reaction, rapid filtering time 37 Sample Description: 38 39 40 41 Test No. 1 – Soluble Fraction 42 43 Data: 44 188.9 Container A weight 8. <u>No</u> Hair or fiber type 1. 45 201.4 Container A and sample 9. 3.1 Fines and paper weight 2. 10. 2.6 Filter paper weight 46 3. 771.65 Barometric pressure 4._____ 23 11. 197.7 Sand and Container A weight 47 Temperature 48 5.____ 0.15 Liters of water displaced 12. 6.2 cc. of sand 13. 37.5 Weight of graduated cylinder and sand 49 6. Champagne Filtrate color 7. Dark tan Fines color 14. 28.7 Weight of graduated cylinder 50 51 52 Computations: 53 15. 12.5 Starting weight of sample: No. 2 – No. 1

	Weight of soluble conte Mols. Of CO2: No. 5 x 1	nt: No. 15 – (No No. 3. x 0.016 di	. 16 + No. 17) vided by (No. 4 -	+ 273.16 C.)			
21. 0.625	Gram weight of CaCO3	_Gram weight of CaCO3: 100 x No. 20					
22. 2.575	Gram weight of Ca(OH)	2: No. 19 - No.	21				
230348 24 3.04	_MOIS. OI Ca(OH)2. NO. 2 Gram total weight of Ca	$(OH)^2$ · 74 v (No	20 + No(23)				
24. <u>3.04</u> 25 <u>028</u>	Gram total weight of Ca(OH)2: $/4 \times (No. 20 + No. 23)$ Gram weight CO2: No. 20 x 44						
26. 1.81	Gram weight total possi	ble CO2: 44 x (N	N_{0} , 20 + N_{0} , 23)				
27. 15.47	%CO2 gain: No. 25 divi	ded by No. 26	,				
Conclusions.							
28. 12.22	Gram weight of sample:		No. 15 – No. 2	5			
29. 4.09	Fine parts/volume:		No. 16 divided	l by No. 28			
30. 50.74	Sand parts/volume:		(No. 17 divide	d by No. 28) x No. 18			
31. 27.36	Lime parts/volume:		(No. 24 divide	d by No. 28) x 1.1			
Cement (if pre	sent)						
32	Portland cement parts/ve	olume:	(No. 16 divide	d by No. 28) x 0.78			
33	Natural cement parts/vo	lume:	(No. 16 divide	d by No. 28) x 0.86			
34	Lime with cement parts/	volume:	(No. 16 x o.2)	divided by No. 28 x 1.			
Test No. 2 – Sa Sieve No. 10	and Sieve Analysis Sieve w/ sand weight 106 8	Sieve weight	Sand weight	Sand ratio			
Test No. 2 – Sa Sieve No. 10 No. 20 No. 30 No. 40 No. 50 Base	and Sieve Analysis Sieve w/ sand weight <u>106.8</u> <u>108.1</u> <u>101.9</u> <u>103.4</u> <u>94.3</u> <u>71.9</u>	Sieve weight <u>106.8</u> <u>106.4</u> <u>99.2</u> <u>100.7</u> <u>93.2</u> <u>71.2</u>	Sand weight <u>0.0</u> <u>1.7</u> <u>1.7</u> <u>2.7</u> <u>1.1</u> <u>0.7</u>	Sand ratio 0.00 21.52 21.52 34.18 13.92 8.86			
Test No. 2 – Sa Sieve No. 10 No. 20 No. 30 No. 40 No. 50 Base	and Sieve Analysis Sieve w/ sand weight <u>106.8</u> <u>108.1</u> <u>101.9</u> <u>103.4</u> <u>94.3</u> <u>71.9</u> Mortar	Sieve weight <u>106.8</u> <u>106.4</u> <u>99.2</u> <u>100.7</u> <u>93.2</u> <u>71.2</u> /Plaster/Stucco	Sand weight <u>0.0</u> <u>1.7</u> <u>1.7</u> <u>2.7</u> <u>1.1</u> <u>0.7</u> Analysis Test Sh	Sand ratio 0.00 21.52 21.52 34.18 13.92 8.86			
Test No. 2 – Sa Sieve No. 10 No. 20 No. 30 No. 40 No. 50 Base Sample No	and Sieve Analysis Sieve w/ sand weight <u>106.8</u> <u>108.1</u> <u>101.9</u> <u>103.4</u> <u>94.3</u> <u>71.9</u> Mortar	Sieve weight <u>106.8</u> <u>106.4</u> <u>99.2</u> <u>100.7</u> <u>93.2</u> <u>71.2</u> /Plaster/Stucco	Sand weight <u>0.0</u> <u>1.7</u> <u>1.7</u> <u>2.7</u> <u>1.1</u> <u>0.7</u> Analysis Test Sh	Sand ratio <u>0.00</u> <u>21.52</u> <u>21.52</u> <u>34.18</u> <u>13.92</u> <u>8.86</u>			
Test No. 2 – Sa Sieve No. 10 No. 20 No. 30 No. 40 No. 50 Base Sample No Building:	and Sieve Analysis Sieve w/ sand weight <u>106.8</u> <u>108.1</u> <u>101.9</u> <u>103.4</u> <u>94.3</u> <u>71.9</u> Mortar, <u>85</u> Keeper's Quart	Sieve weight <u>106.8</u> <u>106.4</u> <u>99.2</u> <u>100.7</u> <u>93.2</u> <u>71.2</u> /Plaster/Stucco	Sand weight 0.0 1.7 1.7 2.7 1.1 0.7 Analysis Test Sh d, Apostle Islands	Sand ratio <u>0.00</u> <u>21.52</u> <u>21.52</u> <u>34.18</u> <u>13.92</u> <u>8.86</u> heet			
Test No. 2 – Sample No. 20 No. 20 No. 30 No. 40 No. 50 Base Sample No Building: Location:	And Sieve Analysis Sieve w/ sand weight <u>106.8</u> <u>108.1</u> <u>101.9</u> <u>103.4</u> <u>94.3</u> <u>71.9</u> Mortar, <u>85</u> <u>Keeper's Quarte</u> <u>Mortar patch</u>	Sieve weight <u>106.8</u> <u>106.4</u> <u>99.2</u> <u>100.7</u> <u>93.2</u> <u>71.2</u> /Plaster/Stucco	Sand weight 0.0 1.7 2.7 1.1 0.7 Analysis Test Sh d, Apostle Islands	Sand ratio <u>0.00</u> <u>21.52</u> <u>21.52</u> <u>34.18</u> <u>13.92</u> <u>8.86</u> neet			
Test No. 2 – Sa Sieve No. 10 No. 20 No. 30 No. 40 No. 50 Base Sample No Building: Location: Sample Descri	And Sieve Analysis Sieve w/ sand weight <u>106.8</u> <u>108.1</u> <u>101.9</u> <u>103.4</u> <u>94.3</u> <u>71.9</u> Mortar, <u>85</u> <u>Keeper's Quarter</u> <u>Mortar patch</u> ption: <u>Off-white, soft,</u>	Sieve weight <u>106.8</u> <u>106.4</u> <u>99.2</u> <u>100.7</u> <u>93.2</u> <u>71.2</u> /Plaster/Stucco ers, Devils Island fast and bubbly	Sand weight 0.0 1.7 1.7 2.7 1.1 0.7 Analysis Test Sh d, Apostle Islands reaction, modera	Sand ratio <u>0.00</u> <u>21.52</u> <u>21.52</u> <u>34.18</u> <u>13.92</u> <u>8.86</u> neet s NL te filtering time			
Test No. 2 – Sa Sieve No. 10 No. 20 No. 30 No. 40 No. 50 Base Sample No Building: Location: Sample Descri Test No. 1 – Se	And Sieve Analysis Sieve w/ sand weight <u>106.8</u> <u>108.1</u> <u>101.9</u> <u>103.4</u> <u>94.3</u> <u>71.9</u> Mortar, <u>85</u> <u>Keeper's Quarte</u> Mortar patch ption: Off-white, soft, ptionbluble Fraction	Sieve weight <u>106.8</u> <u>106.4</u> <u>99.2</u> <u>100.7</u> <u>93.2</u> <u>71.2</u> /Plaster/Stucco ers, Devils Island fast and bubbly	Sand weight 0.0 1.7 1.7 2.7 1.1 0.7 Analysis Test Sh d, Apostle Islands reaction, modera	Sand ratio <u>0.00</u> <u>21.52</u> <u>21.52</u> <u>34.18</u> <u>13.92</u> <u>8.86</u> neet <u>s NL</u> te filtering time			
Test No. 2 – Sa Sieve No. 10 No. 20 No. 30 No. 40 No. 50 Base Sample No Building: Location: Sample Descri Test No. 1 – Se Data:	And Sieve Analysis Sieve w/ sand weight <u>106.8</u> <u>108.1</u> <u>101.9</u> <u>103.4</u> <u>94.3</u> <u>71.9</u> Mortar, <u>85</u> <u>Keeper's Quarter</u> Mortar patch ption: <u>Off-white, soft,</u> Duble Fraction	Sieve weight <u>106.8</u> <u>106.4</u> <u>99.2</u> <u>100.7</u> <u>93.2</u> <u>71.2</u> /Plaster/Stucco ers, Devils Island fast and bubbly	Sand weight 0.0 1.7 1.7 2.7 1.1 0.7 Analysis Test Sh d, Apostle Islands reaction, modera	Sand ratio <u>0.00</u> <u>21.52</u> <u>21.52</u> <u>34.18</u> <u>13.92</u> <u>8.86</u> neet s NL te filtering time			
Test No. 2 – Sa Sieve No. 10 No. 20 No. 30 No. 40 No. 50 Base Sample No Building: Location: Sample Descri	And Sieve Analysis Sieve w/ sand weight <u>106.8</u> <u>108.1</u> <u>101.9</u> <u>103.4</u> <u>94.3</u> <u>71.9</u> Mortar, <u>85</u> <u>Keeper's Quarte</u> Mortar patch ption: <u>Off-white, soft,</u>	Sieve weight <u>106.8</u> <u>106.4</u> <u>99.2</u> <u>100.7</u> <u>93.2</u> <u>71.2</u> /Plaster/Stucco ers, Devils Island fast and bubbly	Sand weight 0.0 1.7 2.7 1.1 0.7 Analysis Test Sh d, Apostle Islands reaction, modera	Sand ratio <u>0.00</u> <u>21.52</u> <u>21.52</u> <u>34.18</u> <u>13.92</u> <u>8.86</u> heet <u>5 NL</u> <u>te filtering time</u>			

1	4. 23	Temperature	11. <u>19</u>	1.3 Sand and Cor	ntainer A weight
2	5. <u>0.40</u>	Liters of water displaced	d 12. <u>3</u>	<u>.6</u> cc. of sand	
3	6. Off-white	Filtrate color	13. <u>3</u> 4	<u>34.9</u> Weight of graduated cylinder and sand	
4	7. Pastel pink	_Fines color	14. <u>28</u>	<u>8.7 Weight of gra</u>	duated cylinder
5 6	Computations.				
7	$15 \qquad 10.4$	Starting weight of some	la No 2 No 1		
0	13. <u>10.4</u> 16 0.4	Starting weight of samp	10. 10. 2 - 10. 1		
0	10. 0.4	Weight of fines. No. 9 -	- INO. 10		
9 10	17. <u>0.2</u>	weight of sand. No. 11	= NO. I	N- 14)	
10	18. <u></u>	_Sand density: No. 12 div	ided by (No. 13 -	-N0.14)	
11	19. 3.8	weight of soluble conte	nt: No. $15 - (NO)$	10 + N0.1/)	
12	20. 0.016675	\sim Mols. Of CO2: No. 5 x	No. 3. $\times 0.016$ di	vided by (No. 4 -	F 2/3.16 C.)
13	21. 1.6/	_Gram weight of CaCO3	: 100 x No. 20	<u>01</u>	
14	22. 2.13	_Gram weight of Ca(OH)2: No. 19 – No.	21	
15	23. <u>.0288</u>	Mols. of Ca(OH)2: No.	22 divided by 74	•	
16	24. 3.37	Gram total weight of Ca	u(OH)2: 74 x (No	o. 20 + No. 23)	
17	25. <u>0.73</u>	_Gram weight CO2: No.	20 x 44		
18	26. <u>2.00</u>	_Gram weight total possi	ble CO2: 44 x (N	No. $20 + No. 23$)	
19	27. 36.50	_%CO2 gain: No. 25 divi	ided by No. 26		
20					
21	Conclusions:				
22	28. <u>9.67</u>	_Gram weight of sample:		No. 15 – No. 2	5
23	29. 4.14	Fine parts/volume:		No. 16 divided	by No. 28
24	30. 37.23	Sand parts/volume:		(No. 17 divide	d by No. 28) x No. 18
25	31.	Lime parts/volume:		(No. 24 divide	d by No. 28) x 1.1
26		_ 1		,	5 /
27	Cement (if pres	sent)			
28	32.	Portland cement parts/v	olume:	(No. 16 divide	d by No. 28) x 0.78
29	33	Natural cement parts/vo	lume [.]	(No 16 divide	$d by No (28) \times 0.86$
30	34 4 55	Lime with cement parts	volume.	$(N_0, 16 \ge 0.2)$	divided by No 28×1.1
31	0 <u></u>			(100.10110.2)	
32					
33	Test No. 2 – Sa	nd Sieve Analysis			
34	с.	0. / 1 . 1 /	G 1.	G 1 . 14	
35	Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
36	No. 10	106.8	106.8	0.0	0.00
37	No. 20	106.4	106.4	0.0	0.00
38	No. 30	99.3	99.2	0.1	1.64
39	No. 40	101.2	100.7	0.5	8.20
40	No. 50	96.5	93.2	3.3	54.10
41	Base	73.4	71.2	2.2	36.07
42					
43					
44					
45			Assistant Keepe	r's Quarters	
46		Sampl	e 86	Muns	ell
47		White		N 9.5/	,
48		White		N 9 5/	,
49		Charee	al	5Y 2/	l
50		Grav		5Y 7/	1
51		Black		N 0 5/	-
52		Black		N 0 5/	,
53		Charco	al	5Y 3/	[

1 2 Sample 86 resumed the paint sample series and was taken from the porch post of the assistant keeper's 3 quarters. Beneath a pair of stark white layers was a series of black and charcoal colored layers with a gray 4 sandwiched between them. 5 6 7 **Assistant Keeper's Quarters** 8 Sample 87 Munsell 9 Dark green 2.5G 3/410 White N 9.5/ 11 12 Sample 87 was collected from the exterior window trim of the assistant keeper's quarters. Above a very 13 weathered wood substrate were two thin layers of which the older was stark white. 14 15 16 **Assistant Keeper's Quarters** 17 Sample 88 Munsell 18 Black N 0.5/ 19 White N 9.5/ 20 21 Sample 88 came from the exterior window trim paint of the assistant keeper's quarters. Like its counterpart, 22 sample 87 it retained only two paint layers on its wood surface. 23 24 25 **Assistant Keeper's Quarters** 26 Sample 89 Munsell 27 Dark green 2.5G 3/4 28 N 9.5/ White 29 30 Sample 89 was removed from the exterior door trim of the assistant keeper's quarters. It was identical to 31 sample 87, including the weathered wood substrate. 32 33 34 **Assistant Keeper's Quarters** 35 Sample 90 Munsell 36 Pink 2.5R 8.5/3 37 Yellow 2.5Y 8.5/4 38 Light green 7.5G 8/2 39 Grav 5Y 6/1 40 Light gray 5Y 8/1 2.5Y 8/4 41 Tan 42 Tan 2.5Y 8/4 43 7.5G 3/2 Dark green 44 7.5G 6/2 Green 45 46 Sample 90 was from the sitting room of the assistant keeper's quarters. It retained a succession of paint layers 47 which were very thin and evenly applied. The oldest surviving color was green. 48 49 50 **Assistant Keeper's Quarters** 51 Sample 91 Munsell 52 White 5Y 9/1 53 Tan 2.5Y 7/4

1		Tan	2.5Y 7/4
2		Yellow	2.5Y 8/6
3	~		
4	Sample 91 was the first samples of	of the second set of samples from	Devils Island. It was a paint sample
5	collected from the first floor hally	way of the assistant keeper's quart	ers. It retained four paint layers. The
6	oldest yellow paint was quite var	table in its thickness.	
/			
8			
9 10		Assistant Keeper's Quart	lers Mungall
10		Sample 92 White	
11		Ton	31.9/1
12		Tan	$2.51 \frac{1}{4}$
13		1 dii	2.31 //4
14	Sample 02 came from the second	floor stair/hallway of the assistant	t kaanar's quarters. Its analysis revealed
16	three layers of paint with tan beir	in the oldest of the three	r Reeper's quarters. Its analysis revealed
17	three layers of paint with tan ben	ig the oldest of the three.	
18			
10		Assistant Keener's Quart	ers
20		Sample 93	Munsell
20		Dark green	2 5G 4/4
21		Tan	2.50 -1/4 2.5V 7/4
23		Tan	2.5Y 7/4
24		1 411	2.01 // 1
25	Sample 93 was removed from the	e second floor sitting room wall of	the assistant keeper's quarters. It was
26	similar to its counterpart sample	92 but with a dark green layer on	its surface rather than white There was a
27	distinct dirt film on the dark gree	n laver	
28			
29			
30		Assistant Keeper's Quart	ters
31		Sample 94	Munsell
32		White	5Y 9/1
33			
34	Sample 94 was from the second f	loor sitting room ceiling of the ass	sistant keeper's quarters. It revealed only a
35	single layer of white paint which	was firmly adhered to its plaster s	ubstrate.
36		-	
37			
38		Assistant Keeper's Quart	ters
39		Sample 95	Munsell
40		Blue-green	2.5BG 6/4
41		White	5Y 9/1
42			
43	Sample 95 was found on the wall	of bedroom 2 of the assistant keep	per's quarters. In addition to the white layer
44	seen in its counterpart, sample 94	there was a blue-green layer above	ve it.
45			
46			
47		Assistant Keeper's Quart	ters
48		Sample 96	Munsell
49		Pastel green	5G 9/1
50		White	5Y 9/1
51			
52	Sample 97 was collected from the	e second floor bathroom of the ass	istant keeper's quarters. Beneath a layer of

53 pastel green paint was a typical white layer.

1			
2		A	-2- 0
3		Assistant Keepe	er's Quarters Muncoll
5		Green	10G 7/2
6		White	5V 9/1
7		Grav	N 5 5/
8		White	5V 0/1
0		white	51 9/1
10	Sample 97 was collected from	n bedroom #1 of the second	floor of the assistant keeper's quarters. It revealed
10	four paint layers of which a	v_{pical} white color was the o	Idest laver
12	four paint layers of which a	sphear white color was the o	luest layer.
12			
17		Assistant Koone	r's Augrtars
15		Somple 08	Muncoll
15		White	5 V 0/1
10		White	5 1 9/1 5 V 0/1
1/		Willie Destal groop	50 0/1
18		Pastel green	50 9/1 57 5/1
19		Dark gray	5 Y 5/1 N 2 5/
20		Charcoal	N 5.5/
22 23 24 25	Sample 98 was from the star thinly-applied layers. The of	to the basement of the assist dest charcoal-colored paint v	tant keeper's quarters. Its analysis revealed five was cleanly disengaged from its substrate.
26		Assistant Keepe	er's Quarters
27		Sample 99	Munsell
28		Gray	N 6.0/
29		Dark gray	N 4.5/
30		Gray	5Y 5.5/1
31		Dark gray	5Y 5/1
32		Black	N 1.0/
33		Tan	2.5Y 7/4
34		Charcoal	N 3.5/
35			
36	Sample 99 was removed from	n the stair to the basement of	the assistant keeper's quarters. Other than its oldest
37	charcoal-colored lavers it wa	s quite dissimilar to its coun	terpart, sample 98. Here again the oldest layer did not
38	retain any substrate beneath	it.	
39			
40			
41	Sample 100 continued the m	ortar and plaster series and w	as from the first floor hallway plaster of the assistant
42	keeper's quarters. It was tan	in color. Unlike other plaste	r samples, this sample had a fast and bubbly reaction.
43	indicating the presence of lin	ne along with the sand. The	fines, which were minimal, contained a small amount
44	of hair. An approximate ratio	o of four parts of lime to seve	en parts of sand was revealed. The sand sieve analysis
45	revealed surprisingly coarse	sand of which almost 7% fai	led to pass any of the sieves and almost half was
46	trapped in sieve $#20$ the sec	ond largest sieve Only slight	ly over 4% made it through all of the sieves
47		Server only singli	
48			
49	Sample 101 was taken from	the mortar of the assistant ke	eper's quarters. It was dark tan in color and was

50 relatively soft. The softness in addition to a fast and bubble reaction indicated a lime and sand mixture of

51 which there was approximately three times as much sand as there was lime, by volume. There was an

52 unusually large proportion of fines produced which have been assumed to be dirt associated with the original

sand. The sand sieve analysis revealed very fine sand of which over 18% passed all of the sieves, almost 32% was trapped in the finest sieve and less than 2% failed to pass any sieve.

2 3 4

1

Sample 102 was collected from the mortar patch of the assistant keeper's quarters. It was off-white in color and was relatively soft. It gave clear evidence of being composed of sand, lime, and Portland cement. The relatively large water displacement is typical of lime mortars, but the prolonged reaction is typical of Portland cement mortars. A lime mortar typically has a rapid filtering time. This had a moderate filtering time. There were, however, no gelatinous by-products which characterize some Portland cement mortars but not all. The sand sieve analysis revealed very fine sand of which over 16% passed all of the sieves and slightly over 41% was trapped in the finest sieve.

12 13

14 Sample 103 came from the mortar of oil house #1. It was very soft and was off-white in color. It was also well below average in size (20.0 grams being the standard size). It had a fast and bubbly reaction and a rapid 15 16 filtering time, both of which a typical indications of a lime and sand mortar. There was a proportionally large 17 amount of fines which were probably dirt in association with the sand. If so, then the approximate mixture was 18 five parts of lime to eight parts of sand, by volume, or, roughly, one part of lime to two parts of sand. The sand 19 sieve analysis revealed coarse sand. Although all of it passed the largest sieve, slightly over one-fifth was 20 trapped in the next sieve, #20. Over 37% was trapped in sieve #30 and over one-quarter was trapped in sieve 21 #40.

22 23

Sample 104 was removed from the mortar patch of oil house #1. It was off-white in color and was relatively soft. It gave clear evidence of being composed of sand, lime, and Portland cement. The relatively large water displacement is typical of lime mortars, but the prolonged reaction is typical of Portland cement mortars. A lime mortar typically has a rapid filtering time. This had a moderate filtering time. There were, however, no gelatinous by-products which characterize some Portland cement mortars but not all. The sand sieve analysis revealed very fine sand of which over 32% passed all of the sieves and over 46% was trapped in the finest sieve.

31 32

Sample 106 was the mortar from oil house #2. It was gray and hard, which are both indications of a Portland cement and sand mortar. Although the sample size was small it had a minimal water displacement, a prolonged reaction and only moderate filtering time which are also indications of a Portland cement and sand sample. The sand sieve analysis revealed fine sand of which all passed the largest sieve and over one-fifth passed all of the sieves. Almost 45% was trapped in the finest sieve, #50 and almost one-quarter was trapped in the next finest sieve, #40.

- 39 II
- 40
- 41
- 42
- 43

Mortar/Plaster/Stucco Analysis Test Sheet

44		
45	Sample No.	100
46	Building:	Assistant Keeper's Quarters, Devils Island, Apostle Islands NL
47	Location:	First floor hallway plaster
48	Sample Description:	Tan with pieces of thin white skim coat, soft, fast and bubbly reaction, extremely fast
49	filtering time	
50		
51		

52 Test No. 1 – Soluble Fraction

1	Data:				
2	1. 187.8	_Container A weight	8. <u>Y</u> 6	es Hair or fiber	type
3	2. 221.5	Container A and sample	e 9. <u>2.7</u>	<u>Fines and papers</u>	per weight
4	3. 771.65	Barometric pressure	10. <u>2.7</u>	Filter paper v	veight
5	4. 23	Temperature	11. <u>21</u> 4	4.7 Sand and Cor	ntainer A weight
6	5. <u>0.40</u>	Liters of water displace	d 12. <u>16</u>	6.0 cc. of sand	
7	6. <u>Off-white</u>	Filtrate color	13. <u>55</u>	6.6 Weight of gra	aduated cylinder and sand
8	7. Pink-tan	Fines color	14. <u>28</u>	<u>8.7</u> Weight of gra	aduated cylinder
9					
10	Computations:				
11	15. <u>33.7</u>	Starting weight of samp	le: No. 2 – No. 1		
12	16. <u>0.0</u>	_Weight of fines: No. 9 -	- No. 10		
13	17. <u>26.9</u>	Weight of sand: No. 11	– No. 1	NT 14	
14	18. <u></u>	_Sand density: No. 12 div	1ded by (No. 13 -	- No. 14)	
15	19. <u>6.8</u>	Weight of soluble conte	ent: No. $15 - (No.$	16 + No. 17)	
16	20. 0.0166753	_Mols. Of CO2: No. 5 x	No. 3. x 0.016 dr	vided by (No. 4 +	- 2/3.16 C.)
17	21. 16/	Gram weight of CaCO3	: 100 x No. 20	0.1	
18	22. 5.13	Gram weight of Ca(OH)2: No. $19 - No. 22$	21	
19	23. 0.0693577	MOIS. OF Ca(OH)2: NO.	22 divided by /4	$20 + N_{2} + 22$	
20	24. 0.37	_Gram unight CO2: No	$4(OH)2. 74 \times (NO)$	20 ± 100.23	
21	23. 0.73 26 3.70	Gram weight CO2. No.	20 X 44 blo CO2: 44 x (N	$1_{2} 20 \pm N_{2} 22$	
22	20. 3.79 27 10.26	<u></u> Oralli weight total possi	ided by No. 26	10.20 ± 100.23	
23 24	27. 19.20		ided by No. 20		
2 4 25	Conclusions.				
25 26	28 32 97	Gram weight of sample		No $15 - No 2$	5
20 27	20. <u>32.97</u> 29 0.00	<u>Fine narts/volume</u>	•	No. 16 divided	by No. 28
28	<u>30</u> <u>48</u> 53	Sand narts/volume:		(No 17 divided	$\frac{1}{1}$ by No 28) x No 18
29	31 27 25	Lime parts/volume:		(No 24 divided	$1 \text{ by No} 28 \times 11$
30	51. <u> </u>			(110.21 41)1400	
31	Cement (if pres	sent)			
32	32.	Portland cement parts/v	olume:	(No. 16 divided	l by No. 28) x 0.78
33	33.	Natural cement parts/vc	olume:	(No. 16 divided	l by No. 28) x 0.86
34	34.	Lime with cement parts	/volume:	(No. 16 x o.2)	divided by No. 28 x 1.1
35				× , , , , , , , , , , , , , , , , , , ,	5
36					
37	Test No. 2 – Sa	and Sieve Analysis			
38					
39	Sieve	Sieve w/ sand weight	Sieve weight	Sand weight	Sand ratio
40	No. 10	108.6	106.8	1.8	6.77
41	No. 20	119.4	106.4	13.0	48.87
42	No. 30	104.5	99.3	5.2	19.55
43	No. 40	104.4	100.8	3.6	13.53
44	No. 50	95.1	93.2	1.9	7.14
45	Base	72.3	71.2	1.1	4.14
46					
47					
48		3.F			4
49 50		Mortar	/Flaster/Stucco	Analysis Test Sh	eet
5U					
51 52	Sample Me	101			
52 52	Sample No.	101 A societant V con	or's Augustana Da	vila Island Anas	tla Ialanda NI
55	Dunung	Assistant Keep	er s Quarters, De	viis Islailu, Apos	IC ISIAIIUS INL

Location: Sample Dese	Mortar cription: Dark tan, soft, fast a	and bubbly reaction, extremely rapid filtering time
Test No. 1 –	Soluble Fraction	
Data:		
1. 192.0	Container A weight	8. <u>No</u> Hair or fiber type
2. 209.3	Container A and sample	9. <u>3.6</u> Fines and paper weight
3. 771.65	5 Barometric pressure	10. 2.7 Filter paper weight
4. 23	Temperature	11. 205.2 Sand and Container A weight
5. 0.23	Liters of water displaced	12. <u>8.7</u> cc. of sand
6. Off-whi	te Filtrate color	13. <u>41.9</u> Weight of graduated cylinder and san
7. <u>Pink-ta</u>	n Fines color	14. 28.7 Weight of graduated cylinder
Computation	15:	
15. 17.3	Starting weight of sample: N	No. 2 – No. 1
16. <u>0.9</u>	Weight of fines: No. 9 – No.	. 10
17. 13.2	<u>2</u> Weight of sand: No. 11 – N	0.1
18. <u>659</u>	Sand density: No. 12 divided	by (No. 13 – No. 14)
19. 3.2	Weight of soluble content: N	No. 15 – (No. 16 + No. 17)
20. <u>0.00958</u>	<u>83</u> Mols. Of CO2: No. 5 x No. 1	$3. \times 0.016$ divided by (No. 4 + 273.16 C.)
21. <u>0.96</u>	Gram weight of CaCO3: 100	0 x No. 20
22. 2.24	Gram weight of Ca(OH)2: N	No. 19 – No. 21
23. <u>0.030280</u>	6 Mols. of Ca(OH)2: No. 22 d	101 ded by 74
24. <u>2.95</u>	Gram total weight of Ca(OH	$1)2: 74 \times (No. 20 + No. 23)$
25. 0.42	Gram weight total passible ((144)
20. 1.73 27 24	<u>%CO2 gain: No. 25 divided</u>	by No. 26
27. <u>27</u>		09 110. 20
Conclusions	:	
28. <u>16.8</u>	Gram weight of sample:	No. 15 – No. 25
29. 5.3	<u>Fine parts/volume:</u>	No. 16 divided by No. 28
30. <u>51.78</u>	Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
31. 19.22	<u>2</u> Lime parts/volume:	(No. 24 divided by No. 28) x 1.1
Conserve (if a		
Cement (II p	Dentland compart norte/vielum	(No. 16 divided by No. 29) $\times 0.79$
32	Polulatid cetterit parts/volum	$(No. 10 divided by No. 20) \times 0.76$
33. <u></u>	Ivalular cement parts/volume	$(N_0, 10 \text{ ulvided by } N_0, 20) \times 0.00$
J 4	Line with cement parts/volt	$(100, 10 \times 0.2) \text{ divided by } 100, 28 \times 1.1$
Test No. 2 –	Sand Sieve Analysis	
	2	
Sieve	Sieve w/ sand weight Sie	eve weight Sand weight Sand ratio
No. 10	107.0 1	06.8 0.2 1.51
No. 20	107.8 1	06.4 1.4 10.61
No. 30	100.9	99.3 1.6 12.12
No. 40	104.2 1	00.8 3.4 25.76
No. 50	07.4	93.2 4.2 31.82
Base	73.6	71.2 2.4 18.18

Iing: Assistant Keeper's Quarter tion: Mortar patch ble Description: Off-white, soft, fast and b ing time Off-white, soft, fast and b No. 1 – Soluble Fraction Image: Container A weight 185.5 Container A weight 205.7 Container A and sample 9 760.99 Barometric pressure 1 23 Temperature 10.66 Liters of water displaced Off-white Filtrate color 1 State color 1 State color 1 State color	<u>No</u> Hair or fiber type <u>3.3</u> Fines and paper weight <u>1.198.9</u> Sand and Container A weight <u>2.8.1</u> cc. of sand <u>3.42.2</u> Weight of graduated gulinder and cond
tion: <u>Mortar patch</u> ble Description: <u>Off-white, soft, fast and b</u> ing time No. 1 – Soluble Fraction : <u>185.5</u> Container A weight 8 <u>205.7</u> Container A and sample 9 <u>760.99</u> Barometric pressure 1 <u>23</u> Temperature 1 <u>0.66</u> Liters of water displaced 1 <u>Off-white</u> Filtrate color 1 ight gray Fines color 1	<u>No</u> Hair or fiber type <u>3.3</u> Fines and paper weight <u>1.198.9</u> Sand and Container A weight <u>2.8.1</u> cc. of sand <u>3.42.2</u> Weight of graduated gulinder and cond
Description: Off-white, soft, fast and b ing time	<u>No</u> <u>Hair or fiber</u> <u>type</u> <u>3.3</u> <u>Fines and paper weight</u> <u>1.198.9</u> Sand and Container A weight <u>2.8.1</u> <u>cc. of sand</u>
Ing timeNo. 1 – Soluble Fraction185.5Container A weight205.7Container A and sample9760.999Barometric pressure12323Temperature0.66Liters of water displaced0.66Filtrate color1Off-white5Fines color	. <u>No</u> _Hair or fibertype . <u>3.3</u> _Fines and paper weight 0. <u>2.8</u> _Filter paper weight 1. <u>198.9</u> Sand and Container A weight 2. <u>8.1</u> _cc. of sand 3.42.2 Weight of graduated gulinder and cond
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Other Solution Difference 1 Off-white Filtrate color 1 ight gray Fines color 1	2. <u>0.1</u> U. 01 Sallu 3. <u>42.2</u> Weight of graduated exclinder and cond
ight gray Fines color 1	
i <u>gitt gray</u> i mes color i	$3. \underline{+2.2}$ weight of graduated cylinder and sand
	T. <u>20.7</u> Weight of gladuated cyllidel
putations:	
20.2 Starting weight of sample: No. 2 –	No. 1
<u>0.5</u> Weight of fines: No. 9 – No. 10	
<u>13.4</u> Weight of sand: No. 11 – No. 1	
.6045 Sand density: No. 12 divided by (N	o. 13 – No. 14)
6.3 Weight of soluble content: No. 15 -	- (No. 16 + No. 17)
<u>0.0271341</u> Mols. Of CO2: No. 5 x No. 3. x 0.0	16 divided by (No. 4 + 273.16 C.)
<u>271</u> Gram weight of CaCO3: 100 x No.	20
<u>3.59</u> Gram weight of Ca(OH)2: No. 19 -	- No. 21
<u>.0485</u> Mols. of Ca(OH)2: No. 22 divided	by 74
5.59 Gram total weight of Ca(OH)2: 74	x (No. 20 + No. 23)
<u>1.19</u> Gram weight CO2: No. 20 x 44	
<u>3.33</u> Gram weight total possible CO2: 44	$4 \times (N0.20 + N0.23)$
35.74 %CO2 gain. No. 25 divided by No.	20
elusions:	
<u>19.01</u> Gram weight of sample:	No. 15 – No. 25
2.62 Fine parts/volume:	No. 16 divided by No. 28
42.63 Sand parts/volume:	(No. 17 divided by No. 28) x No. 18
Lime parts/volume:	(No. 24 divided by No. 28) x 1.1
ant (if magant)	
Portland cement narts/volume	(No. 16 divided by No. 28) $\times 0.78$
Natural cement parts/volume.	(No. 16 divided by No. 28) \times 0.76
0.58 Lime with cement parts/volume.	$(N_0, 16 \ge 0.2)$ divided by $N_0, 200 \ge 0.00$
	(

0 107.0 106.4 $-$ 0 100.1 99.3 $-$ 0 104.7 100.8 $-$ 0 98.7 93.2 $ 73.4$ 71.2 $-$ 73.4 71.2 $-$ Mortar/Plaster/Stucco Andle No	0.4 2.99
0 100.1 99.3 $-$ 0 -104.7 100.8 $-$ 0 -98.7 93.2 $ -73.4$ 71.2 71.2 -75.0 71.4 $71.$	0.6 4.48
0 104.7 100.8 0 98.7 93.2 73.4 71.2 73.4 ing: 0 103 ing: 0 103 ing: 0 103 ing: 0 11 House #1, Devils Island, Apostlion: Mortar Ie Description: $0ff$ -white, very soft, fast and bubblic No. 1 – Soluble Fraction 10.2.6 23 Temperature $10.2.6$ 23 Temperature $11.194.4$ 0.17 Liters of water displaced $12.3.9$ nampagne Filtrate color $13.34.3$ Tan Fines color $14.28.7$ vutations: 8.6 Starting weight of sample: No. 2 – No. 1 0.5 Weight of fines: No. 9 – No. 10 5.5 5.5 Weight of sand: No. 11 – No. 1 $.709$ $.709$ Sand density: No. 12 divided by (No. 13 – N 2.2 Weight of CaCO3: 100 x No. 20 1.50 Gram weight of Ca(OH)2: No. 19 – No. 21 00069891 Mols. of Ca(OH)2: No. 22 divided by 74 2.02 Gram	0.8 5.97
98.7 93.2 73.4 71.2 73.4 71.2 73.4 71.2 73.4 71.2 73.4 71.2 73.4 71.2 73.4 71.2 73.4 71.2 73.4 71.2 73.4 71.2 73.4 71.2 73.4 71.2 73.4 71.2 71.2 71.2 73.4 71.2 <t< td=""><td>3.9 29.10</td></t<>	3.9 29.10
Image: No. 103 ing: Oil House #1, Devils Island, Apostlion: ion: Mortar le Description: Off-white, very soft, fast and bubblion: No. 1 – Soluble Fraction 188.9 Container A weight 197.5 Container A and sample 9.3.1 760.99 Barometric pressure 10. 2.6 23 Temperature 11. 194.4 0.17 Liters of water displaced 12.3.9 hampagne Filtrate color 13. 34.3 Tan Fines color 14. 28.7 V utations: 8.6 Starting weight of sample: No. 2 – No. 1 0.5 Weight of fines: No. 9 – No. 10 5.5 Weight of santl: No. 11 – No. 1 .709 Sand density: No. 12 divided by (No. 13 – N 2.2 Weight of Saulte content: No. 15 – (No. 16 0069891 Mols. Of CO2: No. 5 x No. 3. x 0.016 divide 0.70 Gram weight of Ca(OH)2: No. 20 1.50 Gram weight of Ca(OH)2: No. 21 – No. 21 .0203 Mols. of Ca(OH)2: No. 20	5.5 <u>41.04</u>
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TanFines color $14. 28.7$ nutations:8.6Starting weight of sample: No. 2 – No. 10.5Weight of fines: No. 9 – No. 105.5Weight of sand: No. 11 – No. 1.709Sand density: No. 12 divided by (No. 13 – N2.2Weight of soluble content: No. 15 – (No. 16.0069891Mols. Of CO2: No. 5 x No. 3. x 0.016 divided0.70Gram weight of CaCO3: 100 x No. 201.50Gram weight of Ca(OH)2: No. 19 – No. 21.0203Mols. of Ca(OH)2: No. 22 divided by 742.02Gram total weight of Ca(OH)2: No. 20 x 441.20Gram weight total possible CO2: 44 x (No. 202.5.83%CO2 gain: No. 25 divided by No. 26usions:8.29.47.04Sand parts/volume:.47.04Sand parts/volume:.11.12.12.13.13.14.14.14.15.15.15.12.15.15.15.10.15.10.15.10.15.10.15.10.15.10.15.10.15.10.15.10.15.10.15.10.15.10.15.10.15.10.15.10.16.10.17.10.18.10.19.10.10.10.10.10.10.10.10.10<	Weight of graduated cylinder and sand
butations:8.6Starting weight of sample: No. 2 – No. 10.5Weight of fines: No. 9 – No. 105.5Weight of sand: No. 11 – No. 1.709Sand density: No. 12 divided by (No. 13 – N2.2Weight of soluble content: No. 15 – (No. 160069891Mols. Of CO2: No. 5 x No. 3. x 0.016 divide0.70Gram weight of CaCO3: 100 x No. 201.50Gram weight of Ca(OH)2: No. 19 – No. 21.0203Mols. of Ca(OH)2: No. 22 divided by 742.02Gram total weight of Ca(OH)2: 74 x (No. 200.31Gram weight CO2: No. 20 x 441.20Gram weight total possible CO2: 44 x (No. 225.83%CO2 gain: No. 25 divided by No. 26usions:8.296.03Fine parts/volume:47.04Sand parts/volume:(133.04Lime parts/volume:	Weight of graduated cylinder
butations:8.6Starting weight of sample: No. 2 – No. 10.5Weight of fines: No. 9 – No. 105.5Weight of sand: No. 11 – No. 1.709Sand density: No. 12 divided by (No. 13 – N2.2Weight of soluble content: No. 15 – (No. 16.0069891Mols. Of CO2: No. 5 x No. 3. x 0.016 divided0.70Gram weight of CaCO3: 100 x No. 201.50Gram weight of Ca(OH)2: No. 19 – No. 21.0203Mols. of Ca(OH)2: No. 22 divided by 742.02Gram total weight of Ca(OH)2: 74 x (No. 200.31Gram weight total possible CO2: 44 x (No. 2225.83%CO2 gain: No. 25 divided by No. 26usions:8.2947.04Sand parts/volume:47.04Sand parts/volume:(133.04Lime parts/volume:	
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3.5 weight of said. No. $11 - 100.1$.709Sand density: No. 12 divided by (No. $13 - 100.1$ 2.2 Weight of soluble content: No. $15 - (No. 160.160)$.0069891Mols. Of CO2: No. $5 \ge 100 \ge 100$ Mols. Of CO2: No. $5 \ge 100 \ge 100 \ge 100$.700Gram weight of Ca(OH)2: No. $19 - No. 210$.701Gram weight of Ca(OH)2: No. $19 - No. 210$.702Gram total weight of Ca(OH)2: No. $19 - No. 2100$.703Mols. of Ca(OH)2: No. 2200 .704Gram weight of Sample:.705Mols. 2500 .706Sand parts/volume:.707Gram weight of Sample:.708Mols. 47.04 .704Sand parts/volume:.705Mols. 1000 .701Sand parts/volume:.702Mols. 10000 .703Mols. 100000 .704Sand parts/volume:.704Sand parts/volume:.704Sand parts/volume:.705Mols. 100000000 .705Mols. $1000000000000000000000000000000000000$	
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2.2weight of soluble content. 10: 15(10: 10) $.0069891$ Mols. Of CO2: No. 5 x No. 3. x 0.016 divide 0.70 Gram weight of CaCO3: 100 x No. 20 1.50 Gram weight of Ca(OH)2: No. 19 – No. 21 $.0203$ Mols. of Ca(OH)2: No. 22 divided by 74 2.02 Gram total weight of Ca(OH)2: 74 x (No. 20) 0.31 Gram weight CO2: No. 20 x 44 1.20 Gram weight total possible CO2: 44 x (No. 20) 25.83 %CO2 gain: No. 25 divided by No. 26usions:8.29 6.03 Fine parts/volume: 47.04 Sand parts/volume: 33.04 Lime parts/volume:	$5 + N_0 (17)$
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2.02Gram total weight of Ca(OH)2: 74 x (No. 200.31Gram weight CO2: No. 20 x 441.20Gram weight total possible CO2: 44 x (No. 225.83%CO2 gain: No. 25 divided by No. 26usions:8.296.03Fine parts/volume:47.04Sand parts/volume:33.04Lime parts/volume:	
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25.83%CO2 gain: No. 25 divided by No. 26usions:8.29Gram weight of sample:N6.03Fine parts/volume:47.04Sand parts/volume:33.04Lime parts/volume:	20 + No. 23)
Ausions:N8.29Gram weight of sample:N6.03Fine parts/volume:N47.04Sand parts/volume:(133.04Lime parts/volume:(1	
8.29Gram weight of sample:N6.03Fine parts/volume:N47.04Sand parts/volume:(133.04Lime parts/volume:(1	
6.03Fine parts/volume:N47.04Sand parts/volume:(1)33.04Lime parts/volume:(1)	No. 15 – No. 25
47.04Sand parts/volume:(1)33.04Lime parts/volume:(1)	No. 16 divided by No. 28
<u>33.04</u> Lime parts/volume: (1	No. 17 divided by No. 28) \times No. 18
•	110.17 MINIMUM UV 110. 207 A 110. 10
	No. 24 divided by No. 28) x 1.1
nt (if present)	No. 24 divided by No. 28) x 1.1
Portland cement parts/volume: (1	No. 24 divided by No. 28) x 1.1

33. <u></u> 34	Natural cement parts/volume: Lime with cement parts/volume:	(No. 16 divided (No. 16 x o.2) c	1 by No. 28) x 0.86 divided by No. 28 x 1.1
Test No. 2 – Sa	and Sieve Analysis		
Sieve	Sieve w/ sand weight Sieve weight	Sand weight	Sand ratio
No. 10	106.8 106.8	0.0	0.00
No. 20	107.5 106.4	1.1	20.37
No. 30	101.3 99.3	2.0	37.04
No. 40	102.2 100.8	1.4	25.93
No. 50	93.7 93.2	0.5	9.26
Base	71.6 71.2	0.4	7.41
	Mortar/Plaster/Stucco A	nalysis Test Sh	eet
0 1 37	104		
Sample No.		4 1 1 1 1 1 1	
Building:	Oil House #1, Devils Island, Apo	stle Islands NL	
Location:	Mortar patch	C. 11	11 1 1 1 1 1
Sample Descri	otion: OII-white, soit, last and bubbly	reaction tollowe	ed by prolonged reaction, mo
filtering time Test No. 1 – So	bluble Fraction		
<u>filtering time</u> Test No. 1 – So Data: 1. <u>185.1</u> 2. <u>206.3</u> 3. <u>760.99</u> 4. <u>23</u>		Hair or fiber Fines and pap Filter paper w 4 Sand and Con	type per weight veight tainer A weight
filtering time Test No. 1 – So Data: 1. 185.1 2. 206.3 3. 760.99 4. 23 5. 0.80		Hair or fiber Fines and pap Filter paper w Sand and Con cc. of sand	type per weight veight tainer A weight
filtering time Test No. 1 – So Data: 1. 185.1 2. 206.3 3. 760.99 4. 23 5. 0.80 6. Off-white		Hair or fiber Fines and pap Filter paper w Sand and Con cc. of sand Weight of gra	type per weight veight itainer A weight aduated cylinder and sand
filtering time filtering time Test No. 1 – So Data: 1. 185.1 2. 206.3 3. 760.99 4. 23 5. 0.80 6. Off-white 7. Pastel pink		Hair or fiber Fines and pap Filter paper w Sand and Con cc. of sand Weight of grac Weight of grac	type per weight veight tainer A weight aduated cylinder and sand duated cylinder
filtering time filtering time Test No. 1 – So Data: 1. 185.1 2. 206.3 3. 760.99 4. 23 5. 0.80 6. Off-white 7. Pastel pink		Hair or fiber Fines and pap Filter paper w Sand and Con cc. of sand Weight of grac Weight of grac	type per weight veight tainer A weight aduated cylinder and sand duated cylinder
filtering time Test No. 1 – So Data: 1. 185.1 2. 206.3 3. 760.99 4. 23 5. 0.80 6. Off-white 7. Pastel pink Computations: Computations:		Hair or fiber Fines and pap Filter paper w ASand and Con cc. of sand Weight of grac	type per weight veight atainer A weight aduated cylinder and sand duated cylinder
filtering time filtering time Test No. 1 – So Data: 1. 185.1 2. 206.3 3. 760.99 4. 23 5. 0.80 6. Off-white 7. Pastel pink Computations: 15. 15. 21.2		Hair or fiber Fines and pap Filter paper w Sand and Con cc. of sand Weight of grac Weight of grac	type per weight veight itainer A weight aduated cylinder and sand duated cylinder
filtering time filtering time Test No. 1 – So Data: 1. 185.1 2. 206.3 3. 760.99 4. 23 5. 0.80 6. Off-white 7. Pastel pink Computations: 15. 15. 21.2 16. 1.4		Hair or fiber Fines and pap Filter paper w Sand and Con cc. of sand Weight of grac Weight of grac	type per weight veight tainer A weight aduated cylinder and sand duated cylinder
filtering time filtering time Test No. $1 - Sc Data: 1. 185.1 2. 206.3 3. 760.99 4. 23 5. 0.80 6. Off-white 7. Pastel pink Computations: 15. 21.2 16. 1.4 17. 13.3 $		Hair or fiber Fines and pap Filter paper w Sand and Con cc. of sand Weight of grac Weight of grac	type per weight veight itainer A weight aduated cylinder and sand duated cylinder
filtering time filtering time Test No. 1 – So Data: 1. 185.1 2. 206.3 3. 760.99 4. 23 5. 0.80 6. Off-white 7. Pastel pink Computations: 15. 21.2 16. 1.4 17. 13.3 18609		Hair or fiber Fines and pap Filter paper w ASand and Con cc. of sand Weight of grad Weight of grad	type per weight veight itainer A weight aduated cylinder and sand duated cylinder
filtering time filtering time Test No. 1 – So Data: 1. 185.1 2. 206.3 3. 760.99 4. 23 5. 0.80 6. Off-white 7. Pastel pink Computations: 15. 15. 21.2 16. 1.4 17. 13.3 18. .609 19. 6.5		Hair or fiber Fines and pap Filter paper w Sand and Con cc. of sand Weight of grac Weight of grac No. 14)	type per weight veight itainer A weight aduated cylinder and sand duated cylinder
filtering time filtering time Test No. 1 – So Data: 1. 185.1 2. 206.3 3. 760.99 4. 23 5. 0.80 6. Off-white 7. Pastel pink Computations: 15. 15. 21.2 16. 1.4 17. 13.3 18. .609 19. 6.5 20. 0.0328898		Hair or fiber Fines and pap Filter paper w Sand and Con cc. of sand Weight of grad Weight of grad Weight of grad No. 14) 16 + No. 17) ided by (No. 4 +	type per weight veight itainer A weight aduated cylinder and sand duated cylinder
filtering time filtering time Test No. 1 – So Data: 1. 185.1 2. 206.3 3. 760.99 4. 23 5. 0.80 6. Off-white 7. Pastel pink Computations: 15. 15. 21.2 16. 1.4 17. 13.3 18. .609 19. 6.5 20. 0.0328898 21. 3.29		Hair or fiber Fines and pap Filter paper w Sand and Con cc. of sand Weight of grac Weight of grac Weight of grac No. 14) (6 + No. 17) ided by (No. 4 +	type per weight veight tainer A weight aduated cylinder and sand duated cylinder
filtering time filtering time Test No. $1 - Sc Data: 1. 185.1 2. 206.3 3. 760.99 4. 23 5. 0.80 6. Off-white 7. Pastel pink Computations: 15. 21.2 16. 1.4 17. 13.3 18. .609 19. 6.5 20. 0.0328898 21. 3.29 22. 3.21 $		Hair or fiber Fines and pap Filter paper w 4_Sand and Con cc. of sand 0_Weight of grac 7_Weight of grac 4-No. 14) 16 + No. 17) ided by (No. 4 +	type per weight veight itainer A weight aduated cylinder and sand duated cylinder
filtering time filtering time Test No. $1 - Sc Data: 1. 185.1 2. 206.3 3. 760.99 4. 23 5. 0.80 6. Off-white 7. Pastel pink Computations: 15. 21.2 16. 1.4 17. 13.3 18. .609 19. 6.5 20. 0.0328898 21. 3.29 22. 3.21 23. .0434 $		Hair or fiber Fines and pap Filter paper w 4_Sand and Con cc. of sand 0_Weight of grac 7_Weight of grac 10 + No. 17) ided by (No. 4 +	type per weight veight itainer A weight aduated cylinder and sand duated cylinder
filtering time filtering time Test No. $1 - Sc Data: 1. 185.1 2. 206.3 3. 760.99 4. 23 5. 0.80 6. Off-white 7. Pastel pink Computations: 15. 21.2 16. 1.4 17. 13.3 18. .609 19. 6.5 20. 0.0328898 21. 3.29 22. 3.21 23. .0434 24. 5.64 $		Hair or fiber Fines and pap Filter paper w ASand and Con cc. of sand Weight of grac Weight of grac Weight of grac No. 14) 16 + No. 17) ided by (No. 4 + 1 20 + No. 23)	type per weight veight atainer A weight aduated cylinder and sand duated cylinder
filtering time filtering time Test No. $1 - Sc$ Data: 1. 185.1 2. 206.3 3. 760.99 4. 23 5. 0.80 6. Off-white 7. Pastel pink Computations: 15. 21.2 16. 1.4 17. 13.3 18. .609 19. 6.5 20. 0.0328898 21. 3.29 22. 3.21 23. .0434 24. 5.64 25. 1.45		Hair or fiber Fines and pap Filter paper w A Sand and Con cc. of sand Weight of grac Weight of grac Weight of grac No. 14) 16 + No. 17) ided by (No. 4 + 1 20 + No. 23)	type per weight veight itainer A weight aduated cylinder and sand duated cylinder
filtering time filtering time Test No. $1 - Sc$ Data: 1. 185.1 2. 206.3 3. 760.99 4. 23 5. 0.80 6. Off-white 7. Pastel pink Computations: 15. 21.2 16. 1.4 17. 13.3 18. .609 19. 6.5 20. 0.0328898 21. 3.29 22. 3.21 23. .0434 24. 5.64 25. 1.45 26. 3.36 27. 43.15		Hair or fiber Fines and pap Filter paper w Sand and Con cc. of sand Weight of grac Weight of grac Weight of grac No. 14) 16 + No. 17) ided by (No. 4 + 1 20 + No. 23)	type per weight veight itainer A weight aduated cylinder and sand duated cylinder

1 2 3 4	28. 19.75 29. 7.09 30. 41.01 31.	Gram weight of sample Fine parts/volume: Sand parts/volume: Lime parts/volume:	:	No. 15 – No. 2 No. 16 divided (No. 17 divide (No. 24 divide	5 by No. 28 d by No. 28) x No. 18 d by No. 28) x 1.1
5 6 7 8 9 10	Cement (if pres 32 33 342.52	ent) _Portland cement parts/v _Natural cement parts/vc _Lime with cement parts	olume: blume: /volume:	(No. 16 divide (No. 16 divide (No. 16 x o.2)	d by No. 28) x 0.78 d by No. 28) x 0.86 divided by No. 28 x 1.1
11 12 13	Test No. 2 – Sa	nd Sieve Analysis			
14 15 16 17 18 19 20 21 22	Sieve No. 10 No. 20 No. 30 No. 40 No. 50 Base	Sieve w/ sand weight <u>106.8</u> <u>106.7</u> <u>99.8</u> <u>102.8</u> <u>99.3</u> <u>75.5</u>	Sieve weight <u>106.8</u> <u>106.4</u> <u>99.3</u> <u>100.8</u> <u>93.2</u> <u>71.2</u>	Sand weight 0.0 0.3 0.5 2.0 6.1 4.3	Sand ratio <u>0.00</u> <u>2.27</u> <u>3.79</u> <u>15.15</u> <u>46.21</u> <u>32.58</u>
24 25 26 27 28 29 30	Sample No Building: Location: Sample Descrip	Mortar 106 Oil House #2, I Mortar otion: gray, hard, fast	/Plaster/Stucco Devils Island, Ap	Analysis Test Sh ostle Islands NL ction followed b	y prolonged reaction, rapid filteri
 31 32 33 34 35 36 37 38 39 40 41 42 43 44 	time Test No. 1 – So Data: 1. <u>187.8</u> 2. <u>195.7</u> 3. <u>760.99</u> 4. <u>23</u> 5. <u>0.05</u> 6. <u>Off-white</u> 7. Light gray	luble Fraction _Container A weight _Container A and sample _Barometric pressure _Temperature _Liters of water displace _Filtrate color _Fines color	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0 Hair or fiber 2 Fines and pa 3 Filter paper v 3 Filter paper v 1.7 Sand and Co 3.4 cc. of sand 2.7 Weight of gr 3.8 Weight of gr	type per weight veight ntainer A weight aduated cylinder and sand aduated cylinder
45 46 47 48 49 50 51 52 53	Computations: 15. 7.9 16. 0.4 17. 3.9 188718 19. 3.6 20. 0.0020556 21. 0.21 22. 3.39	_Starting weight of samp _Weight of fines: No. 9 - _Weight of sand: No. 11 _Sand density: No. 12 div _Weight of soluble conte _Mols. Of CO2: No. 5 x _Gram weight of CaCO3 _Gram weight of Ca(OH	le: No. 2 – No. 1 - No. 10 - No. 1 ided by (No. 13 - ent: No. 15 – (No No. 3. x 0.016 di : 100 x No. 20)2: No. 19 – No.	- No. 14) . 16 + No. 17) vided by (No. 4 - 21	- 273.16 C.)

23. 0.0458	Mols. of Ca(OH)2: No. 22 divided by 7	74	
24. 3.55	24. 3.55 Gram total weight of Ca(OH)2: 74 x (No. $20 + No. 23$)		
25. <u>0.09</u> Gram weight CO2: No. 20 x 44			
26. 2.11	Gram weight total possible CO2: 44 x ((No. 20 + No. 23)	
27. 4.27	2 %CO2 gain: No. 25 divided by No. 26		
Conclusions	r.		
28. 7.8	<u>I</u> Gram weight of sample:	No. 15 – No. 25	
29. <u>5.1</u>	<u>2</u> Fine parts/volume:	No. 16 divided by No. 28	
30. <u>43.</u>	53 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 p	present)		
32. <u>3.9</u>	<u>9</u> Portland cement parts/volume:	(No. 16 divided by No. 28) x 0.78	
33	<u>Natural cement parts/volume:</u>	(No. 16 divided by No. 28) x 0.86	
34	Lime with cement parts/volume:	(No. 16 x o.2) divided by No. 28 x 1.1	
Test No. 2 –	- Sand Sieve Analysis		
Sieve	Sieve w/ sand weight Sieve weight	Sand weight Sand ratio	
No. 10	106.8 106.8	0.0 0.00	
No. 20	106.6 106.4	0.2 5.26	
No. 30	<u> </u>	0.2 5.26	
No. 40	100.7 100.8	0.9 23.68	
No. 50	94.9 93.2	<u> 1.7 44.74 </u>	
Base	72.0 71.2	0.8 21.05	
		nse #1	
	Sample 105	Munsell	
	Dark green	2.5G 4/4	
	White	5Y 9/1	
Sample 105	resumed the paint sample series. It was take	en from the trim of the oil house #1 It analysis showe	
only two, th	in layers of paint with white being the older	of the two.	
	Oil Ho	use #2	
	Sample 107	Munsell	
	Maroon	7.5R 3/5	
	Yellow-orange	10YR 7/8	
	Maroon	7.5R 3/5	
	Yellow-orange	10YR 7/8	
	Yellow-orange	10YR 7/8	
	Dark green	2.5G 4/4	
	Yellow-orange	10YR 7/8	
	Dark green	2.5G 4/4	
	Dark green	2.5G 4/4	
	Dark green	2.5G 4/3	
	Dark green	2.5G 4/3	
	Dark green	2.5G 4/2	
	Dark green	2.50 5/2	
--	--	--	--
	Gray	5Y 6/1	
	Dark gray	5Y 4/1	
	Dark gray	5Y 4/1	
	White	5Y 9/1	
	White	5Y 9/1	
Sample 107 was colle	ected from the trim of oil house #2_1	t was very good in its quality with o	nly the oldest
pair of white layers e	xhibiting marked deterioration The	aver number of thin evenly-applied	l lavers was quite
impressive both for th	ne number and for the variety of colo	rs.	
1	<i>y</i>		
	Lightho	ouse	
	Sample 108	Munsell	
	White	N 9.5/	
	Tan	10YR 8/4	
	Red	7 5R 5/5	
	White	5V 9/1	
	white	51 9/1	
Sample 108 came fro of warm tan layers. B paint.	m the interior of the lighthouse. Ben eneath that set was a variable layer of	eath a set of stark white paint layers of red, below which was a layer of o	was another set il-based white
Sample 108 came fro of warm tan layers. B paint.	m the interior of the lighthouse. Ben eneath that set was a variable layer of	eath a set of stark white paint layers of red, below which was a layer of o	was another set il-based white
Sample 108 came fro of warm tan layers. B paint.	m the interior of the lighthouse. Ben eneath that set was a variable layer of Lightho	eath a set of stark white paint layers of red, below which was a layer of or puse	was another set il-based white
Sample 108 came fro of warm tan layers. B paint.	m the interior of the lighthouse. Ben teneath that set was a variable layer of Lightho Sample 109	eath a set of stark white paint layers of red, below which was a layer of or puse Munsell	was another set il-based white
Sample 108 came fro of warm tan layers. B paint.	m the interior of the lighthouse. Ben beneath that set was a variable layer of Lightho Sample 109 Gray	eath a set of stark white paint layers of red, below which was a layer of or Duse N 6.0/ N 6.0/	was another set il-based white
Sample 108 came fro of warm tan layers. B paint.	m the interior of the lighthouse. Ben reneath that set was a variable layer of Lightho Sample 109 Gray Gray Charael	eath a set of stark white paint layers of red, below which was a layer of or buse Munsell N 6.0/ N 6.0/ N 5.0/	was another set il-based white
Sample 108 came fro of warm tan layers. B paint.	m the interior of the lighthouse. Ben reneath that set was a variable layer of Lightho Sample 109 Gray Gray Charcoal Dull red	eath a set of stark white paint layers of red, below which was a layer of or ouse Munsell N 6.0/ N 6.0/ N 1.5/ 7.5 D (2)	was another set il-based white
Sample 108 came fro of warm tan layers. B paint.	m the interior of the lighthouse. Ben reneath that set was a variable layer of Lightho Sample 109 Gray Gray Charcoal Dull red	eath a set of stark white paint layers of red, below which was a layer of or Munsell N 6.0/ N 6.0/ N 1.5/ 7.5R 6/3	was another set il-based white
Sample 108 came fro of warm tan layers. B paint.	m the interior of the lighthouse. Ben eneath that set was a variable layer of Lightho Sample 109 Gray Gray Charcoal Dull red Gray Charcoal	eath a set of stark white paint layers of red, below which was a layer of or Munsell N 6.0/ N 6.0/ N 1.5/ 7.5R 6/3 N 6.0/ N 2.0/	was another set il-based white
Sample 108 came fro of warm tan layers. B paint.	m the interior of the lighthouse. Ben beneath that set was a variable layer of Lightho Sample 109 Gray Gray Charcoal Dull red Gray Charcoal	eath a set of stark white paint layers of red, below which was a layer of or Munsell N 6.0/ N 6.0/ N 1.5/ 7.5R 6/3 N 6.0/ N 2.0/	was another set il-based white
Sample 108 came fro of warm tan layers. B paint.	m the interior of the lighthouse. Ben reneath that set was a variable layer of Lightho Sample 109 Gray Gray Charcoal Dull red Gray Charcoal Gray Charcoal Gray	eath a set of stark white paint layers of red, below which was a layer of or Munsell N 6.0/ N 6.0/ N 1.5/ 7.5R 6/3 N 6.0/ N 2.0/ N 6.0/ N 2.0/	was another set il-based white
Sample 108 came fro of warm tan layers. B paint.	m the interior of the lighthouse. Ben reneath that set was a variable layer of Lightho Sample 109 Gray Gray Charcoal Dull red Gray Charcoal Gray Charcoal Gray Charcoal Gray Charcoal	eath a set of stark white paint layers of red, below which was a layer of or Munsell N 6.0/ N 1.5/ 7.5R 6/3 N 6.0/ N 2.0/ N 3.0/	was another set il-based white
Sample 108 came fro of warm tan layers. B paint.	m the interior of the lighthouse. Ben reneath that set was a variable layer of Lightho Sample 109 Gray Gray Charcoal Dull red Gray Charcoal Gray Charcoal Gray Charcoal	eath a set of stark white paint layers of red, below which was a layer of or Munsell N $6.0/$ N $6.0/$ N $1.5/$ 7.5R $6/3$ N $6.0/$ N $2.0/$ N $6.0/$ N $3.0/$	was another set il-based white
Sample 108 came fro of warm tan layers. B paint. Sample 109 came fro	m the interior of the lighthouse. Ben reneath that set was a variable layer of Lightho Sample 109 Gray Gray Charcoal Dull red Gray Charcoal Gray Charcoal Gray Charcoal Bull red Gray Charcoal Gray Charcoal	eath a set of stark white paint layers of red, below which was a layer of or Munsell N 6.0/ N 6.0/ N 1.5/ 7.5R 6/3 N 6.0/ N 2.0/ N 6.0/ N 3.0/ was extremely challenging in its qu	was another set il-based white ality. The top
Sample 108 came fro of warm tan layers. B paint. Sample 109 came fro pair of gray layers we	m the interior of the lighthouse. Ben eneath that set was a variable layer of Lighthon Sample 109 Gray Gray Charcoal Dull red Gray Charcoal Gray Charcoal Gray Charcoal m the floor/stair of the lighthouse. It ere in excellent condition but the layer	eath a set of stark white paint layers of red, below which was a layer of or Munsell N 6.0/ N 6.0/ N 1.5/ 7.5R 6/3 N 6.0/ N 2.0/ N 6.0/ N 3.0/ was extremely challenging in its quers beneath them were in extremely paints.	was another set il-based white ality. The top poor condition.
Sample 108 came fro of warm tan layers. B paint. Sample 109 came fro pair of gray layers we The intermediate gray	m the interior of the lighthouse. Ben eneath that set was a variable layer of Lighthon Sample 109 Gray Gray Charcoal Dull red Gray Charcoal Gray Charcoal Gray Charcoal dray Charcoal Gray Charcoal dray dray charcoal dray dray dray dray dray dray dray dray	eath a set of stark white paint layers of red, below which was a layer of or Munsell N 6.0/ N 6.0/ N 1.5/ 7.5R 6/3 N 6.0/ N 2.0/ N 6.0/ N 3.0/ was extremely challenging in its quers beneath them were in extremely pother layers were thick and flaky.	was another set il-based white ality. The top poor condition.
Sample 108 came fro of warm tan layers. B paint. Sample 109 came fro pair of gray layers we The intermediate gray	m the interior of the lighthouse. Ben reneath that set was a variable layer of Lighthon Sample 109 Gray Gray Charcoal Dull red Gray Charcoal Gray Charcoal Gray Charcoal and Gray Charcoal Gray Charcoal Gray Charcoal Bull red Gray Charcoal Gray Charcoal Gray Charcoal Gray Charcoal Gray Charcoal Gray Charcoal Multing Charcoal Gray Charcoal Muthe Charcoal Gray Charcoal Muthe Charcoal	eath a set of stark white paint layers of red, below which was a layer of or Munsell N 6.0/ N 1.5/ 7.5R 6/3 N 6.0/ N 2.0/ N 6.0/ N 3.0/ was extremely challenging in its quers beneath them were in extremely pother layers were thick and flaky.	was another set il-based white ality. The top poor condition.
Sample 108 came fro of warm tan layers. B paint. Sample 109 came fro pair of gray layers we The intermediate gray	m the interior of the lighthouse. Ben reneath that set was a variable layer of Lightho Sample 109 Gray Gray Charcoal Dull red Gray Charcoal Gray Charcoal Gray Charcoal Built red Gray Charcoal Gray Charcoal Built red Gray Charcoal Charcoal Gray Charcoal Gray Charcoal Gray Charcoal Gray Charcoal Gray Charcoal Gray Charcoal Gray Gray Gray Gray Gray Gray Gray Gray	eath a set of stark white paint layers of red, below which was a layer of or Munsell N 6.0/ N 1.5/ 7.5R 6/3 N 6.0/ N 2.0/ N 6.0/ N 3.0/ was extremely challenging in its quers beneath them were in extremely pother layers were thick and flaky.	was another set il-based white ality. The top poor condition.
Sample 108 came fro of warm tan layers. B paint. Sample 109 came fro pair of gray layers we The intermediate gray	m the interior of the lighthouse. Ben reneath that set was a variable layer of Lighthon Sample 109 Gray Gray Charcoal Dull red Gray Charcoal Dull red Gray Charcoal Gray Charcoal Gray Charcoal Built red Gray Charcoal Charcoal Gray Charcoal Gray Charcoal Gray Charcoal Gray Charcoal Gray Charcoal Charcoal Charcoal Gray Charcoal Gray Charcoal Charcoal Gray Charcoal Cha	eath a set of stark white paint layers of red, below which was a layer of or Munsell N 6.0/ N 6.0/ N 1.5/ 7.5R 6/3 N 6.0/ N 2.0/ N 6.0/ N 3.0/ was extremely challenging in its quers beneath them were in extremely pother layers were thick and flaky.	was another set il-based white ality. The top poor condition.
Sample 108 came fro of warm tan layers. B paint. Sample 109 came fro pair of gray layers we The intermediate gray	m the interior of the lighthouse. Ben eneath that set was a variable layer of Lighthon Sample 109 Gray Gray Charcoal Dull red Gray Charcoal Dull red Gray Charcoal Gray Charcoal m the floor/stair of the lighthouse. It ere in excellent condition but the layer y layers were extremely thin and the Fog Sig Sample 110	eath a set of stark white paint layers of red, below which was a layer of or Munsell N 6.0/ N 6.0/ N 1.5/ 7.5R 6/3 N 6.0/ N 2.0/ N 6.0/ N 3.0/ was extremely challenging in its quers beneath them were in extremely pother layers were thick and flaky.	was another set il-based white ality. The top poor condition.
Sample 108 came fro of warm tan layers. B paint. Sample 109 came fro pair of gray layers we The intermediate gray	m the interior of the lighthouse. Ben reneath that set was a variable layer of Lighthon Sample 109 Gray Gray Charcoal Dull red Gray Charcoal Dull red Gray Charcoal m the floor/stair of the lighthouse. It ere in excellent condition but the layer y layers were extremely thin and the Fog Sig Sample 110 White	eath a set of stark white paint layers of red, below which was a layer of or Munsell N 6.0/ N 6.0/ N 1.5/ 7.5R 6/3 N 6.0/ N 2.0/ N 6.0/ N 3.0/ was extremely challenging in its quers beneath them were in extremely pother layers were thick and flaky. mal Munsell N 9.5/ N 9.5/	was another set il-based white ality. The top poor condition.
Sample 108 came fro of warm tan layers. B paint. Sample 109 came fro pair of gray layers we The intermediate gray	m the interior of the lighthouse. Ben eneath that set was a variable layer of Lighthon Sample 109 Gray Gray Charcoal Dull red Gray Charcoal Dull red Gray Charcoal m the floor/stair of the lighthouse. It ere in excellent condition but the layer y layers were extremely thin and the Fog Sig Sample 110 White White	eath a set of stark white paint layers of red, below which was a layer of or Munsell N 6.0/ N 6.0/ N 1.5/ 7.5R 6/3 N 6.0/ N 2.0/ N 6.0/ N 3.0/ was extremely challenging in its quers beneath them were in extremely pother layers were thick and flaky. mal Munsell N 9.5/ N 9.5/ N 9.5/ N 9.5/	was another set il-based white ality. The top poor condition.
Sample 108 came fro of warm tan layers. B paint. Sample 109 came fro pair of gray layers we The intermediate gray	m the interior of the lighthouse. Ben eneath that set was a variable layer of Lighthon Sample 109 Gray Gray Charcoal Dull red Gray Charcoal Mult red Gray Charcoal Gray Charcoal m the floor/stair of the lighthouse. It ere in excellent condition but the layer y layers were extremely thin and the Fog Sig Sample 110 White White White	eath a set of stark white paint layers of red, below which was a layer of or Munsell N 6.0/ N 6.0/ N 1.5/ 7.5R 6/3 N 6.0/ N 2.0/ N 6.0/ N 3.0/ was extremely challenging in its quers beneath them were in extremely pother layers were thick and flaky. mal Munsell N 9.5/ N 9.5/ N 9.5/ N 9.5/ N 9.5/	was another set il-based white ality. The top poor condition.

Appendix D: Fabric Analysis

1	White	N 9.5/
2	White	N 9.5/
3	White	N 9.5/
4	White	N 9.5/
5	White	N 9.5/
6	Dark tan	2.5Y 6/4
7	Dark tan	2.5Y 6/4
8	Off-white	5Y 8.5/1
9	Off-white	5Y 8.5/1
10	Off-white	5Y 8.5/1
11	Off-white	5Y 8.5/1
12	Off-white	5Y 8.5/1
13	Off-white	5Y 8.5/2
14	Light gray	5Y 8/2
15	Light gray	5Y 8/2
16	Brown	2.5Y 5/4
17	Dark tan	2.5Y 6/2
18	Dark gray	N 4.0/
19	Gray	N 5.5/
20	Charcoal	N 2.0/
21	White	5Y 9/1
22	Very dark maroon	10R 2/2
23		

Sample 110 was removed from the interior of the fog signal. Its quality was truly outstanding with clear layers
 of thinly applied paint. The oldest very dark maroon layer retained no substrate beneath it and was variable in
 color with some black areas as well.

28		
29	Fog Signal	
30	Sample 111	Munsell
31	Gray	N 5.0/
32	Dark gray	N 4.0/
33	Gray	N 5.0/
34	Gray	N 5.0/
35	Gray	N 5.0/
36	Gray	N 5.0/
37	Dark gray	N 4.0/
38	Gray	N 5.0/
39	Dark gray	N 4.0/
40	Dark gray	N 4.5/
41	Dark gray	N 4.0/
42	Gray	5Y 6/1
43	Gray	5Y 6/1
44	Gray	5Y 6/1
45	Light gray	5Y 8/1
46	Gray	5Y 6/1
47	Dark maroon	7.5R 3/4
48	Dark maroon	7.5R 3/4
49	Dark green	2.5G 3/4
50	Dark green	2.5G 3/4
51	Dark green	2.5G 3/4
52	Dark maroon	7.5R 3/4
53	Dark glossy varnish	

1 Sample 111 was from the interior of the fog signal. Like sample 100 it revealed a large set of clearly distinct layers. The oldest layer was a very dark varnish with an extremely high gloss so that no substrate remained beneath it.

6 7		Fog Signal	
/	Sl- 113	Fog Signal	
0	Sample 112 White	Munsen N 0.5/	
9	w file	N 9.5/	
10	white	N 9.5/	
11	white	N 9.5/	
12	White	N 9.5/	
13	White	N 9.5/	
14	White	N 9.5/	
15	White	N 9.5/	
16	White	N 9.5/	
17	White	N 9.5/	
18	Dark tan	2.5Y 6/4	
19	Dark tan	2.5Y 6/4	
20	Off-white	5Y 8.5/1	
21	Off-white	5Y 8.5/1	
22	Off-white	5Y 8.5/1	
23	Off-white	5Y 8.5/1	
24	Off-white	5Y 8.5/1	
25			
26	Sample 112 was found on the new addition inter	rior of the fog signal. It matched sample 110 layer fo	or layer
27	until it ended at an off-white layer.		-
28	-		
29			
30		Fog Signal	
31	Sample 113	Munsell	
32	Dark green	2.5G 3/4	
33	White	N 9.5/	
34	White	N 9 5/	
35	White	5Y 9/1	
36	White		
37	Sample 113 was taken from the door trim of the	e fog signal. There were two naint lavers – dark greer	1 and stark
38	white atop a thick collection of stark white white	itewash layers which was above another collection of	slightly
39	off-white whitewash layers	te wash layers which was above another concerton of	Singhting
40	on white white wash layers.		
40 41			
41 42		Fog Signal	
72 //3	Sample 114	Munsall	
45 AA	Dark green	25G 3/A	
44	Dark green	2.50 5/4	
43	Dalk green	2.50 4/4	
40 47	Dark green	2.30 4/4	
4/	Community 114 meres and the stand form the series down their		
48	Sample 114 was collected from the window trim	n of the log signal. It revealed three extremely thin la	iyers of
49 50	uark green paint.		
50			
51			
52 52		Boat House	
55	Sample 1	Nunseli	

White	N 9.5/
White	N 9.5/

Sample 115 came from the exterior siding of the boat house. It retained a thin layer of stark white paint atop a
thick encrustation of whitewash layers.

7		
8	Boat House	
9	Sample 116	Munsell
10	Dark green	2.5G 3/4
11	White	N 9.5/
12	Dark green	2.5G 3/4
13	White	5Y 9/1
14	Dark green	2.5G 3/4
15	White	5Y 9/1
16	White	5Y 9/1
17	White	5Y 9/1
18	Dark green	2.5G 3/4
19	C	

Sample 116 was removed from the exterior wood trim of the boat house. Beneath a set of nine paint layers was
 extremely weathered wood.

23		
24	Boat House	
25	Sample 117	Munsell
26	Dark green	2.5G 3/4
27	White	N 9.5/
28	Gray	5Y 5/1
29	Tan	2.5Y 7/6
30	Tan	2.5Y 7/6
31	Brown	10YR 5/2
32	Charcoal	N 2.0/
33	White	5Y 9/1
34	White	5Y 9/1
35	White	5Y 9/1
36	Dark green	2.5G 3/4
37	Gray	5Y 7/1

39 Sample 117 was from the exterior door trim of the boat house. It revealed an impressive number of paint 40 layers, especially for an exterior sample. The oldest gray layer was applied to heavily weathered wood.

	Boat House
Sample 118	Munsell
Tan	2.5Y 7/6
Tan	2.5Y 7/6

Sample 118 was found on the interior door trim of the boat house. It retained only two layers of tan paintwhich matched the pair of tan layers in its counterpart, sample 117.

Boat House

Sample 119

Munsell

1				Dark green	2.5G 3/4	
2				Dark green	2.5G 3/4	
3				White	N 9.5/	
4				White	N 9.5/	
5				White	N 9.5/	
6				Dark green	2.5G.3/4	
7				Grav	5Y 9/1	
8				Oluy	51 9/1	
9 10 11 12	Sample surface	119 w as in s	as taken from the ample 117.	eave trim of the boat he	ouse. It retained gray pair	nt on its weathered wood
12 13 14	A numb	per of c	conclusions can be	drawn from the analys	is, as follow:	
15 16 17	1.	There some	was a fair degree firm conclusions.	of consistency betweer	the several of the sample	es, making it possible to draw
18 19	2.	A nui	nber of samples ha	ad so few layers that on	e of the following conclu	isions can be reached:
20 21		a	. The oldest laye	rs had either weathered	away over time, which	s probable with exterior paint.
22		b	They may have	been stripped. This wo	ould be especially true if	the older finish was a
23			calcimine paint	which is impossible to	cover with any coating	including calcimine paint
24			itself. It was ar	n extremely popular pai	nt for interior plaster sur	faces during the nineteenth and
25			early twentieth	centuries. In light of th	e use of whitewash. whi	ch is a related waterborne
26			paint, the proba	bility of calcimine pair	t here is very high.	
27			1 / 1	5 1	, ,	
28		с	. The element its	elf had been replaced o	or is of recent date.	
29				1		
30		d	. Other covering	s such as wallpaper or o	calcimine paint may have	preceded the paint and were
31			removed prior t	to painting. Wallpaper	was a popular covering,	especially for damaged plaster.
32			1		1 1 8,	
33		e	. Because very li	ttle is known today abo	out calcimine paint a few	comments are in order to
34			explain it.	5	1	
35			· · · · ·			
36			It was immense	ely popular throughout	the nineteenth century ar	d into the early twentieth
37			century. It was	cheap, easily applied a	nd removed, had a very s	oft and lustrous sheen, and
38			could be mixed	and used by the average	ge homeowner who could	l not afford a painter. In this
39			case it could ha	we been applied by Coa	ist Guard personnel rathe	er than painters. Decorative
40			painters freque	ntly used it because of i	ts sheen. It is still in pro-	duction to this day, although it
41			is very rarely us	sed.	I I I I I I I I I I I I I I I I I I I	,
42			in the second			
43			It is waterborne	e glue distemper paint v	which, unlike its cousin.	whitewash, must be entirely
44			removed prior t	to repainting. The diffe	rence between calcimine	paint and whitewash is in the
45			formulation Ca	alcimine paint was deve	loped for interior use on	ly and was developed to carry
46			a nigment wher	eas the high lime conte	nt of whitewash prevent	ed it from taking on a nigment
47			Whitewash was	s primarily used for ext	eriors and for dark servic	e areas of interiors
48				r , abea for ent		
49			Nothing will sti	ick to it, including calci	mine paint. Its absence	therefore, is about the only
50			means of its det	tection. This is a real C	atch-22. Because it was t	vpically removed prior to
51			repainting its n	resence is usually indic	ated either through histor	ric documentation (which is
52			very rare) or the	e very small number of	lavers where many would	Id normally be found or where
53			other, similar su	urfaces retain considera	bly more.	a normany of round of where

- 3. There is no doubt that at least one element (the door trim Sample 113) of the fog signal was whitewashed as its probable original finish.
 - 4. Many samples revealed lengthy sequences of paint layers with some of these samples having an exterior exposure. These are most likely to have retained original finishes and stand in contrast with those samples with very few layers which, logically, probably did not reveal original finishes.
- 5. Of some interest was the apparent original golden varnish layers seen on several samples from the keeper's quarters. Although golden varnish was typically used on woodwork, it was also found on wall surfaces.
- 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 state. 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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