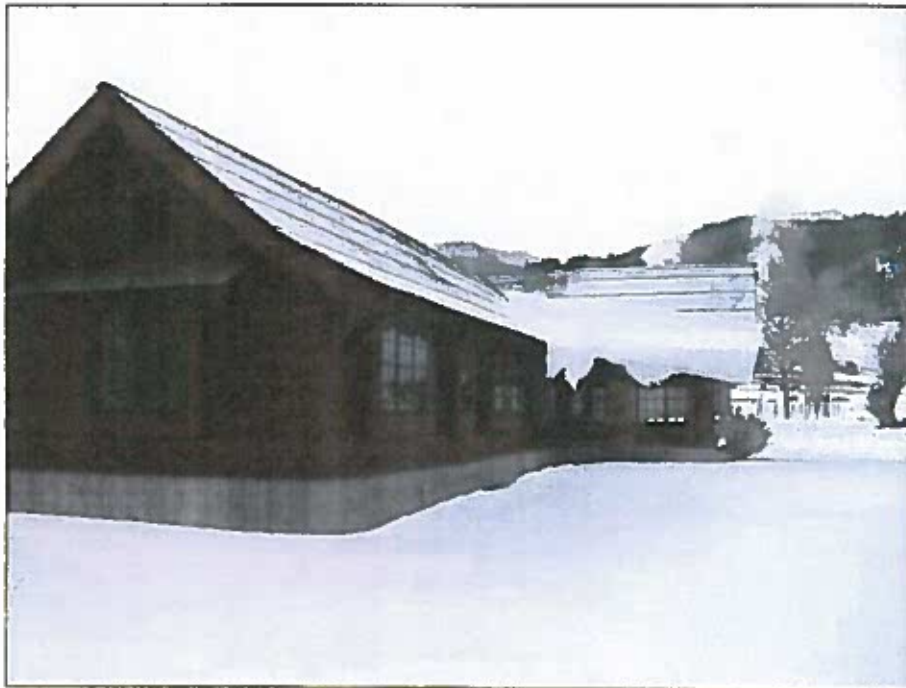


HISTORIC STRUCTURE REPORT

NICHOLS RESIDENCE Mammoth, Wyoming

August 5, 2008



Presented to:

Xanterra Parks & Resorts, Inc.

Presented by:



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I. Introduction

A. Purpose of this Report

The building known as the Nichols Residence, utilized by park concessioner Xanterra Parks & Resorts (Xanterra) for executive housing, is currently between occupants, facilitating needed repairs and renovation. The National Park Service has requested that Xanterra provide a basis of understanding the history and significance of the dwelling, prior to making any modifications to the building. In accordance with National Park Service standards, a Historic Structure Report provides a road map to guide such modifications by identifying the components that are most representative of the building's significance. Preservation treatments and priorities establish a frame of reference for future work.

CTA Architects Engineers' Historic Preservation Services was engaged by Xanterra in late January 2008 to provide the Historic Structure Report for this building. This report provides a construction history and physical assessment, both of which are critical components in any preservation plan. As with any historic structure report, this one is intended to be an evolving document to be expanded – and to act as a clearing house – as more information is gathered. CTA and Xanterra welcome supplemental, documented, information.

B. Acknowledgements

CTA Architects Engineers' Historic Preservation Services would like to thank the following for their assistance with the preparation of this report:

Dan Brown, Xanterra Parks & Resorts
Herb Dawson, Historic Architect, Yellowstone National Park
Robert Goss, Project Coordinator, Xanterra Parks & Resorts
Bridgette Guild, Museum Technician, Yellowstone National Park Research Center
Larry Marks, Project Manager, Xanterra Parks & Resorts
Mary Murphy, Concessions Specialist, Yellowstone National Park
Brian Shovers, Montana Historical Society Research Library
Addie Wickham, Assistant Director of Engineering, Xanterra Parks & Resorts

C. Project Information

Building Name, Current: Dan Tompkins Residence

Building Name, Historic: Huntley Child Residence
William Nichols Residence

Building Number: 02-109

Architect: Unknown

Owner: National Park Service / Yellowstone National Park

Concessioner: Xanterra Parks & Resorts

Location: Base of Capitol Hill
Mammoth Hot Springs, Wyoming
Yellowstone National Park

Nichols Residence
Historic Structure Report
Yellowstone National Park

Building Area:	First Floor	2754	Square feet
	Second Floor	578	Square feet
	Total	3332	Square feet

Historical Status: Contributing structure in Mammoth Hot Springs Historic District

Building Orientation: The main wing of the T-shaped building is oriented east-west. A perpendicular wing is positioned to the south. The main entry is from a porch at the north face of the building. This entry looks toward the area that was originally the Parade Ground for the Army stationed in Mammoth.

D. Proposed Use of the Building

Xanterra will continue to use the building as a year-round single-family dwelling, for a Xanterra executive. This continues the traditional use of the building established c.1905 when Park concessioner William Nichols is purported to have begun residency there.¹

E. Methodology

In February 2008 CTA's Historic Preservation Services team of architects and engineers investigated the major architectural, structural, mechanical, and electrical components of the Nichols Residence. This assessment was aided by Bob Goss and Larry Marks of Xanterra, who provided access to the building and information about the recent history of the building. CTA's team was comprised of: Historic Preservation Services director Lesley M. Gilmore, A.I.A.; Jessica Marshall, preservation specialist; Erok Rosberg, Structural Engineer-in-Training; Dave French, Structural Engineer; Matthew Carr, Mechanical Engineer-in-Training; and Clint Laferriere, Electrical Engineer.

This report documents the building's existing conditions, records its character-defining features, discusses the conditions of materials and systems, assesses code compliance, and provides recommendations for improvements to extend the life of the various components of the building. This report is based upon observations on the dates of these inspections. The inspections were based on those building components accessible to view; some material probes and selective removal supplemented the visible evidence where necessary. CTA makes no representations regarding latent or concealed defects that may exist. This report is made only in the best exercise of our ability and judgment. Not all locations of all materials are described herein, yet all areas of concern are addressed. Photographs presented in this report were taken by CTA unless otherwise indicated.

Historical information for this report was gathered from written sources and architectural documents provided by the National Park Service and Xanterra Parks & Resorts. CTA was engaged to perform limited secondary research and an archival search of the Yellowstone Research Center's photographic collection for this report.

¹ Nichols' residency was seasonal, however, unlike the current year-round occupation. Robert Goss's books *Yellowstone: The Chronology of Wonderland* and *Making Concessions in Yellowstone*, both self-published in 2003, provide valuable information about William Nichols and his 1905 marriage to Harry Child's daughter Ellen Dean Child.

II. Executive Summary

This report contains an architectural construction history of the structure, an evaluation and condition assessment of the building systems, identification of the character-defining features of the building, recommendations for treatment, a preservation plan, and a prioritized list of recommendations. The purpose of presenting this information is to identify and document the character-defining features remaining in the building in order to ensure that the upcoming planned renovation will not have a negative effect on these features, or that appropriate mitigation measures will be taken.

The Nichols Residence is located in Mammoth, Wyoming, where it appears to have been built in the late 1880's and added onto in subsequent construction campaigns. Parts of several of these additions might have been moved from other locations in Mammoth or the Park.

The Nichols Residence is currently used by Xanterra Parks and Resorts for employee housing. The building is in good condition and has been well maintained, with the exception of the Kitchen which was recently damaged by a ruptured plumbing pipe which resulted in a water leak.

The building, however, is in need of structural improvements to ensure its stability and safety. Primarily, the building has been subjected to the vagaries of its foundation on travertine. While this rock can be hard, it can also dissolve in water. This has generated some uneven settling of the foundation, which has been exacerbated by accumulation of deep snow at the foundations and soil sloping towards the building. These latter two actions have introduced water into the concrete; the frozen water has expanded and caused the top surfaces of the concrete watertable and entry landing to spall.

In addition, the wooden support structure in the basement is often undersized for the loads it is meant to support and the lack of mechanical connections between the wooden members could result in imminent failure.

The support systems – mechanical, plumbing, and electrical – in the building are in poor condition or have reached the end of their useful lives. Much of the crawlspace is filled with corroded piping that has been installed in various stages throughout the years, resulting in a crowded and inefficient space. Some areas of the house are still operated with the original knob-and-tube wiring; the protective cloth on this wiring can abrade and create a fire hazard.

This report recommends a full upgrade of the structural support system in the basement, complete replacement of the heating and plumbing piping, and complete replacement of the electrical system. The structural work in the crawlspace is so extensive that it requires room to work, necessitating removal of the piping. This drives the scope of the proposed project.

III. History of the Structure

A. Summary of Documentary Information

1. Reports

List of Classified Structures: LCS ID #010619

2. Drawings

- a) 1903 Topographic Map by Chittenden
- b) 1912 Mammoth Hot Springs Terraces Site Plan from 1912 edition of *Haynes Official Guide to Yellowstone Park*.
- c) 1929 Site Plan²
- d) *Surficial Geologic Map of the Mammoth Quadrangle and part of the Gardiner Quadrangle, Yellowstone National Park, Wyoming and Montana* by Kenneth L. Pierce (Washington D.C.: U.S. Geological Survey, 1973)
- e) Current USGS Topographic Map of Mammoth and the surrounds

3. Existing Condition Drawings

Existing condition drawings have been prepared based upon the dimensions CTA/HPS measured in the field. These drawings include room names and numbers that are referenced throughout the report. The following drawings are on the following pages and are included in the Appendix as well:

- a) A100: Crawlspace Plan
- b) A101: First Floor Plan
- c) A102: Second Floor/Attic Plan
- d) A103: Roof Plan

4. Existing Exterior Elevation Photographs

For the ease of someone unfamiliar with the building, current photographs of the exterior of the building follow the existing condition drawings in this section of the report.

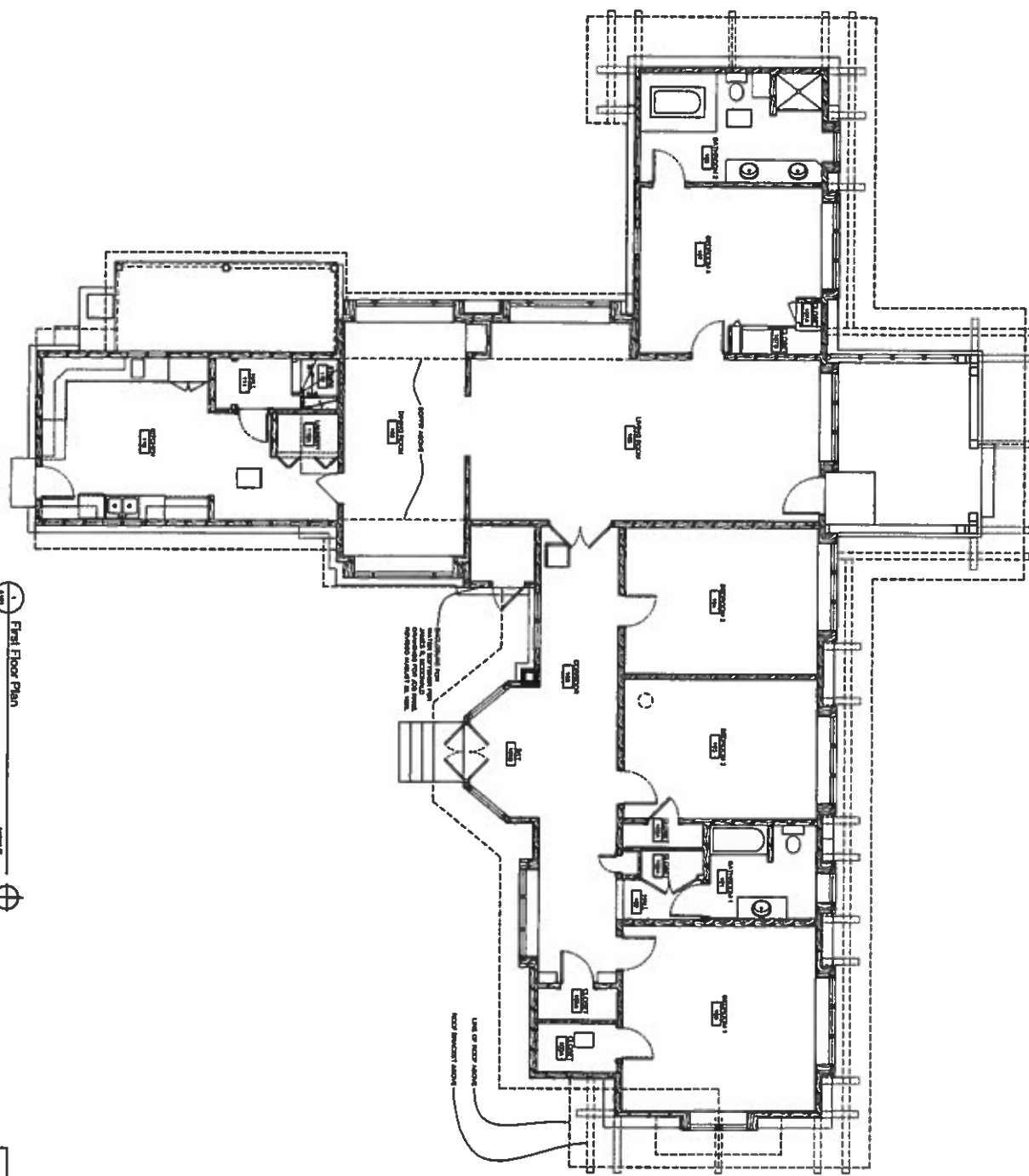
5. Resources Reviewed

- a) Yellowstone National Park Heritage & Research Center, Gardiner, Montana
- b) Montana Historical Society Research Library
- c) Montana State University – Burlingame Special Collections for Architectural Drawings (only one building in Mammoth is listed in this collection)

² CTA is grateful to Bob Goss for the receipt of these invaluable images.

6. Photographs – from the Yellowstone National Park Heritage & Research Center


<i>Catalog #</i>	<i>Description</i>	<i>Date</i>
YELL 30285a	Looking towards base of Capitol Hill from above the U.S. Commissioner's House at base of terraces	Before 1893-4
YELL 36433	J.A. Clark's Transportation & Livery at base of Capitol Hill	1886
YELL 36469	Haynes Photo Shop (on Parade Grounds)	1884
YELL 36472	Haynes Photo Shop (on Parade Grounds)	1892
YELL 128753	Mammoth Hot Springs from the terraces, Fort Yellowstone in background in front of Mount Everts	c.1908-1925
YELL 127738	Mammoth Hot Springs from the terraces, looking northeast.	1912
YELL 128013	Mammoth Hot Springs from the terraces, looking northeast.	1884
YELL 133427	Mammoth Hot Springs Hotel from Capitol Hill	1935
YELL 133533	Mammoth Hot Springs Hotel exterior (between 1913 & 1936)	nd
YELL 133545	Overview of Mammoth Hot Springs Hotel and Fort Yellowstone	nd
YELL 133596	"The Liberty Cap and Hymen Terrace"	nd
YELL 133607	The Child Cottage at Yellowstone Park	nd
YELL 133622	Marion Child, Unidentified Child, and Emilie James Child by sandbox	c.1911
YELL 133633	Marion Child, with Parade Ground & Mount Everts in background	nd
YELL 133643	Marion Child and her Grandmother James in a Garden	c.1914
YELL 133661	Unidentified Man Sitting in Front of Executive House with Child on his Lap.	nd
YELL 133664	View of Mammoth/Fort Yellowstone from the Terraces	c.1901-1913
YELL 133671	Huntley Child Jr. and Nanny Bessie Ferguson and Horseback in Middle of Transportation Compound	c.1913



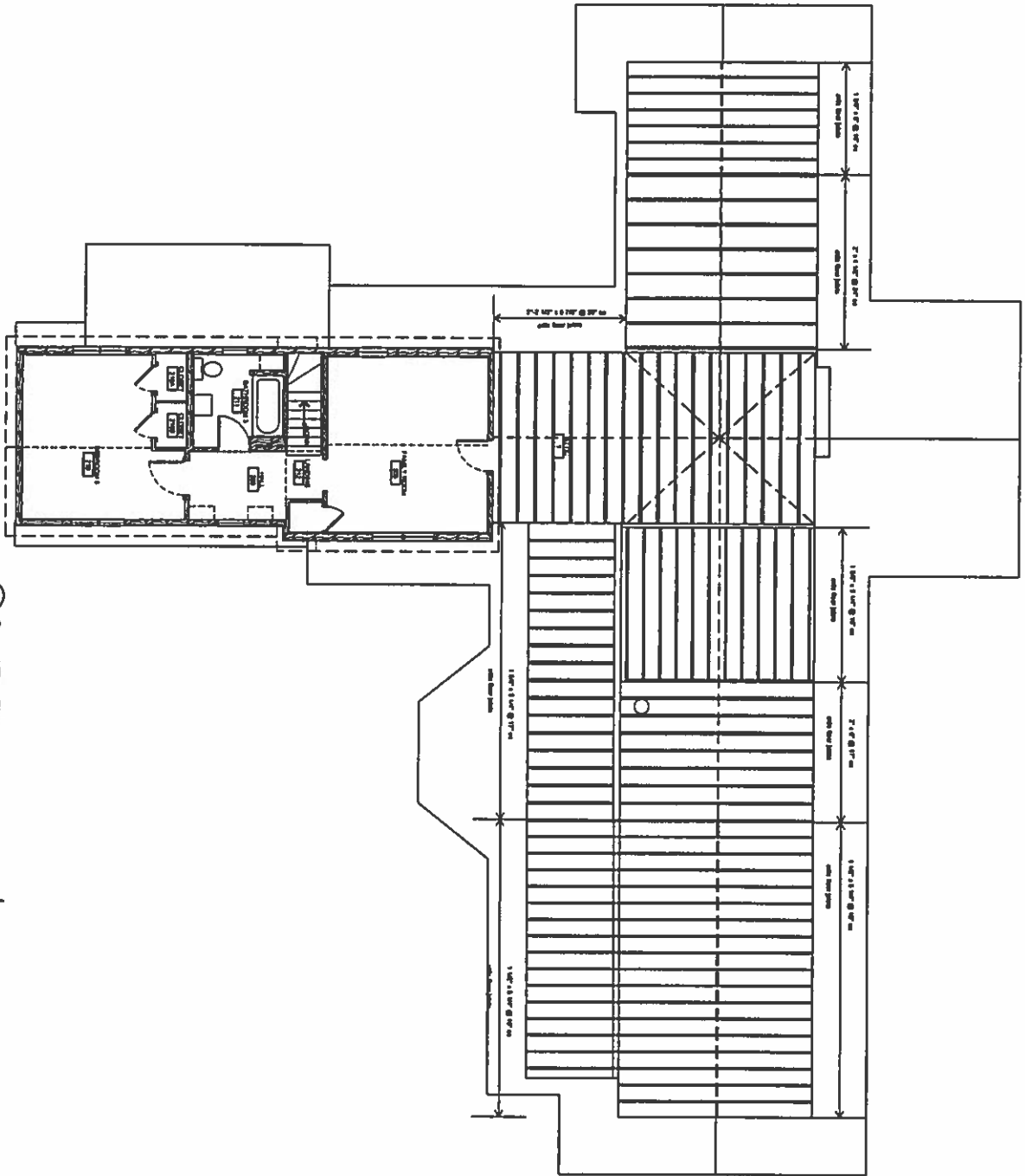
1 First Floor Plan

NPS DRAWING NO.: 101
70807

HISTORIC STRUCTURE REPORT - NOT FOR CONSTRUCTION

		<p>HISTORIC STRUCTURE REPORT</p>	<p>NICHOLS RESIDENCE MAMMOTH, WY</p>	<p>REVISIONS:</p>

DIRECT
A101

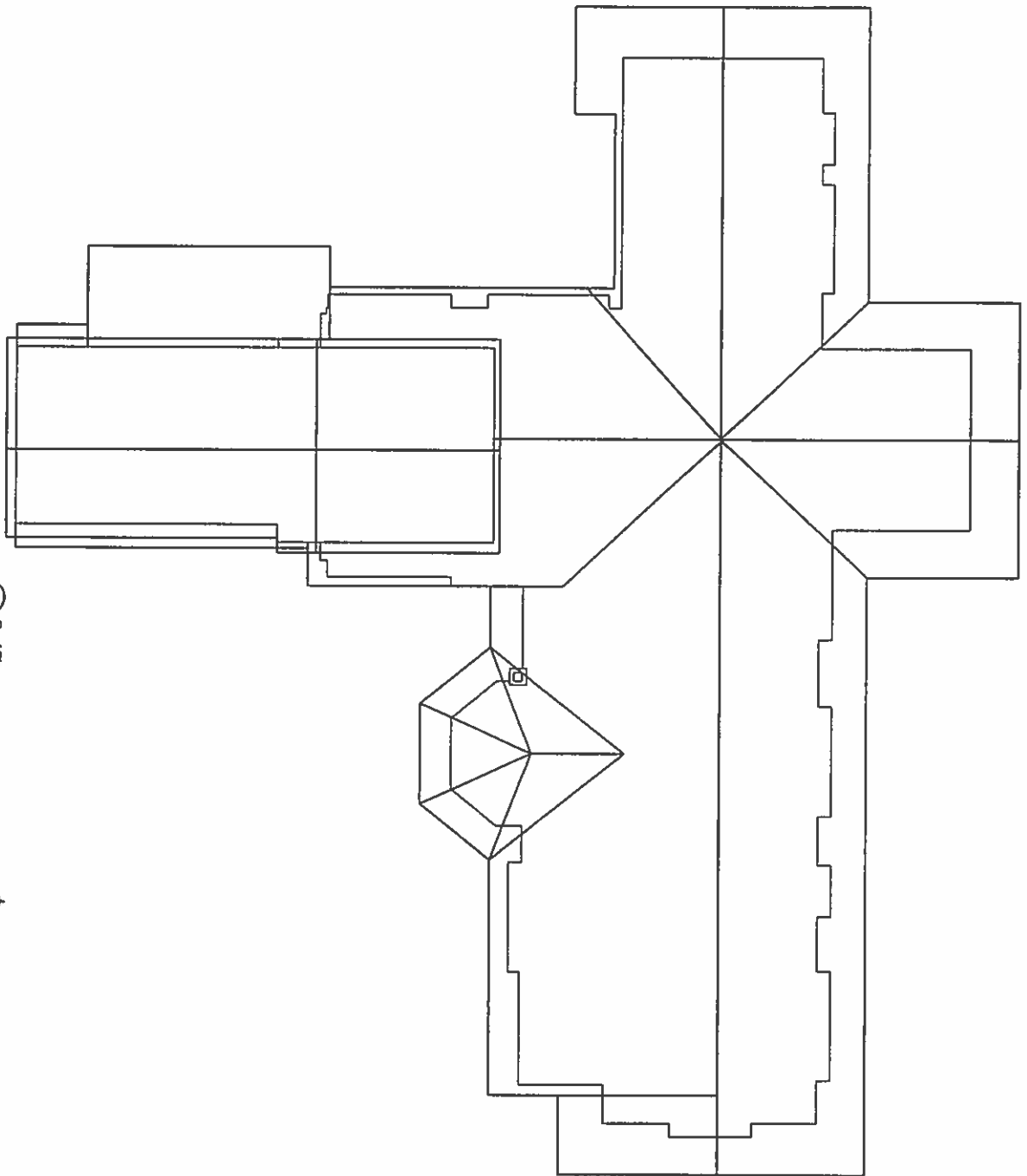


Second Floor Plan

NPS DRAWING NO.: 101
7080T

HISTORIC STRUCTURE REPORT - NOT FOR CONSTRUCTION

<p>SHEET A102</p>	<p>CTA CONSTRUCTION TECHNOLOGY ASSOCIATES 1000 N. 10TH ST. SUITE 100 MAMMOTH, WY 83424 PHONE: (307) 675-1234 FAX: (307) 675-1235 WWW.CTA-CTA.COM</p>	<p>HISTORIC STRUCTURE REPORT</p> <p>PROJECT NO.: 101 DATE: 10/1/2001 DRAWN BY: J. BROWN CHECKED BY: M. JONES SCALE: AS SHOWN</p>	<p>NICHOLS RESIDENCE MAMMOTH, WY</p>	<p>REVISIONS:</p> <table border="1"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>										



1
Roof Plan
1/8" = 1'-0"

NPS DRAWING NO.: 101
7080T

HISTORIC STRUCTURE REPORT - NOT FOR CONSTRUCTION

SHEET
A103



HISTORIC STRUCTURE
REPORT

NICHOLS
RESIDENCE
MAMMOTH, WY

REVISIONS

Nichols Residence
Historic Structure Report
Yellowstone National Park



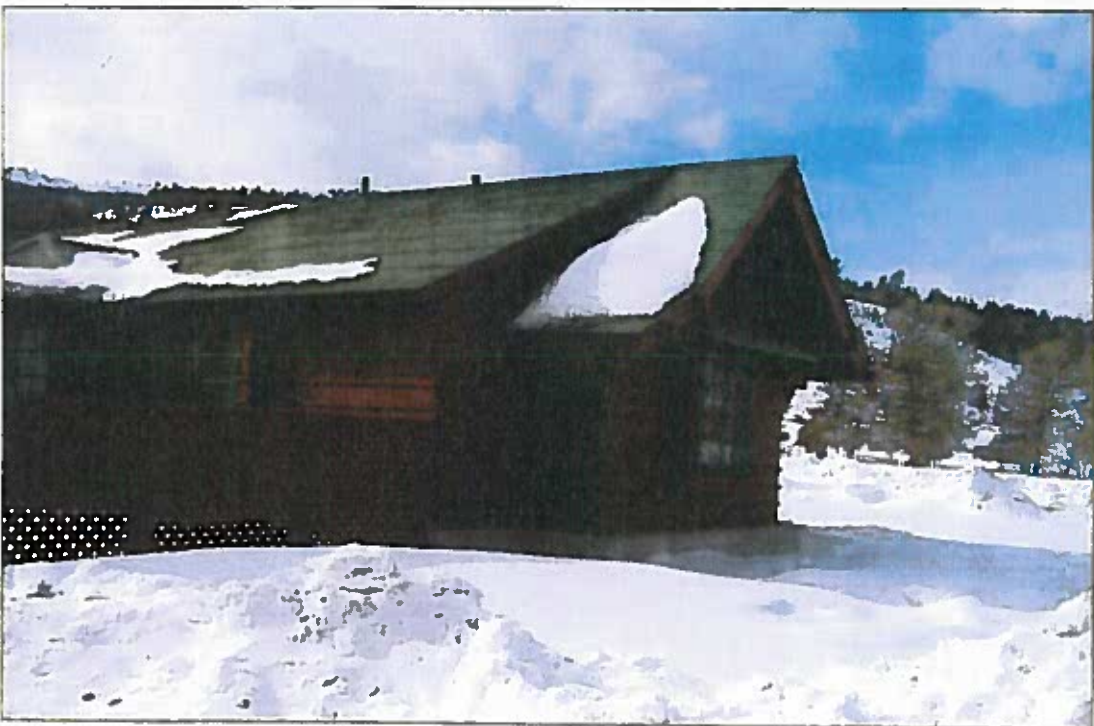
Front (north) elevation of the Nichols Residence.



Looking west along north elevation.



East elevation of east wing.



Southeast elevation.

Nichols Residence
Historic Structure Report
Yellowstone National Park



Looking northwest at southeast inside corner (south elevation is to the right).



East elevation of east wing, looking south.



East elevation of south wing, looking north.



South elevation of south wing.



West elevation of south wing.

Nichols Residence
Historic Structure Report
Yellowstone National Park



Looking northeast at southwest interior corner (west elevation of south wing is to the right).



South elevation of west wing.



West wing, looking from the southwest.



Main entry, looking from the northwest.

B. Brief History of the Nichols Residence

1. Statewide Significance

The Nichols Residence is a contributing structure in the Mammoth Hot Springs Historic District. This district has statewide significance "as the administrative and concession headquarters of the largest national park in Wyoming. The district is significant under Criterion A for its historical association with the early history of the National Park Service, the development of Yellowstone National Park, and more specifically, with the development of administrative and concession policies in Yellowstone and the national park system."³ The district is also significant under Criterion C for its architecture. "Buildings erected after the military era in the administrative area of the district are significant for their representation of the work of architects of the National Park Service, and the landscape of the district reflects the influence of the agency's master plans and the efforts of its landscape architects."⁴ As an architecturally significant concessioner-owned building, the Nichols Residence contributes to both of these criteria. In fact, the house is an amalgam of pre-Army and early concessioner construction and its street-front facades represent the influence of the Robert Reamer version of the Prairie School of Architecture.

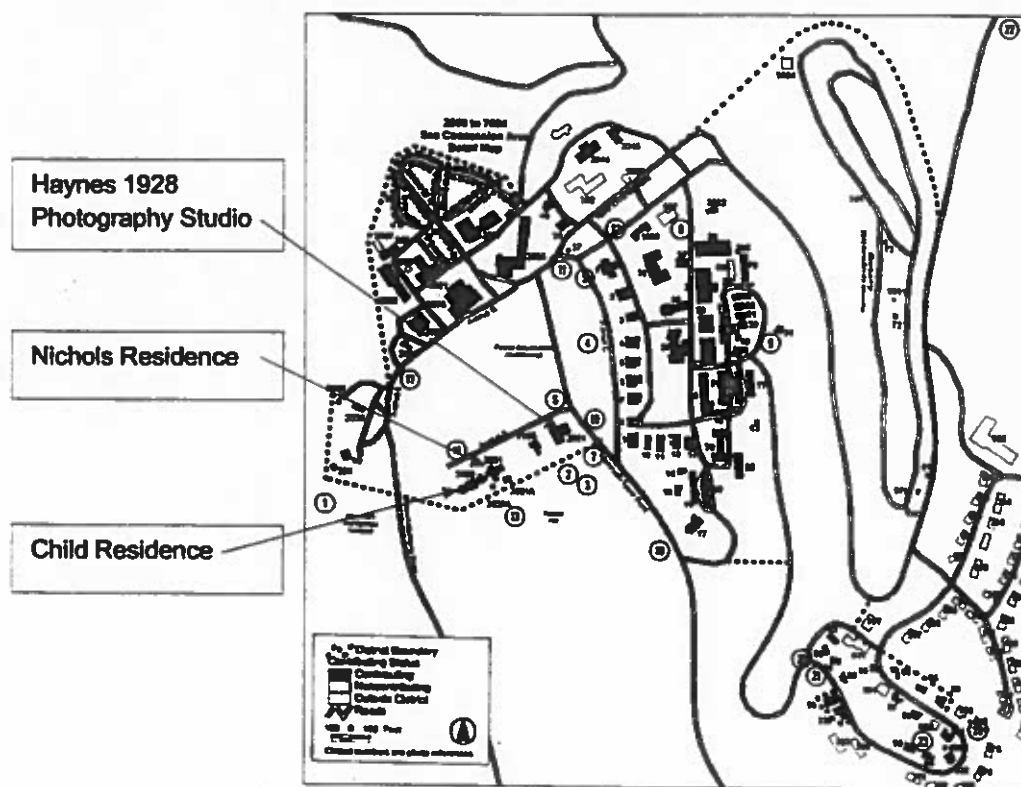


Figure 1: Mammoth Hot Springs Historic District, from National Register Nomination.

³ R. Laurie Simmons and Thomas H. Simmons, *Mammoth Hot Springs Historic District National Register Registration Form*, submitted September 28, 2001, and listed March 20, 2002, page 48.

⁴ *Ibid.*, p. 49.

The National Register Nomination for the Mammoth Hot Springs Historic District and the Classified Structures report erroneously label this house as the "Vernon Goodwin Residence."⁵ Apparently Goodwin never lived here, although he did live in one of the cliff houses in Mammoth.⁶ Goodwin did have designs drafted for a house in Mammoth, by now-famous Park architects Gilbert Stanley Underwood and Robert Reamer. Neither of these designs was implemented.⁷ Reamer did, however, design the Harry Child Residence immediately west of the Nichols Residence. This building, of the Craftsman style, was built in 1908 and has certain design similarities to the Nichols Residence.⁸ The Child Residence is sheltered with a low sloped cross-gabled roof with deep overhangs, set on a chamfered concrete watertable, and clad with a horizontal board-and-batten wall treatment – all features present on the Nichols House.



Figure 2: Front facade of the Nichols Residence, looking west.



Figure 3: East facade of the adjacent Child Residence, looking south towards Capitol Hill.

⁵ Ibid., page 15, and List of Classified Structures, Mammoth Hot Springs Vernon Goodwin Residence.

⁶ Bob Goss, email January 10, 2008.

⁷ Ruth Quinn, *Weaver of Dreams: The Life and Architecture of Robert C. Reamer* (Gardiner, MT.: Leslie and Ruth Quinn, Publishers, 2004), p. 161-162.

⁸ Ibid., p. 66.

The connection between the two buildings is reinforced socially through the relationship between William Nichols and his father-in-law Harry Child. William Nichols apparently moved into the Nichols Residence soon after he married Harry Child's daughter Ellen Dean Child in 1905.⁹ It is conceivable that the Nichols Residence received a new façade and exterior treatment, to more closely align with the style of the Child Residence, soon after (or perhaps while) the Child Residence was constructed.

2. Social History

The Nichols Residence is important in the history of the Park's long-term concessioner William Nichols - as probably the first Nichols-altered building in what would become substantial holdings in the Park - and as a fairly cohesive ultimate design within the framework of the Craftsman Style, despite - or because of - the various accretions to the building over time. This building represents a long history of construction in the Mammoth Hot Springs area of the Park - perhaps dating as far back as the 1880's - and a subsequent string of additions and remodelings, culminating in the current Craftsman Style appearance as visible from the public right-of-way.

This building is representative of the concessioner's role in the Park as well, for as early as 1905, it appears to have been used as the Nichols' residence during their summer residences. Like the Hamilton family of concessioners, the Nichols' family wintered in California. The historic name of the building - the Nichols Residence - is used throughout this report, in deference to William Nichols and his long-term commitment to the Park.

3. William Nichols

In *Making Concession in Yellowstone*, author Robert V. Goss succinctly summarizes and characterizes the life and impact of William Morse Nichols:

"He was born in 1881 in Hartford, Conn. Familiarly known as "Billie," he attended the US Military Academy at West Point from around 1899 to 1903. He graduated as a second lieutenant in 1903 and was assigned to the 11th Cavalry and sent to Yellowstone Park. He married Harry Child's daughter, Ellen Dean Child, in 1905 and resigned his commission in the Army in September of that year. In 1907 he served as secretary to Harry Child, and two years later became Secretary of the newly formed YPHCo. He was the second largest shareholder of the Cody-Sylvan Pass Motor Co. in 1916 with 28% of the shares. With the death of Harry Child in 1931, Nichols was elevated to president of the company. The various Child/Nichols enterprises were merged together in 1936 with Nichols as President of the new Yellowstone Park Co. During the lean war years, business was bad in the park and few facilities were open. Nichols was forced to sell his shares of the Flying D Ranch in 1944 to help pay off debts to the railroad companies. During the mid-1940's his son John Q. gradually began to take over active management of the company. In 1956 Billie resigned as president of the company to take over as chairman of the board of directors of YPCo. He remained with the company until his death on August 6, 1957 at Mammoth, after suffering a heart attack about nine days earlier."¹⁰

⁹ Ibid., p. 66.

¹⁰ Robert V. Goss, *Making Concessions in Yellowstone* (Self-published, 2004), p. 76-77.

4. Architectural Style

The residence is a welcoming example of the Craftsman style bungalow which reached its peak in the United States in the period from 1910 through the 1920s. The most salient features include being one-story under a low-sloped gabled roof with broad eaves. The robust nature of the eaves with heavy knee brace supports contributes to the comfortable, embracing look of a cottage. Groupings of casement windows are nestled in irregularly spaced suspended bays; they belie the irregular, nearly haphazard construction of the earlier buildings behind the façade. The entire composition is well grounded with the expressive concrete watertable at the base.



Figure 4: This Craftsman style home was typical of those providing a comfortable living to middle-class families throughout the States.

The interior also demonstrates the great effort expended to provide a consistent appearance – with windows, doors, and trim treated similarly throughout, and the introduction of the sun-filled hallway that connects the public spaces with the Bedroom wing. The deep window bays provide a strong visual focus to each room, while framing views of the magnificent Mammoth terrain. The fireplace – the mainstay of the Craftsman cottage – is conspicuously absent from the Living Room / Dining Room in the center of the building. The features described herein are expounded upon further in Character-Defining Features.

C. Construction History

1. Site – Mammoth Hot Springs

The Nichols Residence is located at the northern base of Capitol Hill in the historic district of Mammoth Hot Springs. Travertine from hydrothermal deposits was dug and carved to pour the concrete foundations of the twentieth century crawlspace. The travertine appears to be of older deposits. The Surficial Geologic Map of the Mammoth Quadrangle describes it as: "...light-gray, yellowish- to grayish-weathering calcium carbonate, commonly subhorizontally layered."¹¹ Several travertine-depositing hot springs are located nearby; travertine is accumulating along the Mammoth Hot Springs and at Opal Terrace just west of the adjacent Child Residence. This travertine is essentially a reformation of limestone formed underground millions of years ago. The limestone dissolves in the carbon dioxide-rich water heated by the molten rock of the Yellowstone caldera. This hot water, saturated in calcium carbonate from the limestone, rises to the surface where it cools. As it cools, the minerals drop from the solution and deposit calcium carbonate (travertine) on the hot spring terraces. This process is rapid; "Geologists have

¹¹ Kenneth L. Pierce, *Surficial Geologic Map of the Mammoth Quadrangle and Part of the Gardiner Quadrangle, Yellowstone National Park, Wyoming and Montana* (Washington, D.C.: U.S. Geological Survey, 1973).

reported an average rate of about eight inches of rock deposited each year. A drill hole by the U.S. Geological Survey found 253.4 feet of travertine in the Mammoth area."¹²

These travertine deposits "are water-soluble and can dissolve in the presence of irrigation water, snowmelt run-off, and precipitation."¹³ This dissolution of the travertine can cause formation of underground voids, which sometimes rise to create sinkholes. Apparently some of the settlement of buildings in Mammoth is attributed to the development of sinkholes. "However, it should be noted that a majority of the buildings, many of them over fifty years old, have performed quite well."¹⁴

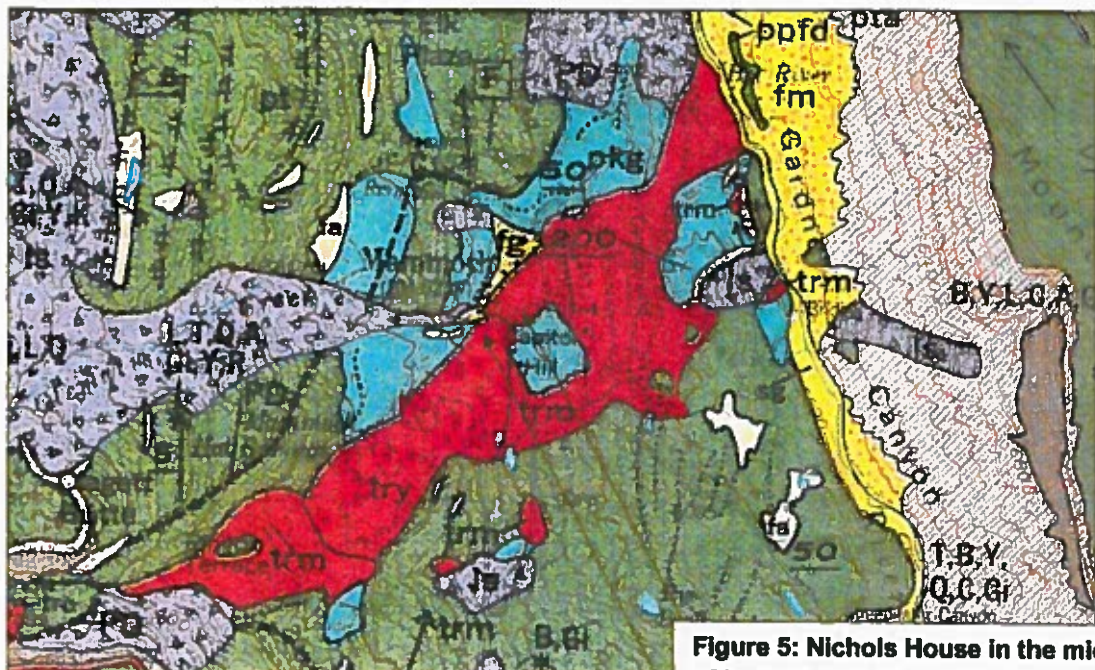


Figure 5: Nichols House in the midst of hydrothermal travertine deposits.

Travertine-depositing hot spring (depicted by orange square).

¹² William J. Fritz, *Roadside Geology of the Yellowstone County* (Missoula, MT: Mountain Press Publishing Company, 1985), p. 71-72.

¹³ Allied Engineering Services, Inc. *Geotechnical Report: Yellowstone Justice Center, Mammoth Hot Springs, Wyoming* (Project No. 04-279, provided to CTA Architects Engineers for design of foundations for the Yellowstone Law and Justice Center. January 24, 2005, introductory letter. (Allied Engineering notes in their report that they conferred with two Yellowstone National Park archeologists during the preparation of their report.)

¹⁴ *Ibid.*, p.3.

2. Site Construction History

Capitol Hill has served as the backdrop for several buildings since the early development of Mammoth Hot Springs. Prior to construction of the Nichols Residence (as we know it today), the base of the hill was the site of various buildings constructed by James A. Clark. Clark "...constructed a small tent hotel at the base of Capitol Hill in 1885 and was granted a 4-acre lease for 10 years that permitted him to build a hotel and necessary outbuildings. He also established a transportation and guide service that year for his guests...They advertised renting carriages, hacks, and saddle horses, with or without drivers."¹⁵ Clark never built the hotel allowed by his lease and subsequently sold his hotel interests to George Wakefield in 1888. Clark did construct several buildings on the site; it is thought that parts of some of these buildings might have been incorporated into the Nichols Residence. One residence, shown in the following photograph, depicts a cross-gable building at what might be the Nichols Residence site; this building might be the core of the Nichols Residence. If so, this building was also built in stages and probably with portions of other buildings.



Figure 6: 1886 photograph of Clark's Transportation & Livery barn at the base of Capitol Hill. Photograph courtesy National Park Service, Yellowstone National Park, YELL #14316.

Historic photographs indicate that Clark's Transportation & Livery barn was located approximately where the current Hayne's Photography Studio is. In 1885, the *Livingston Enterprise* noted that: "Clark's Town" is located at the foot of Capitol Hill and contains five houses and a number of tents."¹⁶ Historic photographs depict

¹⁵ Robert V. Goss, *Making Concessions in Yellowstone* (Robert Goss, 2003), p. 28-29.

¹⁶ This citing was provided by Robert V. Goss, in an email correspondence of March 24, 2008.

several outbuildings and views of some houses that might have provided construction material – and even building wings – that ultimately became the Nichols Residence. Physical evidence in the building (See The Building Form – Informed by Frame Construction) indicates that portions of the building were built in the 1880's and that building parts were added to the house over the years. Several of the most telling (i.e. potentially leading) photographs are illustrated herein, with an attempt at providing a possible scenario of construction. This analysis should be examined in conjunction with studies being performed on the other properties in the area - most specifically the Haynes Photography Studio of 1928 at the far east end of this residential row. The cross-gable roofed building pointed out above could be the basis for the Nichols Residence.



Figure 8: Clark's Transportation Company barn. Future (1903) site of the relocated Hayne's Photo Shop.



Figure 9: One of Clark's houses which probably provided framing or building wings to the Nichol's Residence.

Figure 7: Base of Capitol Hill, c.1893-1894. Photograph courtesy National Park Service, Yellowstone National Park, YELL #30285a.

The first Hayne's Photography Studio buildings (there appear to have been two buildings in the complex), which had been built in 1884 on the parade grounds south of the hotel, were moved to Clark's site in 1903. The studio "was razed in 1928 upon completion of the present headquarters building of Haynes, Inc."¹⁷ (on the site immediately east).

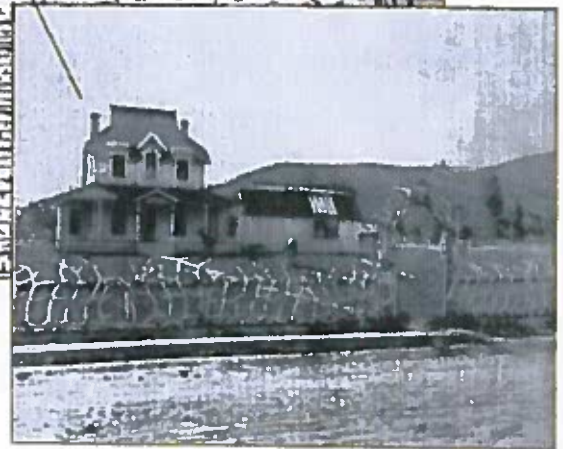
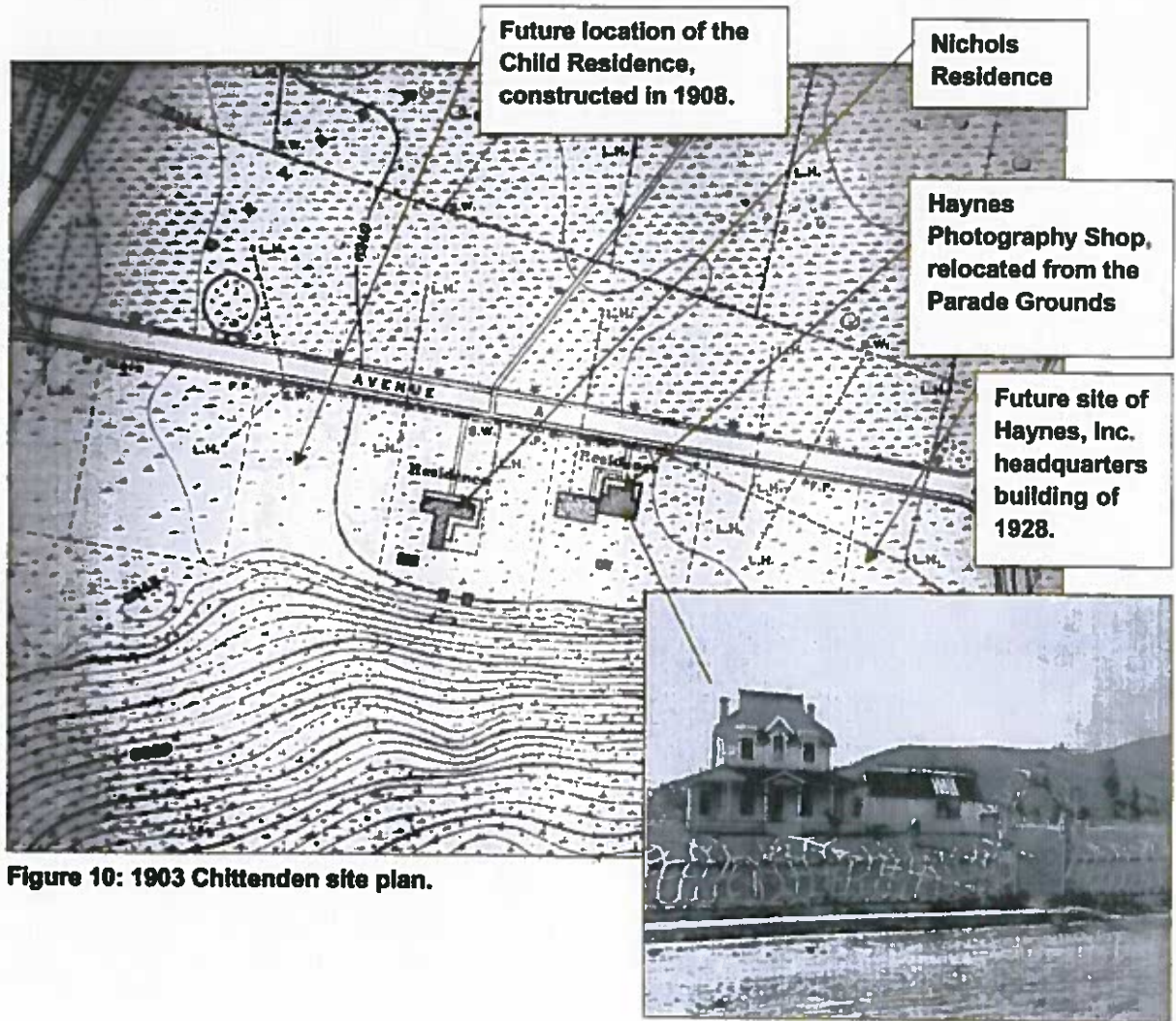


Figure 11: Haynes Photo Shop in its original Parade Ground location, c.1884. Photograph courtesy National Park Service, Yellowstone National Park, YELL #36469.

By 1903, when Chittenden prepared a site plan of the area, the only buildings depicted are the L-shaped Nichols Residence, the relocated Haynes Photography Studio buildings (joined together), and four smaller outbuildings. Whatever building wings and materials might have been integrated into what became the Nichols

¹⁷ Jack Ellis Haynes, *Haynes Guide: Handbook of Yellowstone National Park* (Yellowstone Park, Wyoming: Haynes, Inc., 1947) p. 156.

Residence had primarily been added at this point. The rear wing, however, was modified after construction of the adjacent Child Residence in 1908, as evident in a most informative photograph from the period between 1908 (when the Child Residence was constructed) and 1928 (when the relocated Haynes Photo Studio was demolished). The image of the Nichols' Residence behind the westernmost Child Residence clearly shows the north-south oriented gable roof – with a configuration of the south wing of the building that warrants further discussion in *Construction History Informed by Historic Photographs* below.

3. Construction History of the House

The construction history proposed herein is derived from examination and analysis of the physical evidence present in the building, as supplemented and informed by historic photographs and the historic use of the site as discussed previously. The foundation and interior supports, beams, joists, rafters, sheathing, and fasteners all provide clues as to the approximate dating and sequencing of construction. The interior and exterior finish work – wall treatments, trim, windows, doors, and roofing – are generally of the same time period, with the exception of the south wing of the building. Prior to the application of this cohesive exterior treatment, it appears that there were eight substantial building campaigns, several of which might have entailed the relocation of parts of other buildings.

4. The Building Form – Informed by Plot Plans

Two site plans depicting the Nichols Residence provide a timeframe of when the building came to sport its present form. A 1903 topographical map depicts the residence as a T-shaped building with a wrap-around porch. A 1929 site plan shows this T-shaped building with the east wing thickened, a polygonal porch extending from this thickened area (which contains the corridor), bays flanking the Dining Room wing, and a large front porch meeting the front sidewalk. The wrap-around porch present in the 1903 plan is not shown in the 1929 plan. These expansions are supported by the physical evidence which is presented below.

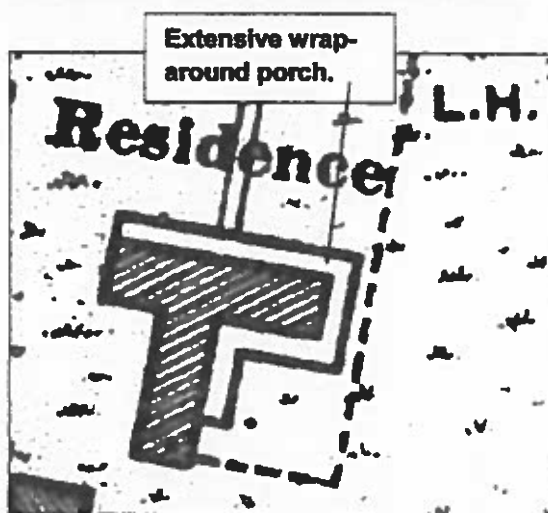


Figure 12: The Nichols Residence is shown on the 1903 Chittenden site plan above.

Post-1903 corridor and bay entry.

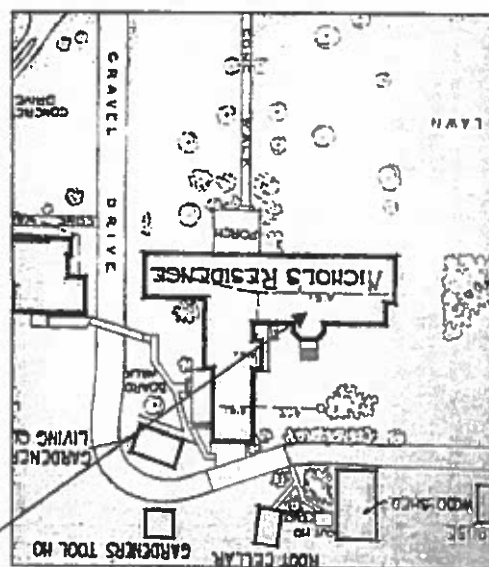


Figure 13: The Nichols Residence is shown above, in this 1929 site plan.

5. The Building Form – Informed by Historic Photographs

Two historic photographs of the Nichols Residence help generate a construction sequence that is used below, in conjunction with the physical evidence in the building. These photographs are shown in chronological sequence below, with a current photograph for comparison.

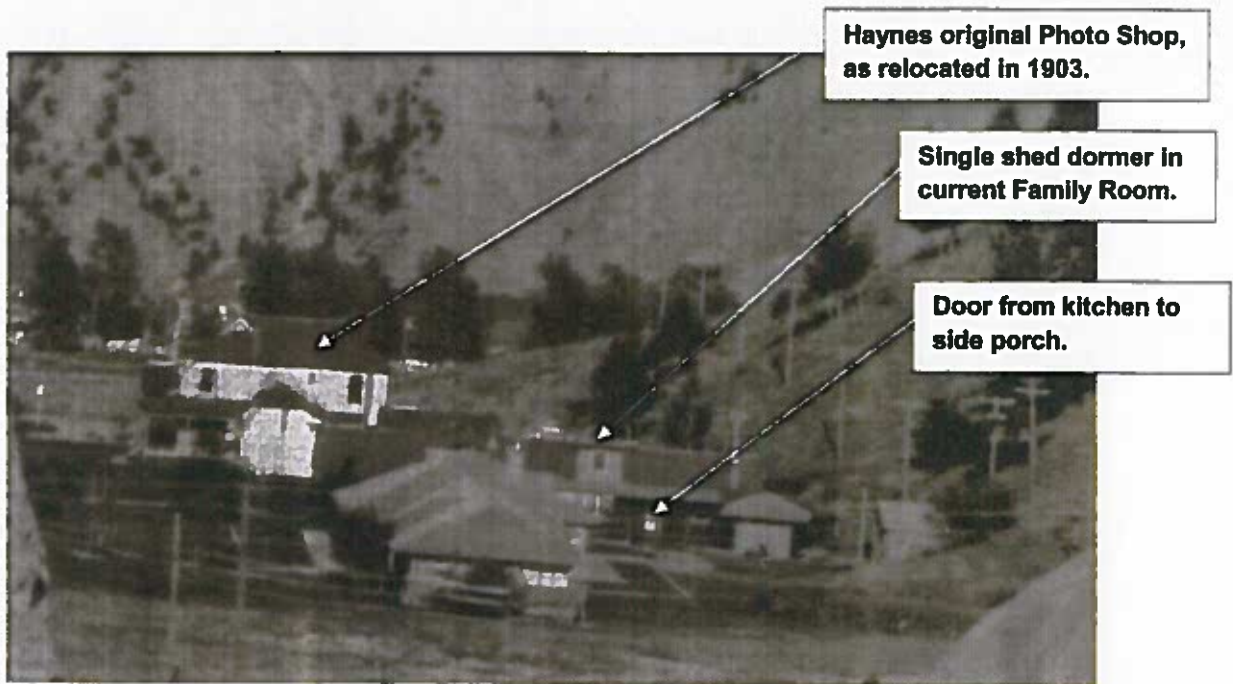


Figure 14: West elevation, with Child Residence in foreground, between 1908 and 1925. Photograph courtesy National Park Service, Yellowstone National Park, YELL #128753.



Figure 15: West elevation, with Child Residence in foreground, June 2008.



Figure 16: "Unidentified man and child" in front of Nichols Residence, with Child Residence in background. Undated photograph courtesy National Park Service, Yellowstone National Park, YELL #133661.

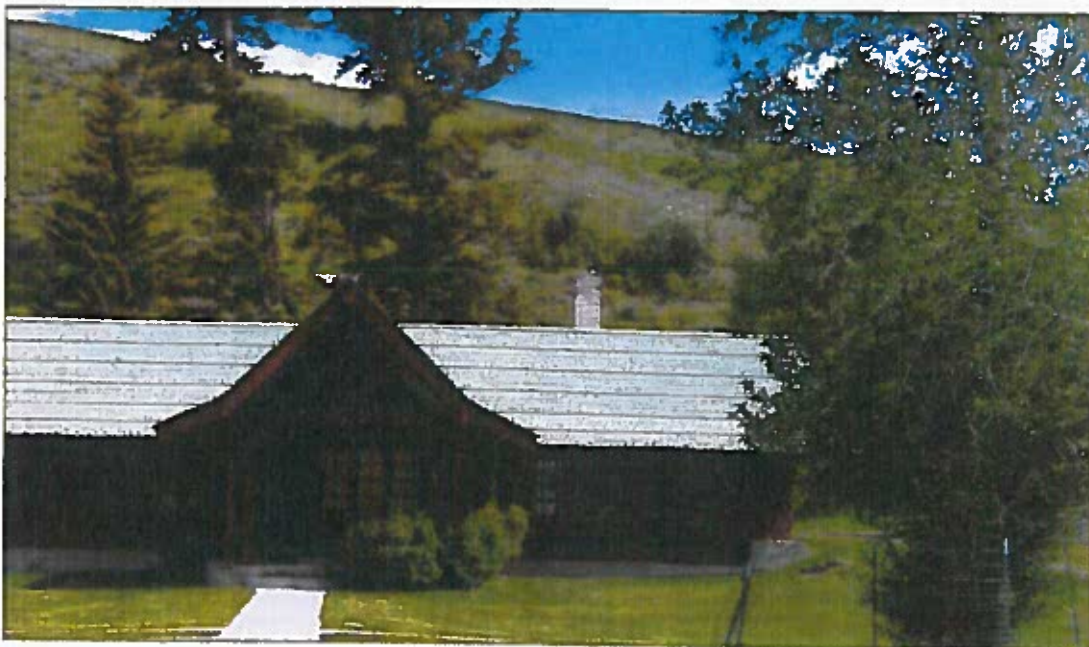


Figure 17: Master Bedroom Suite with one 3-bay and a single window at the bathroom, June 2008.

6. The Building Form – Informed by Framing Comparison

Physical evidence in the building tells part of the construction history of the building. This starting point establishes a rough sequence of the construction, but isn't able to identify who constructed the building or the modifications, nor is it able to provide exact dates for the work. The form of the building, informed by an understanding of the framing, provides the majority of the clues, as the nearly consistent exterior cladding presumably covers much evidence. In addition, exposed wall materials in the crawlspace help identify where previous exterior walls were, and exposed roofing materials in the attic reveal roof framing sequences.

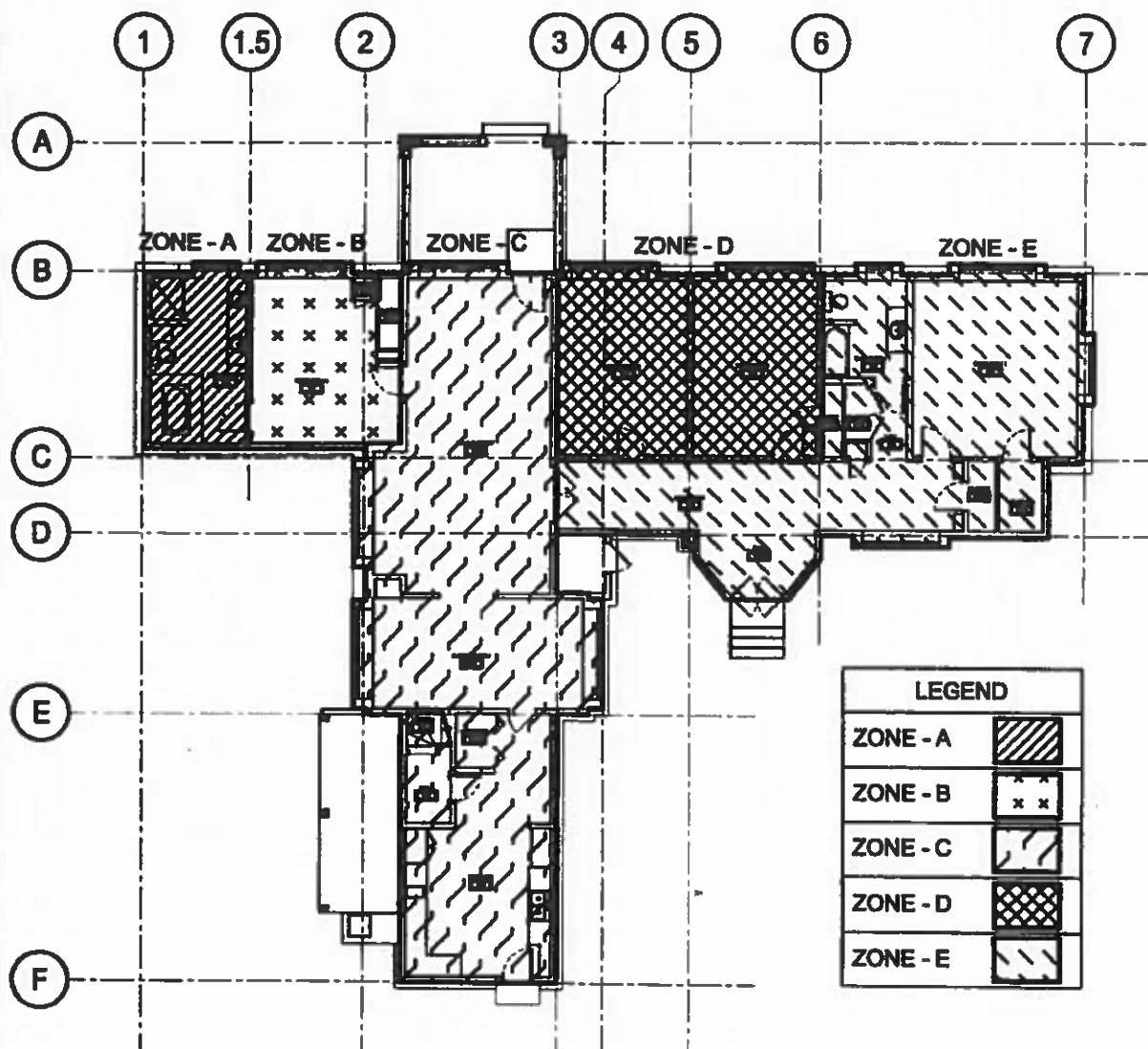
The following study of the framing of the building documents the size, spacing, and direction of the framing. In order to categorize and discuss the various parts of the building, the house has been sequentially "zoned" on the following plans. To facilitate an unbiased analysis, the zones were objectively labeled and are not representative of a proposed construction sequence.

The Nichols Residence is a stick-built frame house with wood studs, wall sheathing, and an exterior wood board finish. The largest lumber discovered in the building is a 4" x 6" sill plate at the top of the south wall of Bedroom #103 (Zone D). Framing evidence indicates that this is the oldest room in the house, as discussed below. However, the method in which the attic framing of Zone K/L above was built onto the roof slope of Zone H indicates that Zone H (and Zone C below) were located on the site before Zone D. The remainder of the framing is of wood 2x's of varying widths and depths.

The older parts of the building appear to have been framed with Douglas Fir; the framing of the newer parts added between 1903 and 1929, which are framed in nominal dimension lumber, was not tested. All the dimensions provided on the following pages were measured on site and are the actual dimensions.



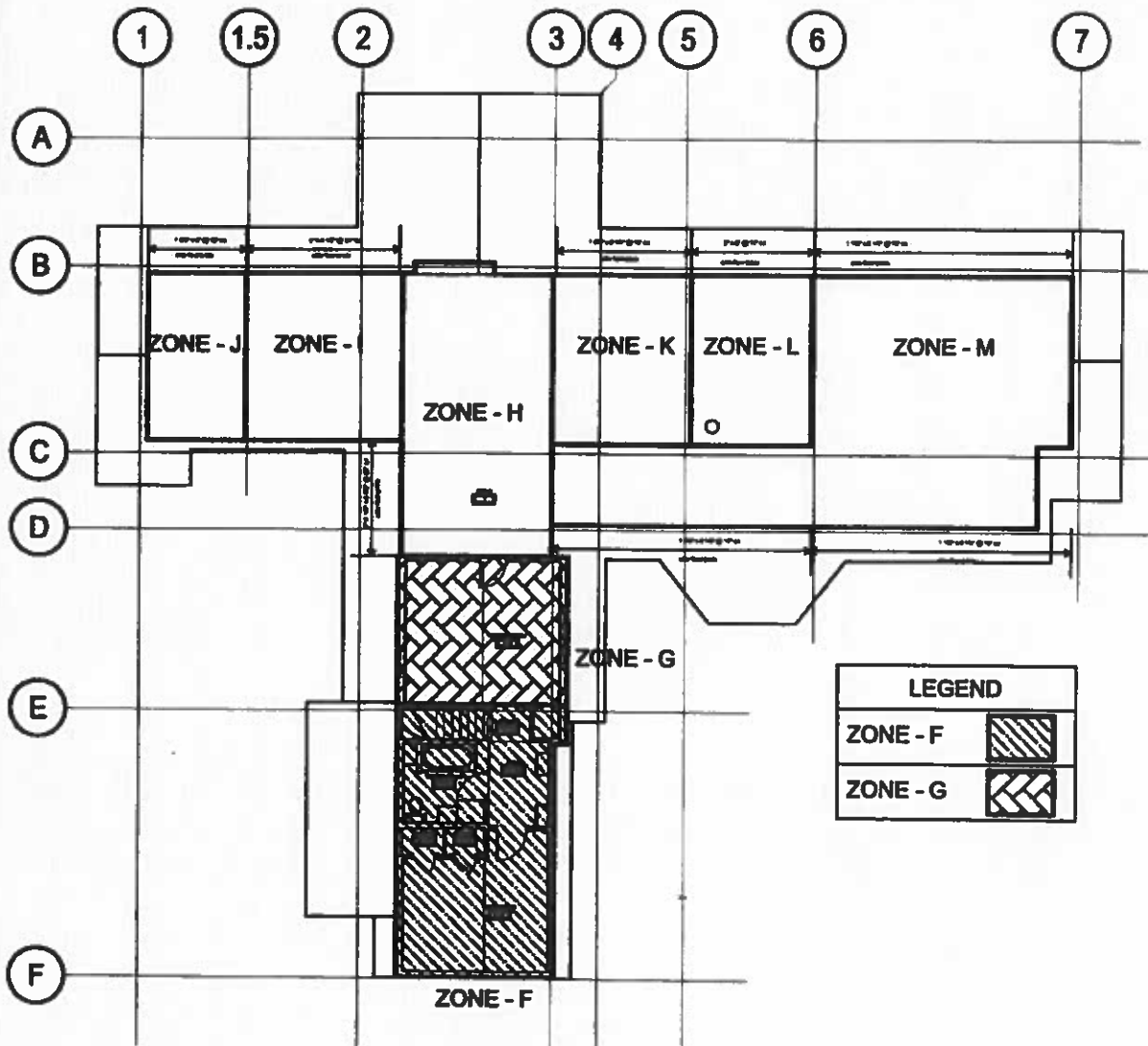
Figure 18: Framing of attic in Zone K onto existing finished roof slope of Zone H. Looking west from Zone K attic. This establishes Zone C/H as the initial mass of the building, to which other building wings – some of which (Zone D/K-L specifically) were of older materials – were added.



1
HSR-1

First Floor Key Plan

1/16"=1'-0"



1
HSR-2

Second Floor Key Plan

1/16"=1'-0"

Nichols Residence
Historic Structure Report
Yellowstone National Park

Zone	Floor framing (crawl)			Ceiling framing (attic floor framing)		Roof framing		Roof Sheathing
A&J	Joists Spacing Span Subfloor	2 x 9 $\frac{1}{4}$ " 16" o.c. n-s 7/8" x 7'-9", half-lapped, diagonal ¹⁸		Joists Spacing Span	1-5/8" x 5" 16" o.c. n-s	Rafters Spacing Slope Ridge Nails	1 $\frac{1}{2}$ " x 3 $\frac{1}{2}$ " 17" o.c. 12:12 5 $\frac{1}{2}$ " Wire nails	t: $\frac{3}{4}$ " Width: 10 $\frac{1}{2}$ - 11" Gaps: None Some T & G board
B&I	Joists Spacing Span Subfloor	1 $\frac{3}{4}$ " x 7 $\frac{1}{2}$ " 24" o.c. e-w 1" x 7 $\frac{1}{2}$ " butted rough-sawn boards, n-s		Joists Spacing Span	2" x 4 $\frac{1}{2}$ " 24" o.c. n-s	Rafters Spacing Slope Ridge Nails	1-5/8" x 3 $\frac{1}{4}$ " 24" o.c. $\frac{3}{4}$ " x 7" Wire nails	t: $\frac{3}{4}$ " assumed Width: 11-11 $\frac{1}{2}$ " Gaps: 0 - $\frac{1}{2}$ "
C&H	Joists Spacing Span Subfloor	2x8 24" o.c. e-w Wide bark edge, butted. Runs n-s		Joists Spacing Span	2-2 $\frac{1}{2}$ " x 6-7/8" 20" o.c. 13'-10" e-w	Rafters Spacing Slope Ridge Nails	2 x 4 24" o.c. 9 $\frac{1}{2}$:12 No beam Cut nails	t: 1", with bark Width: 9" - 16" Gaps: 0 - $\frac{1}{2}$ " Joints Butted
D&K ¹⁹	Joists Spacing Span Subfloor	True 2x6 32" o.c. 17'-6" n-s Rough-sawn planking, e-w		Joists Spacing Span Clg Hgt	1-5/8" x 5 $\frac{1}{4}$ " 16" o.c. ²⁰ e-w 8'-4 $\frac{1}{2}$ " aff	Rafters Spacing Slope Ridge Nails	2"-2 $\frac{1}{2}$ " x 5 $\frac{1}{4}$ "-6" 16" o.c. 10 $\frac{1}{2}$:12 No beam Cut nails	Sheathing is shared with Zone L - runs across rafters.
D&L	Joist: Spacing Span Subfloor	True 2x6 32" o.c. 15'-7" n-s Rough-sawn planking e-w		Joists Spacing Span Clg Hgt	True 2 x 6 17" o.c. n-s 7'-6" aff	Rafters Spacing Slope Ridge Nails	1 $\frac{1}{2}$ "-2" x 6" 36" o.c. 10 $\frac{1}{2}$:12 No beam Cut nails	t: 1"-1-1/8" Width: 6"-11 $\frac{1}{2}$ " Gaps: $\frac{1}{2}$ " - 2"
E&M	Joists Spacing Span Subfloor	1 $\frac{1}{2}$ " x 7 $\frac{1}{2}$ " 16" o.c. n-s $\frac{3}{4}$ " diag. half- lap joint		Joists Spacing Span	1 $\frac{1}{2}$ " x 5 $\frac{1}{4}$ " 16" o.c. n-s	Joists Spacing Slope Ridge Nails	1-5/8" x 5 $\frac{1}{4}$ " 16" o.c. 5:12 1 $\frac{1}{2}$ " x 5 $\frac{1}{2}$ " Wire nails	t: $\frac{3}{4}$ " Width: 7" typical Gaps: None Some lapped joints
Dining	Joists Spacing Span Subfloor	2" x 5 $\frac{1}{2}$ " 24" o.c. e-w 7/8" x 8'-14" Bark edge, butted, n-s			Not accessible		Not accessible	Not accessible
Kitchen	Joists Spacing Span Subfloor	1-5/8" x 5 $\frac{1}{2}$ " 24" o.c. e-w $\frac{3}{4}$ " x 6'-10", n-s Butt joints ²¹		Joists Spacing Span	1 $\frac{1}{2}$ " x 5 $\frac{1}{2}$ " 16" o.c. e-w		Not accessible	Not accessible

¹⁸ Additional flooring has been added: 3/8" underlayment has been installed over the tongue-and-groove finish fir flooring of the bathroom, as a base for the current sheet vinyl flooring.

¹⁹ The east portion of Zone K ceiling framing is built on top of the west portion of the ceiling framing for Zone L.

²⁰ The walls in this room are spaced 16" on center as well (ascertained by use of a studfinder), but their size is unknown.

²¹ Additional flooring has been added: $\frac{3}{4}$ " OSB/pulp underlayment has been installed over the tongue-and-groove finish fir flooring of the Kitchen. The sheet vinyl finish flooring has been removed.

The zones - C/H, D/K, D/L, and the Dining Room, as highlighted on the above chart – are the older portions of the building. Their full size framing members, cut nails, and bark edge subflooring and sheathing are representative of framing methods used up through 1890. With their wide joist and rafter spacing and 4" x 6" top plates, Zones K & L are the oldest parts of the building; although as noted above, the attic framing of Zone K is built onto the east finished slope of Zone H. This indicates that Zone H (and Zone C below) were probably on the site first. The sequencing of construction appears to have been as follows, in ascending chronological order:²²

- a) Phase 1 - Zone C/H: Original construction on site, with exception of Kitchen wing to the south. Constructed c.1884.
- b) Phase 2 - Zone Dining Room: This was probably constructed soon after zone C/H. The second story over the Dining Room was constructed later, probably coincident with construction of the second floor over the Kitchen.
- c) Phase 3 - Zone D/K & D/L: Constructed onto Zone C/H.
- d) Phase 4 - Zone B/I: Zone B's finished west concrete foundation wall – which was busted into later to provide access to the later Zone A crawlspace – appears to have been an exterior wall at some point.
- e) Phase 5 - Zone A/J: The floor framing of this portion is older than the roof framing, indicating that either the floor or the roof framing might have been moved to this site.
- f) Phase 6 - Zone Kitchen, before 1903 (Chittenden plan). The build-out of the second story was added between 1903 and 1925.
- g) Phase 7 - Zone E/M: The 1903 and 1929 site plans indicate that this sizable addition post-dated the Kitchen addition and occurred between 1903 and 1929. It probably occurred in 1910 or soon after, soon after the construction of the adjacent Child Residence.
- h) Phase 8 – Second floor addition above Kitchen and Dining Room.
- i) Phase 9 - c.1980's: Interior renovations – updating of finishes, plumbing fixtures, and the Kitchen.
- j) Phase 10 – 1996 addition of water softener closet at southeast interior corner (and concrete masonry foundation wall below).
- k) Phase 11 – c.1997 Reroofing.

7. Crawlspace Evidence

The above is further informed by exterior wall evidence visible in the crawlspace. In the crawlspace below Zone C – below the west wall of the Living Room – exterior wall boards extend down below the beam. These painted boards are ¾" thick, 9" wide, and fastened vertically to the concealed substrate. This confirms that the construction of Zone B post-dated that of Zone C.

The concrete foundation walls provide sequencing evidence as well. The thick concrete foundation walls at Gridlines 1.5 and 5 (between C and D) were both busted into to provide access to new crawlspaces to the west of each gridline. Note, however, that the framing installed west of Gridline 1.5 probably comes from an earlier building moved to this site. In addition, small vents within the crawlspace obviously predate the construction of Zone E/M, for one of these vents is on Gridline

²² We are grateful to Herb Dawson, NPS Historic Architect, for his insights into the probable relocation and incorporation of parts of other buildings into this building.

C between Gridlines 5 & 6. This erstwhile exterior wall was enclosed with the addition of Zone E's corridor.



Figure 19: South elevation of the Kitchen Wing - Zone F - utilizes low-slope roofing 2x4 framing. Both first & second floor exterior cladding differ from each other and from the horizontal board-and-batten finish on the primary elevations.

8. Attic Evidence

Wood framing throughout the building was all cut with circulating saws which were used dominantly throughout the United States as early as 1860. These members might have been sawn at the Park's sawmill, which provided lumber (and a bill to be paid with a certified check) to private parties in order to discourage buildings "...of rough logs and mud..." during the 1880's.²³ Earlier roofing treatments are visible in the attic, providing additional construction sequencing information, as follows:

- a) **Zone H:** The east and west slopes of Zone H's roof are exposed to the exterior, south of the cross-gable. North of the cross-gable, the slopes are contained within the crossing gables of the later roofs to either side. Where contained, the original roofing treatment is exposed, described as follows: 16" long sawn

²³ Mary Shivers Culpin, *A History of Concession Development in Yellowstone National Park, 1872-1966* (Yellowstone National Park, Wyoming: National Park Service, 2003), p. 28.

Western Yellow Pine shingles, fastened with machine-headed cut nails,²⁴ are typically 3" to 8" wide and laid with a typical exposure of 4". The shingles are installed over thick roofing felt over sheathing boards spaced closely together. The shingles are painted red, at the exposed surface only. No gutter or sheet metal flashing remains at the eaves; they are covered with the construction of Zone I.

- b) *Zone L*: The extended southern slope of the east cross gable covers the original roof of Zone L as the later framing (of Zone M) extends past to cover the corridor below. The original roofing treatment remains on the south slope of Zone L here, described as follows: 16" long sawn Redwood shingles, fastened with machine-headed cut nails, are typically 4" to 9¼" wide and laid with an exposure ranging from 4¾" to 5¼". The shingles are installed over thick roofing felt over skip sheathing boards (the gaps range from ½" – 2"). The shingles are painted green, at the exposed surface only. The sheathing is 1 1/8" thick and 6" to 11½" wide. The underside of the sheathing and the rafters are white-washed; this is a singular treatment in the building. The roof edge flashing remains at the south edge, just visible next to the cripple wall supported the newer roof framing above. The flashing is of a heavy gauge steel sheet, part of which is painted red.

²⁴ Machine-headed cut nails were commonly available from 1825-1890. Wire nails began to replace cut nails c.1880.

9. Chronological Sequence Plan

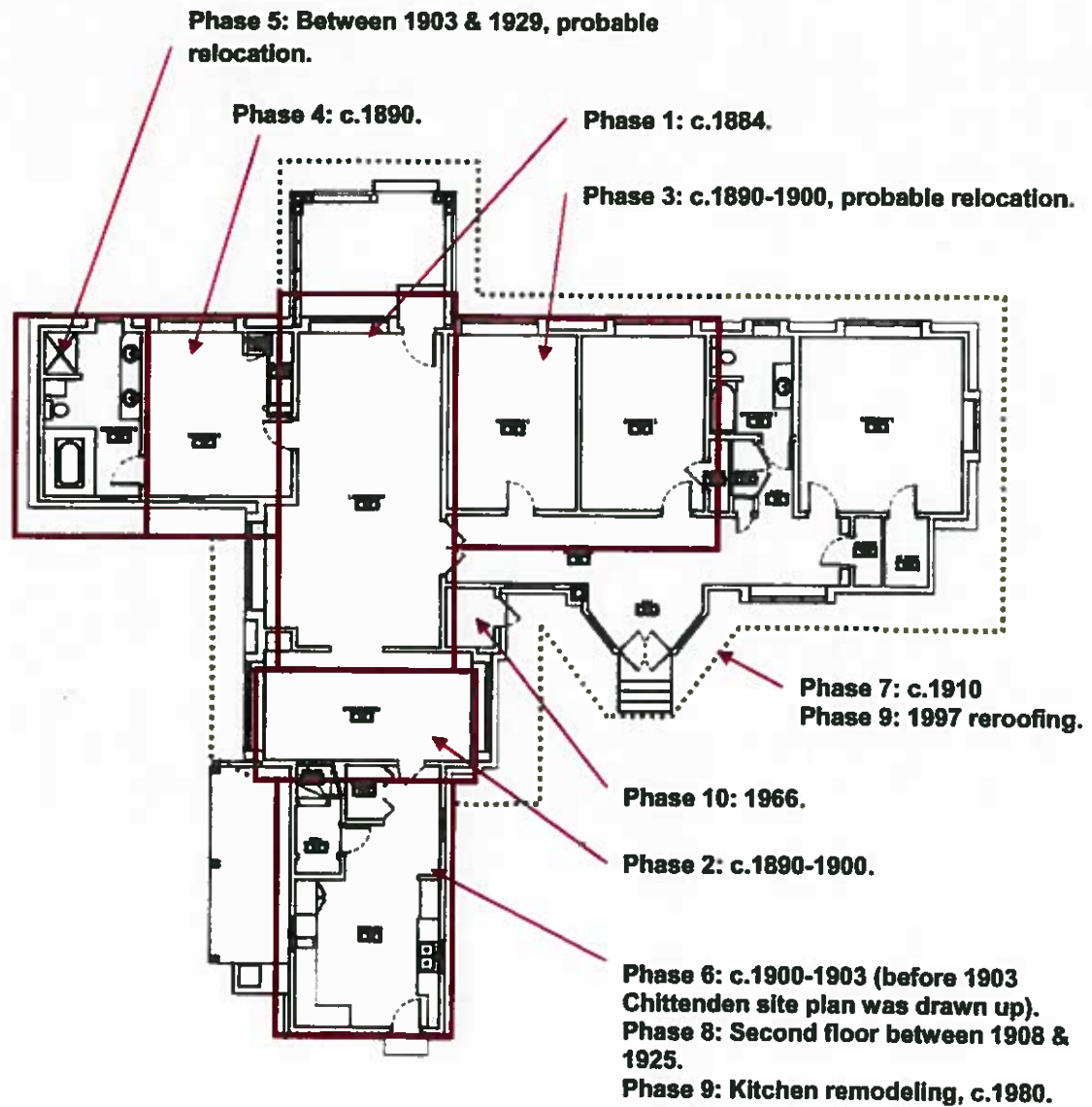


Figure 20: First Floor Plan, not to scale.

IV. Identification of Character-Defining Materials and Finishes

A. Exterior

1. Watertable

The concrete watertable is one of the hallmarks of the Prairie School of Architecture, which is considered a subset of the Arts & Crafts period. Frank Lloyd Wright mastered the watertable in his attempt to bring the building up out of the basement and to provide a robust base to the building. The top horizontal surface of the watertable at the Nichols House is sloped to drain water away from the wall and is accentuated by its typical 10½" depth (exceptions to this are noted below).



Figure 21: The concrete watertable of the Nichols House is chamfered and painted. This joint is located between Zone D and E.



Figure 22: Frank Lloyd Wright's Dana-Thomas House of 1904 extends the watertable to the sidewalk.

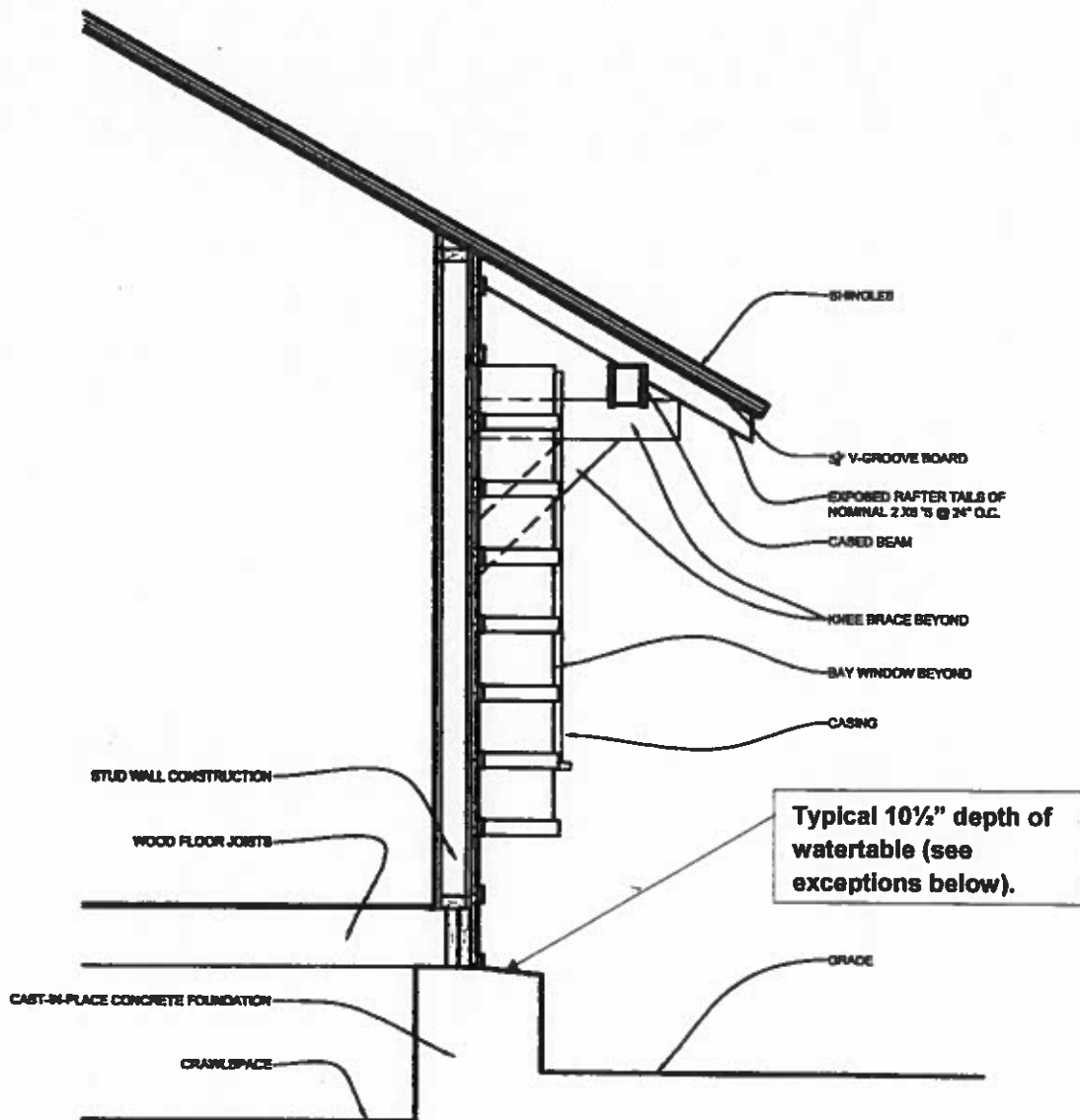


Figure 23. Typical wall section depicting concrete foundation / watertable.

Where the foundation is of later construction along the south and bay walls of Corridor #105, the concrete walls are thinner and flush with the finished wall above.



Figure 24: Watertable at south wall of Corridor #105, looking west, is flush with the wall above.

2. Walls

There are three primary exterior wall treatments at the Nichols Residence, indicative of a two-phased completion of the exterior. A Craftsman style horizontal board-and-batten treatment is visible from the streetscape and wraps around the majority of the one-story portion of the building. The exposed exterior walls of the south appendage – enclosing the west bay of the Living Room, all of the Dining Room, and all of the Kitchen – is finished with a vertical board-and-batten treatment on the first floor and wood shingles on the second floor. The lower story treatment is common to western residences in the late 1880's. The first Canyon Hotel in the Park was a one-story, gable-roofed structure with vertical board-and-batten. The upper story shingling was added between 1908 and 1925 (except for the shed dormer – located in the current Family Room – which predated the second story build-out.



Figure 25: The southwest interior corner where the south and west wings meet. This provides a direct comparison of the two board-and-batten treatments used on the exterior.



Figure 26: East wall of the Dining Room and Kitchen, showing the transition from shingled upper story to vertical board-and-batten first story.

3. Windows

The exterior windows are primarily contained within elevated boxed bays that extend up among the beams that support the extended rafter tails. The boxes continue the board-and-batten wall treatment, which is accentuated at the outside mitered corners and the base of the box. Within the boxes, single casement windows are juxtaposed with groupings of two or three in adjacent boxes. Each casement is protected with a wood storm window hung from the top trim. The storms' muntin patterns match those of the interior windows.



Figure 27: Window Bays

Within the horizontal board-and-batten wall treatment, five windows are set directly in the wall plane and not within bays. These windows are all on the south side of the building. The trim on these windows is built-out to extend the window further out into the plane of the wall. Because this occurs on what would have been the new south wall of the corridor, this is believed to have been an intentional aesthetic treatment, and not one resolving an existing condition.

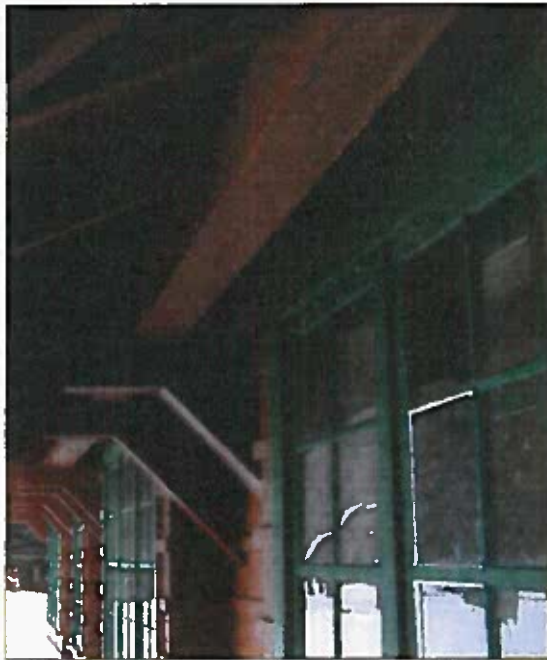


Figure 28: Wood storm windows hung by small hinges from the top trim.



Figure 29: Trim extension at south window of Bathroom #108.

4. Front Porch

The front porch roof is supported by wood posts with exposed beams and roof framing. The structure projects well to the north of the house façade, and the low deep eaves provide a sheltered entrance, which is typical of the Craftsman style of architecture.



Figure 30: The west wall of the porch is glazed with sliding wood sash that provide protection from the wind or allow in gentle breezes.



Figure 31: The front porch provides a sheltered entry.

5. Roofing

The gabled and shed roofs are clad with smooth sawn wood shingles (see Building Assessment for discussion of roofing over the Kitchen wing). This characteristic roofing material was shared with many other buildings in the Park. The shingles are arranged in a stepped pattern, where every seventh course is doubled. This stepped roofing pattern was common among Prairie Style architects practicing from 1902 through 1926, such as George Maher and Robert Reamer. One of the other known examples for this treatment in the Park (now currently considered to be in Gardiner, just north of the Park's boundary) is the bunkhouse and mess house designed by Robert Reamer in 1906.

While stepped shingle roofs were not common in the Park, this roof treatment was utilized at a few buildings built by William Nichols' fellow concessioner and friend Charles Hamilton, including the 1924 West Thumb Store, the 1929 Hamilton Auto Camp Store, and the original Old Faithful campground store.

The valleys are flashed with painted sheet metal, with the inverted 'V' to help direct water away from the shingles.

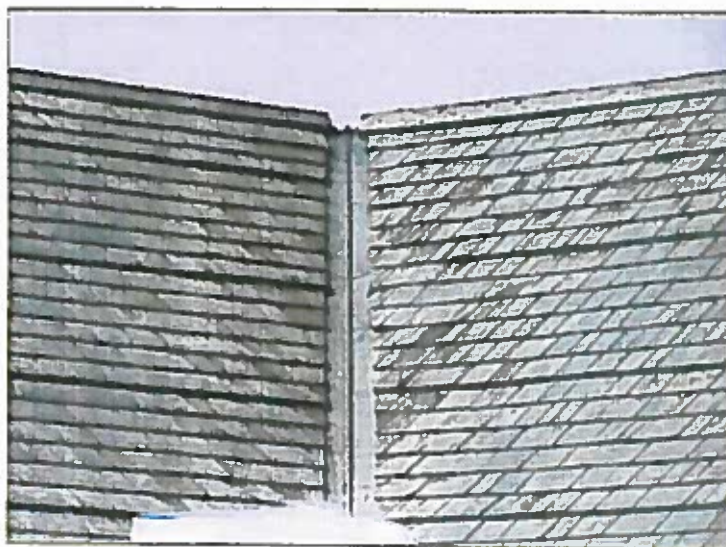


Figure 32: Typical stepped wood shingle roofing, valley lined with sheet metal, and ridges protected with wooden boards.

6. Soffit Treatment

- a) *Exposed Rafter Tails and Knee Braces:* These heavily cased knee brackets support cased beams, providing more support than is physically necessary for the 4'-deep overhangs. Instead they provide a comfortably substantial support. This common Craftsman treatment works successfully here as the braces alternate with the bay windows. The rafters are 1-5/8" x 5 1/2" actual size, indicating that were probably installed at the time this eastward extension and corridor addition were constructed.
- b) *Soffit Boards:* The deep overhanging soffits are open, with an exposed finish of V-groove boards. The boards are consistently 5 1/4" wide throughout the first floor roof soffit.



Figure 33: The soffits are finished with V-groove board and supported by cased brackets and beams.

B. Interior

1. Floor Plan

Physical evidence indicates that the Nichols Residence was originally a small structure with a rectangular footprint. Through a series of additions and renovations it was transformed into an example of the Craftsman style of architecture which first became popular in the early twentieth century. The interior include several characteristics of Craftsman style houses, including simple wood trim, built-in cabinets and shelving, and grouped window bays. The deep roof overhangs with exposed rafter ends shelter many box-bay windows with built-in window seats.

2. Walls & Ceiling

The first floor walls are of smooth plaster (or gypsum board overlayment) and treated very simply. There is no ornamental or cast plaster. The walls were probably originally colored with earth-toned or ochre paints; they are currently painted a creamy white.

The second floor room and stair walls and ceilings are finished with an 1/8" thick pulp-composite wallboard. Such a wallboard was available as early as 1907, when the Beaver Board Company of New York began producing wallboard.²⁵ This material was heavily used in modest housing in the United States through the 1960s, when plywood and particleboard took over the lion's share of the market.²⁶ The joints of the boards are concealed with a thin wood batten which is finished to blend with the adjacent boards. The fiberboard walls of Bedroom #210, Hall #209, Landing #212, and the stairway have received a faux-painting treatment described below. The ceilings have been painted a creamy white color. The fiberboard walls of the Family Room are covered with 1/8" thick paneling, probably representative of a remodeling effort in the 1960s. This fiberboard material might be Celotex, which is considered a readily flammable material.

The shower walls of Bathroom #211 are of 1/2" gypsum board which provided a backing for the plastic shower enclosure components.



Figure 34: Bedroom #210 with faux-painted fiberboard walls and creamy white fiberboard ceiling.

²⁵ Carol S. Gould, Kimberly A. Konrad, Kathleen Catalano Milley, and Rebecca Gallagher, "Fiberboard," in *Twentieth-Century Building Materials: History and Conservation*, ed. Thomas C. Jester (Washington, D.C.: The McGraw-Hill Companies, 1995), p. 122.

²⁶ *Ibid.*, p. 122.

3. Windows

The windows throughout the house are primarily casement windows; some are fixed picture windows flanked by casements. Two types of casement windows were identified.

The first type of casement window is located in the west Living Room wall, the Dining Room and the Kitchen. These windows have interior screens, and casements swing to the exterior by operation of a crank handle. The Dining Room windows are located in box-bays with a fixed window between two casements. These fixed windows have double-paned glass. These windows are indicative of the later remodeling efforts in these rooms – the bays and the kitchen.

The second type of casement window is located throughout the east-west wing of the house and the second floor. A few of these wood casement windows are single windows, however most are paired or in groups of three. The windows have exterior wood, six-lite storms; the wood, six-lite, casements swing to the interior. (The southwest window in Bathroom #108 is a four-lite window.) A simple, brass casement sash fastener is installed at each window. (Note: One window has what appears to be a replacement casement sash fastener. It is slightly different in appearance and it is ferrous.) Each sash has two, non-ferrous, five-barrel ball tip hinges. The bathroom window hinges are nickel-plated.

These windows are divided into three sub-groups. The first sub-group of these windows has a thick and substantial horizontal muntin. These are mostly in locations that are visible from the front of the house. Windows in the second sub-group have delicate, thinner horizontal muntins, the shape of which was common in the 1870's and c. 1915. The third sub-group has wide muntins both vertically and horizontally. Note that the windows on the second floor have smaller sash and are currently fitted with exterior screen windows. Typical installations of this period (of the completion of the house, c.1910) would have fitted both exterior storm and screen sash for each window.

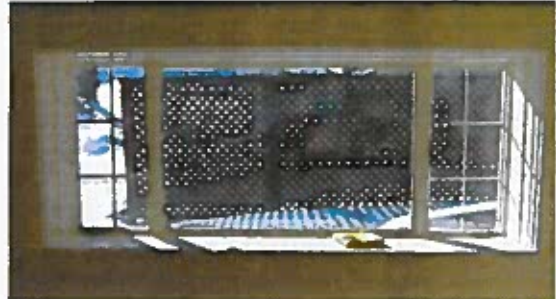


Figure 35: Dining Room Window

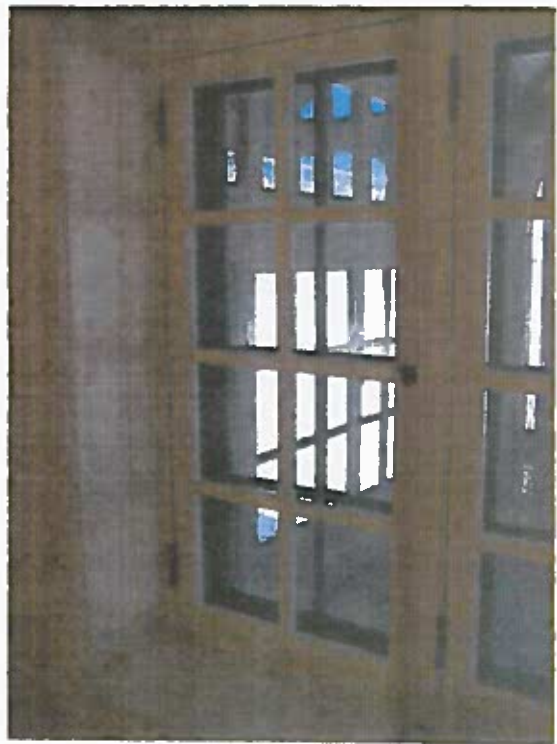


Figure 36: Box-bay window with in-swinging casements.



Figure 37: Casement operator handle typical of the out-swinging casement of the later installation.

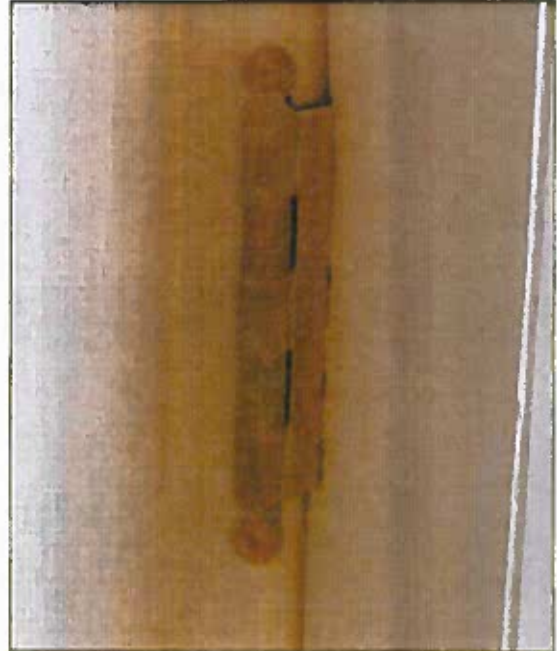


Figure 38: Window hinge typical of the in-swinging casement.



Figure 39: Sash fastener typical of the in-swinging casement window.



Figure 40: Thin horizontal muntin compared to the wide vertical muntin of the typical in-swinging casement window.

4. Flooring

Wood tongue-and-groove strip flooring is present throughout the house. The thickness of the tongue-and-groove planks varies in different areas of the house from $\frac{3}{4}$ " to 1". The tongue-and-groove flooring is laid over wood subflooring supported by the floor joists below. The subflooring type and span is noted in *Construction History* above.

There are three types of wood flooring throughout the house, indicative of the construction periods:

- a) $3\frac{1}{2}$ "-wide Douglas Fir flooring remains in Bedrooms #103 & 104, the original Zone D of the house. This flooring is oriented north-south, perpendicular to the subflooring. Since this flooring is covered with vinyl tile, the standard length and condition could not be ascertained.
- b) $3\frac{1}{2}$ "-wide Douglas Fir flooring spans the length of Corridor 105 and the floors of the other rooms in Zone M. $3\frac{1}{2}$ "-wide Douglas Fir is also used in the two rooms of the west wing and the Kitchen, as well as the second floor. The flooring in Bathroom #108 is oriented east-west, over diagonal subflooring; and the flooring in Bedroom #107 is oriented north-south, set perpendicular to the subflooring. The standard length of board is approximately 16'-7". The Kitchen flooring is oriented in line with the subflooring below.
- c) 2 $\frac{1}{4}$ "-wide plain sawn White Oak flooring is run the length of the Living Room and the Dining Room, directly in line with the subflooring below. The standard length of board is approximately 14'-6".

The finishing on the tongue-and-groove flooring varies. The fir flooring in the west Bedroom #107 has been painted, and the wood flooring through the corridor and Bedroom #100 appears to have been sanded and refinished. The original golden warm patina of the fir flooring remains in Closets #100A, #102A, #105A, and the corridor closet. The flooring at the door openings is typically butted against the adjacent flooring. There are only two wood thresholds inside the house: at the door to Closet #105A, and the door between the Kitchen and the Dining Room.

5. Baseboards

The baseboards throughout the house are of wood, except in the Laundry Room where a vinyl baseboard has been installed. The baseboards in the east-west wing are $7\frac{1}{4}$ " x 1" square edge boards with a $\frac{3}{4}$ " quarter-round shoe. The Kitchen has 5" high by $\frac{7}{8}$ " thick colonial style baseboards without a shoe. However, these were slightly damaged by the recent water leak. The baseboards on the second floor, like the windows, are slightly different from the ones on the first floor east-west wing. The baseboards in the second floor bathroom and bedrooms are $5\frac{1}{2}$ " high by $\frac{7}{8}$ " deep square edge boards with a quarter-round shoe. In the second floor landing and adjacent hall there are $6\frac{1}{4}$ " high square edge baseboards with a beveled base shoe.

The different styles of baseboard installed throughout the house indicate areas where different renovations or additions have occurred.



Figure 41: Typical First Floor Craftsman style baseboard.



Figure 42: c.1980's baseboard in Kitchen.

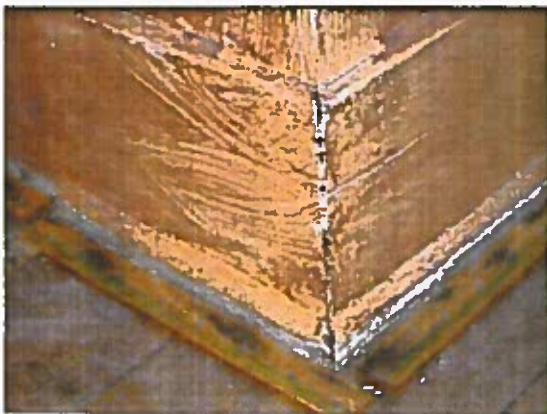


Figure 43: Baseboard with quarter-round shoe in second floor bathroom and bedrooms.



Figure 44: Baseboard with beveled shoe at second floor landing and hall.

6. Doors

Interior doors throughout the house are of wood. Four-raised-panel solid wood stile-and-rail doors are typical throughout the first floor. The standard thickness of the interior doors is 1 1/4". The few doors that are 1-1/16" and 1-1/8" thick are probably older doors that were original to the early wings of the house or culled from other buildings in Mammoth. The thinner doors are as follows:

- a) The door to Stair #112 is 1-1/16" thick and has a painted steel rimlock typical of the 1850s, with white porcelain knobs.
- b) The door to Closet #103A is 1-1/8" thick; the mortise lock faceplate is neatly fit into the stile.
- c) The door to Closet #100A is 1-1/16" thick; the mortise lock faceplate has split the stile.
- d) The door to Bedroom #103 is 1-1/8" thick.



Figure 45: Typical Interior First Floor Door

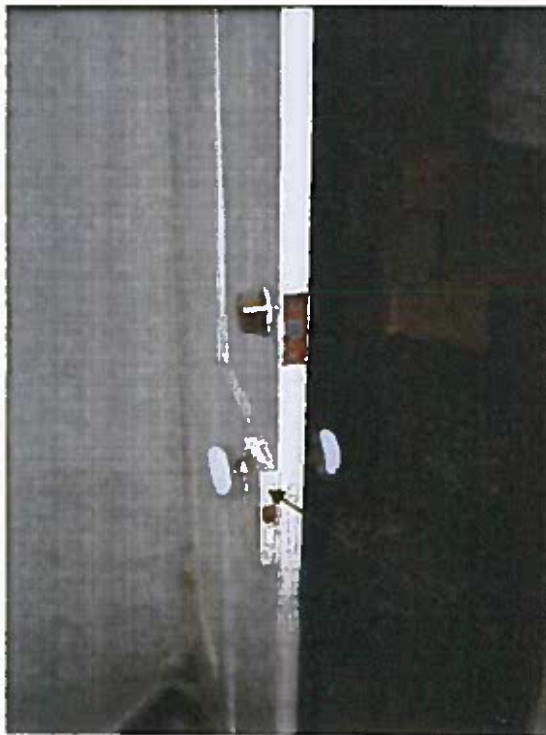


Figure 46: Older door, with rimlock, at entry to Stair #112.

The 1-3/8" thick doors are probably later additions, located as follows:

- a) The doors to Closets #210A and #210B.
- b) The French doors into Corridor #105.
- c) The door to Bedroom #100.
- d) The door to Bathroom #108.
- e) The door to Bathroom #211.

There is one set of paired typical doors at Closet #102A. A set of wood eight-lite paired French doors typical of the Craftsman period separates the Living Room from the corridor to the private spaces. These typical doors generally have a full mortise latch set.

There are a few exceptions to the standard door at the first floor. The door to Bathroom #101, the half-door between the Kitchen and Dining Room, and the door between the Kitchen and Hall #111 are hollow core doors with cylinder latchsets. The door at the Laundry Room is a hollow core wood bi-fold door with plastic knobs. These doors indicate the c.1980s renovations that occurred in the house.

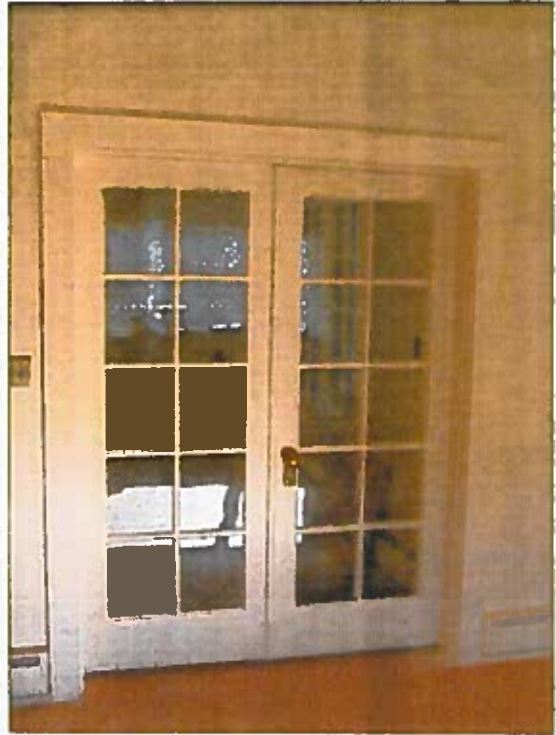


Figure 47: Pair of French doors to Corridor #105.



Figure 48: Pair of French doors to exterior from Corridor #105.

The second floor doors are also wood stile-and-rail style. The doors to the Bedroom and Bathroom #211 match the typical first floor doors. Two closet doors in Bedroom #210 and the door to the attic space are five flat panel stile and rail wood doors. The door to the attic has five raised panels has a steel rimlock typical of the 1850s, and black porcelain knobs.



Figure 49: The rimlock on the raised panel door from Room #206 to the attic.



Figure 50: Typical flat-panelled second floor door.

7. Door and Window Trim

Doors and windows throughout the house generally have a plain, square edged trim. The depth of the trim varies between $\frac{3}{4}$ " and $1\frac{1}{4}$ ". At the second floor windows where interior wood veneer paneling has been installed on the adjacent walls the depth of the window trim is only about $\frac{1}{4}$ ". There is also some variation in the width of the trim, however it usually measures $4\frac{1}{4}$ " to $4\frac{1}{2}$ ". The widths of the trim at the north window in the Living Room are slightly larger

than the standard measurements and there is an additional quarter round below the stool. The increased trim size and added feature at this window are probably indicative of the increased public nature of this room.

The simplicity of the trim is consistent with the Arts and Crafts movement, which did not encourage artificial embellishment, but promulgated the use of natural materials and construction methods. The trim is currently painted, but might not have been originally.

The exceptions to the standard trim detailing are at the west Living Room window and the Dining Room where the trim has a slightly chamfered edge, and the doors and windows in the Kitchen and first floor bathrooms where a $2\frac{1}{4}$ " wide Ranch trim has been installed.

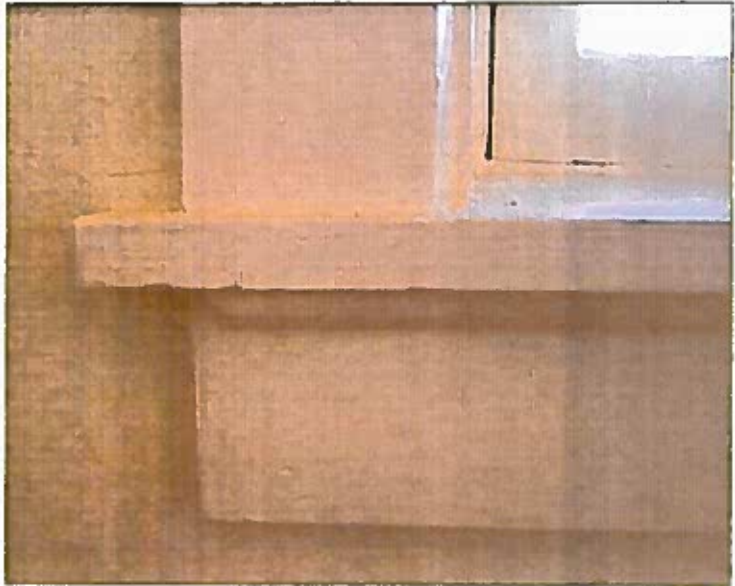


Figure 51: Window Stool at North Living Room Window, with Quarter-round.



Figure 52: Ranch Trim at First Floor Bathrooms

8. Built-In Cabinetry

Built-in shelving and cabinetry is located throughout the first floor. The hall and bedroom closets have built-in shelves, and many of the closets also have a raised floor level with the height of the baseboard. A simple built-in shelving arrangement surrounds the closet door at the east end of Corridor #105.

Windows throughout the house are constructed with deep stools which provide natural seating or shelving spaces. A conveniently located cabinet in the Dining

Room provides both an upper and lower cupboard, and a counter-height shelf. The cupboards are equipped with turn latches. Built-in features and cabinetry such as these are typical of the Craftsman style.

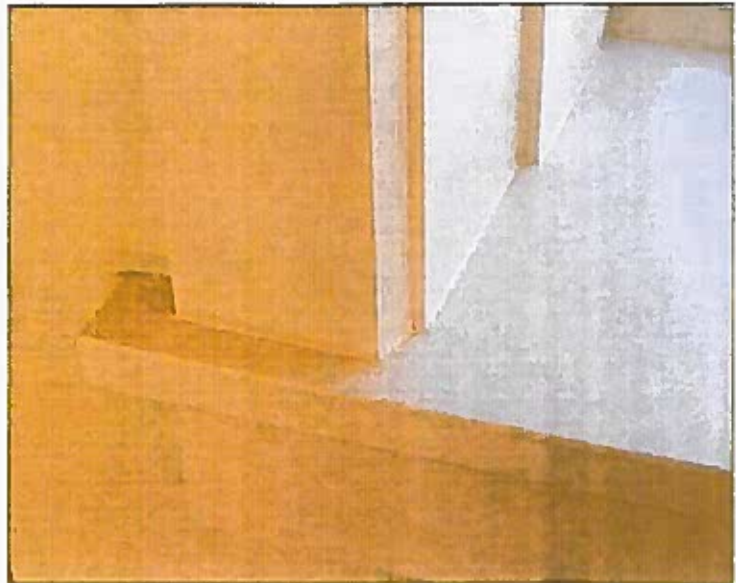


Figure 53: Trim with Chamfered Edge at the West Living Room Window and Dining Room Windows.

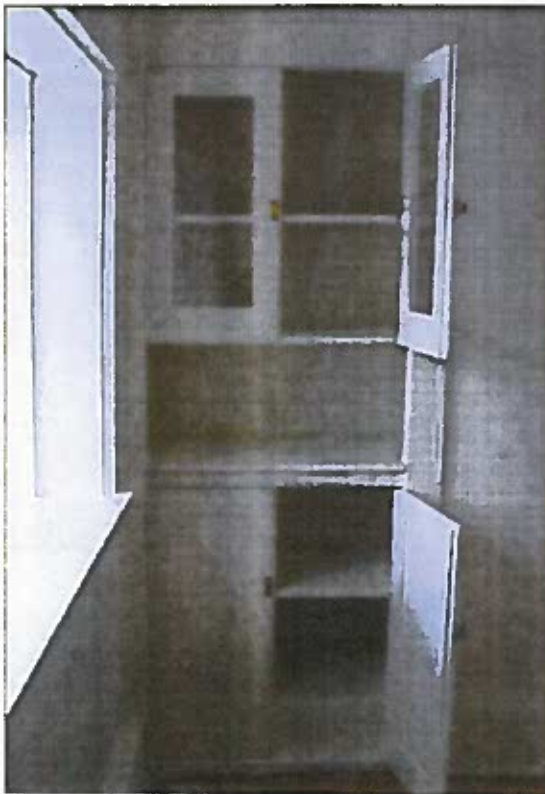


Figure 54: Built-In Cabinet in Dining Room.



Figure 55: Shelving at east end of Corridor #105.



Figure 56: Closet #100A with boot shelf at back and shelving above.

The closet in Bedroom #107 has been modified from its earlier c.1910 configuration. The closet was originally only along the north wall; an extension built of particle board has been added perpendicularly to it along the east wall.

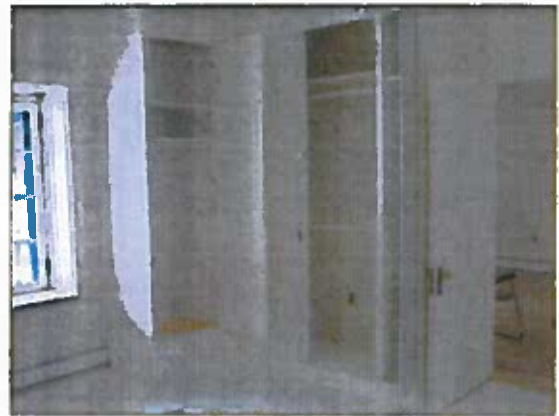


Figure 57: Closet in Bedroom #107.

Figure 58: Upper portion of original closet is visible at east wall.

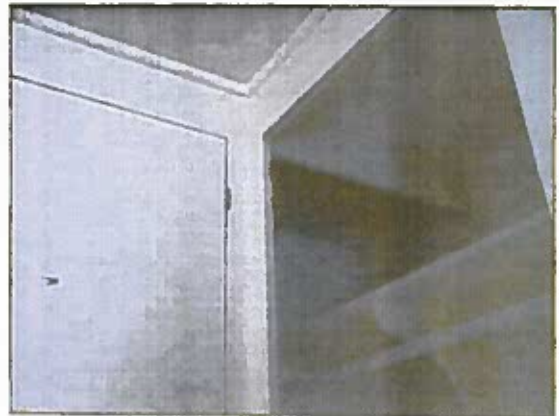
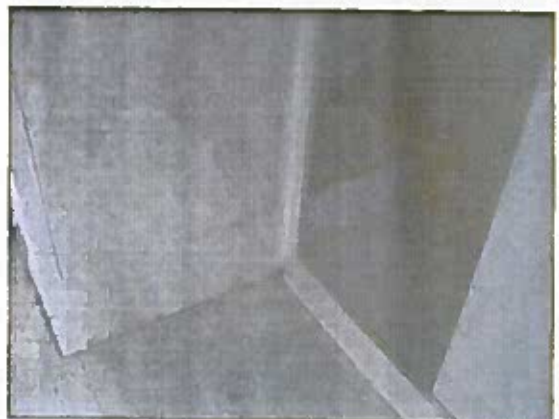


Figure 59: Lower portion of original closet is visible at east wall.



9. Decorative Faux Painting

The walls, doors, and trim throughout the second floor, and including the stairwell up to the second floor, have been embellished with decorative faux painting. The work, performed over the past three years, was done by Dan Tompkins' father, who lived in the second floor apartment. Although the recent painting is not a 'historic' feature, it is an excellent example of traditional folk art, depicting the nature in Yellowstone National Park.



**Figure 60: Faux Painting at
Second Floor Window Trim**



**Figure 61: Faux Painting at
Second Floor Hall #209**

V. Evaluation and Condition Assessment

A. General

Prior to CTA's series of field investigations at the building, freezing air infiltrated a blown-open window and froze water in some of the water supply pipes. Most of the damage, upon thawing, was isolated to the Kitchen: the gypsum board ceiling and soffits, the center island, and the flooring underlayment. Upon discovery of the leak, Xanterra rectified the piping issue and removed most of the interior finishes and the center island from the Kitchen. A box fan was installed to facilitate drying of the Kitchen and the crawlspace below. During our investigations, the crawlspace below the Kitchen remained wet, but was drying at a slow rate.

CTA/HPS was instructed to leave the water-damaged materials out of the equation in addressing needed repairs on the building. The repairs for this isolated damage will be addressed separately by Xanterra.

B. Architectural – Exterior

1. Foundation / Watertable

a) *Description*

The concrete watertable extends from the wall plane at most of the exterior walls. It ranges in projection from the wall plane from 5½" (west wall of kitchen) to 10½" (street-face walls) and ranges in height from approximately 6" to 1'-10" above grade. The wall steps up to accommodate the raised grade at the west end of the building. The portion of wall that defines Corridor #105 does not have a projecting watertable; it is flush with the wall above.



Figure 62: The foundation at the perimeter of Corridor #105 is flush with the wall above.



Figure 63: The typical concrete watertable as visible from the street. The raised portion to the right meets the raised grade at the adjacent driveway.

b) *Condition*

With two exceptions that follow, the majority of the watertable is in excellent shape. There are also isolated locations of minor cracking. The watertable at the inside southwest corner at the building (at Gridline intersection 2C) is level with grade and subject to much water penetration. The resultant spalling exacerbates the deterioration. It appears that this inside corner is at a lower elevation than the hill that rises to the south and west. In addition, the watertable along the east wall of the Kitchen wing has water penetration as well – probably from a dripping hose bibb - resulting in spalling concrete and organic growth (not uncommon for a north-facing wall). The water penetration has rotted the end of at least one of the floor joists that bears on this wall.



Figure 64. Spalled concrete watertable at east wall of the Kitchen.



Figure 65. The top of the watertable at the southwest inside corner is spalling off the base. Due to excessive water and ice build-up at what is presumably a lowered grade.



Figure 66. The interior southeast corner receives run-off, which freezes, from the roof.

Snow and ice build-up occurs at all the inside corners where the roofs meet. The concrete watertable's top surface – where it extends from the face of the finish wall above - is typically spalling, due to entry of water which freezes and expands. During the winter season, snow and ice accumulate at and over the watertable. Excessive vertical ice build-up at the southeast corner prevents operation of the door to the exterior closet during the winter months. Ice build-up at the northwest corner is considerably less; yet is approximately 2"-3" thick.



Figure 67: Northeast inside corner of the watertable, with typical spalling of top horizontal surface of the concrete watertable.

c) Recommendations

The concrete foundation at the southwest inside corner should be replaced for the extent determined in the Structural Analysis. The watertable along the east wall of the Kitchen should be patched, cleaned of organic growth, and painted. The top surface of the remainder of the watertables that extends from the wall surface should be removed and replaced with a compatible concrete patch. The hose bibb should be extended away from the watertable. Further examination of the watertable will be necessary after the spring thaw.

2. Concrete Landings

a) Description

The front and rear entries to the building are accessed via raised concrete landing and steps. The concrete landing at the front entry is contained within the entry porch and protected by the gable roof above. The rear entry to the Kitchen is a landing with a step at the door; it is uncovered.

Figure 68: The front entry concrete is heavily spalled from freeze-thaw.



b) *Condition*

The rear landing appears to be in good condition. The front landing has two sections of concrete at the front, by the step, that have experienced freeze-thaw and have spalled. The 1996 construction drawings prepared by James R. McDonald called for repairs to the northeastern-most section of landing; it does not appear that these repairs were implemented.

c) *Recommendations*

For long-term repair, the two deteriorated sections of concrete landing (two 4' x 5' sections) should be replaced for their full thickness and sealed with a clear penetrating breathable sealant.



Figure 69: The west porch has an actively sloped floor.

3. Wooden Porches

a) *Description*

There are two wooden porches at the Nichols Residence – one along the west side of the Kitchen and one from the polygonal exit from Corridor #105. The west porch is covered with a shed roof which is supported by three 6" x 6" cased columns. The columns in turn bear on 6' x 6' concrete piers. The floor is finished with 3 1/4" painted tongue-and-groove fir boards which slope 4 3/4" in the 7'-5" width of the porch. The exit stair from Corridor #105 is of wood-frame construction and appears to be a temporary replacement.

b) *Condition*

The west porch is in good condition, given that it is raised about one-foot above grade. Some of the paint has worn to bare wood on the floor boards. The exit stairs from Corridor #105 are warping slightly, due to worn paint and water penetration.

c) *Recommendations*

Repaint the flooring of the west Kitchen porch. Replace the exit stairs from Corridor #105 with a landing and stairs more in keeping with the Craftsman style of the house.

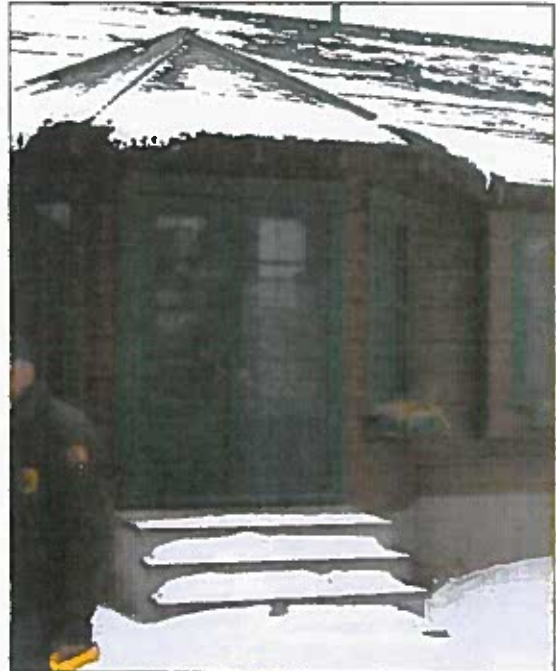


Figure 70: The exit stairs from Corridor #105 appear to be a temporary solution.

4. Walls

a) *Description*

The walls are finished with three different treatments. The street-face walls are finished with horizontal board and batten. The lower walls of the south wing are finished with a vertical board and batten, whereas the upper walls are finished with painted wood shingles.

The horizontal battens are a robust 2½" high and 7/8" deep. They are spaced approximately 11" on center and arranged to align with the bottom of the window bays. The exterior corners are mitered.



Figure 71: The west wall of the Kitchen has had a number of vertical boards and battens replaced; some were deteriorated, and some filled in prior openings.

The vertical board and batten is comprised of 7/8" thick x 3-1/8" batten spaced about 10" on center.

b) *Condition*

The condition of the exterior wall surfaces is generally good, with some isolated exceptions at areas of water penetration and areas of UV-degradation from the southern exposure. The southern wall of the west wing has a narrow (approx. 7") overhang, hence is subject to more water penetration than the walls protected by the deeper (nearly 4'-deep) soffits.

The degradation is primarily limited to the protective paint coating and not the wood. A good number of the vertical battens on the south wing have been replaced. The shingles appear to be in good condition.



Figure 72: South wall of the west wing, where the wood has expanded and swelled due to moisture penetration and UV-degradation. This area has a shallow roof overhang above.



Figure 73: The lower portion of the west wall of the Dining Room has been subject to water splash from grade and moisture from snowpack.

c) *Recommendations*

The protective paint finishes should be maintained on the wall boards. Such maintenance should include replacement of the sealant in the top horizontal joint of the battens.

5. Openings

a) Windows & Trim

(1) *Description*

Natural illumination is gathered through multiple wood casement windows located throughout the house. The windows are paired, and some are arranged in groups of two or three. The sash are divided into multiple panes – two wide by four high. The sash in the Dining Room and Living Room bays and Kitchen are out-swinging. The remainder of the casements are in-swinging, allowing for operation of the exterior storm units.

Most of the first floor windows are fitted with exterior wood storm units that hang from the top trim. These sash have multiple-lites as well. The second floor windows are fitted with exterior wood screen sash.

The storm windows operate as out-swinging awnings, with under-sized hinges at the top rail and a ventilating hinge arm at each side stile (fastened to the inside jamb).

(2) *Condition*

The condition of the windows is good. Some of them appear to be painted shut, prohibiting easy operation. It appears that some of the windows have

been reputtied recently (the putty hasn't been painted, exposing the bare putty to deleterious UV rays from the sun). The condition of the paint is generally good, except for the UV-degradation typical of the southern exposure.

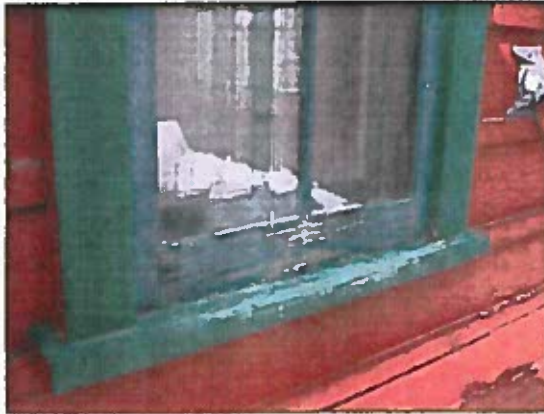


Figure 74: Typical condition of storms and trim at southern exposure.



Figure 75: Hinges at top of storm sash are under-sized and bent.

The hinges of the exterior storm windows are under-sized and bending under the weight and operation of the storms. About half of the hinge arms are missing in full, missing a part, bent, or detached from the jamb. The storms are secured with exterior screws.

(3) Recommendations

The ongoing maintenance of the glazing and putty should be continued; the putty should be painted for protection against the UV-rays which could prematurely dry the material. The windows, storms, and trim on the southern exposure should be prepared and repainted.

The hinges of the storm sash should be replaced and missing and broken portions of the hinge arms should be replaced. The hinge arms should be lubricated to ensure smooth operation.



Figure 76: Ventilating hinge arms extend to hold the storm sash open.

b) Doors & Trim

(1) *Description*

The front entry has a solid core wood slab door with no openings. This simple door might be original to the c.1910 remodeling. The exterior wood screen door is typical for the 1910 vintage.

The exterior access to the kitchen has a c.1980s pre-molded door with exterior aluminum screen door.

The exit from Corridor #105 has a pair of French doors on the interior which is mirrored by a pair of wooden screen doors on the exterior. These appear to be original to the c.1910 construction.



Figure 77: The front entry has a c.1908 wood screen door at the exterior.



Figure 78: The door to the kitchen was replaced c.1980s.



Figure 79: The joint between the rail and stile is broken at the exit from Corridor #105.



Figure 80: The joints between the bottom rail and stiles are coming apart.

(2) Condition

The doors are in good condition, except for the exterior storm doors at Corridor #105. The joints of these doors have become unglued due to moisture penetration from the snow. The paint finish of the east door has degraded excessively, providing little protection to the wood beneath.

(3) Recommendations

The Kitchen door should be replaced with a Craftsman style door and the other two exterior doors should be fitted with weatherstripping to make them weathertight. The storm doors at Corridor #105 should have their joints refit and glued, and they should be refinished.

6. Soffits, Rafters, & Fascias

a) *Description*

Much of the expression of the exterior of the building is due to the deep soffit treatment with robust knee braces and exposed rafter tails. These open soffits are finished with 5½" V-groove boards common to c.1910 construction. The soffits of the walls visible from the street are approximately 4'-deep. Fascia boards cap the end of the exposed rafters. Typical construction for the period would indicate that the boxed beams shown are wood casing concealing built-up 2x wooden members.

b) *Condition*

The wood of the soffits, rafters, and fascias appears to be in good condition, primarily due to the protection afforded by the depth of the soffit. Several of the fascias though are worn to bare wood.



Figure 81: The street facade presents a deep and detailed soffit typical of the Craftsman style.



Figure 82: The fascia of the lower sloped roof, west wall of Kitchen wing.

c) *Recommendations*

Prepare and repaint the fascias which have worn to bare wood.

7. Roofs

a) *Description*

The main roofs of the building are clad in wood shingles laid in a stepped pattern typical of the Craftsman period. The shingles have been inaccessible during the field investigation, due to the snow load on the roof and the adjacent ground. At the roof edge, it appears that there is only one roofing layer on the building – the standard two starter courses are visible. It is assumed that the c.1997 reroofing of the building included a complete tear-off of the existing roof. The roof has a main slope of approximately 10:12, with a decrease in slope at the eaves.

The roofing of the Kitchen wing is of a much gentler slope than that of the main roof. Based upon interior measurements, it appears to be 1½:12. It is not visible from grade, hence its material and condition are unknown.

b) *Condition*

The shingles visible from grade, with binoculars, appear to be in good condition. This is to be expected for such a relatively young roof.

c) *Recommendations*

The roofing should be examined after the snow melt. Specifications and details for the reproofing project should be examined for the type and size of shingle, the ventilation layer, fastener type, and installation methods.

8. Chimneys

a) *Description*

The building has one chimney at the west side of the exit door from Corridor #105. This is presumed to have contained a flue for a heating system that is no longer contained in the building. The chimney is of a tapestry brick common to the 1920's and is corbelled at the top. The chimney is currently capped over the top of the flue with a sheet metal cap.

b) *Condition*

The mortar in the top courses of brick has eroded, resulting in open joints.

c) *Recommendations*

The open mortar joints should be repointed.



Figure 83: The brick chimney at the south elevation of the east wing.

C. Architectural – Interior

1. Crawlspace

a) *Description*

The crawlspace is defined by the exterior board-formed concrete foundation walls, some of which are now contained within subsequent construction. Many of the board forms – some 1 ½" thick – remain inside the crawlspace; they are supported by 2x4 stud walls. The first floors are supported by floor joists which are supported by the perimeter walls and interior supports. See the Structural Analysis for further information.

b) *Condition*

The concrete is in good condition. Some walls have been busted through in order to provide access to crawlspaces beneath additions. At these broken areas, the cross section of the concrete reveals large aggregate. The thickness of the walls – approximately 1'-10" - allows for such large aggregate, which is larger than standard construction practices warrant.

c) *Recommendations*

See Structural Analysis.

2. Flooring

a) *Description*

The interior is finished with tongue-and-groove strip flooring throughout, of two types: 2¼" oak flooring in the Living Room and Dining Room, and 3¼" and 3½" wide fir flooring elsewhere. The stairs have been carpeted. An early installation of linoleum remains beneath the carpet; it is applied to the treads only.



Figure 84: The Living Room has strip oak flooring.



Figure 85: Corridor #105 has fir flooring that has been sanded.

The risers, also covered with the carpeting, are of a finished pine or fir. Two different linoleum patterns, and one application of sheet vinyl, remain at the lower run of the stairs; the bottom tread is finished with sheet vinyl, the bottom two winders are covered with red linoleum, terminated at an aluminum nosing strip. The rest of the treads are covered with a green and cream colored linking octagon pattern over a grey background, terminated with a brass nosing strip.

b) *Condition*

The areas of wood flooring that remain visible are in fair condition. All of the flooring is supported by a proper subfloor. A few joints have grown, tack strips in some rooms indicate that carpeting has been removed, and the floors are not completely level; however, no severe deterioration of the wood flooring material was noted. Where accessible – primarily at access panels to the crawlspace – the flooring has at least 3/16" of thickness remaining above the tongue. The wood flooring in Bathroom #108 and the Kitchen is currently covered with underlayment and subflooring respectively, and sheet vinyl.

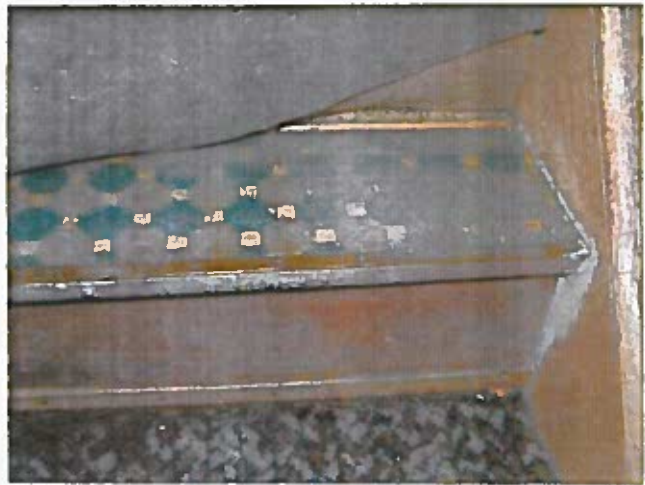


Figure 86: The upper run of wooden stair treads were covered with an octagon-patterned linoleum prior to the installation of the padded carpet.

The linoleum on the stairs is generally in good condition, with a few areas of abrasion and tearing. The linoleum, treads, and risers will have penetration holes from the tack strips that secure the carpeting. The clear finish of the risers is in fair condition, with a few abrasions probably coincident with earlier use.



Figure 87: The fir flooring of Bedroom #107 has been painted from overspray.

The fir flooring in Bedrooms #103 and #104 is concealed by 9" x 9" vinyl tile.²⁷ The tiles are broken and some are missing at the openings to the hallway and below the window seats. There is sheet vinyl in Hall #209 and Bathrooms #101 and #211. In Bathroom #211 the raised floor is very warped. In Bathroom #108 and

²⁷ The vinyl tile and adhesive both tested negative for asbestos. See TetraTech report in Appendix.

in the Kitchen, vinyl flooring was installed over new plywood underlayment and subflooring, respectively, which was placed directly on the wood tongue-and-groove boards. The newer vinyl flooring is generally not in good condition. As noted previously, some of the tiles in the Bedrooms are broken, and they are also very worn. The sheet vinyl at the second floor hall is wrinkled. Most of the vinyl flooring in the Kitchen was removed as part of the cleaning process after a recent water leak, leaving the plywood subflooring exposed. There is carpeting in the second floor living area. The different floor finishes indicate more recent renovations.

c) *Recommendations*

Remove the vinyl tile and sheet vinyl from the floors and refinish the fir flooring to match the finishes remaining in the closets. Rejuvenate the finish of the oak flooring. Remove the carpeting from the stair run, exposing the octagon-patterned linoleum. Remove the linoleum and vinyl from the last two winders and bottom landing; provide period linoleum that's compatible with linoleum of the upper stair run.

3. Walls & Ceilings

a) *Description*

The walls and ceiling of the first floor are of plaster and/or gypsum board. Some of the original plaster surfaces remain; some are covered with gypsum board; and some have been replaced with gypsum board. The Kitchen is finished entirely of gypsum board.

The second floor walls and ceilings are of fiberboard, which is probably of flammable Celotex (with wood content). The joints are covered with thin wooden battens that are painted the color of the wall or ceiling. This wall finish has been covered with 1/8" thick paneling in the Family Room.



b) *Condition*

The condition of the first floor walls and ceilings is good. The Kitchen ceiling was removed recently after being damaged by the water from the piping leak.

Figure 88: South wall of stairway, where water has swollen the fiberboard and caused the paint to flake off.

Some of the second floor fiberboard has expanded and swelled from the water penetration of the piping leak.

c) *Recommendations*

Replace the water-damaged wall and ceiling finishes; provide replica faux painting to infill new areas. Replace the Celotex ceiling panels with ½" Type X gypsum board, covering the joints with a batten system similar to that currently concealing the ceiling joints.

4. Doors

a) *Description*

Most of the interior doors throughout the house of stile-and-rail wood doors with three different paneling systems. See Character-Defining Features for further information about the doors.

b) *Condition*

Most of the doors are in good condition. Several of the older, thinner doors, however, are split at the stile where the mortise casing is installed.

c) *Recommendations*

Repair the doors whose stile has split from the mortise casings.



Figure 89: The latch stile of the door to Bedroom #104 has split at the mortise casing.

5. Windows

a) *Description*

The windows are described in Character-Defining Features and Exterior Architectural Analysis.

b) *Condition*

The current condition of the windows is fair. All of the window parts appear to be present. However, many of the casement windows are stuck, painted, or nailed shut, and several of the window panes are cracked. The storm windows at the first floor are screwed shut from the exterior, the top hinges are too small for the sash load, and the hardware that governs the extent of opening is broken at about half the window openings.

c) *Recommendations*

Remove the excess paint that prevents operation of the windows. If it is intended to have the storm windows operate, remove the screws, replace the broken vent operators, and replace all the top hinges.



Figure 90: Typical wood storm window on first floor is held by undersized hinges.

6. Trim

a) *Description*

The trim described in Character-Defining Features. The trim – the baseboard, window trim, and the door trim – in the Kitchen and the first floor bathrooms is from the c.1980s remodeling and is not in keeping with the Craftsman style of the building. The casing is ranch style and mitered at the corners, whereas the original side casing is butted at the head trim of the windows and doors.



Figure 91: The first floor bathroom door casing was replaced in the c.1980s remodeling.

The window trim treatment has been modified as follows:

(1) Bathroom 1 (Room #101):

- (a) North window: The interior casing is mitered at the head. The apron has been replaced. The original stool remains.

(2) Bathroom 2 (Room #108):

- (a) North window: The interior casing is mitered at the head. The stool has been rounded at the edges and the apron has been replaced.
- (b) South window: The interior casing is mitered around all four sides of the window. There is no stool or apron.
- (c) Kitchen (Room #110): The interior casing is mitered at the head. The stool has been rounded at the edges and the apron has been replaced or removed (at the two counter locations).



Figure 92:
Kitchen trim
from c.1980s
remodeling.

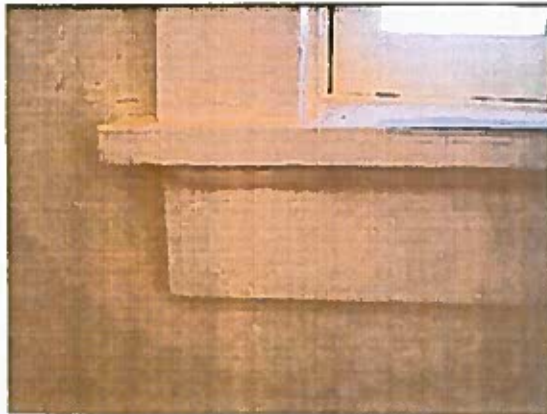


Figure 93: Original Craftsman style window trim treatment.



Figure 94: Original stool surrounded by replacement casing and apron from 1980's remodeling.

b) *Condition*

The trim is in good condition.

c) *Recommendations*

The trim should continue to be maintained. The non-characteristic trim in the Kitchen and the first floor bathrooms should be replaced with trim more in keeping with the Craftsman style of the house.

D. Structural

1. Description & Condition of Structural Systems

The following first floor plan should be used for reference to the descriptions included below. Note: "o.c." indicates spacing "on center."

a) *Foundation & Main Floor Framing*

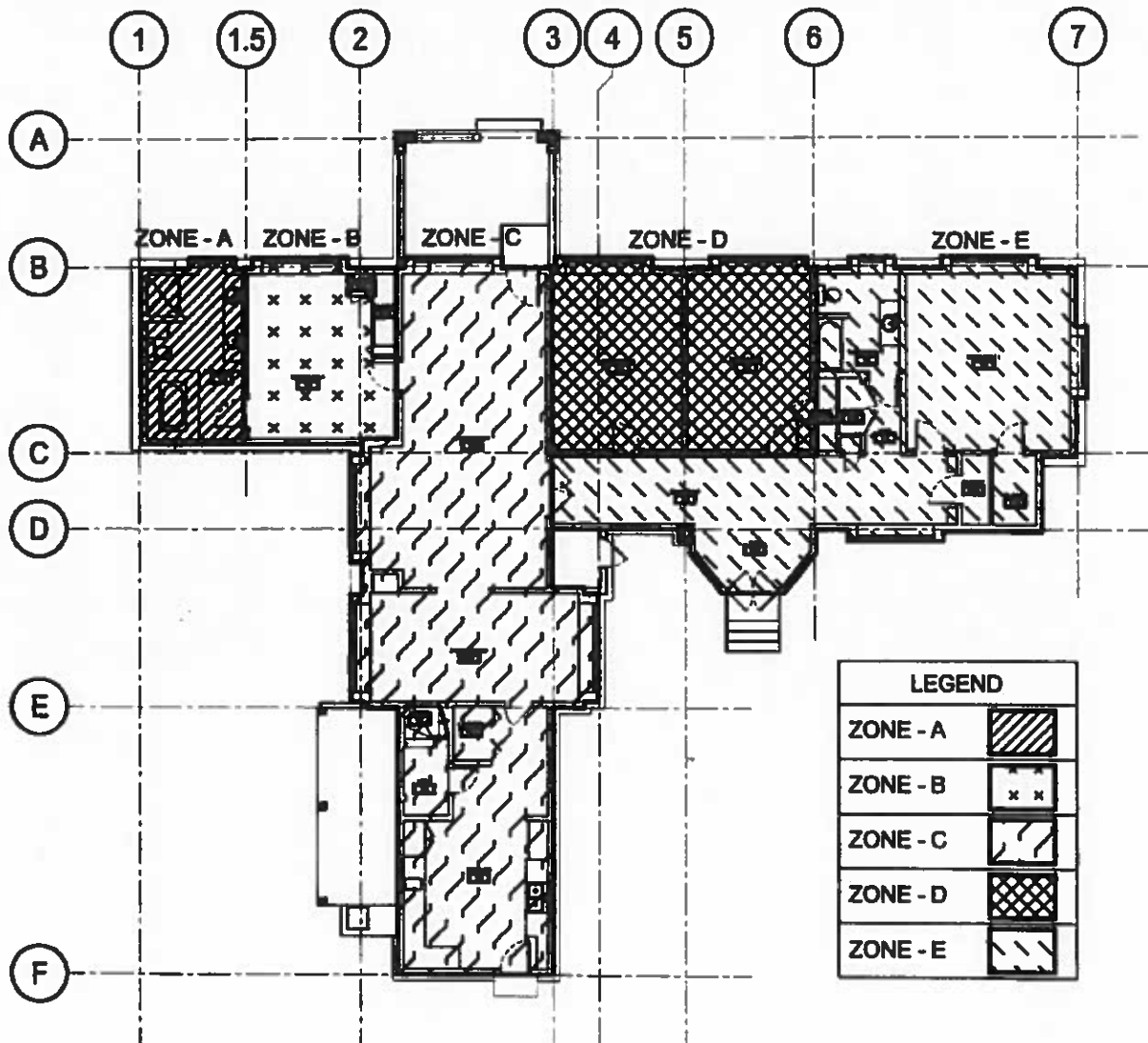


Figure S-1: First Floor Plan (north at top)

(1) Zone A

The Main Floor in Zone A is framed by 2x10 wood joists at 16" o.c. running lengthwise N-S to perimeter concrete foundation wall.

The condition of the framing in this area is generally good. There is no evidence of damage or excessive deterioration of the structural elements.

(2) Zones B & C

The Main Floor in Zones B & C is in general framed by 2x8 wood joists at 24" o.c. running lengthwise E-W from interior concrete foundation wall (which appears to have once been an original exterior perimeter wall) from Gridline 1.5 to a nominal double 2x8 built-up floor beam. From there, the framing system is of 2"x 7-5/8" wood joists @ 24" o.c. running E-W over to a nominal double 2x8 built-up floor beam at Gridline 3. From Gridline 3, 2"x6" @ 32" o.c. span N-S from the perimeter foundation wall at Gridline B to a 6x6 floor beam at Gridline C.

Intermediate 6x6 floor beams run N-S approximately halfway between adjacent beams. Floor beams are supported by approximately 18"X18" concrete piers roughly 4-6' o.c. Floor beams are typically spliced over the columns end to end, but are also lap spliced beyond the piers in some locations.

Zones B & C exhibit numerous locations of screw jack steel pipe supports and wood debris shims. Shims occur both at the pier to floor beam connections, as well as random locations, where the shims rest only on the earth/limestone floor.

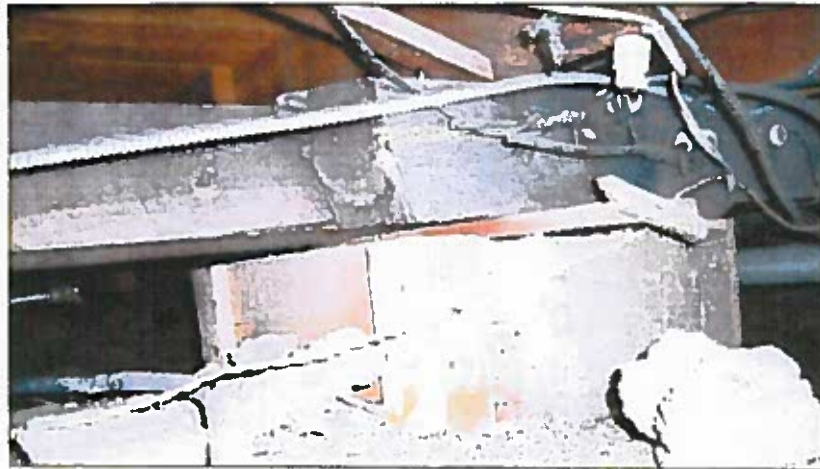


Figure S-2: Floor beam lap splice at pier.



Figure S-3: Floor beam lap splice beyond pier and wood debris shim

Floor Beam Condition: The wood appears to be dry and in good condition. The extent of debris shims and screw jacks at the beams would indicate that they have crept or are undersized for the floor loading, leading to excessive deflection. In general, no mechanical connection is provided for either beam splices or at the pier supports, which can contribute to excessive deflection. The floor beams in general exhibit significant damage and/or rotting at the beam pockets in the perimeter foundation wall.



Figure S-4: Wood debris shim

Pier Condition: The current condition of the piers is generally fair to good. However, a few piers have moderate to significant damage or degradation. This damage typically occurs at the top beam bearing, the bottom soil

interface, or both. In general the floor beams are shimmed to the top of the pier with wood debris. The integrity of the shims is poor.



Figure S-5. Damaged Pier at floor beam bearing

Floor Joists: The members themselves appear to be generally dry and in good condition. Some floor joists are partial log sections, but those also appear to be performing adequately. Floor joists are typically either continuous over floor beams, or lap spliced beyond the floor beams on each side. Each of these conditions is in generally good condition. At perimeter edges, the floor joist to foundation wall connection is generally in good condition. The floor joists in general appear to be lacking blocking or bridging.

Perimeter Foundation wall is in generally good condition. There has been apparent moisture damage and significant deterioration of the soil and concrete foundation wall at the interior corner of the foundation wall at the intersection of Gridlines 2 and C, and to the interior concrete pier immediately adjacent. The beam pockets for the floor beams at the perimeter foundation wall appear to be in fair condition, however the degraded wood floor beam ends obscure the pocket.



**Figure S-6:
Degradation of
floor beam at
foundation
beam pocket.**



Figure S-7: Degradation of Concrete foundation wall at interior corner

Board Floor Sheathing: Wood boards are generally in good condition and appear to be performing adequately. No excessive warping or separation was seen.

(3) Zone D

The Main Floor in Zone D is in general framed by 2x6 wood joists at 36" o.c. spanning N-S from the exterior concrete foundation wall along Gridline B to interior concrete foundation wall along Gridline D. There is an intermediate 4 1/4" x 6 1/4" wood floor beam support spanning between interior foundation wall along Gridline G to the built up wood beam along Gridline 3. A 2x4 @ 16" o.c. partial pony wall runs along Gridline 4, over approximately a 2-3 standard brick course base. The pony wall is non bearing, and the crawlspace access door is no longer attached.

Zone D exhibits much of the same characteristics of Zones B & C. In general the members and supports are in good condition. The floor of the Bedroom above appears to be slightly bowed upward, suggesting the beams have been overshimmed at the beam to pier connection. The integrity of the shims in this Zone is fair, however there is no mechanical connection between beam/shim/pier support.

(4) Zone E

The Main Floor in Zone E is in general framed by 2x8 wood joists at 16" o.c. running lengthwise N-S between perimeter concrete foundation walls. There is a single intermediate 6x6 wood floor beam spanning E-W from Gridline B to G. The floor joists are lap spliced at the floor beam. The floor beam has two concrete pier intermediate supports. The beam is butt spliced at the pier support furthest east, and is continuous over the other pier support. In the hallway area the floor joists are identical except that at the western end of the corridor the joists span between cmu foundation wall along Gridline D, and the 6x6 wood floor beam along Gridline C.

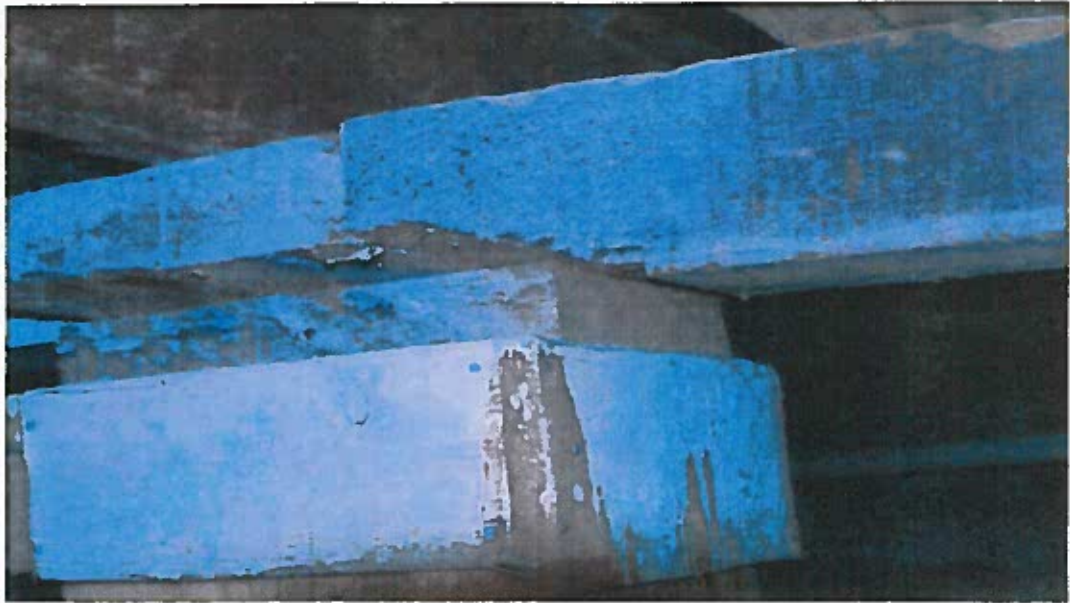


Figure S-8: Floor beam butt splice over pier in Zone E.

Zone E exhibits much of the same characteristics of Zones B & C. In general the members and supports are in good condition. However, the floor in both the corridor and Bedroom #100 of Zone E are significantly bowed upward, suggesting the beams have been overshimmed at the beam to pier connection. The floor beam at the perimeter foundation wall appears like it might have been replaced. The concrete which supports the floor beam along Gridline 5 appears to be an original foundation wall; it has been busted through to accommodate expansion, possibly damaging the floor beam bearing material. The pier at grid intersection 3D is significantly damaged at the floor beam bearing. The integrity of that beam and supports is very poor.

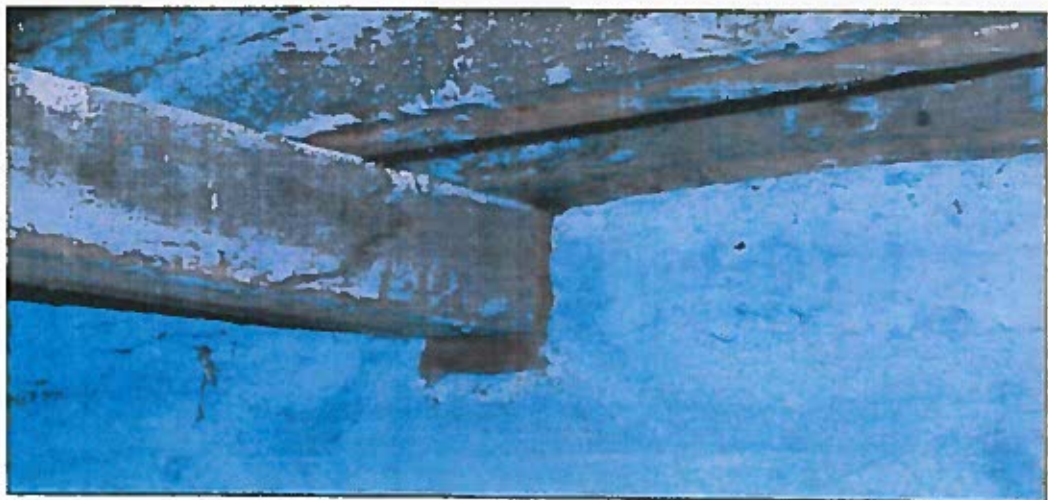


Figure S-9: Beam pocket at foundation wall.

b) Upper Level and Roof Framing

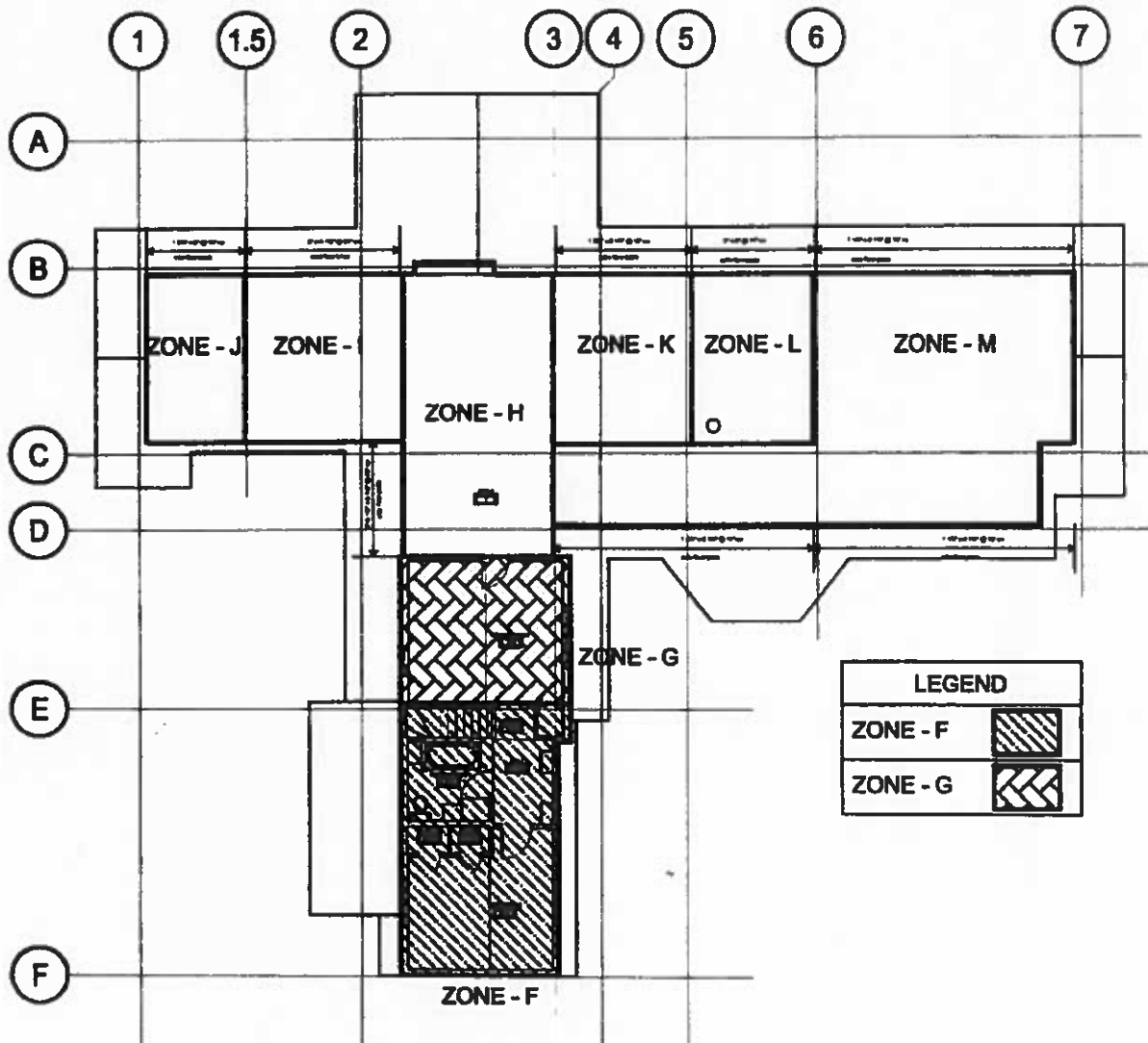


Figure S-10: Second Floor & Attic Plan (north at top).

(1) Zones I & J

Zone J attic floor/ceiling is framed by 1 5/8"x5" wood ceiling joists @ 16" O.C spanning N-S between perimeter bearing wall plates. Zone I attic floor/ceiling is framed by 2"x6" wood floor/ceiling joists @ 24" o.c. Both Zones I and J are part of the same attic and gable roof volume, and framed by a wood ridge nailer and 2x6 wood rafters @ 24" o.c. Note that the roof rafters are connected to every other floor/ceiling joist where the spacings are not equal. There are approximately 3 2x6 intermediate "kingpost" type vertical wood supports in the center 3 bays of the attic framing. The roof membrane is

composed of approximately 12" wide board sheathing running perpendicular to the roof framing. This attic is over-framed onto the Zone H attic.

The condition of the framing and sheathing in Zone I-J is generally good. There is no evidence of moisture damage or other deterioration to the members themselves. The system appears to be performing adequately, without noticeable deflection or connection separation.



Figure S-11: Zones I & J Attic Framing



Figure S-12: Zone I & J rafter - floor/ceiling joist connection.

(2) Zone H

Zone H north of approximately Gridline D is framed by 2" x 6" attic floor/ceiling joists at 16" o.c. The roof is framed by 2" x 4" wood truss top chord members @ 124" o.c., spanning between perimeter bearing walls. Intermediate scissor type 1x web truss members generally frame from each sloped top chord to the center of an adjacent floor/ceiling joist, with a web member each side of the rafter. Note that due to the offset in the member spacing, typically only every other rafter is connected to the floor/ceiling joist. The 1x web members run both plumb and canted to connect the rafter to at least one floor/ceiling joist.

The condition of the framing and sheathing in Zone H is generally good. There is no evidence of moisture damage or other deterioration to the members themselves. The system appears to be performing adequately; however, there are some spot locations where the wood members making up the attic truss are separating at their connection points.



Figure S-13: Zone H rafter truss with 1x web members.

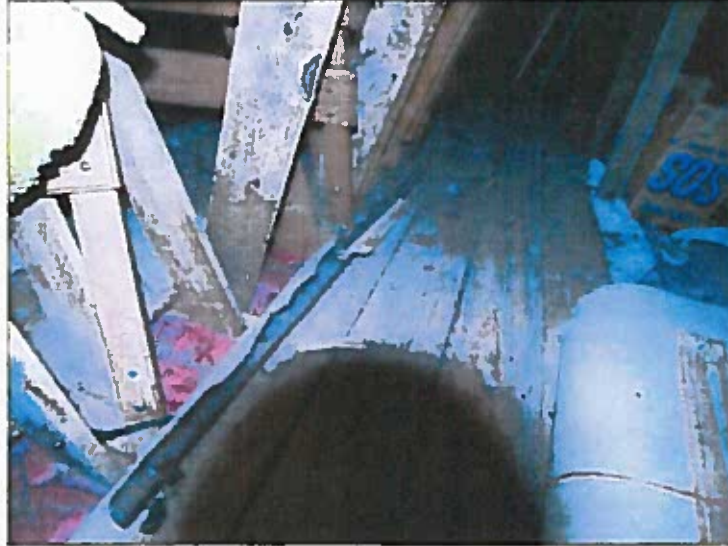


Figure S-14: Zone H truss web members to floor joist connection.

The condition of the floor and roof framing in Zone H south is generally good. No evidence of damage or deterioration to the elements or system was seen.

(3) Zones K, L, & M

Zone K attic floor/ceiling is framed by 1-5/8"x5¼" wood ceiling joists @ 16" o.c. spanning E-W between interior bearing walls at Gridlines 3 and 5. The floor joists are sheathed with wood board sheathing. Zone L & M attic floor/ceiling is framed by 2" x 6" wood joists @ 16" o.c., spanning N-S between perimeter bearing walls along Gridlines B and C. Zone K & L share the same attic volume and framing system of 2"x6" rafter truss top chords at 16" o.c. The last four truss bays toward Gridline 6 also have intermediate vertical web members at approximately the half spans of the sloping top chords. The roof membrane is composed of approximately 12" wide board sheathing running perpendicular to the roof framing.

Zone M is framed identically to Zones K & L, except that it is a dual-slope roof. The rafters south of the ridgeline slope at a lower pitch than the rafters north of the ridgeline. An intermediate supporting pony wall runs E-W along Gridline C, continuing back through Zones K & L as the lower slope roof over-frames onto the south roof of Zones B & C.

The condition of the framing and sheathing in Zone K, L, & M is generally good. There is no evidence of moisture damage or other deterioration to the members themselves. The system appears to be performing adequately, without noticeable deflection. The roof truss top chords are exhibiting some separation at the ridge of the gable roof, which is significant in some locations.

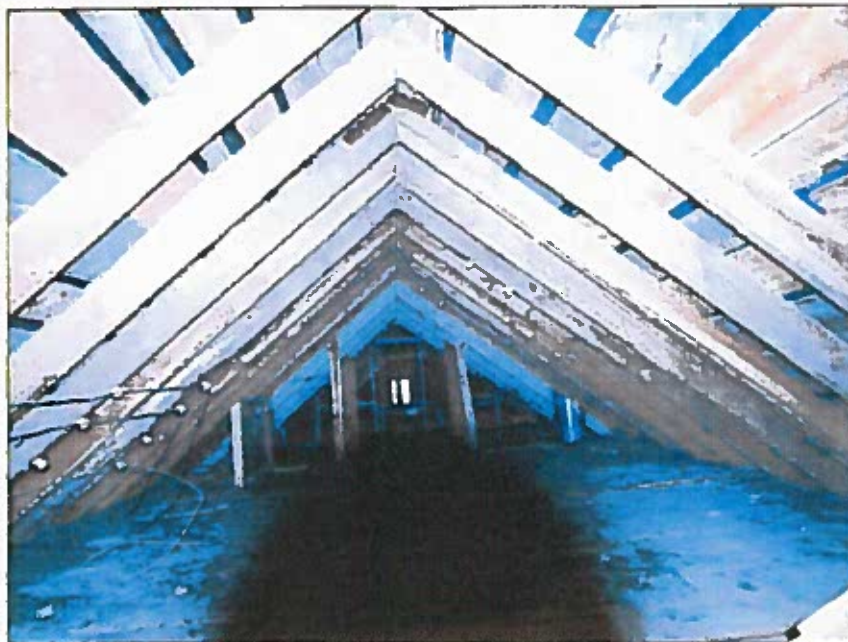


Figure S-15: Zones K & L attic framing.



Figure S-16: Zone M framing, looking west towards framing over Zone L.



Figure S-17: Zone K & L ridge member separation.

2. Recommendations

The following recommendations are prioritized in order of immediacy of the work required. They are predicated on reasonable weather and conditions – not 100-year storms, earthquakes, or snow loads. The scope items are prioritized to accommodate potential funding availability; however, it is recommended that all of the work be corrected simultaneously. This will facilitate access to the crawlspace and attic, and provide for economy of cost.

The work item associated with Item #2 below, replacing the portion of the foundation wall at Gridline 2C, would be a convenient location to stage the work. An opening here would allow for larger construction materials – and piping (see Mechanical System Evaluation) – to be introduced to the crawlspace with less intrusion into the upper floors of the building.

The "Immediacy" categories – which apply to both foundation and attic work - are as follows, in descending order of urgency:

- 1: Immediately
- 2: Within one year
- 3: Within two years
- 4: Within five years
- 5: Within ten years

a) *Foundation and Main Floor Framing, Listed in Descending Order of Priority*

Scope of Work	Immediacy
1. Repair damaged piers, paying particular attention to floor beam bearing points. Provide mechanical connectors for all beams to piers.	1
2. Remove and replace damaged portion of foundation wall at Gridline 2C. Provide waterproofing at newly placed concrete foundation wall and provide positive slope to grade to drain away from the building. Replace or repair concrete pier immediately adjacent.	2
3. Remove all soil bearing debris shims at floor beams. Provide screw jacks and/or additional concrete pier supports as necessary. Shim beams to piers as level as possible.	3
4. Provide mechanical connections at all beam connections, including beam-to-beam splices, and beam-to-pier supports. Without mechanical connections, the gravity forces currently holding the beams in place over the piers could be overcome by lateral forces (seismic or wind) and the beams could "walk" off their supports.	3
5. Remove wood floor beam with connection to perimeter concrete foundation wall and replace with treated wood or precast concrete beam – this applies only to the portion from the foundation bearing wall to the next bearing pier. Mechanically fasten beam to both piers and foundation. Untreated wood in contact with concrete will tend to degrade over time due to moisture; these "edge" beams will degrade over time and could fail at the pockets in the concrete foundation wall.	4
6. Provide additional blocking/bridging at floor joist bearing points and at joist mid-spans. Floor joists members are typically deep with narrow sections, and they could buckle laterally under gravity loads alone. This would typically happen at or near supports, and at mid-span, where bending moments are high.	5

b) *Attic and Upper Level Floor Framing, Listed in Descending Order of Priority*

Scope of Work	Immediacy
1. There is some spot separation of connections between vertical web members, floor/ceiling joists, and roof rafters. Each connection point should be inspected and repaired where separation is found. A mechanical connection should be provided, to connect rafter truss butt ends to each other at the ridge line at all trusses, whether the butt ends have separated or not.	2
2. The roof truss systems in general are open trusses – meaning they lack web or cross members between the sloping top chords and bottom flat chords. This could cause the trusses to "rack" as there is little resistance for the truss	4

members to deflect in plane. It is recommended that vertical web members be added and mechanically connected to both the sloping top truss chord, and the bottom floor/ceiling chord at every truss. These new web members can be canted to an adjacent floor/ceiling joist where the joists and rafters are offset (similar to the attic construction in Zone H).

E. Crawlspace

1. Description

There is a shallow crawlspace under the entire building, with cast-in-place concrete walls dividing some spaces while defining various building campaigns. The thicker 1'-9" thick concrete walls indicate the configuration before the eastward expansion and addition of the corridor. The aggregate used in the concrete is very large, which has probably contributed to some of the foundation cracking (as prompted by earth tremors).

Four openings provide well-distributed access to the crawlspace from the Kitchen, the long Corridor #105, Closet #105A, and Bathroom #108. The crawlspace floor is of uneven layers of travertine and dirt. The west portion of the crawlspace below the Kitchen and Bedroom #107 has been built onto the travertine. This hard rock has been excavated only where deemed necessary to provide a tunnel-like access to the various areas of the building. At these tunnels through the travertine, the height below the joists is 2'-5". At the built-up portions of stone, there is only 12"-14" of clearance.

The dirt and travertine are not covered with a vapor barrier; this rough surface never has been covered. The floor joists and support beams are exposed to view; there is no insulation in the joist cavities or at the perimeter foundation walls. The older – pre-1910 – portions of the crawlspace have wood-framed 6' x 6" vents that extend the entire foundation wall thickness. Vents were not incorporated into the construction of Zone C or E, so cross-ventilation has been curtailed.

2. Condition

The crawlspace is not conducive to regular maintenance of the building. Most of the repairs appear to have been installed in a makeshift fashion aimed at rectifying the perceived issue only and at abbreviating the time required for the repair. This tight space – currently full of temporary shores below beams and substantial runs of piping – is hard to work in and difficult to insert materials of standard construction lengths.

3. Recommendations

Coincident with necessary structural repairs, the crawlspace should be dug out further to facilitate the immediate repairs and to encourage future maintenance. This work should be carefully coordinated in order to ensure that the existing foundations and footings are not undermined in the process. The venting system should be



Figure 95: Excessively large aggregate in the concrete mix of the foundation. Photograph taken looking southwest into the crawlspace below Bathroom #108.

expanded, activated in the warmer months, and protected with screening. With the heat radiating from the hot water pipes in the crawlspace, the need to insulate between the floor joists is obviated; however, the interior surfaces of the exterior foundation walls should be insulated.

F. Attic

1. Description

- a) There are three primary attic spaces:
- b) Zone H: The central north-south spine that represents an early gable roof.
- c) The east wing extending perpendicularly from the central spine. This is comprised of three construction periods, in ascending chronological order of construction:

- (1) Zone L: The earliest of the three.

- (2) Zone K.

- (3) Zone M: This included a large addition with Bathroom, Bedroom, and the long connecting corridor, believed to be coincident with the exterior façade improvements. This latter portion included an additional layer of framing and roofing over the south slope of Zones K & L, to provide a consistent roof slope over the long corridor that widened this wing of the building. This slope of approximately 5:12 is gentler than that of the roof's north slope of 10½:12.

In order to normalize the effect at the east gable end of this roof, a short segment of roofing at the east end mirrors the north slope; the corridor addition is truncated here.

The framing and sheathing of Zone M is composed of wood members salvaged from elsewhere. Some of the rafters have bird-mouths from prior installations, coincident with painted rafter ends. The sheathing is of different board types with a variety of finishes.



Figure 96: The east attic wing was built from salvaged material post WWI.

- d) The west wing extending perpendicularly from the central spine. This is comprised of two construction periods, in ascending chronological order of construction. Note that both of these periods occurred after the work in Zone K & L, but predate the construction of Zone M.

- (1) Zone I: The earliest of the two.

- (2) Zone J

The framing, sheathing, and detailing of these attic portions are documented and analyzed in *Construction History*.

Floor boards were installed throughout the attic from an early date, except for the two portions (Zone I & J) of the west wing. With insulation between or on the floor joists, to keep the conditioned air within the habitable spaces below, the attic functions as a cold attic. This allows the attic to vent freely, with air infiltrating through numerous

openings and open joints in the walls. Thus, while snow accumulation might be heavy on the roofs, ice melt and build-up is minimal.

2. Condition

The framing is of Douglas Fir²⁸ and in good condition: it is straight, uncracked, untwisted, and not rotted or otherwise compromised. Some water staining is present on some of the sheathing and framing boards, yet the wood is sound and the water penetration does not appear to be active. Records indicate that the roof was replaced ten years ago.²⁹

3. Recommendations

Maintain watertight conditions at the roof and retain the cold attic system.

G. Insulation

1. Description

The crawlspace is not insulated at the exterior concrete walls, nor between the floor joists. The wall cavities are not visible from the crawlspace or the attic. Due to the vintage of the building and the lack of major modifications during the twentieth century, it is presumed that the walls are not insulated. The attic floor, however, is insulated with three types of insulation probably correlating to a sequence of remodeling efforts.

The predominant insulation is loose Rock-wool, a mineral wool insulation that's installed between the joists in Zone K, L, and M. This was probably the first installation, c.1930's. The second phase, c.1950's, included installation of "Red Top" Mineral Wool by the United States Gypsum Company.³⁰ This mineral wool is sandwiched between red Kraft paper facing up into the attic and a black vapor barrier paper facing down to the plaster ceiling of the finished space below. The mineral between the papers is a matted down yellow fiber. This sandwiched insulation is installed in two different manners:

- a) In Zone H, the insulation is installed within the joist cavity.
- b) In Zone I & J, the insulation is installed over and across the joists.

Figure 98: Red Top mineral insulation between floor joists of attic Zone H.



Figure 97: Loose Rock-wool in the easternmost portion of the attic.



²⁸ See Wood Type Testing in Appendix.

²⁹ Larry Marks, Xanterra.

³⁰ United States Gypsum Company was formed in 1901 and manufactured the Red Top products primarily from the 1920's on.

Two layers of 5½" thick pink fiberglass insulation (which are clean, indicating recent installation) are laid over the Red Top insulation in Zone J. This insulation was installed the most recently, probably c.1995.

Note: The attic framing above the two-story portion of the building is not insulated.



Figure 99: 1888 newspaper glued to underside of sheathing in attic Zone H.



Figure 100: Two layers of fiberglass insulation over the Red Top above Bathroom #108.

Newspaper was glued to the underside of the sheathing of the south portion of Zone H at some point. One of the remnants is from the May 13, 1888 issue of the *St. Paul & Minneapolis Pioneer Press*. Much of the paper has dried and fallen from the sheathing, and no glue residue appears to remain. This newspaper is not a reliable construction dating tool, as it could have been applied many years after the printing of the newspaper. It might have been fastened as a crude attempt at insulation or vapor barrier, or potentially as a form of interior finish treatment for a makeshift room.

2. Condition

All of the insulation is generally in good condition. The Rock-wool has compressed, reducing its R-value; the Red Top insulation doesn't appear to have compressed, and its initial R-value is comparable with that of the fiberglass batt insulation. The approximate R-values are as follows:

- a) Rock-wool, loose fill: 3.7/inch x 5" = 18.5
- b) Red Top mineral wool, batt: 3.12/inch x 5" = 15.6
- c) Fiberglass, batt: 3.6/in x 11" = 39.6

3. Recommendations

The existing insulation should be retained. Additional insulation can be added as required to increase R-values and the efficacy of the cold attic as a ventilation space.

H. Fire Protection

1. Description

There is currently no fire protection system in the house. The International Existing Building Code does not require that work areas in Group R occupancies three stories or less in height be protected with automatic sprinkler systems.³¹

2. Condition

Not applicable.

3. Recommendations

a) *Sprinklers*

An automatic sprinkler system type 13R would provide the protection for the building and occupants that has been requested by the National Park Service. Such a system should be installed in as unobtrusive a manner as possible; sidewall heads should be avoided and concealed pendant heads should be selected. This disallows the use of a dry system. A system using Glycol would be reliable since freezing water would be avoided.

The water supply can enter the crawlspace through a backflow assembly, and where it would be converted to glycol for distribution throughout the building. Because this is a 13R application, the attic does not have to be sprinklered. However, if the attic will continue to be use for storage of furniture and other flammable items, it is recommended that the system be installed there as well.

The water flow to the area needs to be tested to confirm adequate flow and pressure for the recommended system.

b) *Alarms*

As stated below in the Electrical Analysis, the building is equipped with battery-operated smoke detectors, the location of which is not in compliance with current code. A fire alarm and detection system is required to be installed per the International Fire Code for existing Group R-1 occupancies. An approved automatic fire detection system should be installed in connection with the automatic sprinkler system.

c) *Second Floor Emergency Egress*

Per Section 705.3 of the International Existing Building Code, the building need only have one exit. This building currently has three exits from the first floor. An additional egress from the second floor is not required by code. However, per Section R310 of the 2006 International Residential Code, emergency escape and rescue openings are required in every sleeping room, to provide a means of escape and access for rescue. Such emergency escape and rescue openings are required to be as follows:

³¹ International Building Code Council, *International Existing Building Code 2006*, Article 604.2.2 Exception.

Emergency Egress Requirements

Code Section	Requirement	Current Conditions Second Floor
R310.1	Sill height not less than 44" above the finished floor.	20½" to 25"
R310.1.1	Minimum net clear opening of 5.7 s.f.	6 s.f. min.
R310.1.2	Minimum opening height of 24".	3'-4½" min.
R310.1.3	Minimum opening width of 20".	24" (single casement)

The second floor exterior wall openings meet the code requirements.

I. Plumbing

1. Description

The plumbing system located in the house appears to have been redone and added onto several times. The additions to the plumbing system, which more than likely coincide with the building's multiple additions, contain many different piping materials, connection types and abandoned branches.

2. Condition

In general, the plumbing system is in poor condition. The plumbing fixtures throughout the house appear to have been replaced or added sometime in the 1970's or 80's. All of the fixtures are in working order. The second floor tub/shower and Kitchen sink have been removed or disabled due to pipes freezing. These old fixtures are also inefficient compared to modern fixtures. For instance, older toilets have flush rates of 3.5 to 5 gallons per flush while newer toilets typically use 1.6 gallons per flush.

The fixtures throughout the house all have different types of fixture connections. These connections range from Type M flexible copper, plastic PEX, and flexible brass. These conditions reinforce the fact that fixtures have been added or replaced over time. The connections themselves seem to be in fair condition.

Domestic water piping located in the house ranges from moderate to poor condition. The connection of dissimilar materials has led to the electrolysis of the pipe over time. The many additions and renovations to the house have resulted in piping being abandoned in place; many branches are capped, as shown in Figure P-1. Also, corrosion of the piping has also occurred over time most likely due to the soft/hard condition of the domestic water. This corrosion can be seen Figure P-1 and P-2. Moreover, the age of the piping suggests that lead soldering was used in the connection of the piping. Lead soldering was used to join copper piping until 1988 and is a source of contamination of potable water.

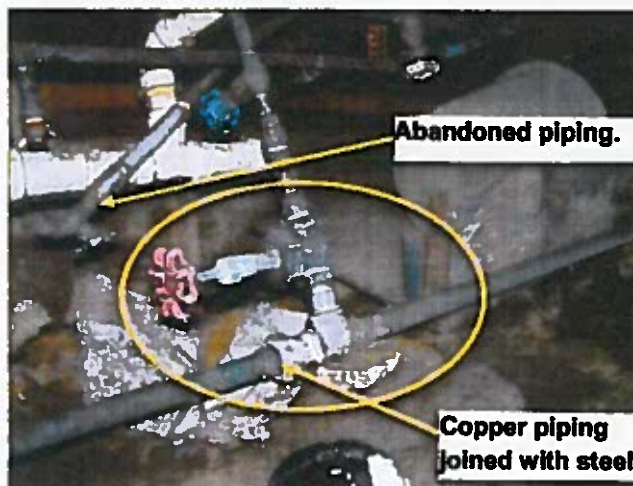


Figure P-1: Piping with dissimilar piping material, abandoned lines and corrosion



Figure P-2: Corroded valve underneath Kitchen sink

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Some of the problem areas with the waste system are as follows. Located in the crawl space is an indirect drain with two garden hoses connecting to it as shown in Figure P-4. This condition is a violation of the Uniform Plumbing Code because the drain is not vented. The additions to the house have also combined two dissimilar piping materials. The older sections of piping are cast iron while the newer additions are PVC. The connection piping material used to connect the fixtures to the waste system also varies throughout the house. The newer connections use PVC connections and traps while the older sections use metal connections, which are more prone to corrosion.

From what can be visually inspected of the vent piping, it appears to be in good condition. It shares a similar situation as the waste piping as the older section of the house uses cast iron and the newer addition and second floor use PVC. The waste system seems to be properly vented and no problems have been reported other than the indirect drain as mentioned before.

Flexible copper tubing was used for the natural gas piping system which supplies fuel to the two Rinnai wall heaters on the second floor. This copper tubing is run from the meter outside then under and over the roof and through the exterior wall. The tubing then runs into and through the upstairs to connect to the units. The use of copper piping for conveying natural gas can lead to corrosion under circumstances of high hydrogen sulfide concentrations. According to the International Fuel Gas Code, natural gas must contain less than 0.3 grains of hydrogen sulfide per 100 cubic feet of gas for copper pipe to be used. The natural gas piping seems to be in overall good condition and is probably in compliance.



Figure P-4: Indirect drain connection and pipe corrosion

3. Recommendations

With respect to the above noted criteria, CTA recommends a complete renovation of the domestic hot and cold water systems back to the piping entrance of the house. This would alleviate some of the current problems by consolidating piping through removal of abandoned lines, use of proper piping material and total removal of corroded materials. Replacing the piping would also remove any lead that might be present in the system. It is recommended that the fixtures also be replaced with more efficient fixtures. Replacing current fixtures with high efficient low flow toilets, faucets, and showers would greatly reduce the water usage of the building. The DWV system should be replaced up to the building entrance to consolidate all the various piping materials to one type and to fix the current connection issues. Lastly, it is recommended that the natural gas be tested to verify that the hydrogen sulfide

levels are not above the International Fuel Gas Code's maximum limit in order to prevent future corrosion of and possible damage to the copper piping.

J. Heating

1. Description

The current mechanical system consists of a radiant baseboard system and natural gas-fired direct vented wall heaters. There is no cooling system. The radiant baseboard serves the first floor and has hot water supplied to it from the boiler located in the building to the southwest. The two wall heaters are located on the second floor and each serve a room on either side of the stairway. The system is in working order and is reported to maintain a comfortable space temperature. Bathroom #108 contains an exhaust fan that appears to operate. The other two bathrooms have had their fans removed or never have had one. The crawlspace has a radon venting system fan with its fan located in the attic above Closet #105A.

2. Condition

The hydronic system located on the first floor utilizes hydronic baseboard radiators as a means of heat transfer to the spaces. Hot water is supplied from the boiler in the adjacent building and enters in the southwest corner of the crawlspace. Multiple circulator pumps in the crawlspace distribute hot water to the radiant baseboards. The pumps' current conditions are fair as can be seen in Figure M-1 and M-2. An electric wall heater supplies supplemental heat in the Kitchen but this is not the most efficient way to heat a space when there is a hydronic system available.



Figure M-1: Hydronic circulator pump



Figure M-2: Hydronic circulator pump

The hydronic piping located in the crawl space varies in condition from fair to poor. This copper piping shows its worst signs of corrosion at its older sections and joints. This piping also is not fully insulated. This violates the International Mechanical Code (IMC). See Figure M-4 below.

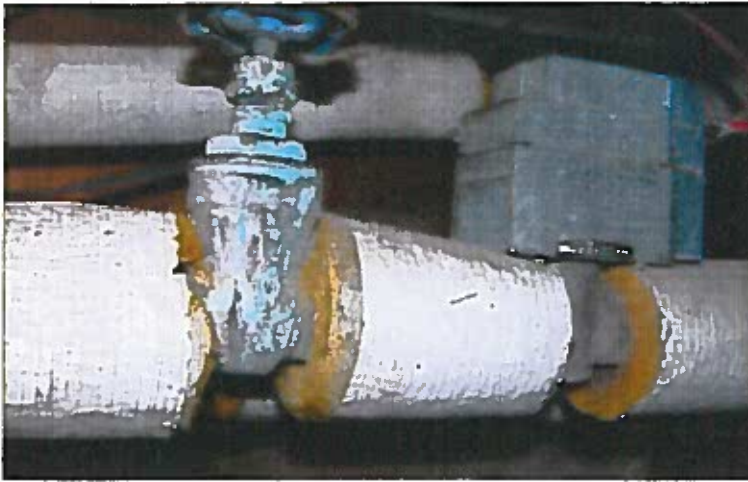


Figure M-3: Corroded hydronic valve



Figure M-4: Pipe not fully insulated

The system has been added on to over time as needed to accommodate new additions and to increase heat output. The piping also shows signs of repair; various components, such as valves and pumps, have been replaced.

There are four different types of baseboard coverings on the first floor. The coverings have been repainted several times and are in fair condition. The radiating fins themselves appear to be in fair to poor condition. While some of the piping is in good condition, much of it is corroding. See Figures M-5 and M-6. Due to the amount of corrosion visible on the exterior of the pipe, further inspection of the inside of the piping may be necessary to determine the overall condition of the pipe.

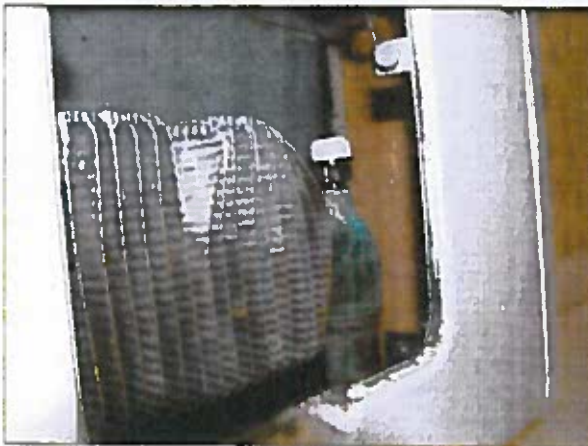


Figure M-5: Corroded hydronic valve

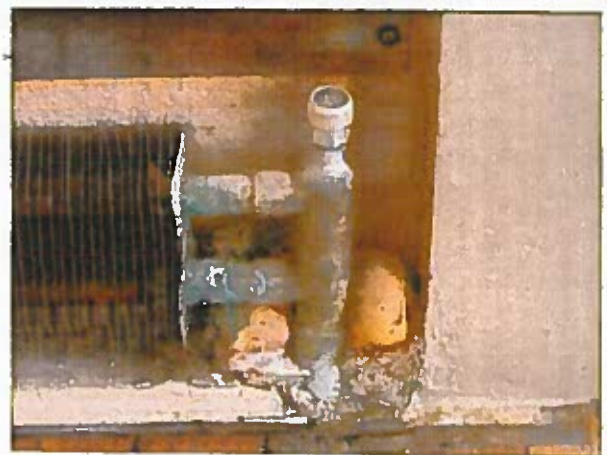


Figure M-6: Corroded hydronic valve

The baseboard hydronic radiation system on the first floor is controlled by three thermostats, in the Kitchen, Living Room, and the corridor. The thermostats appear to be working properly. The thermostat in the corridor, however, contains mercury

which might be a potential source of contamination. A fourth thermostat in the Kitchen operates the electric wall heater in the Kitchen.

There is only one bathroom exhaust fan in the house. This fan located in Bathroom #108 works properly but the internal heater does not; it emitted a burning smell when turned on. An exhaust rate of 50 cfm per bathroom is required by the International Mechanical Code. In order to meet the IMC, installation of new exhaust fans would be required. Recently, a Kitchen exhaust fan in the island was removed due to the recent water damage in that area. Kitchens are required by the IMC to have at least 100 cfm of intermittent exhaust. A sidewall fan is installed in the upstairs hall where the King Mini-Kitchen used to be. This fan is not working and appears to be from the 1950's, see Figure M-7.

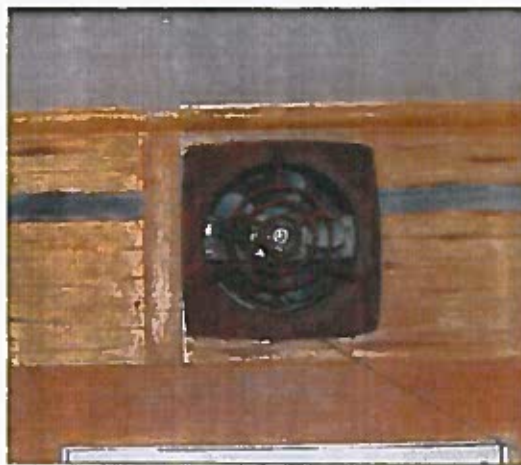
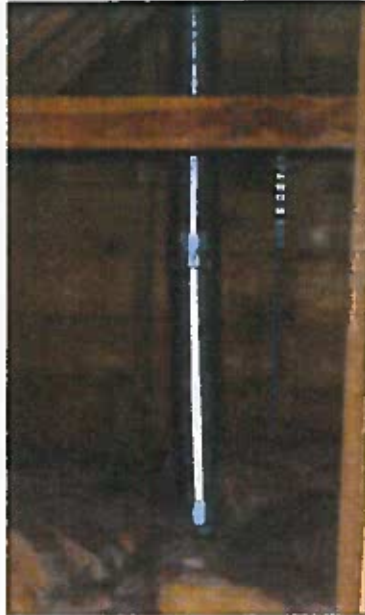


Figure M-7: Second floor wall fan

The ductwork for the exhaust fan in Bathroom #108 is in fair shape. However, the ductwork is connected using duct tape which is an IMC code violation as seen in the Figure M-9. The exhaust ductwork for the dryer vent was removed from the crawl space but the dryer cap on the exterior wall remains. The exhaust duct for the Kitchen exhaust is in poor condition. It is connected with duct tape in the same way as the Bathroom #108 exhaust and connected to the floor opening with flexible ductwork; refer to Figure M-8. A double-walled flue pipe (16" dia.) is abandoned in Bedroom #103. The walls of this flue pipe are capped in the attic below the abandoned roof penetration and capped about 6" below the ceiling.



Figure M-8: Kitchen exhaust duct



**Figure M-9: Master Bath
exhaust duct**



**Figure M-10: Rinnai direct vent ductless
furnace**

The two second floor Bedrooms are heated via gas-fired Rinnai direct vent ductless furnaces, as shown in Figure M-10 above. The temperature controls are unit mounted. The heaters maintain adequate temperature in the space but are not the most efficient way to heat a space when a hydronic system is available.

3. Recommendations

After analysis of the mechanical system, CTA recommends that the hydronic system should be further investigated. This investigation should include internal inspection of pipe and fin tubes, hydronic pumps and analysis of controls. If the hydronic piping is not adversely affected by internal corrosion, the piping should be properly insulated. The two Rinnai direct vent ductless furnaces should be replaced by more efficient and centralized radiant baseboard heating. The electric wall heater in the Kitchen should be removed and the Kitchen should be incorporated into the hydronic system. The thermostat containing mercury in the first floor's Corridor 105 should be replaced. The Kitchen and bathrooms should be properly exhausted to meet IMC code requirements. The capped double walled flue duct can be removed from the ceiling if desired. However, in order to retain physical evidence of the building's construction history, the attic portion of the duct should be retained. Dryer exhaust ductwork should be replaced with proper materials and workmanship to meet the IMC.

K. Electrical

1. Description and Condition

The building has a 120/240 volt underground service with a 100 amp main circuit breaker located in the metering equipment as shown in Figure E-1 to the right. The metering equipment is located at the south end of the west exterior wall of the Kitchen. The main panel is a Federal Pacific load center as shown in Figure E-2 below. It is a 200 amp, 24 circuit panel, with no space for additional breakers. There is an additional panel upstairs in room 210 that is a Square D load center rated at 100 amps with a 50 amp main circuit breaker. This panel is shown in Figure E-3 below.



Figure E-1: Electrical service entry.

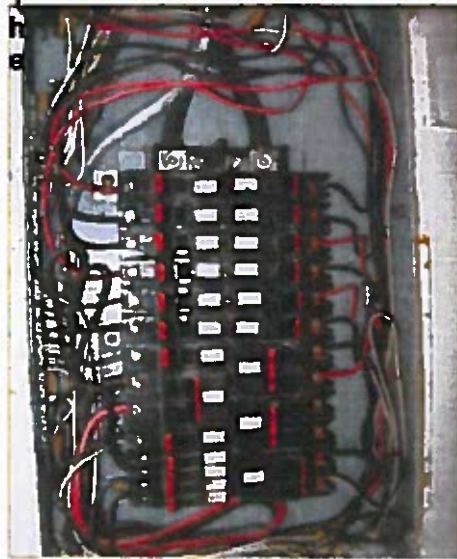


Figure E-2: Main electrical panel.

There is a weather resistant box on the exterior located at the west end of the south exterior wall of the Kitchen that contains four electrical disconnects that serve a few larger loads on the premises. This includes feeding the garage behind the building with an overhead service.

There is a variety of wiring installed throughout the building. In the attic and the crawl space there are remnants of dated "knob and tube" style of wiring which appears to be mostly abandoned. This type of wiring is shown in Figure E-4. The other exposed wiring of the building show that it has been wired with NM type conductors or Romex. This wiring is used for conventional residential wiring.

The number of receptacles in the building is not adequate to meet current code for new construction. To comply, additional receptacles would need to be added to rooms 104, 103, 100, 206, 210, and 211. There are no AFCI (Arc Fault Circuit Interrupted) receptacles throughout the building although GFCI (Ground Fault Circuit Interrupted) receptacles are present in the Kitchen and bathrooms. AFCI receptacles are required by the NEC 2008 for new construction in all areas of residences except bathrooms and Kitchens. GFCI receptacles are required in the Kitchen and bathrooms. There are currently no receptacles on the exterior of the building.

**Figure E-3: Upstairs
Electrical panel**



**Figure E-4: Knob-and-Tube style
wiring in attic space.**

The lighting throughout the building is a mixture of incandescent and fluorescent fixtures. Existing fluorescent fixtures utilize T12 lamps and are probably from the 1980's remodel. Existing incandescent fixtures are dated as well. The majority of the ceiling fixtures in habitable rooms of the first floor are recessed incandescent lights with flush-mounted chrome frames supporting a sandblasted lens. A fluorescent fixture is shown in Figure E-5 below. The interior of a typical ceiling incandescent fixture is shown in Figure E-6.



**Figure E-6: Incandescent fixture in
Bathroom #101**



Figure E-5: Fluorescent fixture

Light switches throughout the building are dated and near the end of life and can become hazards.

The smoke detectors in the building are stand alone type battery-backup detectors. The quantity of detectors is not sufficient to provide coverage required by NFPA 72. The detectors are in acceptable condition.

2. Recommendations

It is recommended that a new electrical service be brought into the building rated at 200 amps given the size of the building. The main electrical panel should be replaced because it is obsolete and there is no spare room for future electrical loads. The disconnect cabinet on the exterior of the building next to the service meter should be consolidated into a main distribution panel. This is because the disconnects are aged, obsolete, and in poor condition. The interior of the cabinet is shown in Figure E-7 at left.

Figure E-7: Aged disconnects in poor condition with building code violations.



All "knob and tube" wiring and all wiring with braided type insulation should be abandoned and removed throughout the building. All circuits should be wired with NM type insulated wires throughout. All circuits not connected should have the wires pulled back to a junction box and capped, or pulled back to the source completely. An example of this shown in Figure E-8 below.

Per NEC 2008, all electrical loads within the building need to be AFCI (Arc Fault Circuit Interrupter) protected except those in the Kitchen or bathroom areas.

It is recommended that all non-grounding receptacles be replaced with new due to them being dated, near end of life, and a fault hazard. Also, new receptacles need to be added in areas in order to satisfy NEC 2008 requirements. This would also include adding receptacles at the front and back of the exterior of the house that are GFCI protected.



Figure E-8: Example of exposed wiring. This is evident throughout Kitchen and in upstairs hallway.

It is recommended that the heater upstairs should be hardwired and not plugged in across the room with an extension

cord. Also all exposed junction boxes in the Kitchen and attic space should be capped with cover plates. An example of this is shown in Figure E-9.

It is recommended that all interior lighting devices be removed and replaced with new energy efficient fluorescent and compact fluorescent fixtures. Included in this would be to replace all dated lighting switching devices. All exterior fixtures should be replaced with weatherproof fixtures. An example of an existing exterior light fixture is shown in Figure E-10 below.



Figure E-9: Example of exposed junction box



Figure E-10: An existing exterior light fixture.

Lastly, smoke detectors need to be added immediately outside bedrooms and at the top of the stairs per NFPA 72.

3. Additional Recommendations: Existing Building and the Code

The 2006 International Existing Building Code requires that alterations or repairs to the electrical system conform to the ICC Electrical Code; it does not require that the existing installation comply with all the requirements of the code. Replacement of the receptacles is a recommendation above the mandate of the code. Rewiring should be facilitated from the attic above and the crawlspace below. In addition, there is no requirement to remove the knob-and-tube system; it is recommended that it be abandoned, but it can be abandoned in place in a fashion to clearly indicate that it is not operative.

The 2006 International Existing Building Code requires the following minimal compliance items for residential buildings:

- a) All enclosed areas, other than closets, Kitchens, basements, garages, hallways, laundry areas, utility areas, storage areas, and bathrooms shall have a minimum of two duplex receptacle outlets or one duplex receptacle outlet and one ceiling or wall-type lighting outlet.
- b) Kitchen areas shall have a minimum of two duplex receptacle outlets.

- c) Laundry areas shall have a minimum of one duplex receptacle outlet located near the laundry equipment and installed on an independent circuit.
- d) Newly installed receptacle outlets shall be provided with ground fault circuit interruption as required by the ICC Electrical Code.
- e) At least one lighting outlet shall be provided in every bathroom, hallway, stairway, attached garage, and detached garage with electric power, and to illuminate outdoor entrances and exits.
- f) At least one lighting outlet shall be provided in utility rooms and basements where such spaces are used for storage or contain equipment requiring service. While the Nichols Residence does not technically have a basement, installation of spot lighting in the crawlspace would greatly facilitate maintenance of the piping and equipment contained there.
- g) Clearance for electrical service equipment shall be provided in accordance with the ICC Electrical Code.

When the light switches are replaced, consideration should be given to installing push-button switches as would have been installed with the original electrical system. The existing incandescent light fixtures should be retrofitted with compact fluorescent bulbs wherever possible. If the fixtures are replaced with fixtures more in keeping with the Craftsman period of the house, selection should allow for insertion of compact fluorescent bulbs.

L. Radon Mitigation

1. Description

A radon fan installed in the attic vents the crawlspace. This fan is ducted via 4" PVC pipe. A power supply and indicator panel located in Closet #100A at the end of the corridor monitors the status of the fan.

2. Condition

The radon mitigation system was installed around May 1994, according to the plate on the fan power supply/indicator panel. The fan was working on Feb. 20, 2008 but was malfunctioning on Feb. 7, 2008, as illustrated in the following Figures. The PVC duct work is in good condition.



Figure R-1: Properly Running Radon Indicator Panel, as observed on February 28, 2008.



Figure R-2: Malfunctioning Radon Indicator Panel, as observed on February 7, 2008.

3. Recommendations

CTA recommends that the radon fan should be retained as is, but monitored for failure.

M. Hazardous Materials

The following materials are those typically found in pre-1978 buildings. The reports referenced below are included in the Appendix of this report.

1. Lead Based Paint

Tetra-Tech inspected the building for components with lead-based paint in their Pre-Renovation Asbestos and Lead-Based Paint Inspection report dated November 30, 2007. The list of components tested, and those that tested positive for lead-based paint, is included in the Appendix. Exterior wood trim, shingles, windows, and siding tested positive for lead. Interior wood door casing, doors, window sash, sills [sic], and trim tested positive for lead. If these components are disturbed during renovation, precautions should be followed in accordance with the recommendations in Tetra-Tech's report.

2. Asbestos

Tetra-Tech inspected the building for asbestos and reported in their Pre-Renovation Asbestos and Lead-Based Paint Inspection report dated November 30, 2007 that no asbestos was detected in any of the suspect materials that were tested. The list of materials tested does not include the Rock-wool or mineral wool insulation in the attic, which might sometimes be included in such testing. According to the United States Gypsum Corporation's claims website, while other Red Top brand products manufactured from 1920 through 1978 might have contained asbestos, Red Top insulation products are not included in the list of potential ACM materials.

3. Ceiling Tile

Northern Industrial Hygiene tested one sample of the fiberboard ceiling from the second floor (sample was taken from the closet in the Family Room). This sample tested negative for asbestos content. In accordance with state law, two more samples need to be taken and tested for confirmation.

N. Accessibility

1. Evaluation of Accessibility of the Current Building

a) *General*

The National Park Service/Yellowstone National Park, has requested an investigation of the building code, ADA (Americans with Disabilities Act), and the UFAS (Uniform Federal Accessibility Standards) accessibility requirements, and a plan for accomplishing accessibility throughout the first floor of the Nichols Residence.

b) *2006 International Residential Code*

As a privately funded project of a single-family residence, accessibility requirements for the Nichols Residence should comply with the International Residential Code for One and Two Family Dwellings. Section R322.1 of this code states "Where there are four or more dwelling units or sleeping units in a single structure, the provisions of Chapter 11 of the International Building Code for Group R-3 shall apply." The Nichols Residence is a single-family dwelling, therefore these accessibility requirements do not apply.

c) **ADA**

The ADA applies to public places and commercial facilities only. The standard set forth in this document will not apply to the Nichols Residence, a single-family dwelling.

Americans with Disabilities Act

Code Reference	Code Provision	Code Application
28 CFR Ch. 1 (7-1-94 Edition) Pt. 36, App. A 1. Purpose	Purpose	This document sets guidelines for accessibility to places of public accommodation and commercial facilities by individuals with disabilities.

d) **UFAS**

UFAS requirements may apply to the Nichols Residence, a federal building, as described in Section 4.1.4 (11) (c) of the UFAS. If the Nichols Residence is to comply with the UFAS requirements, then any space or common area of the Nichols Residence that will be altered must be accessible. The Kitchen and at least one bathroom, if renovated, must be designed for adaptability. For full accessibility the residence must also have one accessible entrance and an accessible route through the house.

Uniform Federal Accessibility Standards

Code Reference	Code Provision	Code Application
4.1.4 (11) (c)	Residential Occupancies in one and two family dwellings where the occupancies are primarily permanent in nature and not classified as preceding residential categories or as institutional. (Transient occupancy is indicated in section 4.1.4 (11) (a) as less than 30 days)	One and two family dwelling: 5% of the total, or at least one unit, whichever is greater, in projects of 15 or more dwelling units, or as determined by the appropriate Federal agency following a local needs assessment conducted by local government bodies or states under applicable regulations. Federally owned: 5% of the total, or at least one unit, whichever is greater.
4.1.6 (1) (a)	Accessible Buildings. Alterations	If existing elements, spaces, essential features, or common areas are altered, then each such altered element, space, feature, or area shall comply with the applicable provisions of 4.1.1 to 4.1.4 of 4.1, Minimum Requirements.
4.1.7 (1) (a)	Accessible Buildings: Historic Preservation Applicability	As a general rule, the accessibility provisions of part 4 shall be applied to "qualified" historic buildings and facilities. "Qualified" buildings or facilities are those buildings and facilities that are eligible for listing in the National Register of Historic Places, or such properties designated as historic under a statute of the appropriate state

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Yellowstone National Park

		or local government body. Comments of the Advisory Council on Historic Preservation shall be obtained when required by Section 106 of the National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470 and 36 CFR Part 800, before any alteration to a qualified historic building.
4.1.7 (1) (b)	Historic Preservation: Exceptions	The Advisory Council shall determine, on a case-by-case basis, whether provisions required by Part 4 for accessible routes (exterior and interior), ramps, entrances, toilets, parking, and displays and signage, would threaten or destroy the historic significance of the building or facility.
4.1.7 (1) (c)	Historic Preservation: Exceptions	If the Advisory Council determines that any of the accessibility requirements for features listed in 4.1.7 (1) would threaten or destroy the historic significance of a building or facility, then the special application provisions of 4.1.7 (2) for that feature may be utilized. The special application provisions listed under 4.1.7 (2) may only be utilized following a written determination by the Advisory Council that application of a requirement contained in Part 4 would threaten or destroy the historic integrity of a qualified building or facility.

Currently, the first floor of the Nichols Residence is not generally accessible. Neither of the two exterior doors are accessible as they both have steps to grade. There is no continuous accessible route through the interior of the building. Many of the interior doors are either too narrow to comply with current accessibility standards, or don't provide the adequate space required for wheelchair access. Furthermore, the doorknobs do not comply with accessibility requirements. There are two small floor level changes, one between the Kitchen and Dining Room, and one at the entrance to Bathroom #108, that do not comply with accessibility requirements. Also, the Kitchen and bathrooms are not fitted with accessible fixtures.

2. **Recommendations to Achieve Accessibility Compliance throughout the First Floor**
Fully adapting the first floor of the Nichols Residence for accessibility will have a negative impact on the character-defining features of the house, hence threaten or destroy the historic character of the building. Per UFAS Article 4.1.4 (11) (c), only 5% of the buildings have to be rendered accessible. If the National Park Service/Yellowstone National Park must adapt one or more of their single-family residences for accessibility compliance, it is strongly recommended that a different house - preferably one that is not historically significant - be selected.

If the first floor of the Nichols Residence must be made fully accessible, then it is strongly recommended that the National Park Service apply for the Historic

Preservation Exceptions to preserve as many of the character-defining features in the house as possible. This would be in accordance with USAF Article 4.1.7 (1).

a) *Kitchen and Bathroom Accessibility*

The Kitchen and at least one bathroom to be remodeled must be designed and constructed for accessible adaptability. Blocking must be provided in walls for potential future installation of grab bars. Fixtures, appliances, and cabinets installed must meet accessibility standards or have the capacity to be removed and replaced with accessible components. Clear spaces required for accessible access must be designed around all fixtures, appliances and doors. These requirements would not have a negative impact on the historic character of the house.

b) *Accessible Entrance*

If the planned renovations do not include changes or modifications to the entrances at the Nichols Residence, then it is not necessary to perform additional work beyond the scope of the project to make them accessible.

To make an entrance at the Nichols Residence accessible a ramp must be provided from grade to floor level at one of the exterior doors, and the exterior door must meet the standards for accessibility.

(1) *Front Entrance (north)*

The door at this entrance meets accessibility standards for width, however, the distance from the first floor level to grade is substantial. A ramp provided to this entrance would be more than twenty feet in length, and would require modifications to the front porch to accommodate a portion of the ramp. A ramp to this entrance would have a negative impact on the historically significant visual appearance of the front of the house. Providing an accessible ramp to the front entrance is not recommended.

(2) *Kitchen Entrance (south)*

The distance from floor level to grade at the Kitchen entrance is much less than that at the front entrance. An accessible ramp to this entrance could be discreetly provided, without having a substantially negative impact on the exterior appearance of the house. The private parking area at the Nichols Residence is also adjacent to this entrance. Confirmation must be made that the clear opening at this door meets accessibility standards, with appropriate modifications made to the doorway if it does not. The doorknob and latch must be replaced with new hardware that meets accessibility standards. If changes made to the door and door opening will result in the removal or destruction of historic material the Advisory Council on Historic Preservation may consider granting an exception for this portion of the accessibility requirements. The Kitchen entrance is the recommended location to provide an accessible entrance.

(3) *Provide a New Entrance*

Another alternative exists to provide an accessible entrance at the Nichols Residence. A ramp could be provided to the existing porch at the west Kitchen wall, and a new door into the Kitchen provided. This is also a recommended location for an accessible entrance.

c) Accessible Route through the Building

Interior spaces that are not reconfigured as part of a remodeling project are not be required to meet accessibility standards. This includes features and spaces that would be part of an accessible route through the building.

Creating a fully accessible route through the Nichols Residence will require many changes, and have a negative impact on the character-defining features in several locations.

(1) Doors

Many of the doors in the Nichols Residence are either too narrow, or do not provide the necessary clear space required, to meet accessibility standards. Furthermore, none of the existing doorknobs meet accessibility standards. Modifying all of the non-compliant doors would require removal of trim, doors, and hardware that are character-defining features of the house. This is not recommended.

There are two specific openings that are critical in planning an accessible route through the common areas of the first floor and to the shared bathroom (Bathroom #101).³² The door between the Kitchen and Dining Room is too narrow to meet accessibility standards. Widening this doorway would require removal of the half door in this location, and removal of the character-defining door trim in the Dining Room. This is not recommended. The door into the common Bathroom #101 does not have adjacent clear space required for accessibility from the corridor. To make this doorway accessible, Closet #102A adjacent to the bathroom door would have to be removed to provide the required clear space. This closet contributes to the historic character of the house. Removing Closet #102A is not recommended.

(2) Floors

In the Kitchen and Bathroom #108 a new floor finish with a plywood subfloor and underlayment, respectively, has been installed on top of the tongue-and-groove wood flooring. As a result, there is a floor level transition at the doorways between these rooms and the rest of the house. This does not comply with accessibility standards.

The vertical height of the flooring transition between Bedroom #107 and Bathroom #108 was measured at less than $\frac{1}{4}$ ". Currently, there is a very small ramp at doorway into Bathroom #108. This is not code compliant. To meet accessibility standards a threshold with a beveled edge may be provided at the doorway into Bathroom #108, or the additional plywood subflooring in the bathroom may be removed.

The vertical height of the flooring transition between the Dining Room and the Kitchen was measured at more than $\frac{1}{4}$ ". To meet accessibility standards, the additional plywood subflooring in the Kitchen must be removed. The existing

³² Generally, when an accessible bathroom is required in a private residence, the shared bathroom is selected for this purpose, as opposed to the master bathroom which is located in a more private area of the house.

tongue-and-groove wood flooring below may be restored, or a new finish floor may be installed over the tongue-and-groove wood flooring. If a new finish floor is installed the transition between it and the existing Dining Room flooring must be less than 3/4" and a threshold with a beveled edge must be provided at the doorway between the Kitchen and the Dining Room.

O. Code Reviews

1. Section 106

Section 106 of the National Historic Preservation Act requires Federal agencies to take into account the effects of their undertakings on historic resources, and allow the State Historic Preservation Office and the Advisory Council on Historic Preservation an opportunity to comment on these undertakings.³³ As a project that requires approval by a federal agency (The National Park Service/Yellowstone National Park), renovations to be performed at the Nichols Residence require Section 106 review and approval. An official from the National Park Service/Yellowstone National Park "must complete the Section 106 process prior to the approval of the expenditure of any Federal funds on the undertaking or prior to the issuance of any license."³⁴

2. 2006 International Existing Building Code

a) *Introduction:*

The Nichols Residence is an existing historic building. As such, it is not required to comply with all the code requirements that a new building must follow. However, it is imperative that the building be made as safe as possible, within the parameters of its historic character, its use, and its specific location. The following analysis addresses each aspect of the code provisions that apply to this building. With few exceptions, where an article does not apply to this building type, size, configuration, etc., the article is not included herein. As with the application of all codes, any questionable areas should be reviewed with local code officials or the authority having jurisdiction. A specific application statement is made where interpretation is required.

b) *Applicable Code:*

Per Section 101.2 of the *2006 International Building Code*, detached one-and two-family dwellings not more than three stories above grade plan in height shall comply with the *2006 International Residential Code*. As an existing building, work performed on the Nichols Residence needs to conform to the *2006 International Existing Building Code*.

c) *Occupancy Type:*

Single-family residential (equivalent to R-3 of the *2006 International Building Code*).

d) *Construction Date:* Constructed c.1880 – c.1910.

e) *Premise:*

Per Article 101.5 of the *2006 International Existing Building Code*, there are three allowable compliance methods, one of which needs to be followed for an existing building's renovation work to comply with the code. They are as follows:

³³ Section 106 of the National Historic Preservation Act of 1966, 36 CFR, Part 800, Subpart A, Purposes and Participants, 800.1 Purposes, (a) *Purposes of the section 106 process*

³⁴ Section 106 of the National Historic Preservation Act of 1966, 36 CFR, Part 800, Subpart A, Purposes and Participants, 800.1 Purposes, (c) *Timing*

- (1) Prescriptive Compliance Method: Repairs, alterations, additions and changes of occupancy comply with Chapter 3 of this code and the International Fire Code. The International Fire Code is not mandatory for the alteration and repair of historic buildings when such buildings or structures do not constitute a distinct hazard to life or property.³⁵
 - (2) Work Area Compliance Method: Repairs, alterations, additions and changes of occupancy comply with applicable provisions of Chapter 4-12 of this code. This is the recommended method for compliance for the Nichols Residence.
 - (3) Performance Compliance Method: Repairs, alterations, additions and changes of occupancy comply with applicable provisions of Chapter 13 of this code.
- f) **Alteration Level:**
Based on the Work Area Compliance Method, the imminent Nichols Residence renovations are classified as Alteration Level 3.

Code Sect.	Code Provision	Code Application
202	Occupancy:	No change in occupancy – it remains residential
202	Historic Building:	Contributing structure in Mammoth Hot Springs Historic District
Chapter 3: Prescriptive Compliance Method (First Option for Compliance)		
302	Scope of Work:	No addition; alterations only. Application: Additions or alterations shall comply with the requirement of the IBC.
302.4	Stairways:	An alteration or replacement of existing stairway in an existing structure shall not be required to comply with the requirements of a new stairway as outlined in Section 1009 of the IBC where the existing space and construction will not allow a reduction in pitch or slope.
302.5	Energy:	Additions, alterations, renovations, or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. Application: The following needn't comply, provided the energy use of the building is not increased: <ul style="list-style-type: none"> • Storm windows installed over existing fenestration. • Replacement glass in existing sash. • Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation. • Construction where the existing roof, wall or floor cavity is not exposed.
302.6	Electrical:	Alterations, renovations, or repairs to electrical installations shall conform to the ICC Electrical Code

³⁵ 2006 International Fire Code, Section 102.5, p. 1.

		without requiring the existing installation to comply with all of the requirements of this code. Alterations shall not cause an existing installation to become unsafe, hazardous or overloaded. Minor alterations and repairs to existing installations shall meet the provisions for new construction unless such work is done in the same manner and arrangement as was in the existing system, is not hazardous and is approved.
302.8	Mechanical:	Same as electrical, with reference to International Mechanical Code.
302.9	Plumbing:	Same as electrical, with reference to International Plumbing Code.
303	Fire Escapes:	Fire escapes shall be permitted only as follows: New fire escapes for existing buildings only where exterior stairs cannot be utilized due to lot lines limiting stair size or due to sidewalks, alleys or roads at grade level. New fire escapes shall not incorporate ladders or access by windows. Application: This and three other instances do not apply.
305	Change in Occupancy:	No change in occupancy. Application: This article does not apply.
308.6	Accessibility/ Alterations:	Alterations shall comply with the applicable provisions in Chapter 11 of IBC unless technically infeasible. Exception 2: Accessible means of egress required by Chapter 10 of IBC are not required to be provided in existing buildings and facilities. Application: Accessible means of egress is not required.
308.7	Alterations affecting area of primary function:	Where alteration affects the accessibility to a, or contains an area of, primary function, the route to the primary function area shall be accessible. Exceptions: The costs of providing the accessible route are not required to exceed 20% of the costs of the alterations affecting the area of primary function.
308.8	Scoping for alterations:	Accessible entrances shall be provided.
Chapter 4: Description of Alteration Levels		
403	Alteration Level 1	Level 1 alterations include the removal and replacement or the covering of existing materials, elements, equipment, or fixture using new materials, elements, equipment, or fixtures that serve the same purpose. Such alterations shall comply with the provisions of Chapter 6.
404.1	Alteration Level 2	Level 2 alterations include the reconfiguration of space, the addition or elimination of any door or window, the reconfiguration or extension of any system, or the installation of any additional equipment. Such alterations shall comply with provisions of Chapters 6 and 7. This Alteration Level applies to the current scope of work anticipated at the Nichols Residence.

404.2	Alteration Level 3	Level 3 alterations apply where the work area exceeds 50 percent of the aggregate area of the building. This applies to the upcoming proposed project. Such alterations shall comply with the provisions of Chapters 6 and 7 for Level 1 and 2 alterations, respectively, as well as the provisions of Chapter 8.
Chapter 6: Alterations – Level 1 (Second, & Recommended, Option for Compliance)		
602.1	Interior Finishes:	All newly installed interior finishes shall comply with flame spread and radiant flux requirements of the IBC.
602.2	Carpeting:	
602.3	Materials & Methods:	All new work shall comply with materials and methods of ICC Electrical Code, IBC, IECC, IMC, and IPC.
603	Fire Protection:	Alterations shall be done in a manner that maintains the level of fire protection provided.
604	Means of Egress:	Repairs shall be done in a manner that maintains the level of protection provided for the means of egress.
605.1	Accessibility:	See prior section on Accessibility.
606	Structural:	Where alteration work includes replacement of equipment that is supported by the building or where a reproofing permit is required, the structural provisions of this section shall apply. Hence, this section does not apply.
607.1	Energy Conservation:	Level 1 alterations are permitted without requiring the entire building or structure to comply with the energy requirements of the International Energy Conservation Code. They shall comply as they relate to new construction only.
Chapter 7: Alterations – Level 2 (Continuation of Second Option for Compliance)		
703.4	Interior Finish:	The interior finish of walls and ceilings in exits and corridors in any work area shall comply with the requirements of the IBC.
703.2	Vertical Openings:	Existing vertical openings between floors shall be enclosed with approved assemblies, except for one- and two-family dwellings. Fire protection & fire alarm and detection are required by NPS/YNP.
704.2.2	Fire Protection:	Work area in Group R occupancies three stories or less in height need not comply with this section. However, Fire protection & fire alarm and detection are required by NPS/YNP.
705.1	Means of Egress:	Requirements shall be limited to work areas that include exits or corridors shared by more than one tenant within the work area in which Level 2 alterations are being performed. Application: Since there is only one tenant in this building, Section 7 does not apply.
705.3	Number of Exits:	The building need only have one exit when it is a Group R-1 or R-2 not more than 2 stories in height, there aren't more than 4 dwelling units per floor, and the exit access travel distance does not exceed 50 feet. Application: This building needs one exit; it has three.

707.1	Structural:	When alteration work includes installation of additional equipment that is structurally supported by the building or reconfiguration of space such that portions of the building become subjected to higher gravity loads as required by the IBC, provision so this section shall apply. Not applicable.
707.3	New Structural Members:	New structural members in alterations, including connections and anchorage, shall comply with the IBC. Application: New members, connections, and anchorage shall comply with IBC.
708.1	Electrical:	All newly installed electrical equipment and wiring relating to work done in any work area shall comply with the materials and methods requirements of Chapter 5. All electrical equipment and wiring in newly installed partitions and ceilings shall comply with all applicable requirements of the ICC Electrical Code.
708.3	Residential occupancies – electrical:	Residential occupancies and buildings regulated by the International Residential Code shall comply with the following only in work areas located within a dwelling unit.
708.3.1	Enclosed areas:	All enclosed areas, other than closets, Kitchens, basements, garages, hallways, laundry areas, utility areas, storage areas, and bathrooms shall have a minimum of two duplex receptacle outlets or one duplex receptacle outlet & one ceiling or wall-type lighting outlet.
708.3.2	Kitchens:	Kitchen areas shall have a minimum of two duplex receptacle outlets.
708.3.3	Laundry areas:	Shall have a minimum of one duplex receptacle outlet located near the laundry equipment and installed on an independent circuit.
708.3.4	GFCI:	Newly installed receptacle outlets shall be provided with ground fault circuit interruption as required by the ICC Electrical Code.
708.3.5	Minimum lighting outlets:	At least one lighting outlet shall be provided in every bathroom, hallway, stairway, attached garage, and detached garage with electric power, and to illuminate outdoor entrances and exits.
708.3.6	Utility rooms and basements: ³⁶	At least one lighting outlet shall be provided in utility rooms and basements where such spaces are used for storage or contain equipment requiring service. The Nichols House has a crawlspace, not a basement.
708.3.7	Clearance for equipment:	Clearance for electrical service equipment shall be provided in accordance with the ICC Electrical Code.
709.1	Mechanical – Reconfigured spaces:	All reconfigured spaces intended for occupancy and all spaces converted to habitable or occupiable space in any work area shall be provided with natural or mechanical ventilation in accordance with the International Mechanical Code.

³⁶ The *International Residential Code*, Section R202, defines a basement as follows: "That portion of a building that is partly or completely below grade." Section R408, however, makes a clear distinction between the crawlspace as under-floor space and a basement.

709.2	Altered existing systems:	In mech. ventilated spaces, existing mech. ventilation systems that are altered shall provide not less than 5 cfm/person of outdoor air and not less than 15 cfm of ventilation air/person; or not less than the amount of ventilation air determined by the IAQ procedure of ASHRAE 62.
709.3	Local exhaust:	All newly introduced devices, equipment, or operations that produce airborne particulate matter, odors, fumes, vapor, combustion products, gaseous contaminants, pathogenic and allergenic organisms, and microbial contaminants in such quantities as to affect adversely or impair health or cause discomfort to occupants shall be provided with local exhaust.
710.1	Plumbing	This section addresses the minimum number of fixtures when the occupant load is increased by more than 20%. Not applicable.
711	Energy Conservation:	The alterations only shall conform to the energy requirements of the International Residential Code as they relate to new construction only.
Chapter 8: Alterations – Level 3 (Continuation of Second Option for Compliance)		
803.2	Fire partitions in Group R-3:	Fire separation is required where the work area is in any attached dwelling unit in Group R-3 or any multiple single-family dwelling. Not applicable.
804.1	Automatic sprinkler systems:	Shall be in accordance with Section 704.2: Work area in Group R occupancies three stories or less in height need not comply with this section. However, Fire protection & fire alarm and detection are required by NPS/YNP.
805	Means of Egress:	Shall be in accordance with Section 705: Requirements shall be limited to work areas that include exits or corridors shared by more than one tenant within the work area in which Level 2 alterations are being performed. Application: Since there is only one tenant in this building, Section 7 does not apply.
806	Accessibility:	A building, facility, or element that is altered shall comply with Section 605.
807.2	Structural:	Alterations shall not reduce the structural strength or stability of the building.
807.3	New structural members:	New structural members in alterations, including connections and anchorage, shall comply with the IBC.
807.4	Minimum design loads:	Minimum design loads on existing elements that do not support additional loads as a result of an alteration shall be the loads applicable at the time the building was constructed.
807.5	Structural alterations:	Buildings undergoing Level 3 structural alterations shall comply with this section. The following exception applies: Buildings of Group R occupancy with no more than five dwelling units used solely for residential purposes that are altered based on

Nichols Residence
Historic Structure Report
Yellowstone National Park

		the conventional light-frame construction methods of the IBC or in compliance with the provisions of the IRC.
808	Energy conservation:	The alterations only shall conform to the energy requirements of the International Residential Code as they relate to new construction only.

VI. Preservation Treatment and Recommendations

A. Preservation Plan

1. Restoration Target Date

The Nichols Residence is significant both for its architecture and for its role in the progressive development and construction of buildings within the Mammoth Hot Springs area of Yellowstone National Park. It is probably a conglomeration of various concessioners' buildings from the area and is conceivably representative of a long history of the area's development. The architectural significance stems from its cohesive appearance as a welcoming Craftsman style residence. It was most certainly built from local materials,³⁷ onto the local travertine.

While all of these early phases of construction contribute immensely to the historic significance of the building, the cloud of unsurety around their origin makes it difficult to craft a Restoration Target Date around them. For this reason, we recommend a Restoration Target Date of c.1910 for the following reasons:

- a) The current form and massing of the residence was extant.
- b) The design of combining all the forms and wrapping them with a consistent exterior façade in the guise of the Craftsman style was representative of the building's history.
- c) To restore to this date does not require the demolition of any building components, hence retaining all evidence for future efforts of analysis.
- d) The c.1910 Craftsman design is a strong representation of the style that was quickly and easily permeating suburbs, rural areas, and urban centers throughout the United States.

Some modifications have been made to the building after the proposed Restoration Target Date, primarily the Folk Art faux painting on the second floor. Because the original treatment of these walls is unknown (they might have been simply painted fiberboard), it is recommended that this Folk Art remain. The paintings reflect the character of Yellowstone National Park and the profound influence it has on all who live and work there.

Any work performed on the building, while complying with the above parameters, should be guided generally by *The Secretary of Interior's Standards for Rehabilitation*. These standards, listed below, are supplemented with guidelines that more specifically address their interpretation and implementation. These supplemental guidelines should be referenced prior to engaging in construction activities at the house.

2. Secretary of the Interior's Standards for Rehabilitation³⁸

- a) A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.

³⁷ See discussion regarding attic framing in Construction History for probable use of the Park's sawmill.

³⁸ U.S. Department of the Interior, *The Secretary of the Interior's Standard for Rehabilitation* (Washington, D.C., 1992), p. vi-vii.

- b) The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.
- c) Each property shall be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken.
- d) Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.
- e) Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a property shall be preserved.
- f) Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.
- g) Chemical or physical treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.
- h) Significant archeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.
- i) New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.
- j) New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

3. Basis for the Preservation Plan

The Preservation Plan is based upon the Restoration Target Date, the above standards, the applicable codes, and the condition of the building. All of these conditions must be weighed and balanced to be able to provide a respectful treatment of the building. Proposed treatments call for replacement in kind as much as feasible, and stabilization or improvement of life safety. Since the use of the building has remained the same since historical knowledge, the building won't have to be modified to comply with stricter codes. Hence, the majority of the Preservation Plan is for repairs to the building, to ensure longevity of the original and character-defining materials.

The intent is to have the building appear much as it does now – as it did c.1910 – and to appear well-maintained and used throughout the years. It should wear the patina of time gracefully and not appear as though newly constructed.

4. Over-arching Priorities

The large-scale priorities that will inform the entire Preservation Plan are as follows:

- a) *Structural Improvements:* Much of the first floor structure, as visible in the crawlspace, has been compromised over time. This is due to under-designed

members that have been added onto and subjected to potentially greater loads than originally intended. Much of the beam support structure in the crawlspace needs to be addressed in order to render the building safe.

- b) *Electrical upgrades:* Provision of new electrical service, abandonment of the knob-and-tube wiring, and replacement of the non-grounded receptacles are critical to the continued safety of the residents.
- c) *Mechanical & Plumbing Improvements:* Much of the piping and connections are corroded and should be replaced. This is not an immediate priority, as indicated below. It is recommended, however, that work in the crawlspace occur simultaneously.
- d) *Miscellaneous Repairs:* Such repairs are not life safety issues, but are associated with keeping the building in good repair. These repairs are identified in the list of Recommended Treatments that follows.

B. Work Requirements for Each Room or Area

- 1. General:
 - a) The over-arching priorities noted above should be addressed.
 - b) Light fixtures should be replaced with period Craftsman style fixtures.
 - c) Plumbing fixtures should be replaced with fixtures and fittings more compatible with the Craftsman style.
 - d) Paint walls and ceilings in colors more in keeping with Craftsman style era of the home.
 - e) Refinish fir flooring, to match color of flooring in Closet #105 B.
- 2. Exterior:
 - a) Repair concrete watertable at east elevation, west elevation of Dining/Living Room, and east elevation of Kitchen.
 - b) Repair concrete landing of entry porch.
 - c) Regrade final site grading for positive drainage away from the building.
 - d) Replace storm window hinges with properly sized hinges for smooth operation.
 - e) Replace broken parts of storm window ventilation operators. Remove screws securing storm windows shut.
- 3. Interior – first floor:
 - a) Kitchen #110:
 - (1) Remove all water-damaged materials: gypsum wall board and underlayment.
 - (2) Assess original fir flooring exposed after removal of underlayment. Repair and refinish.
 - (3) Remove all c.1980s cabinetry and replace with cabinetry compatible with Craftsman style era of house.
 - (4) Reconfigure Kitchen for greater efficiency.
 - (5) Provide door in west elevation to porch (to approximate original exterior door here, whose location is not yet known).
 - (6) Replace c.1980's kitchen door (at south elevation) with one more in keeping with the Craftsman style era of the home.
 - (7) Replace baseboard, door casings, and window trim with wooden trim to match the Craftsman style trim elsewhere in the house.
 - b) Dining Room #109:
 - (1) Replace hollow core flush wood Dutch door to Kitchen with double-swing door typical of the Craftsman style.
 - (2) Provide period lighting fixtures.
 - c) Living Room #108:
 - (1) Screen and apply protective finish to oak strip flooring.

- (2) Replace weatherstripping at front entry door.
- d) Master Bedroom #107:
 - (1) Restore closet to original configuration.
 - (2) Remove paint from fir flooring and refinish.
 - (3) Remove shims at threshold to Bathroom floor.
- e) Master Bathroom #106:
 - (1) Remove sheet vinyl flooring and underlayment.
 - (2) Provide linoleum, cork, or other flooring appropriate to the Craftsman style.
 - (3) Provide period lighting and plumbing fixtures and fittings.
- f) Bedroom #103 and 104:
 - (1) Remove vinyl tile from flooring and restore original fir strip flooring.
 - (2) Repair edge of door stile at mortise lock casing.
 - (3) Provide period appropriate lighting fixtures.
- g) Bathroom #101:
 - (1) Remove sheet vinyl flooring and underlayment.
 - (2) Provide linoleum, cork, or other flooring appropriate to the Craftsman style.
 - (3) Provide period lighting and plumbing fixtures and fittings.
- h) Bedroom #100:
 - (1) Restore the fir strip flooring.
 - (2) Provide period appropriate lighting fixtures.
- i) Corridor #105:
 - (1) Restore the fir strip flooring.
 - (2) Provide period appropriate lighting fixtures.
 - (3) Repair the exterior storm doors at bay.
- 4. Interior – Second Floor:
 - a) General: Retain faux painting throughout. Touch up as required where damaged or bare wall is exposed by fixture removal.
 - b) Stairs #112:
 - (1) Replace the damaged fiberboard panel sections with matching board, labeled on rear to identify date. Provide faux painting to blend with existing. Remove flaking paint and provide infill painting to blend with existing. (See note in Recommended Treatments below regarding identification of non-original pieces).
 - (2) Remove the carpeting and pad. Clean the linoleum on the treads.
 - (3) Remove the non-matching (red) linoleum from the two bottom winders and the sheet vinyl from the bottom landing. Provide compatible linoleum on the treads.
 - c) Family Room #206:
 - (1) Remove carpeting and provide flooring compatible with Craftsman style.
 - (2) Remove Celotex (flammable) ceiling boards. Provide gypsum board with wooden battens to match (or reuse) existing.
 - (3) Provide period appropriate lighting fixtures.
 - (4) Remove space heater and provide painted panel in its framed opening.
 - d) Hall #209:
 - (1) Remove carpeting and provide flooring compatible with Craftsman style.
 - (2) Remove Celotex (flammable) ceiling boards. Provide gypsum board with wooden battens to match (or reuse) existing.
 - (3) Provide period appropriate lighting fixtures.
 - e) Bedroom #210:
 - (1) Remove carpeting and provide flooring compatible with Craftsman style.

- (2) Remove Celotex (flammable) ceiling boards. Provide gypsum board with wooden battens to match (or reuse) existing.
 - (3) Provide period appropriate lighting fixtures.
 - (4) Remove space heater and provide painted panel in its framed opening.
 - (5) Provide egress window on south wall.
- f) Bathroom #211:
- (1) Remove sheet vinyl flooring and provide flooring compatible with Craftsman style.
 - (2) Remove Celotex (flammable) ceiling boards. Provide gypsum board with wooden battens to match (or reuse) existing.
 - (3) Retain period appropriate lighting fixtures.
 - (4) Provide period plumbing fixtures and fittings.

C. Prioritized Recommendations and Sequencing

In order to fulfill the goal of restoring the Nichols Residence to its c.1910 appearance, various repairs are required, some components will need to be replaced or modified, and several surfaces will need to be prepared and repainted. The systems not noted below should be maintained in current condition; modifications are not necessary.

The work item associated with Item #2 below, replacing the portion of the foundation wall at Gridline 2C, would be a convenient location to stage the work. An opening here would allow for larger construction materials, and piping, to be introduced to the crawlspace with less intrusion into the upper floors – and materials - of the building. It is recommended that electrical, plumbing, and heating improvements be made at the time this foundation opening is created. Much of the piping is in the way of making structural modifications properly.

Note on replacements and replica pieces: All replacement and replica pieces should be marked and date-stamped (permanently) on a non-visible side to identify the pieces as new additions to a historic structure. This will aid in future investigations.

The work has been categorized within the following priorities in descending order of immediacy:

1. Category 1: Component or system requires immediate attention in order to make the building reasonably safe for the occupants. This work should be performed immediately.
2. Category 2: Component or system requires immediate attention in order to prevent further deterioration of the building. This work should be performed within one year.
3. Category 3: Component or system requires attention within two years, in order to prevent further deterioration of the system.
4. Category 4: Component or system requires attention within five years.
5. Category 5: Component or system requires attention within ten years. Some of these items will be considered restoration to historic character of the residence.

The following Scope of Work is listed in descending order of priority, with the Immediacy Category provided at the right.

Scope of Work	Immediacy
1. Repair damaged piers, paying particular attention to floor beam bearing points. Provide mechanical connectors for all beams to piers.	1
2. Front Entry: Repair damaged concrete at front steps (hazard).	2
3. Windows at southern exposure: Touch-up paint storms and window trim. (Note, lead-based paint.) (In-house repair.)	2
4. Remove and replace damaged portion of foundation wall at Gridline 2C. Provide waterproofing at newly placed concrete foundation wall and provide positive slope to grade to drain away from the building. Replace or repair concrete pier immediately adjacent.	2
5. Dig out crawlspace to provide greater accessibility for working and maintenance.	2
6. Install light fixtures in crawlspace to facilitate installation and maintenance, with light switches at each access point.	2
7. Electrical Upgrades:	2
a. Provide new 200-Amp electrical service.	
b. Provide new main panel.	
c. Abandon knob-and-tube wiring in place.	
d. Replace non-grounding receptacles with grounded receptacles.	
e. Hardwire heaters on second floor.	
8. There is some spot separation of connections between vertical web members, floor/ceiling joists, and roof rafters. Each connection point should be inspected and repaired where separation is found. A mechanical connection should be provided, to connect rafter truss butt ends to each other at the ridge line at all trusses, whether the butt ends have separated or not.	2
9. Mechanical:	2
a. Investigate pipe and fins in fin tubes, hydronic pumps.	
b. If above test okay, insulate the piping.	
10. Concrete watertable – east of kitchen: remove organic growth and patch and seal concrete. Provide sister at end of deteriorated floor joist.	2
11. Concrete watertable at north elevation: remove top 3-4" of watertable and provide compatible concrete patch.	2
12. Remove all soil bearing debris shims at floor beams. Provide screw jacks and/or additional concrete pier supports as necessary. Shim beams to piers as level as possible.	3
13. Provide mechanical connections at all beam connections, including beam-to-beam splices, and beam-to-pier supports. Without mechanical connections, the gravity forces currently holding the beams in place over the piers could be overcome by lateral forces (seismic or wind) and the beams could "walk" off their supports.	3

Scope of Work	Immediacy
14. Exterior Painting: Wood rafter tails and knee braces. (In-house repair.)	3
15. Insulate crawlspace walls and lay vapor retarder over travertine/soil floor.	3
16. Exterior Painting: Spot repaint exterior wall components as needed. (In-house repair.)	4
17. Concrete Watertable: Seal joints and repaint.	4
18. Remove wood floor beam with connection to perimeter concrete foundation wall and replace with treated wood or precast concrete beam – this applies only to the portion from the foundation bearing wall to the next bearing pier. Mechanically fasten beam to both piers and foundation. Untreated wood in contact with concrete will tend to degrade over time due to moisture; these "edge" beams will degrade over time and could fail at the pockets in the concrete foundation wall.	4
19. The roof truss systems in general are open trusses – meaning they lack web or cross members between the sloping top chords and bottom flat chords. This could cause the trusses to "rack" as there is little resistance for the truss members to deflect in plane. It is recommended that vertical web members be added and mechanically connected to both the sloping top truss chord, and the bottom floor/ceiling chord at every truss. These new web members can be canted to an adjacent floor/ceiling joist where the joists and rafters are offset (similar to the attic construction in Zone H).	4
20. Plumbing: Consolidate piping and replace connections	4
21. Plumbing: Replace fixtures with more efficient fixtures that are more in keeping with the historic character of the house.	5
22. Provide additional blocking/bridging at floor joist bearing points and at joist mi-spans. Floor joists members are typically deep with narrow sections, and they could buckle laterally under gravity loads alone. This would typically happen at or near supports, and at mid-span, where bending moments are high.	5
23. Replace trim in Kitchen to be more in keeping with the historic character of the house.	5
24. Replace trim in first floor bathrooms to be more in keeping with the historic character of the house.	5
25. Master Bedroom Closet: Remove non-original portions and restore original configuration.	5
26. Replace the Kitchen exterior door and storm door with doors more in keeping with the historic character of the house.	5
27. Electrical Light Fixtures: Replace existing with period fixtures more in keeping with the Craftsman style of the residence.	5

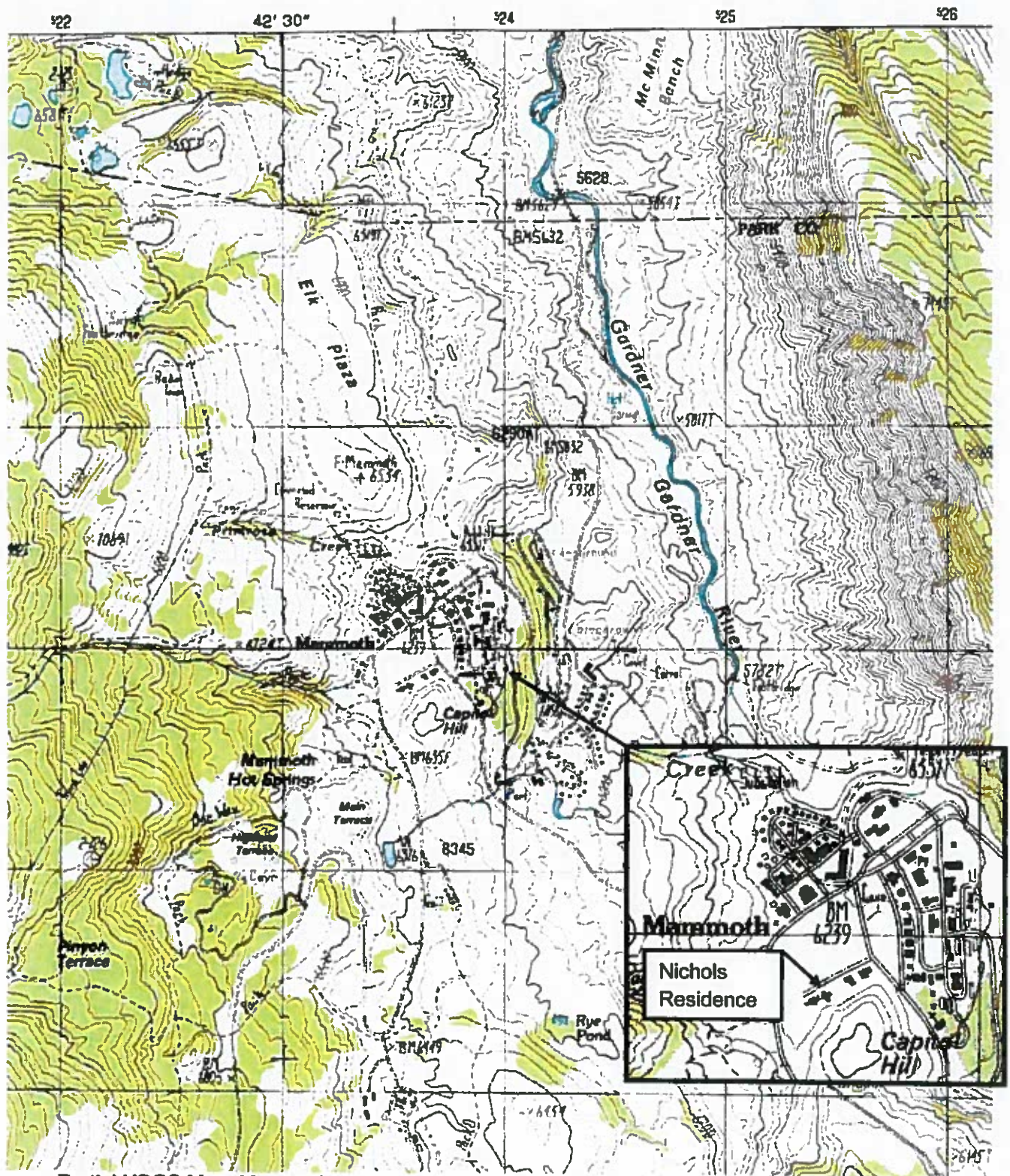
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VIII. Appendix

- A. USGS 7.5 minute site map**
- B. List of Classified Structures Entry for "Mammoth Hot Springs Vernon Goodwin Residence"**
- C. Historic Drawings**
 - 1. 1903 topographic map of Mammoth by Chittenden
 - 2. 1929 drawing
- D. Historic Photographs**
- E. As-Built Drawings**
- F. Test Results**
 - 1. Tetra-Tech
 - a. Lead Based Paint*
 - b. Asbestos*
 - 2. Northern Industrial Hygiene - Ceiling Tile
 - 3. Quirk Consulting - Wood Type Testing

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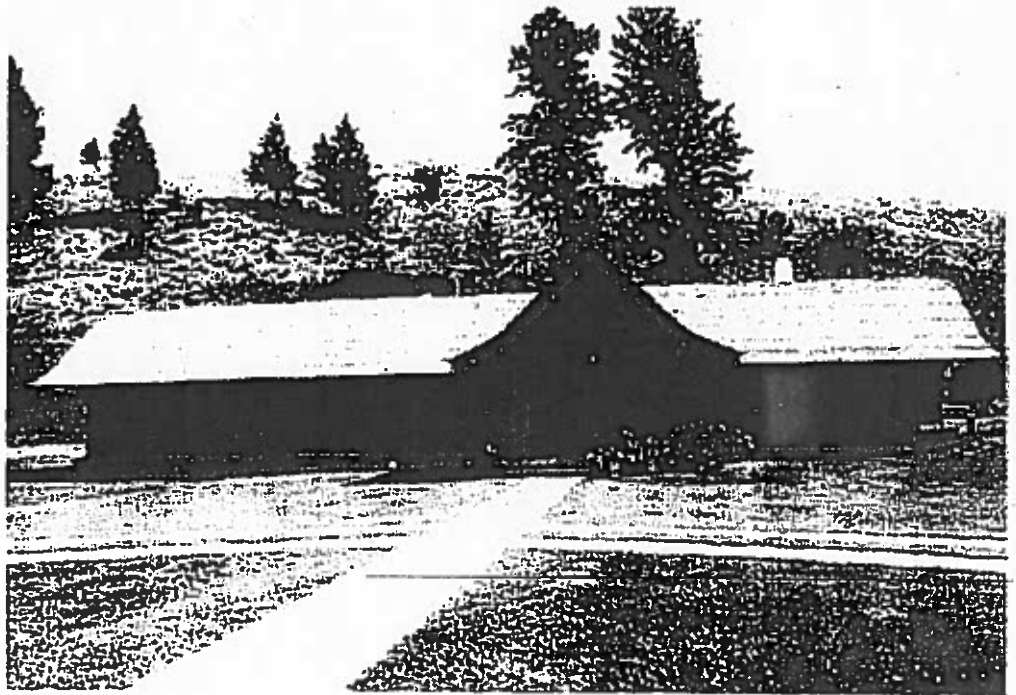


Partial USGS Map, Mammoth

Scale = 7.5 minutes

List of Classified Structures

Mammoth Hot Springs Vernon Goodwin Residence



Identification:

Preferred
Structure
Name:

Mammoth Hot Springs Vernon Goodwin Residence

(Handwritten signature)

Structure
Number:

HS-2031

Other Structure
Name(s):

Other Structure Name(s)

1. Nichols' Residence
2. Tompkin's Residence

Park: Yellowstone National Park

Park District: YELL North Unit

Historic District:

Historic District

1. Mammoth Hot Springs

Structure
State:

Wyoming

Structure
County:

Park

Region: Intermountain
Cluster: Rocky Mountain
Administrative Unit: Yellowstone National Park
LCS ID: 010819

Historical Significance:

National Register Status: Entered - Documented

National Register Date: 03/20/2002

National Historic Landmark?: No

Significance Level: State

Short Significance Description: Period of Significance: 1883-1949. This district has statewide significance under Criteria A and C for its association with the Historic Contexts: "Concessions in Yellowstone National Park 1871-1966" and "Architecture in the National Parks 1872-1966."

Period of Significance: 1883-1949. The Mammoth Hot Springs Historic District has statewide significance under Criterion A for its historical association w/ the development of Yellowstone National Park (YNP), & more specifically, w/ the development of administrative & concession policies in the national park system. The district's location, near one of the major natural curiosities in the park, the Mammoth Hot Springs Terraces, & at the juncture of the 1st entrance road to the park resulted in its selection as the site of the 1st administrative headquarters & the site of the 1st concessions in the 1st national park in the U.S. The 1st hotels in YNP were located at Mammoth Hot Springs, as well as the 1st retail store, photograph shop, & filling station, the successors of which still operate within the district. YNP historian Aubrey Haines called Mammoth "the most important place associated with the district, which includes Fort Yellowstone, the best-preserved post representing the early military efforts to protect the nation's scenic resources. The district is also significant for its association w/ the early history of the NPS, its history reflecting the influence of that agency on park development in areas such as preserving natural features & scenic resources, responding to the popularity of the automobile, the creation of museums & educational programs; & the incorporation of master plans in park design. The district is associated w/ the history of New Deal era public works programs, having benefited from several projects that provide funding and manpower for improvements & new construction.

Long Significance Description:

Mammoth Hot Springs is also significant under Criterion C for its architecture. Fort Yellowstone, within the district, reflects the layout and architecture of a typical western army fort of the late 19th century, remarkable for its level of integrity, the masonry displayed in its native sandstone bldgs., and the substantial quality of its construction. The bldgs. of the military period are representative of the work of the U.S. Quartermaster Corps, Hiram Chittenden, and Reed and Stern. Bldgs. erected after the military era in the administrative area of the district are significant for their representation of the work of architects of the NPS, and the landscape of the district reflects the influence of the agency's master plans and the work of its landscape architects. Government bldgs. of the post-military era include fine representatives of French Renaissance style architecture. The concession area bldgs. are notable for their representation of the evolution of park commercial architecture from the late nineteenth through the mid-twentieth centuries. Included within the district are concession bldgs. that are excellent representatives of Colonial Revival, Rustic, Prairie, and Art Moderne styles. The work of architects hired by concessioners, including Robert C. Reamer, Fred Willson, and Douglas McLellan, is also represented in the district.

Construction Period:

Construction
Period: Historic

Chronology:

	Physical Event	Begin Year	Begin Year AD/BC	End Year	End Year AD/BC	Designer	Designer Occupation
1.	Built	1930	AD	1930	AD	Unknown	

Function and Use:

Primary
Historic
Function: Single Family Dwelling

Primary
Current Use: Single Family Dwelling

Structure
Contains
Museum
Collections?: No

Physical Description:

Structure Type:

Building

Volume: 20,000 - 2,000,000 cubic feet

Square Feet: 3432

Material(s):

	Structural Component(s)	Material(s)
1.	Other	Brick
2.	Foundation	Concrete
3.	Framing	Wood
4.	Walls	Shingle
5.	Roof	Shingle
6.	Walls	Wood
7.	Other	Metal

Short Physical
Description:

This 1-story wood frame res. is constructed on a conc. found. The walls are finished w/ both horizontal & vertical boards & battens & wood shingles. The gable roofs are finished w/ wood shingles. The plan is L-shaped. Windows are fixed & casement sash.

Long Physical
Description:

82'(L) x 24'(W) x 10'(H) This one-story, wood frame residence is constructed on a concrete foundation. The wall finishes vary at the numerous additions; horizontal boards and battens, vertical boards and battens, and wood shingles. The intersecting gable roofs are finished with wood shingles; every seventh course is doubled. The dominant characteristic of the residence is the flared roof line at the main east-west mass of the residence. Large brackets support the deep eaves. A brick chimney and stovepipes penetrate the roofs.

The east-west mass also features ornate window hoods with varying window ornaments. The main one-and-a-half

story mass of the L-shaped plan is oriented east-west. A two-story wing at the south rises from one-and-a-half stories to two stories. The windows are fixed and casement sash. The doors are predominately French style with multiple lights.

The interior finishes of this residence have been updated with carpeting, sheet vinyl flooring, textured gypsum wall board, and paneling. Much of the original five-quarter casings and baseboards and four panel doors have been retained. Wood flooring has also been maintained throughout much of the house. The projecting window bays at the east-west section of the house provide deep window seats. The kitchen and bathrooms have been modernized with new fixtures, cabinetry, and narrow trim. Lighting has been updated with new incandescent fixtures.

Current Photographs



Figure 2: Exterior View, looking southwest.



Figure 1: Front Porch, looking southeast.



**Figure 3: Kitchen Entry,
looking north.**



Figure 4: Front Entry.



Figure 5: Porch at Southwest, looking east.

Tompkins Residence
Historic Structure Report
Yellowstone National Park

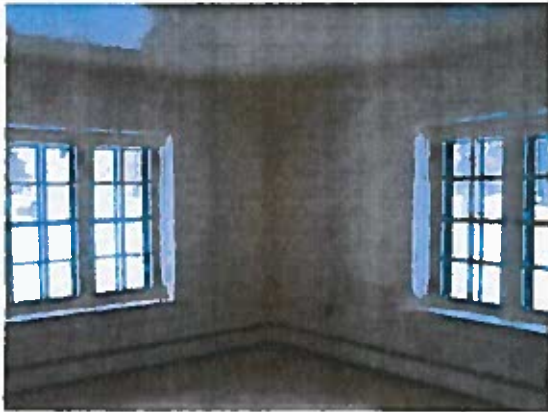


Figure 7: Bedroom 100, looking northeast.



Figure 6: Closet 100A, looking south.

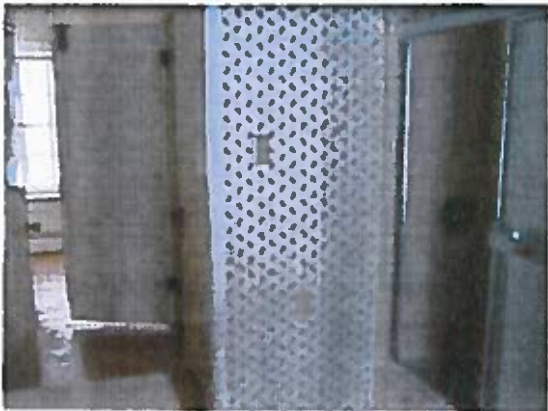


Figure 8: Bathroom 101, looking south.



Figure 9: Bathroom 101, looking northwest.



Figure 12: Hall 102, looking north.



Figure 11: Hall 102, looking south.



Figure 10: Closet 102A, looking northwest.



**Figure 13: Closet 103A,
looking southeast.**



Figure 14: Bedroom 103, looking southwest.



Figure 15: Bedroom 103, looking northwest.



**Figure 16: Bedroom 104,
looking southwest.**



Figure 17: Bedroom 104, looking northwest.

Tompkins Residence
Historic Structure Report
Yellowstone National Park



Figure 19: Corridor 105, looking east.



Figure 18: Corridor 105, looking west.



Figure 21: Closet 105A, looking southeast.



Figure 20: Closet at Corridor, looking north.



Figure 22: Doors between Living Room and Corridor, looking east.



Figure 23: Bay 105B, looking south.



Figure 25: Living Room 106, looking southwest.



Figure 24: Living Room 106, looking north.

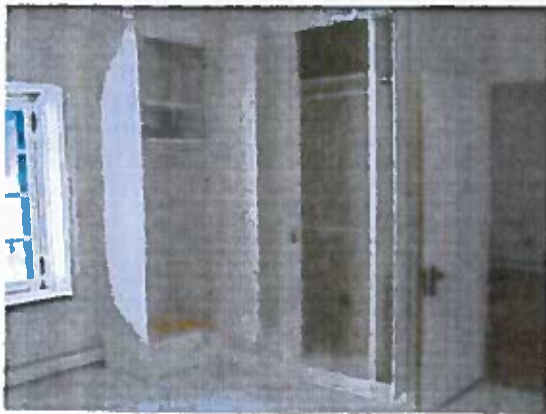


Figure 27: Closet 107A & 107B, looking northeast.



Figure 26: Bathroom 108, looking northeast.



Figure 28: Bathroom 108, looking west.



Figure 29: Bathroom 108, looking northwest.

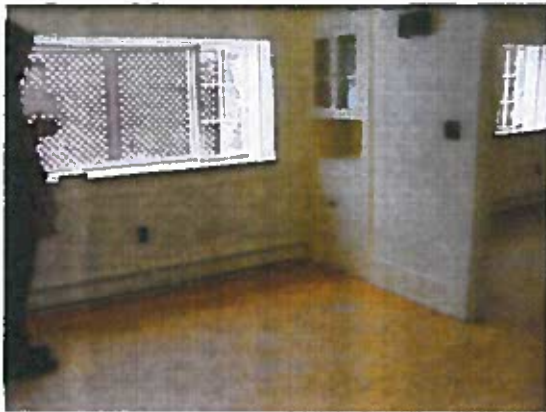


Figure 31: Dining Room 109, looking northwest.

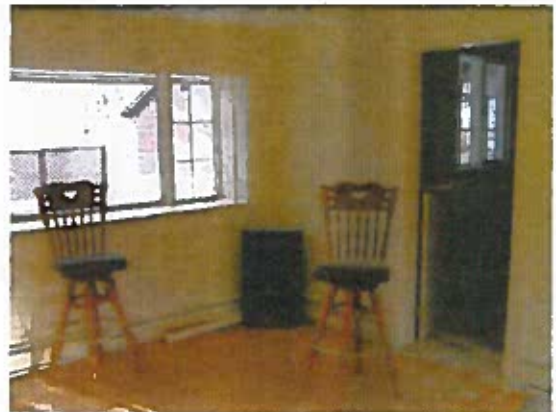


Figure 30: Dining Room 109, looking southeast.



Figure 33: Kitchen 110, looking north.



Figure 32: Kitchen 110, looking east.



Figure 36: Kitchen 110, looking southeast.



Figure 34: Kitchen 110, looking southwest.



Figure 35: Kitchen 110, looking northwest.



**Figure 37: Kitchen 110,
looking northwest
toward Hall 111.**



Figure 38: Hall 111, looking south.



**Figure 39: Laundry 110A,
looking southwest.**



**Figure 40: Laundry 110A,
looking northwest.**



**Figure 41: Hall 111,
looking northwest
toward Stair 112.**



**Figure 42: Stairwell 112,
looking west.**



Figure 44: Family Room 206, looking northeast.



Figure 43: Family Room 206, looking south.



Figure 46: Hall 209, looking southeast.



Figure 45: Hall 209, looking south.



Figure 48: Bedroom 210, looking northwest toward Closet 210B.



Figure 47: Bedroom 210, looking northeast.



Figure 49: Bathroom 211, looking southwest.



Figure 50: Bathroom 211, looking northwest.



Figure 52: Attic, Sheathing of Zone H, with 1888 newspaper glued to underside.



Figure 51: Attic Zone H, looking south towards Family Room 206.



Figure 53: Attic Zone H, looking south towards Family Room 206.



Figure 54: Attic Zone K, looking west towards center attic (Zone H).



Figure 56: Attic Zone K, looking west into center attic (Zone H).



Figure 55: Attic Zone L, looking northeast into Zone M.



Figure 58: Attic Zone M, looking southwest towards Zone L. Attic to the left is directly above Corridor 105.



Figure 57: Attic Zone M, looking southeast towards Zone L. Attic to the left is directly above Corridor 105.



Figure 60: Attic Zone K, looking east towards Zone L and Zone M beyond.



Figure 59: Attic Zone I, looking east towards enclosed roof of center Zone H.



Figure 62: Attic Zone I, looking west towards Zone J.



Figure 61: Attic Zone J, looking west towards end gable wall.



Figure 64: Crawlspace under Zone E, looking north along east exterior wall.



Figure 63: Crawlspace under Zone E, looking north towards west concrete support and beam splice.



Figure 66: Crawlspace under Corridor 105, looking west.



Figure 65: Crawlspace below Bedroom 103, looking northwest toward central concrete pier and beam supporting the mid-span of the joists.

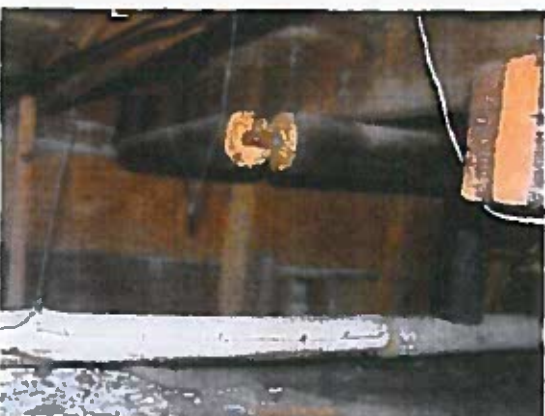


Figure 68: Crawlspace below Bedroom 103, looking northeast towards the exterior wall vent (with loose brick infill) and typical board form of the concrete walls.



Figure 67: Crawlspace below Living Room 106, looking northwest through travertine tunnel leading to area below Bedroom 107.



Figure 70: Crawlspace below Kitchen 110, looking south from floor access opening.



Figure 69: Crawlspace below Kitchen 110, looking west towards exterior access opening.

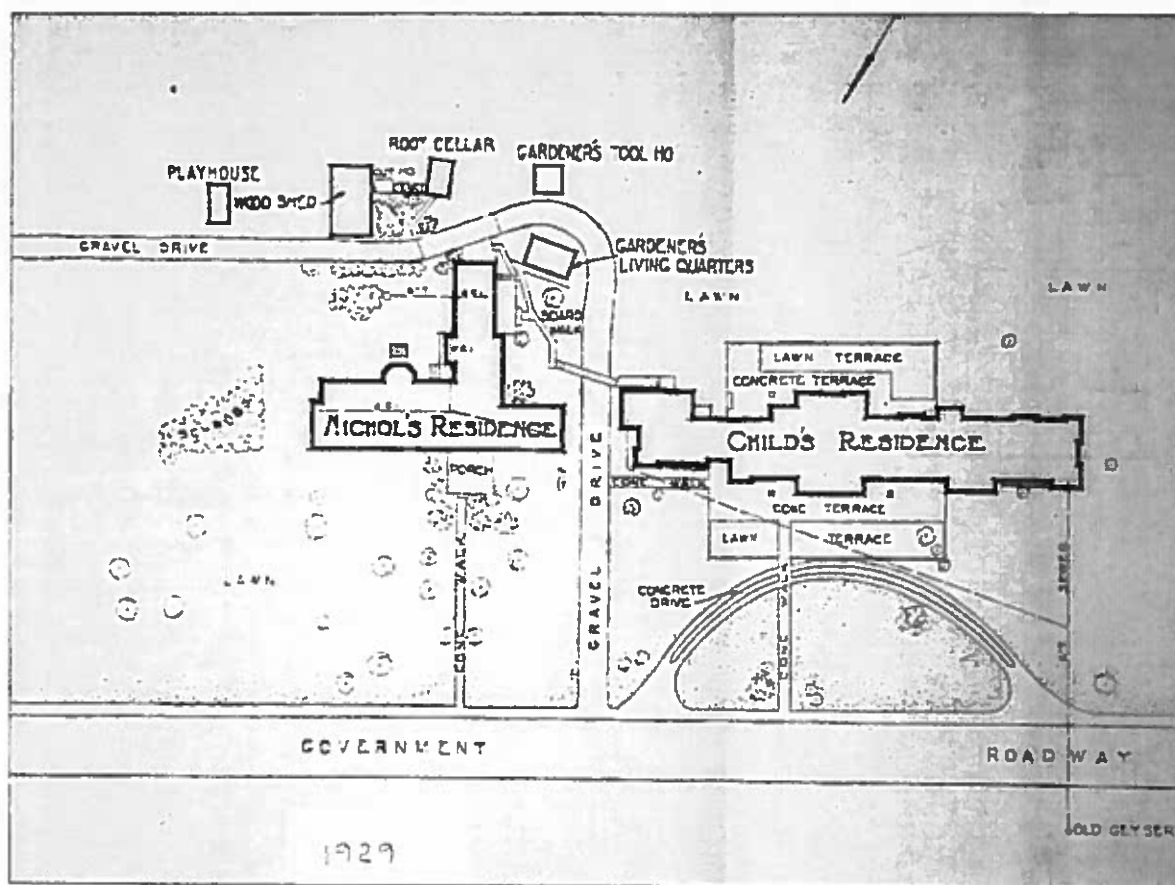


Figure 71: Crawlspace below Kitchen 110, looking north from floor access opening.

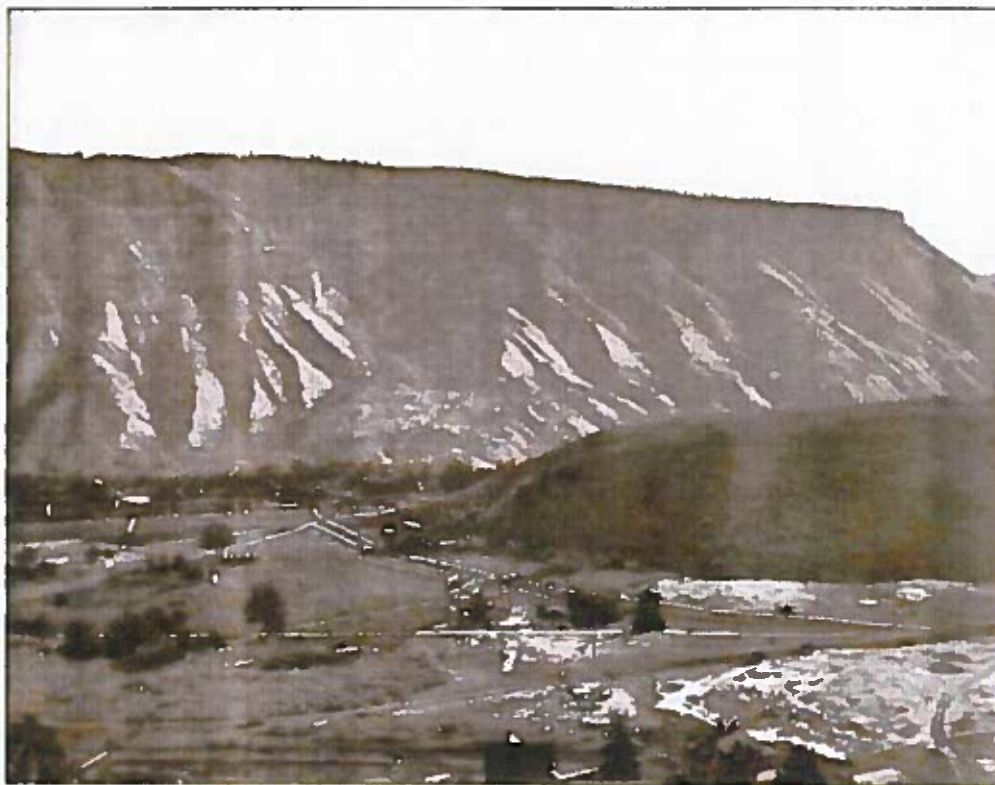


1903 Topographic Map of Mammoth Hot Springs by Chittenden, courtesy Yellowstone National Park.

Nichols Residence
Historic Structure Report
Yellowstone National Park



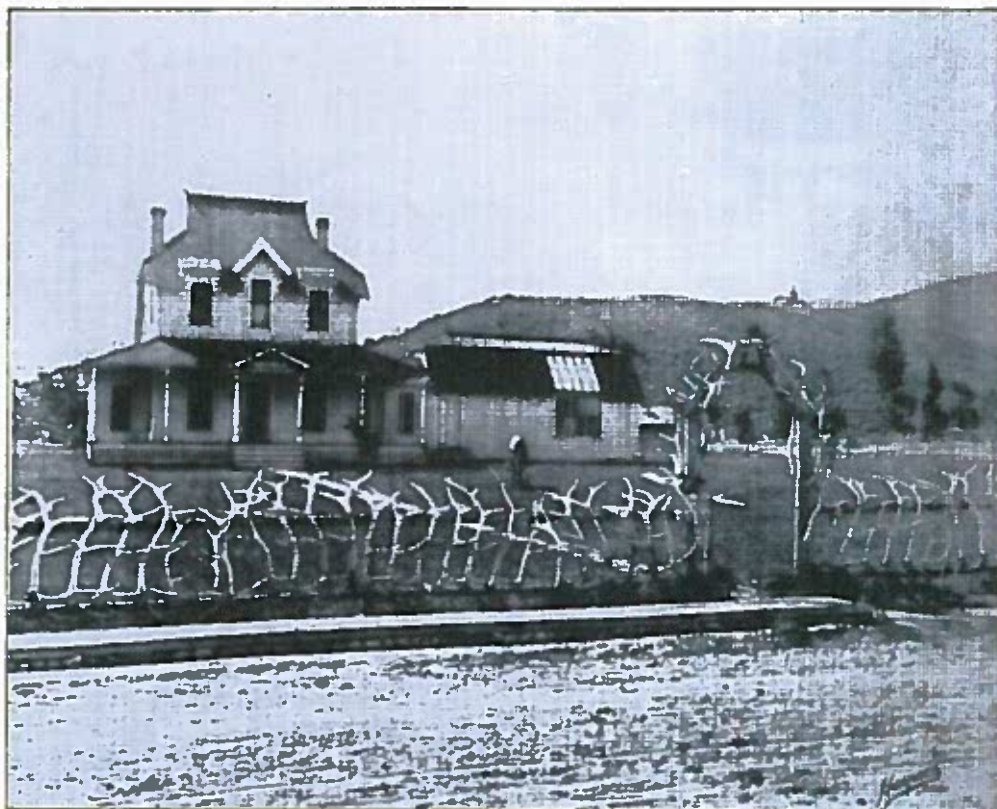
1929 Site Plan, courtesy of Robert V. Goss.



Looking towards base of Capitol Hill from above the U.S. Commissioner's House at base of terraces, before 1893-4. Photograph courtesy of National Park Service, Yellowstone National Park, YELL #30285a.



J.A. Clark's Transportation & Livery at base of Capitol Hill, 1886. Photograph courtesy of National Park Service, Yellowstone National Park, YELL #36433.



Haynes Photo Shop (on Parade Grounds), 1884. Photograph courtesy National Park Service, Yellowstone National Park, YELL #36469.



Haynes Photo Shop (on Parade Grounds), 1892. Photograph courtesy National Park Service, Yellowstone National Park, YELL #36472.



Mammoth Hot Springs from the terraces, Fort Yellowstone in background in front of Mount Everts, c.1908-1925. Photograph courtesy National Park Service, Yellowstone National Park, YELL #128753.



Mammoth Hot Springs from the terraces, looking northeast, 1912. Photograph courtesy National Park Service, Yellowstone National Park, YELL #127738.



Mammoth Hot Springs from the terraces, looking northeast, 1884. Photograph courtesy National Park Service, Yellowstone National Park, YELL #128013.



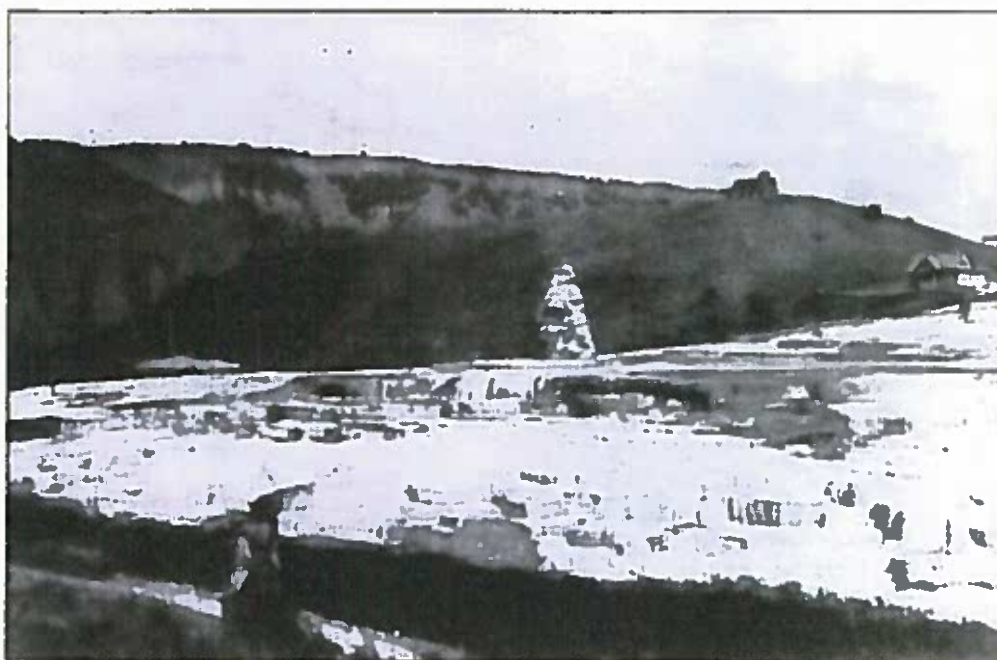
Mammoth Hot Springs from Capitol Hill, 1935. Photograph courtesy National Park Service, Yellowstone National Park, YELL #133427.



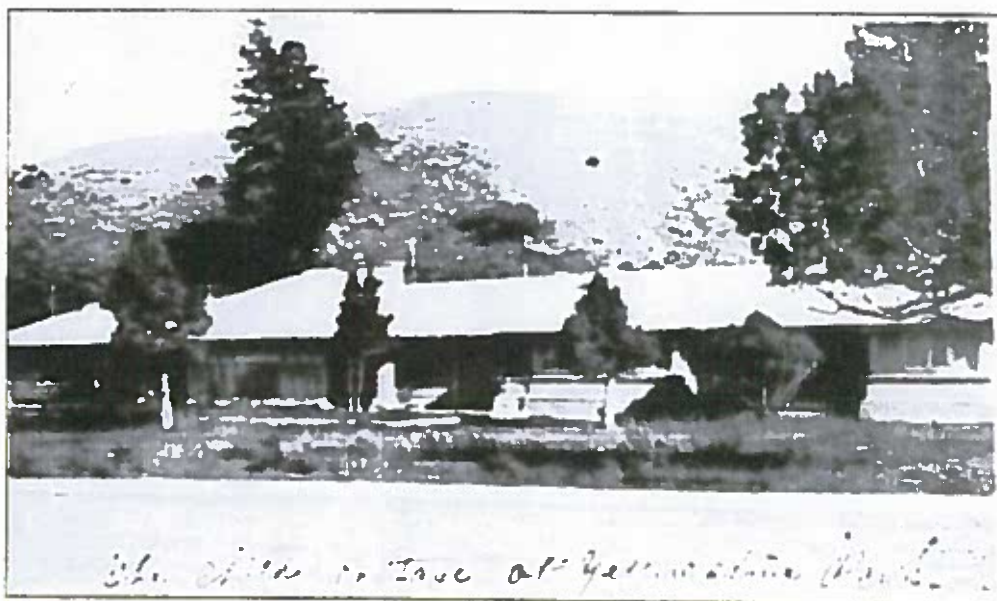
Mammoth Hot Springs Hotel exterior, from Capitol Hill, between 1913 & 1936. Photograph courtesy National Park Service, Yellowstone National Park, YELL #133533.



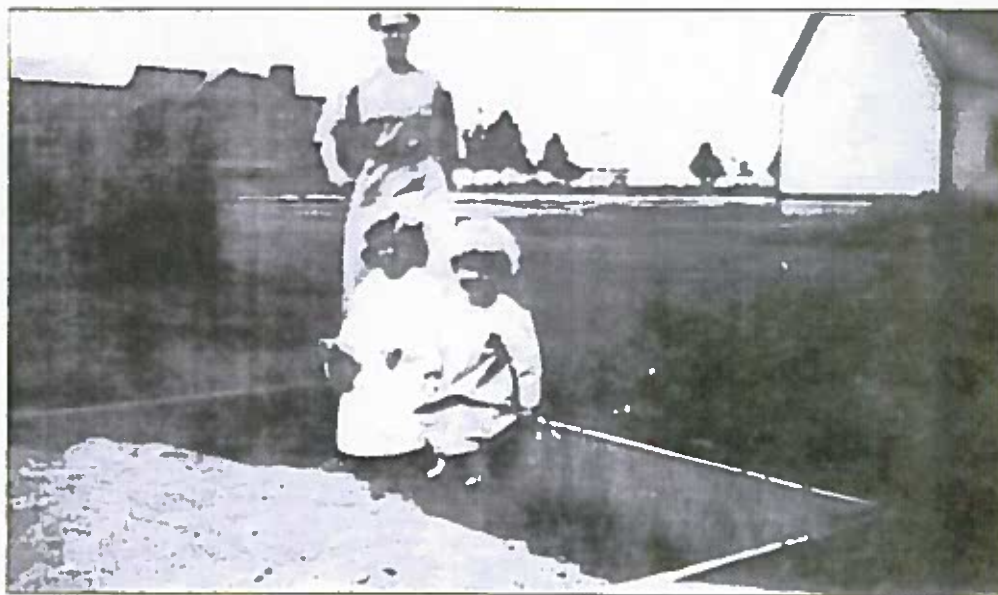
Overview of Mammoth Hot Springs Hotel and Fort Yellowstone, undated. Photograph courtesy National Park Service, Yellowstone National Park, YELL #133545.



"The Liberty Cap and Hymen Terrace," undated. Photograph courtesy National Park Service, Yellowstone National Park, YELL #133596.



The Child Cottage at Yellowstone Park
The Child Cottage at Yellowstone Park, undated. Photograph courtesy National Park Service, Yellowstone National Park, YELL #133607.



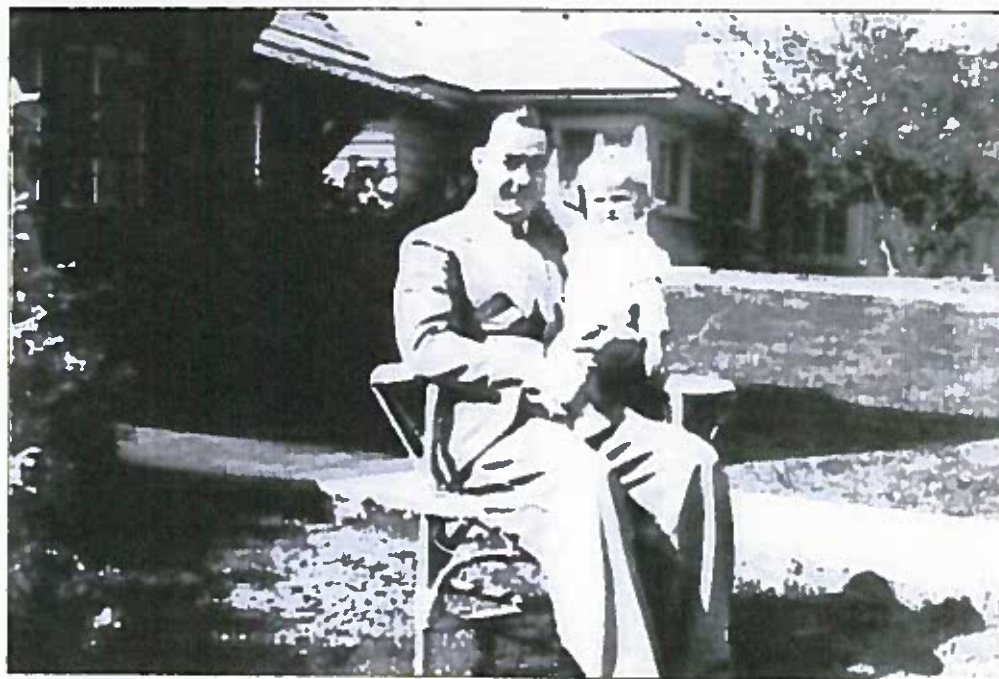
Marion Child, Unidentified Child, and Emilie James Child by sandbox, c.1911. Photograph courtesy National Park Service, Yellowstone National Park, YELL #133622.



Marion Child, with Parade Ground & Mount Everts in background., undated. Photograph courtesy National Park Service, Yellowstone National Park, YELL #133633.



Marion Child and her Grandmother James in a Garden, c.1914. Photograph courtesy National Park Service, Yellowstone National Park, YELL #133643.



Unidentified Man Sitting in Front of Executive House with Child on his Lap, undated. Photograph courtesy National Park Service, Yellowstone National Park, YELL #133661.



View of Mammoth / Fort Yellowstone from the Terraces, c.1901-1913. Photograph courtesy National Park Service, Yellowstone National Park, YELL #133664.



Huntley Child Jr. and Nanny Bessie Ferguson and Horseback in Middle of Transportation Compound, c.1913. Photograph courtesy National Park Service, Yellowstone National Park, YELL #133671.

REVISIONS:

NICHOLS
RESIDENCE
MAMMOTH, WY

HISTORIC STRUCTURE
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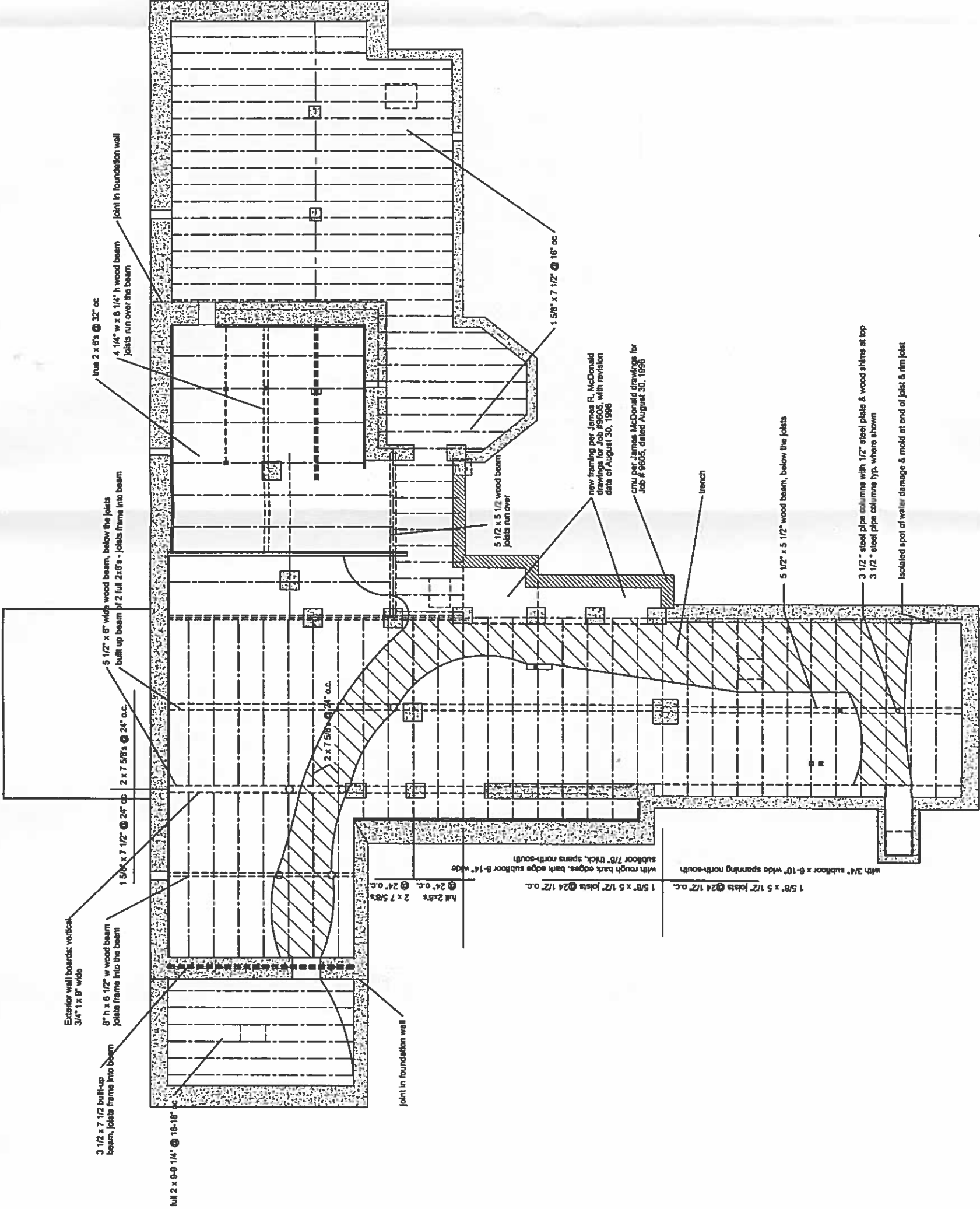
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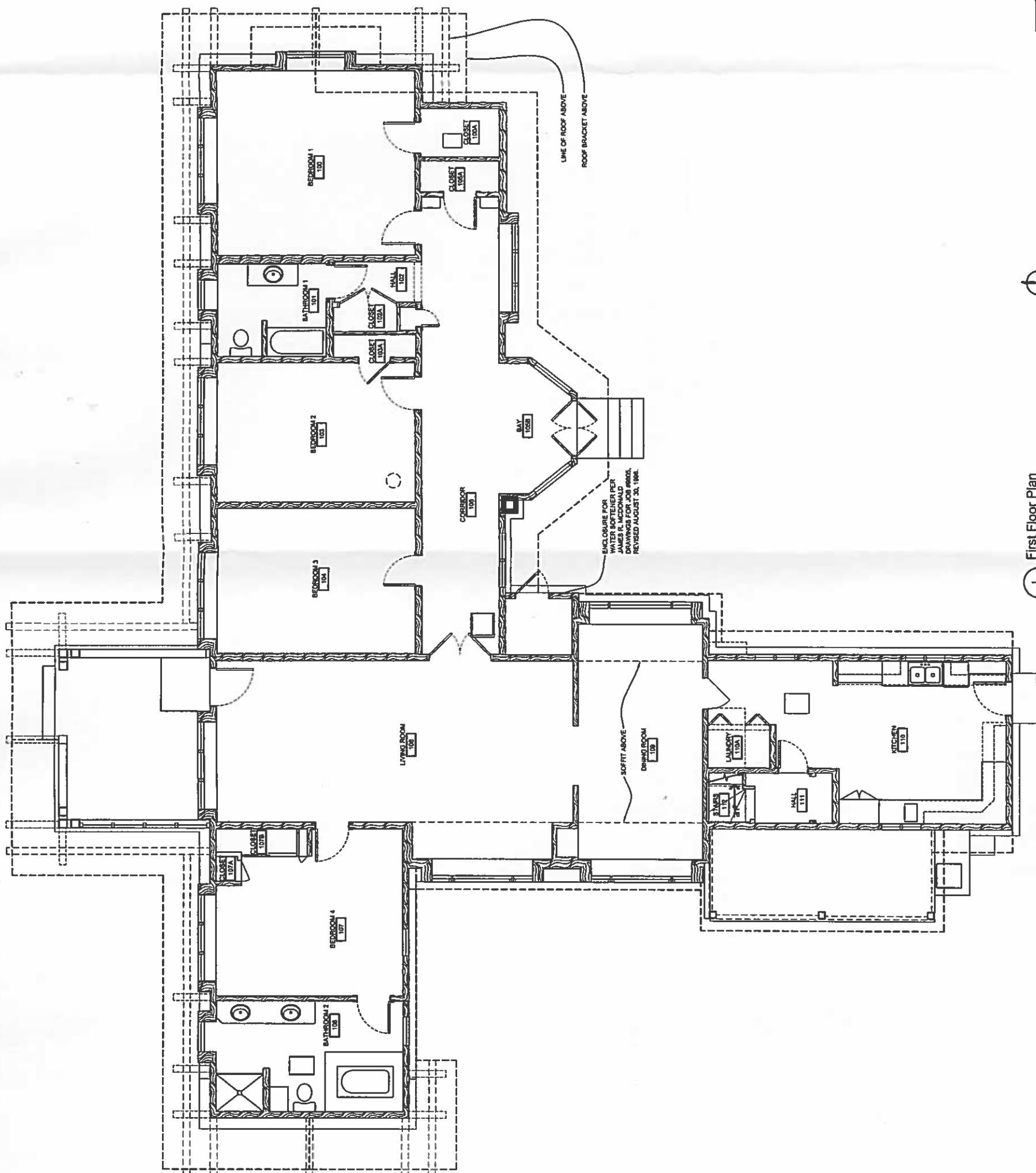


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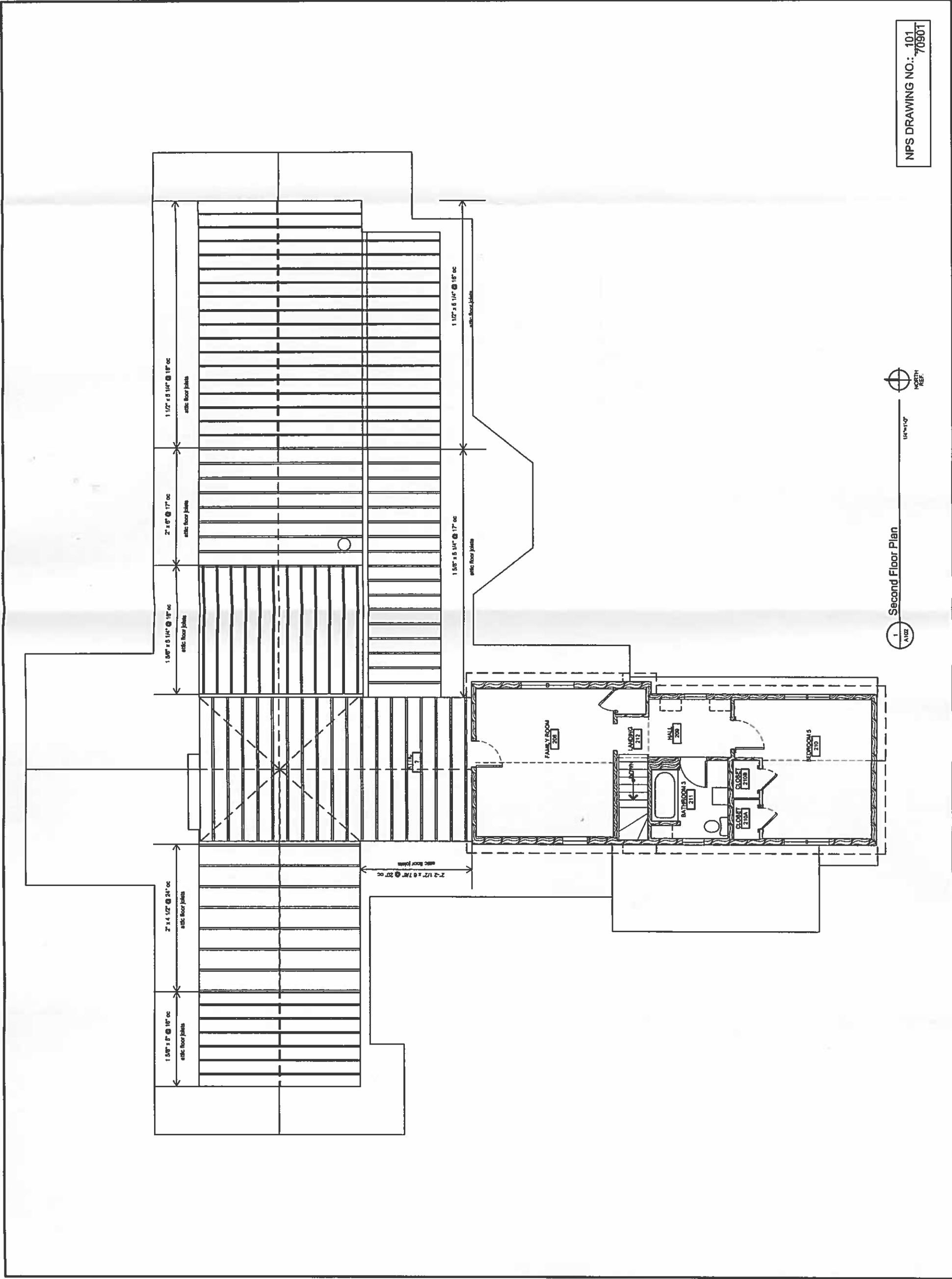
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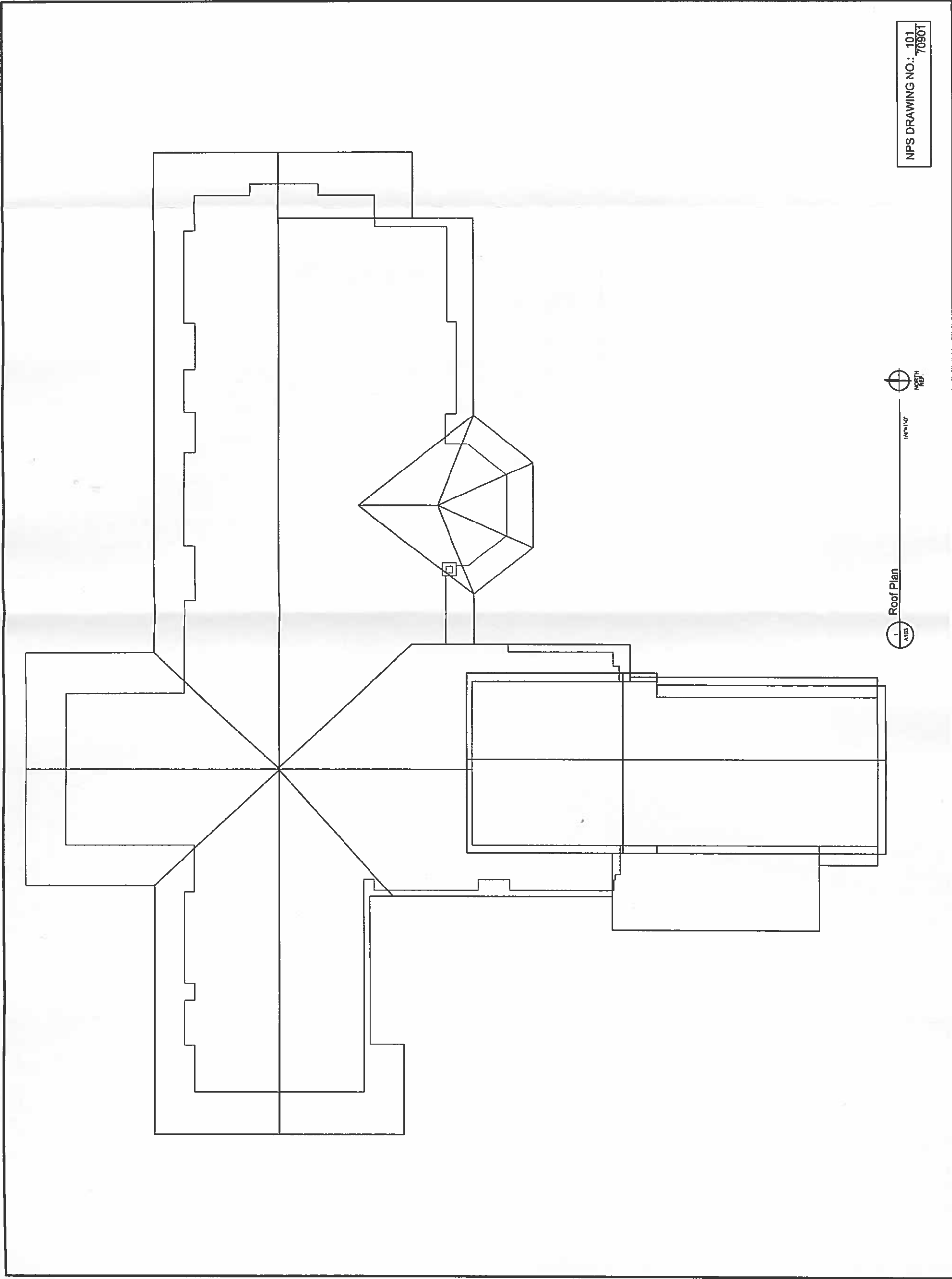
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ROOF
PLAN

SHEET
A103

HISTORIC STRUCTURE REPORT - NOT FOR CONSTRUCTION





TETRA TECH

December 3, 2007

Ms. Addie Wickham
Xanterra Parks & Resorts
P.O. Box 587
Yellowstone National Park, Wyoming 82190
AWickham@xanterra.com

**SUBJECT: Report of Pre-Renovation Asbestos and Lead-Based Paint Inspection
Building M-2
Mammoth, Yellowstone National Park
Tetra Tech Project No. 7551337.100**

Dear Ms. Wickham:

Tetra Tech has completed a pre-renovation asbestos and lead-based paint inspection of Building M-2 located at Mammoth in Yellowstone National Park. The work was conducted at your request in order to identify specific asbestos-containing building materials and building components coated with lead-based paint. Please see the enclosed report for further information regarding the suspect asbestos-containing building materials and lead-based paint identified during this inspection.

We appreciated the opportunity to work with you on this project, and we look forward to continuing to provide environmental consulting and engineering services to you on future projects. If you have any questions or comments, please feel free to contact me in our Billings, Montana office at (406) 248-9161.

Sincerely,

Tetra Tech

Roger W. Herman, Jr.

Roger W. Herman, Jr.
Asbestos, Lead & IH Services Manager

RWH/ba
Enclosure

Shipping Encl 7551337 Mammoth Pre-Renovation and LBP Inspection Bldg M-2

Tetra Tech
P.O. Box 30615, Billings, MT 59107
618 South 25th Street, Billings, MT 59101
Tel 406.248.9161 Fax 406.248.9282 www.tetrattech.com



Pre-Renovation Asbestos and Lead-Based Paint Inspection

**Building M-2
Mammoth, Yellowstone National Park**

Prepared for:

***Ms. Addie Wickham
Xanterra Parks & Resorts***

Prepared by:

Tetra Tech

***618 South 25th Street
Billings, MT 59101
(406) 248-9161
Fax (406) 248-9282
Tetra Tech Project No. 7551337.100***

November 30, 2007

**PRE-RENOVATION INSPECTION REPORT OF
ASBESTOS-CONTAINING BUILDING MATERIALS
AND LEAD-BASED PAINT
BUILDING M-2
MAMMOTH, YELLOWSTONE NATIONAL PARK**

1.0 INTRODUCTION

Tetra Tech has performed an asbestos-containing building material and lead-based paint inspection of Building M-2 located at Mammoth in Yellowstone National Park. This work was performed under the agreement to perform services between Tetra Tech and Xanterra Parks & Resorts. The objective of the inspection was to identify friable and non-friable known or suspect asbestos-containing building materials (ACBM) and lead-based paint (LBP) coated surfaces in the Building scheduled for renovation.

1.1 Scope of Work

The scope of this inspection included:

- 1) Performing an inspection of ACBM and LBP the Building. The inspection included:
 - Inspecting, identifying, and sampling suspect ACBM. For the purposes of this inspection suspect, Category I non-friable, Category II non-friable, and Regulated Asbestos-Containing Materials were sampled.
 - Conducting a U.S. Environmental Protection Agency (EPA) and Department of Housing and Urban Development (HUD) level surface-by-surface inspection to determine the presence of LBP. Tetra Tech followed the HUD LBP inspection guidelines. The LBP inspection included documenting types of painted interior building components and substrate material.
- 2) Preparing a report documenting the sampling procedures and presenting results of the inspection.

1.2 Asbestos Overview

Asbestos is a trade name for a group of fibrous naturally occurring minerals which were used widely in building materials because of the ability of asbestos minerals to bind, resist chemicals, insulate, and fireproof. Exposure to elevated levels of asbestos fibers has been documented to cause a variety of diseases including asbestosis and cancer. Consequently, the application, removal, and disposal of asbestos-containing materials are regulated by several agencies. The following is a summary of pertinent definitions:

SUMMARY OF DEFINITIONS	
Asbestos-Containing Materials (ACM)	Materials containing more than one percent (1%) asbestos
Asbestos-Containing Building Materials (ACBM)	ACM that is in or on interior structural members or other parts of a public or commercial building.
Friable ACBM or ACM	ACM that has been applied on ceilings, walls, structural members, piping, duct work, or any other part of a building, which when dry, may be crumbled, pulverized, or reduced to powder by hand pressure. The term includes non-friable asbestos containing materials (including flooring materials) after they become damaged, by any means, such that when dry, they may be crumbled, pulverized, or reduced to powder by hand pressure.

A summary of the regulations regarding asbestos-containing materials is presented in Appendix A.

1.3 Lead Overview

Lead was used widely in paints and coatings because of the added longevity of the coatings. LBP is defined as surface coatings with a lead concentration greater than or equal to 1.0-milligrams per square centimeter (mg/cm²) or 0.5 percent by weight (Title X and 40 CFR Part 745). Deteriorated LBP can cause elevated lead in dust levels and exposure risks to building occupants.

2.0 PROCEDURES

The scope of work for this investigation included inspection and assessment of the Building. The asbestos inspection was performed in general accordance with 40 CFR Part 763.85 (the currently recognized standard protocol developed for schools under the Asbestos Hazard Emergency Response Act (AHERA) and the National Emission Standards for Hazardous Air Pollutants (NESHAP). The lead inspection was conducted in accordance with the HUD LBP inspection guidelines (HUD, 1995, revised 1997 and 2000).

2.1 Asbestos Inspection

The asbestos inspection was conducted by Tetra Tech Industrial Hygiene Technician and Accredited Asbestos Inspector Mr. Jared Shaw (MTA-3387-IN expires May 15, 2008). The inspection consisted of a detailed visual survey of surfacing materials, thermal system insulation, and miscellaneous materials throughout the building.

2.2 Asbestos Sampling

Homogeneous suspect ACBM were, for the purposes of this study and as outlined in the AHERA sampling protocols, placed into four material type categories. AHERA sampling protocols specify sampling procedures for each material type. Appendix A contains a summary of the sampling protocol under AHERA. Samples were collected from suspect friable materials, non-friable materials and thermal system insulation materials.

Sample locations for this investigation were chosen in a non-random fashion, with emphasis placed on obtaining samples of each type of accessible, suspect material. Samples were collected by carefully removing small portions of the suspect material in a non-abrasive manner, using techniques such as wet slicing, wet boring or similar methods designed to limit contamination of the area during sampling. If possible, samples from existing damaged areas or loose pieces of material were collected. Samples were placed in pre-labeled plastic containers immediately after collection. Containers with samples were then placed in a large resealable plastic bag for transportation to the laboratory. Sampling was performed by accredited asbestos inspectors. Sample locations and room numbers are shown on figures in Appendix B. Accreditation certificates are presented in Appendix C.

2.3 Asbestos Laboratory Analysis

Bulk samples obtained during the inspection were submitted to EMSL Analytical of Indianapolis, Indiana. The analysis was performed in general accordance with EPA Interim Method 600/R-93/116, which employs polarized light microscopic (PLM) techniques with dispersion staining for identification of mineral forms of asbestos. The quantification of asbestos in the sample is intended to be an estimate only and the limit of detection for this method is approximately 1% by volume. The results of the analysis are reported on the laboratory reports included in Appendix D.

2.4 Asbestos Assessment

Homogeneous ACM were identified following receipt of laboratory analytical results. The materials were then categorized using National Emission Standard for Hazardous Air Pollutants (NESHAP) criteria:

The NESHAP Categories are defined as:

- 1) Category I is non-friable asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products.
- 2) Category II are non-friable ACM excluding Category I non-friable ACM.
- 3) Regulated Asbestos-Containing Materials (RACM) are friable materials; Category I non-friable materials that will or may be subjected to sanding, grinding, cutting, or abrading; or Category II non-friable materials that have a high probability of becoming or has become crumbled, pulverized, or reduced to powder by forces expected to act on the material in the course of demolition or renovation operations.

2.5 Lead Inspection

The lead inspection was conducted by Tetra Tech Industrial Hygiene Technician and EPA Accredited Lead Risk Assessor Mr. Jared B. Shaw (MT-R-15503-1 expires August 20, 2010). The LBP inspection included documenting types of painted interior building components and substrate material. Typical building components tested included walls, door units, window units, ceilings and structural members. Substrate materials were typically wood. The painted building components tested were cataloged based on location, specific component type, and substrate material.

The EPA and HUD define a lead inspection as a surface-by-surface investigation to determine the presence of LBP. Tetra Tech followed the HUD LBP inspection guidelines (HUD, 1995, revised 1997 and 2000).

Tetra Tech used field X-Ray Fluorescence (XRF) methodology to determine the presence or absence of LBP. XRF is identified as the recommended method to determine lead in paint (HUD, 1995, revised 1997 and 2000). For these inspections, Tetra Tech personnel utilized the Niton XLP, Spectrum Analyzer XRF, which automatically calculates measurable amounts of lead in paint by correcting for substrate conditions. The *XRF Performance Characteristic Sheet* for the XRF used by Tetra Tech specifies the ranges where XRF results are positive, negative, or inconclusive. The *Performance Characteristic Sheet* for this instrument is presented in Appendix E and results of the XRF testing are contained in Appendix F.

3.0 BUILDING M-2

The asbestos and lead inspection of Building M-2 was conducted from September 24 through 27, 2007 and October 8 through 12, 2007. The findings and results of the inspection are described in the following sections.

3.1 Asbestos Inspection Results

Building M-2, located at Mammoth, Yellowstone National Park is a two-story wood building with a dirt crawl space. Exterior finishes are wood walls with a wood shingle roof. Interior finishes include wallboard, plaster and wood fiberboard walls; wallboard, plaster and wood fiberboard ceilings; and floor tile, sheet vinyl and carpet on wood floors. The following materials sampled from building M-2 were suspected to contain asbestos but were found not to contain asbestos in quantities greater than 1% by laboratory analysis:

- Foundation concrete (M50.1)
- Black roof materials (M1.1)
- Brick mortar on chimney (M19.1)
- Window glazing (M33.1)
- Various sheet vinyl flooring and associated mastic (F1.1, F1.2, F1.3, F1.4, F1.5)
- Brown and tan 9-inch by 9-inch floor tile and associated mastic (F3.1)
- Wallboard, tape, and mud (M3.1, M3.2, M3.3)
- Texture on wallboard system (S1.1, S1.2, S1.3)
- Bumpy plaster (S4.1)
- Light brown 4-inch wall base mastic (M12.1)
- Electrical wiring (M55.1)

3.2 Lead-Based Paint Inspection Results

XRF testing indicated that LBP is present on selected interior and exterior components of Building M-2. A summary of the XRF results is presented in Appendix F. Five painted building component groups were identified which surfaces had covered with LBP, as summarized below:

Summary of Lead Based Paint Building M-2 Mammoth, Yellowstone National Park		
Location	Building Component and General Location	Highest Lead Concentration mg/cm ²
Building Exterior	Brown wood siding side A, B, and C	5.19
Building Exterior	Green wood window casing, sash, sill and mullion components of sides A, B, C, D	34.69
Building Exterior	Green wood door casing, jamb, threshold, mullion and casing components of sides A and C	29.75
Building Exterior	Grey concrete foundation of side C	3.78
Building Exterior	Green metal roof flashing on side D	1.86
Building Exterior	Brown metal electrical conduit	2.47
Building Exterior	Brown wood porch roof beam of side A	1.07
Building Exterior	White wood porch ceiling of side A	6.64
Building Exterior	Brown wood porch lower rail of side A	1.31
Building Exterior	Brown wood shingles on second floor	5.35
Building Interior	White wood door casing room 109, 110, 113, 114, and 116	24.55
Building Interior	White wood door room 116, 117	38.81
Building Interior	White wood door jamb room 110, 116,	22.63
Building Interior	Tan wood door jamb room 117, 200, 202, 204	42.19
Building Interior	Tan wood door room 200	34.66
Building Interior	Grey wood door room 200, 201, 204	28.42
Building Interior	White wood window sill room 103, 106, 108, 109, 110, 111, and 114	36.53
Building Interior	White wood window casing room 106, 108, 109, 110 (side A), and 111	17.33
Building Interior	White wood window sash room 106, 108, 109, 110 (side A), 111	17.33
Building Interior	White wood window mullion room 106, 109, 111, 112	15.45
Building Interior	White wood window trough room 108, 109, 112 (A side only)	17.33
Building Interior	White wood window apron room 108, 109	17.24
Building Interior	Green wood window sash, mullion room 205	9.36
Building Interior	White drywall wall room 106 (A, C, and D), 110 (B and C), 111 wall (A and B), 113, 115 (wall A), 116 (wall A),	1.93
Building Interior	White drywall ceiling room 115	1.77
Building Interior	White wood ceiling room 204	1.26
Building Interior	White wood cabinet and shelves room 113 .	18.43

Summary of Lead Based Paint Building M-2 Mammoth, Yellowstone National Park		
Building Interior	Green wood window trough room 204	3.00
Building Interior	Tan wood window trough 205 (B-side only)	1.81
Building Interior	White wood baseboard closet of room 111	1.17
Building Interior	White wood wall closet of room 111	1.13
Building Interior	White wood shelf closet of room 102	5.20
Building Interior	White wood baseboard room 202, 203, and 206	38.56
Building Interior	Tan wood wall room 204 (D-side only)	1.1
* mg/cm ² = milligram per square centimeter		

The paint condition of the exterior components which tested positive for LBP was generally in poor condition at the time of our September 24 through October 12, 2007 inspection.

4.0 RECOMMENDATIONS

The following section contain Tetra Tech's recommendations concerning the various types of asbestos-containing building materials and LBP coated surfaces that are present in Building M-2 located at Mammoth in Yellowstone National Park.

4.1 Asbestos-Containing Building Materials

This inspection and report was intended to identify suspect Asbestos-Containing Building Materials (ACBM). No suspected ACBM were found to contain asbestos in quantities greater than 1% by laboratory analysis.

4.2 Lead-Based Paint

Tetra Tech recommends that, prior to any renovation activities where the LBP will be disturbed, the LBP covered materials be stabilized or abated. The proper abatement of the LBP will protect workers from lead exposure, ensure that non-affected portions of the Building are not contaminated, and reduce or eliminate the lead hazard in the building. Tetra Tech recommends that the waste generated during the lead-based paint stabilization or abatement project be sampled and analyzed by TCLP for proper disposal as required by 40 CFR 261.24.

5.0 LIMITATIONS

This asbestos and lead-based paint inspection report was prepared based on information obtained during a site visit and interpretation of the laboratory results and of XRF readings. The conclusions of this report are professional opinions based solely upon visual site observations and interpretations of laboratory analyses and testing as described in our report.

This report has been prepared to provide information concerning the various types of asbestos-containing building materials and lead-based paint which may be present in the structures at this site. It includes only those materials that were visible and accessible at the time of our inspection.

This inspection and report is intended to identify and assess asbestos-containing building materials and lead-based paint coated items. The results of the inspection are limited to those areas included as part of the inspection and may not be interpreted to include materials in other areas not included in the inspection.

Our opinions are intended exclusively for use by Xanterra Parks & Resorts. The scope of services performed by Tetra Tech may not be appropriate to satisfy the needs of other users, and any use or re-use of this document, or the findings presented herein is at the sole risk of the user.

The opinions presented herein apply to the site conditions existing at the time of our investigation. Therefore, our opinions and recommendations may not apply to future conditions that may exist at the site, which we have not had the opportunity to evaluate.

6.0 REFERENCES

Code of Federal Regulations (CFR), Title 29, Part 1910.1001, Asbestos; General Industry Standard; Final Rule, August 24, 2006.

Code of Federal Regulations (CFR), Title 29, Part 1926.1101, Asbestos; Construction Industry Standard; Final Rule, August 24, 2006.

Code of Federal Regulations (CFR), Title 40, Part 763, Asbestos; Asbestos-Containing Materials in Schools; Final Rule, October 30, 1987.

Code of Federal Regulations (CFR), Title 40, Part 61, Subpart M -- National Emission Standard for Asbestos; Final Rule, November 20, 1990, revised June 19, 1995.

Code of Federal Regulations (CFR), Title 40, Part 745, Lead; Requirements for Lead-Based Paint Activities in Target Housing and Child Occupied Facilities; Final Rule, August 29, 1996, revised January 5, 2001.

Code of Federal Regulations (CFR), Title 24 Part 35 and Title 40, Part 745, Lead; Requirements for Disclosure of Know Lead-Based Paint and/or Lead-Based Paint Hazards in Housing; Final Rule, March 6, 1996.

Housing and Community Development Act, Residential Lead-Based Paint Hazard Reduction Act, Title X, 1992.

Housing and Urban Development (HUD), *Guidelines for the Control of Lead-Based Paint Hazards in Housing*, June 1995, revised 1997 and 2000.

AHERA SAMPLING PROTOCOL

Friable Surfacing Material

The number of samples collected from friable surfacing material was determined based on the following protocol developed under AHERA.

1,000 square feet or less	Three bulk samples
1,000 to 5,000 square feet	Five bulk samples
Over 5,000 square feet	Seven bulk samples

Thermal System Insulation

Thermal system insulation was sampled in a randomly distributed manner, with at least three bulk samples collected from each homogeneous material. At least one bulk sample was collected from each homogeneous material of patched thermal system insulation that was not assumed to be ACM.

Bulk samples were also collected from each insulated mechanical system where cement or plaster was used on fittings, such as tees, elbows, or valves. The number of samples was sufficient to determine whether the material was asbestos containing. Minimally, at least three samples were collected from each homogenous area.

Bulk samples were not collected from any homogeneous material where the inspector determined that the thermal system insulation is fiberglass, foam glass, rubber, or other non-asbestos containing building material.

Miscellaneous Material

Bulk samples were also collected from each miscellaneous material. The number of samples was sufficient to determine whether the material was asbestos containing. Minimally, at least three samples were collected from each homogenous area.

Non-friable suspected ACM

The number of samples collected from non-friable suspect ACM was sufficient to determine whether the material was asbestos containing. Minimally, at least three samples were collected from each homogenous area.

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Customer ID: MAX052
Customer PO:
Received: 10/17/07 9:00 AM
EMSL Order: 180713185

EMSL Proj:
Analysis Date: 10/18/2007
Report Date: 10/18/2007

Asbestos Analysis of Bulk Materials via EPA 800/R-93/116 Method using Polarized Light Microscopy

Sample	Location	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
M50.1-A 180713185-0001		Gray Non-Fibrous Homogeneous		80% Non-fibrous (other) 20% Quartz	None Detected
M50.1-B 180713185-0002		Green/Gray Non-Fibrous Homogeneous		75% Non-fibrous (other) 25% Quartz	None Detected
M50.1-C 180713185-0003		Gray Non-Fibrous Homogeneous		75% Non-fibrous (other) 25% Quartz	None Detected
M1.1-A 180713185-0004		Black Fibrous Homogeneous	80% Cellulose 5% Synthetic	15% Non-fibrous (other)	None Detected
M1.1-B 180713185-0005		Black Fibrous Homogeneous	80% Cellulose 5% Synthetic	15% Non-fibrous (other)	None Detected
M1.1-C 180713185-0006		Black Fibrous Homogeneous	80% Cellulose 5% Synthetic	15% Non-fibrous (other)	None Detected
M18.1-A/A brick 180713185-0007		Red Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
M18.1-A/B mortar 180713185-0007A		White Non-Fibrous Homogeneous		60% Non-fibrous (other) 40% Quartz	None Detected

Analyst(s)

Margaret Phillips (72)

Richard Harding
 Richard Harding, Laboratory Manager
 or other approved signatory

Due to magnification limitations inherent in PLM, asbestos fibers in dimensions below the resolution capability of PLM may not be detected. The limit of detection as stated in the method is 1%. The above test report relates only to the items tested and may not be reproduced in any form without the express written approval of EMSL Analytical, Inc. EMSL's liability is limited to the cost of analysis. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government.

Analysis performed by EMSL Indianapolis (NVLAP Lab Code 200196-5)

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Customer ID: MAX152

Customer PO:

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EMSL Proj:

Analysis Date: 10/18/2007

Report Date: 10/18/2007

Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Location	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
M18.1-B/A brick 160713186-0008		Red Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
M18.1-B/B mortar 160713186-0006A		White Non-Fibrous Homogeneous		70% Non-fibrous (other) 30% Quartz	None Detected
M18.1-C/A brick 160713186-0009		Red Non-Fibrous Homogeneous		80% Non-fibrous (other) 20% Quartz	None Detected
M18.1-C/B mortar 160713186-0006A		White Non-Fibrous Homogeneous		75% Non-fibrous (other) 25% Quartz	None Detected
M33.1-A 160713186-0010		Green/Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
M33.1-B 160713186-0011		Green/Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
M33.1-C 160713186-0012		Green/White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
F1.1-A 160713186-0013		Tan Fibrous Heterogeneous	10% Cellulose	80% Non-fibrous (other)	None Detected

Analyst(s)

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Analysis performed by EMSL Indianapolis (NVLAP Lab Code 200166-0)

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 EMSL Order: 160713188

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Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Location	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
F1.1-B 160713188-0014		Tan Fibrous Heterogeneous	20% Cellulose 2% Glass	78% Non-fibrous (other)	None Detected
F1.1-C 160713188-0018		Tan Fibrous Heterogeneous	30% Cellulose 5% Glass	65% Non-fibrous (other)	None Detected
F1.2-A 160713188-0016		Tan Fibrous Heterogeneous	30% Cellulose 5% Glass	65% Non-fibrous (other)	None Detected
F1.2-B 160713188-0017		Tan Fibrous Heterogeneous	25% Cellulose 20% Glass	55% Non-fibrous (other)	None Detected
F1.2-C 160713188-0018		Tan Fibrous Heterogeneous	35% Cellulose 5% Glass	60% Non-fibrous (other)	None Detected
F1.3-A 160713188-0019		Beige Fibrous Heterogeneous	15% Cellulose 15% Glass	70% Non-fibrous (other)	None Detected
F1.3-B 160713188-0020		Beige Fibrous Heterogeneous	15% Cellulose 15% Glass	70% Non-fibrous (other)	None Detected
F1.3-C 160713188-0021		White/Tan Fibrous Heterogeneous	15% Cellulose 15% Glass	70% Non-fibrous (other)	None Detected

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Analysis performed by EMSL Indianapolis (NPLAP Lab Code 200186-0)

PLM-1

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EMSL Proj:
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Report Date: 10/18/2007

Asbestos Analysis of Bulk Materials via EPA 800/R-93/116 Method using Polarized Light Microscopy

Sample	Location	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
F1A-A/A Inclosure 160713186-0022		Red/Black Fibrous Heterogeneous	50% Cellulose 10% Synthetic	40% Non-fibrous (other)	None Detected
F1A-A/B mastic 160713186-0023A		Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
F1A-B 160713186-0023					Not Submitted
F1A-C 160713186-0024					Not Submitted
F1B-A 160713186-0025		Tan/White Fibrous Heterogeneous	30% Cellulose 5% Glass	85% Non-fibrous (other)	None Detected
F1B-B 160713186-0026		Tan Fibrous Heterogeneous	15% Cellulose	85% Non-fibrous (other)	None Detected
F1B-C 160713186-0027		Tan/White Fibrous Heterogeneous	20% Cellulose 5% Glass	75% Non-fibrous (other)	None Detected
F3.1-A/A floor tile 160713186-0028		Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

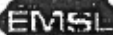
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Due to magnification limitations inherent in PLM, asbestos fibers in concentrations below the resolution capability of PLM may not be detected. The limit of detection, as stated in the method is 1%. The above test report relates only to the items tested and may not be reproduced in any form without the express written approval of EMSL Analytical, Inc. EMSL's liability is limited to the cost of analysis. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government.

Analysis performed by EMSL Indianapolis (NVLAP Lab Code 200188-0)

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Customer ID: **MAX162**
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EMSL Order: **160713186**

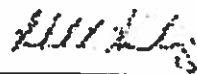
EMSL Proj:
Analysis Date: **10/18/2007**
Report Date: **10/18/2007**

**Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized
Light Microscopy**

Sample	Location	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
F3.1-A/B mastic 160713186-00284		Brown Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
F3.1-B Floor Tile only 160713186-0029	*Insufficient mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
F3.1-C Floor Tile only 160713186-0030	*Insufficient mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
M3.1-A 160713186-0031		White Fibrous Homogeneous		100% Gypsum	None Detected
M3.1-B 160713186-0032		White/Tan Fibrous Heterogeneous	20% Cellulose	80% Gypsum	None Detected
M3.1-C 160713186-0033		White/Tan Fibrous Heterogeneous	20% Cellulose	80% Gypsum	None Detected
S1.1-A/A joint compound 160713186-0034		White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

Analysis by

Margaret Phillips (72)


Richard Harding, Laboratory Manager
or other approved signatory

Due to magnification limitations inherent in PLM, asbestos fibers in dimensions below the resolution capability of PLM may not be detected. The limit of detection as stated in the method is 1%. The above test report relates only to the tests tested and may not be reproduced in any form without the express written approval of EMSL Analytical, Inc. EMSL's liability is limited to the cost of analysis. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government.

Analysis performed by EMSL Indianapolis (NVLAP Lab Code 200185-0)

PLM-1

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Received: 10/17/07 9:00 AM
EMSL Order: 180713186

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Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Location	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
S1.1-A/B drywall 180713185-00344		White/Tan Fibrous Heterogeneous	30% Cellulose 2% Glass	68% Gypsum	None Detected
S1.1-B 180713185-0035		White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
S1.1-C 180713185-0036		White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
M3.2-AA joint compound 180713185-0037		White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
M3.2-A/B drywall 180713185-0037A		White/Tan Fibrous Heterogeneous	35% Cellulose	65% Gypsum	None Detected
M3.2-B 180713185-0038		White/Tan Fibrous Heterogeneous	20% Cellulose	80% Gypsum	None Detected
M3.2-C 180713185-0039		White/Tan Fibrous Heterogeneous	25% Cellulose	75% Gypsum	None Detected
S1.2-A 180713185-0040		Green Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

Analyst(s)

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Customer ID: MAX052
 Customer PO:
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Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Location	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
S1.2-B 180713188-0041		White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
S1.2-C 180713188-0042		White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
M3.3-A 180713188-0043		White/Tan Fibrous Heterogeneous	35% Cellulose	65% Gypsum	None Detected
M3.3-B/A joint compound 180713188-0044		Cream Non-Fibrous Homogeneous		100% Non-fibrous (other)	<1% Chrysotile
M3.3-B/B drywall 180713188-0044A		White/Tan Fibrous Heterogeneous	30% Cellulose	70% Gypsum	None Detected
M3.3-C 180713188-0045		White/Tan Fibrous Heterogeneous	40% Cellulose	60% Gypsum	None Detected
M3.3-D 180713188-0046		White/Tan Fibrous Heterogeneous	40% Cellulose	60% Gypsum	None Detected
M3.3-E 180713188-0047		White/Tan Fibrous Heterogeneous	30% Cellulose	70% Gypsum	None Detected

Analyst(s)

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Analysis performed by EMSL Indianapolis (NVLAP Lab Code 208185-0)

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 Customer PO:
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 EMSL Order: 160713186

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 Analysis Date: 10/18/2007
 Report Date: 10/18/2007

Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Location	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
S1.3-A 160713186-0048		White/Tan Fibrous Heterogeneous	40% Cellulose	60% Gypsum	None Detected
S1.3-B 160713186-0049		Green Non-Fibrous Homogeneous		100% Non-fibrous (other)	<1% Chrysotile
S1.3-C/A joint compound 160713186-0050		White Non-Fibrous Homogeneous		100% Non-fibrous (other)	<1% Chrysotile
S1.3-C/B drywall 160713186-0050A		White/Tan Fibrous Heterogeneous	70% Cellulose	30% Gypsum	None Detected
S1.3-D 160713186-0051		White/Tan Fibrous Heterogeneous	80% Cellulose	20% Non-fibrous (other)	None Detected
S1.3-E 160713186-0052		White/Tan Fibrous Heterogeneous	90% Cellulose	10% Non-fibrous (other)	None Detected
S4.1-A 160713186-0053		White/Gray Non-Fibrous Heterogeneous		60% Non-fibrous (other) 40% Quartz	None Detected
S4.1-B 160713186-0054		White/Gray Non-Fibrous Heterogeneous	2% Hair	66% Non-fibrous (other) 30% Quartz	None Detected

Analyst(s)

Margaret Phillips (72)

Richard Harding
 Richard Harding, Laboratory Manager
 or other approved signatory

Due to magnification limitations inherent in PLM, asbestos fibers in concentrations below the resolution capability of PLM may not be detected. The limit of detection as stated in the method is 1%. The above test report relates only to the items tested and may not be reproduced in any form without the express written approval of EMSL Analytical, Inc. EMSL's liability is limited to the cost of analysis. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government.

Analysis performed by EMSL Indianapolis (NVLAP Lab Code 200188-2)

**EMSL Analytical**

2001 East 52nd St., Indianapolis, IN 46205

Phone: (317) 833-2897 Fax: (317) 833-3847 Email: indianapolis@emsl.com

Attn: Roger Herman
Tetra Tech/Maxim Technologies Inc.
618 South 25th Street
Billings, MT 59101

Fax: (408) 248-8282 **Phone:** (408) 248-8181
Project: Xanterra Mammoth

Customer ID: MAX052
Customer PO:
Received: 10/17/07 9:00 AM
EMSL Order: 180713188

EMSL Proj:
Analysis Date: 10/18/2007
Report Date: 10/19/2007

Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Location	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
84.1-C 180713188-0055		White/Gray Non-Fibrous Heterogeneous		80% Non-fibrous (other) 20% Quartz	None Detected
M12.1-A 180713188-0056		Brown Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
M12.1-B 180713188-0057		Brown/Yellow Non-Fibrous Heterogeneous	2% Wollastonite	98% Non-fibrous (other)	None Detected
M12.1-C 180713188-0058		White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
M55.1-A 180713188-0059		Tan Fibrous Heterogeneous	50% Cellulose	50% Non-fibrous (other)	None Detected
M55.1-B 180713188-0060		Brown/Black Fibrous Heterogeneous	50% Cellulose 5% Min. Wool	45% Non-fibrous (other)	None Detected
M55.1-C 180713188-0061		Black Fibrous Heterogeneous	40% Cellulose 5% Min. Wool	55% Non-fibrous (other)	None Detected
5448- NOT ON -500 F1.48 180713188-0062		Green/Tan Fibrous Heterogeneous	30% Cellulose	70% Non-fibrous (other)	None Detected

Analyst(s)

Margaret Phillips (72)

Richard Harding
 Richard Harding, Laboratory Manager
 or other approved signatory

Due to magnification limitations inherent in PLM, asbestos fibers in dimensions below the resolution capability of PLM may not be detected. The limit of detection as stated in the method is 1%. The above test report relates only to the items tested and may not be reproduced in any form without the express written approval of EMSL Analytical, Inc. EMSL's liability is limited to the cost of analysis. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government.

Analysis performed by EMSL Indianapolis (NVLAP Lab Code 200186-0)

**EMSL Analytical**

2001 East 52nd St., Indianapolis, IN 46205

Phone: (317) 853-2987 Fax: (317) 853-3047 Email: indianapolislab@emsl.com

Attn: Roger Herman
Tetra Tech/Maxim Technologies Inc.
618 South 25th Street
Billings, MT 59101

Fax: (406) 248-8282 Phone: (406) 248-8181
Project: Xanterra Mammoth

Customer ID: MAX152
Customer PO:
Received: 10/17/07 9:00 AM
EMSL Order: 180713186

EMSL Proj:
Analysis Date: 10/18/2007
Report Date: 10/18/2007

Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Location	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>
			% Fibrous	% Non-Fibrous	% Type
F4102-NOT ON CDC 180713186-0083	F1.4C	Green/Tan Fibrous Heterogeneous	40% Cellulose	60% Non-fibrous (other)	None Detected

Analyst(s)

Margaret Phillips (72)

Richard Harding
Richard Harding, Laboratory Manager
or other approved signatory

Due to recognition limitations inherent in PLM, asbestos fibers in dimensions below the resolution capability of PLM may not be detected. The limit of detection as stated in the method is 1%. The above test report relates only to the items tested and may not be reproduced in any form without the express written approval of EMSL Analytical, Inc. EMSL's liability is limited to the cost of analysis. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government.

Analysis performed by EMSL Indianapolis (NVLAP Lab Code 200183-0)

M-2 MANMOTH

160713186



Chain of Custody

Asbestos Lab Services

EMSL Analytical, Inc.
2001 East 52nd Street
Indianapolis, IN 46205

Phone: (317) 803-2997
Fax: (317) 803-3047
<http://www.emsl.com>

Please print all information legibly.

Company: Tetra Tech	Bill To: Tetra Tech
Address 1: 618 South 25th Street	Address 1: 618 South 25th Street
Address 2:	Address 2:
City, State: Billings, MT	City, State: Billings, MT
Zip/Post Code: 59107	Zip/Post Code: 59107
Country: US	Country: US
Contract Number: Roger Herman	Attn: Roger Herman
Phone: 406-248-9161	Phone: 406-248-9161
Fax: 406-248-9282	Fax: 406-248-9282
Email: roger.herman@tetratech.com	Email: roger.herman@tetratech.com
EMSL Ref: NEXA-CHRC	PJA Number:
Project Name/Number: Xantrex Mammoth	

MATRIX			TURNAROUND			
<input type="checkbox"/> Air	<input type="checkbox"/> Soil	<input type="checkbox"/> Micro-Vac	<input type="checkbox"/> 3 Hours	<input type="checkbox"/> 6 Hours	<input type="checkbox"/> Same Day or 12 Hours*	<input checked="" type="checkbox"/> 24 Hours (1 day)
<input checked="" type="checkbox"/> Bulk	<input type="checkbox"/> Drinking Water		<input type="checkbox"/> 48 Hours (2 days)	<input type="checkbox"/> 72 Hours (3 days)	<input type="checkbox"/> 96 Hours (4 days)	<input type="checkbox"/> 120 Hours (5 days)
<input type="checkbox"/> Wipe	<input type="checkbox"/> Wastewater		<input type="checkbox"/> 144+ Hours (6-10 days)			

*12 Hours (must arrive by 11:00am, Mon-Fri), Please Refer to Price Quote

PCM-Air <input type="checkbox"/> NIOSH 7400(A) (Rev. 2 August 1994) <input type="checkbox"/> OSHA w/TWA <input type="checkbox"/> Other:	TEM-Air <input type="checkbox"/> AHERA 40 CFR, Part 763 Subpart B <input type="checkbox"/> NIOSH 7400 <input type="checkbox"/> EPA Level II	TEM-Water <input type="checkbox"/> EPA 100.1 <input type="checkbox"/> EPA 100.2 <input type="checkbox"/> NYS 198.2
PCM-Bulk <input checked="" type="checkbox"/> EPA 800/R-93/116 <input type="checkbox"/> EPA Point Count <input type="checkbox"/> NY Stratified Point Count <input type="checkbox"/> PLM NOB (Gravimetric) NYS 198.1 <input type="checkbox"/> NIOSH 9002 <input type="checkbox"/> EMML Standard Addition	TEM-Bulk <input type="checkbox"/> Drop Mount (Qualitative) <input type="checkbox"/> Chatfield SOP - 1988-02 <input type="checkbox"/> TEM NOB (Gravimetric) NYS 198.4 <input type="checkbox"/> EMML Standard Addition	TEM-Microvac/Wipe <input type="checkbox"/> ASTM D 5755-95 (qualitative method) <input type="checkbox"/> Wipe Qualitative
SEM-Air or Bulk <input type="checkbox"/> Qualitative <input checked="" type="checkbox"/> Quantitative	PLM-Soil <input type="checkbox"/> EPA Protocol Qualitative <input type="checkbox"/> EPA Protocol Quantitative <input type="checkbox"/> EMML MSD 5000 Method overage	XRD <input type="checkbox"/> Asbestos <input checked="" type="checkbox"/> Silica NIOSH 7500 OTHER <input checked="" type="checkbox"/> PAST-TIME STOP

PAGE 1 of 3



Chain of Custody

Asbestos Lab Services

13186

EMSL Analytical, Inc.
2001 East 52nd Street
Indianapolis, IN 46205

Phone: (317) 803-2997
Fax: (317) 803-3047
<http://www.emsal.com>

Please print all information legibly.

Client Sample # (s) M50.1Total Samples #: (61)Relinquished: ShawDate: 10/15/07

Time: _____

Received: Brian BrownDate: 10-17-07Time: 900 pm

Relinquished: _____

Date: _____

Time: _____

Received: _____

Date: _____

Time: _____

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
A50.1 ABC	FOUNDATION CONCRETE	
M1.1 ABC	BLACK ROOF MATERIAL	
M19.1 ABC	BRICK/MORTAR (CHIMNEY)	
M31.1 ABC	WINDOW GLAZING	
FL1 ABC	BROWN GRANITE PATTERN SHIT VINYL	
FL2 ABC	LIGHT GREY SHIT VINYL	
FL3 ABC	WHITE 1"x1" SHIT VINYL	
FL4 ABC	BROWN/GREEN ITALIUM/BLACK MASTEC	(RM 117)
FL5 ABC	BEIGE ITALIUM	(RM 204)
FS.1 ABC	BROWN/TAN 9x9/BLACK MASTEC	
M3.1 ABC	WALL BOARD/TAPING/JOINT	
S1.1 ABC	BUBBLED DRYWALL TEXTURE	
M3.2 ABC	WALLBOARD/TAPING/JOINT	
S1.2 ABC	SMOOTH DRYWALL TEXTURE	

PAGE 1 OF 3

13186

ROGER HERMAN
Contract Name



**616 South 25TH Street
Billings, Montana 59101
Phone (406) 248-9161
Fax (406) 248-9282**

Address

Turn Around Time

Sampler Name (Printed)

Sampler Signature

[illegible]

BUILDING M-2 MAMMOTH, YELLOWSTONE NATIONAL PARK

Serial #XL308-U3787NR8160

PAINT

Header:

Site:

Date: 99/09/09 to 10/8/2007 09:09:37

Ranges (NEG<INC<POS): Device PCS

No	Site	Insp	Side	Room	Source	Sub	Feat	Cnd	Clr	Result	Pbc
1	Mammoth	SHAW		Shutter Cal 1						...	NA
2	Mammoth	SHAW		Shutter Cal 1						...	NA
3	Mammoth	SHAW		Calibrate						POS	3.15
5	Mammoth	SHAW		Calibrate						POS	1.18
6	Mammoth	SHAW		Calibrate						POS	3.68
7	Mammoth	SHAW	A	Outside	House	Wood	Wall	Intact	Brown	INCOM.	1.11
8	Mammoth	SHAW	A	Outside	House	Wood	Wall	Intact	Brown	INCOM	1.3
9	Mammoth	SHAW	A	Outside	House	Wood	Wall	Intact	Brown	POS	2.49
10	Mammoth	SHAW	A	Outside	House	Wood	Wall	Intact	Brown	INCOM	1.39
11	Mammoth	SHAW	A	Outside	House	Wood	Wall	Intact	Brown	NEG	0.32
12	Mammoth	SHAW	A	Outside	House	Wood	Wall	Intact	Brown	NEG	0.58
15	Mammoth	SHAW	B	Outside	House	Wood	Wall	Intact	Brown	POS	2.34
16	Mammoth	SHAW	B	Outside	House	Wood	Wall	Intact	Brown	POS	5.19
19	Mammoth	SHAW	C	Outside 0	House	Wood	Wall	Intact	Brown	POS	1.76
20	Mammoth	SHAW	C	Outside 0	House	Wood	Wall	Intact	Brown	POS	1.77
21	Mammoth	SHAW	D	Outside 0	House	Wood	Wall	Intact	Brown	NEG	0.11
22	Mammoth	SHAW	D	Outside 0	House	Wood	Wall	Intact	Brown	NEG	0.16
23	Mammoth	SHAW		Shutter Cal 1						...	NA
24	Mammoth	SHAW		Calibrate						POS	3.43
25	Mammoth	SHAW		Calibrate						NEG	0.34
26	Mammoth	SHAW		Calibrate						POS	1.61
27	Mammoth	SHAW		Calibrate						POS	3.33
28	Mammoth	SHAW	A	Outside 0	Window	Wood	Casing	Intact	Green	POS	9.43
29	Mammoth	SHAW	A	Outside 0	Window	Wood	Casing	Intact	Green	POS	28.62
30	Mammoth	SHAW	A	Outside 0	Window	Wood	Casing	Intact	Brown	POS	1.38

**BUILDING M-2
MAMMOTH, YELLOWSTONE NATIONAL PARK**

No	Site	Insp	Side	Room	Source	Sub	Feat	Cnd	Clr	Result	Pbc
31	Mammoth	SHAW	A	Outside	Window	Wood	Casing	Intact	Green	POS	28.34
32	Mammoth	SHAW	B	Outside	Window	Wood	Casing	Poor	Green	POS	25.89
33	Mammoth	SHAW	C	Outside	Window	Wood	Casing	Poor	Green	NEG	0.79
34	Mammoth	SHAW	C	Outside	Window	Wood	Casing	Intact	Green	NEG	0.38
36	Mammoth	SHAW	D	Outside	Window	Wood	Casing	Intact	Green	NEG	0.34
37	Mammoth	SHAW	A	Outside	Window	Wood	Sash Ext	Intact	Green	NEG	0.25
39	Mammoth	SHAW	A	Outside	Window	Wood	Sash Ext	Intact	Green	POS	8.41
40	Mammoth	SHAW	A	Outside	Window	Wood	Sash Ext	Intact	Green	NEG	0.01
41	Mammoth	SHAW	B	Outside	Window	Wood	Sash Ext	Intact	Green	POS	8.71
42	Mammoth	SHAW	C	Outside	Window	Wood	Sash Ext	Intact	Green	POS	3.07
43	Mammoth	SHAW	C	Outside	Window	Wood	Sash Ext	Intact	Green	POS	2.48
44	Mammoth	SHAW	C	Outside	Window	Wood	Sash Ext	Intact	Green	NEG	0.28
45	Mammoth	SHAW	D	Outside	Window	Wood	Sash Ext	Intact	Green	NEG	0.03
46	Mammoth	SHAW	D	Outside	Window	Wood	Sash Ext	Poor	Green	NEG	0
47	Mammoth	SHAW	D	Outside	Window	Wood	Sash Ext	Poor	Green	NEG	0
48	Mammoth	SHAW	A	Outside	Window	Wood	Sill	Intact	Green	POS	10.68
49	Mammoth	SHAW	A	Outside	Window	Wood	Sill	Intact	Brown	NEG	0
50	Mammoth	SHAW	A	Outside	Window	Wood	Sill	Intact	Green	POS	34.89
52	Mammoth	SHAW	B	Outside	Window	Wood	Sill	Poor	Green	POS	24.14
53	Mammoth	SHAW	C	Outside	Window	Wood	Sill	Intact	Green	NEG	0.38
54	Mammoth	SHAW	C	Outside	Window	Wood	Sill	Intact	Green	NEG	0.43
55	Mammoth	SHAW	D	Outside	Window	Wood	Sill	Intact	Green	NEG	0.21
56	Mammoth	SHAW	D	Outside	Window	Wood	Sill	Poor	Green	NEG	0.39
57	Mammoth	SHAW	D	Outside	Window	Wood	Sill	Poor	Green	NEG	0.06
58	Mammoth	SHAW	D	Outside	Window	Wood	Sill	Intact	Green	POS	4.86
59	Mammoth	SHAW	D	Outside	Window	Wood	Sill	Intact	Green	NEG	0.11
60	Mammoth	SHAW	A	Outside	Window	Wood	Mullion	Intact	Green	POS	5.24
61	Mammoth	SHAW	A	Outside	Window	Wood	Mullion	Intact	Green	POS	9.37
62	Mammoth	SHAW	A	Outside	Window	Wood	Mullion	Intact	Brown	NEG	0.79
63	Mammoth	SHAW	B	Outside	Window	Wood	Mullion	Intact	Green	POS	26.75
64	Mammoth	SHAW	C	Outside	Window	Wood	Mullion	Poor	Green	POS	18.58

BUILDING M-2
MAMMOTH, YELLOWSTONE NATIONAL PARK

No	Site	Insp	Side	Room	Source	Sub	Feat	Cnd	Clr	Result	Pbc
85	Mammoth	SHAW	C	Outside 0	Window	Wood	Mullion	Intact	Green	POS	22.27
88	Mammoth	SHAW	C	Outside 0	Window	Wood	Mullion	Intact	Green	POS	3.08
89	Mammoth	SHAW	D	Outside 0	Window	Wood	Mullion	Intact	Green	POS	2.77
70	Mammoth	SHAW	D	Outside 0	Window	Wood	Mullion	Intact	Green	POS	10.28
71	Mammoth	SHAW	A	Outside 0	Door	Wood	Mullion	Intact	Green	POS	2.28
72	Mammoth	SHAW	A	Outside 0	Door	Wood	Casing	Intact	Green	POS	22.44
73	Mammoth	SHAW	A	Outside 0	Door	Wood	Threshold	Intact	Green	POS	10.44
74	Mammoth	SHAW	A	Outside 0	Door	Wood	Threshold	Poor	White	NEG	0.05
75	Mammoth	SHAW	A	Outside 0	Door	Wood	Jamb	Intact	Green	POS	27.08
76	Mammoth	SHAW	A	Outside 0	Door	Wood	Door	Intact	Green	POS	1.21
77	Mammoth	SHAW	A	Outside 0	Door	Wood	Door	Intact	Green	POS	2.05
78	Mammoth	SHAW	C	Outside 0	Door	Wood	Door	Intact	Green	NEG	0.77
79	Mammoth	SHAW	C	Outside 0	Door	Wood	Casing	Intact	Green	POS	4.01
80	Mammoth	SHAW	C	Outside 0	Door	Wood	Door	Poor	Green	POS	28.75
81	Mammoth	SHAW	C	Outside 0	Door	Wood	Threshold	Poor	Green	POS	10.21
82	Mammoth	SHAW	C	Outside	Window	Wood	Mullion	Poor	Green	NEG	0
83	Mammoth	SHAW	C	Outside	Door	Wood	Door	Poor	Brown	NEG	0
84	Mammoth	SHAW	C	Outside	Door	Wood	Casing	Intact	Brown	NEG	-0.1
85	Mammoth	SHAW	C	Outside 0	Door	Wood	Casing	Intact	Green	NEG	0
86	Mammoth	SHAW	C	Outside 0	Door	Metal	Casing	Intact	Black	NEG	0
88	Mammoth	SHAW	C	Outside 0	Door	Metal	Casing	Intact	Green	NEG	0.18
88	Mammoth	SHAW	C	Outside 0	Window	Metal	Mullion	Intact	Green	NEG	0
89	Mammoth	SHAW		Calibrate					White	POS	3.28
90	Mammoth	SHAW		Calibrate						NEG	0.35
91	Mammoth	SHAW		Calibrate						POS	1.18
93	Mammoth	SHAW	A	Room 114	Wall	Wood	Baseboard	Intact	White	NEG	0.02
94	Mammoth	SHAW	A	Room 114	Door	Wood	Casing	Intact	White	NEG	0
95	Mammoth	SHAW	A	Room 114	Door	Wood	Casing	Intact	White	POS	20.34
96	Mammoth	SHAW	A	Room 114	Door	Wood	Door	Intact	White	NEG	0.03
97	Mammoth	SHAW	A	Room 114	Wall	Metal	Heater	Intact	White	NEG	0.31
98	Mammoth	SHAW	A	Room 114	Door	Wood	Casing	Intact	White	NEG	0
99	Mammoth	SHAW	A	Room 114	Door	Metal	Door	Intact	White	NEG	0.02

**BUILDING M-2
MAMMOTH, YELLOWSTONE NATIONAL PARK**

No	Site	Insp	Side	Room	Source	Sub	Feat	Cnd	Clr	Result	Pbc
100	Mammoth	SHAW	A	Room 114	Window	Wood	Casing	Intact	White	NEG	0
101	Mammoth	SHAW	A	Room 114	Window	Wood	Casing	Intact	White	NEG	0.01
102	Mammoth	SHAW	A	Room 114	Window	Wood	Sash	Intact	White	NEG	0.35
103	Mammoth	SHAW	A	Room 114	Window	Wood	Sill	Intact	White	NEG	0.58
104	Mammoth	SHAW	A	Room 114	Window	Wood	Mullion	Poor	White	NEG	0.12
105	Mammoth	SHAW	D	Room 114	Window	Wood	Mullion	Poor	White	NEG	0.12
106	Mammoth	SHAW	D	Room 114	Window	Wood	Casing	Intact	White	NEG	0
107	Mammoth	SHAW	D	Room 114	Window	Wood	Sill	Intact	White	POS	21.47
108	Mammoth	SHAW	D	Room 114	Ceiling	Drywall		Intact	White	NEG	-0.23
110	Mammoth	SHAW	B	Room 114	Cabinet	Wood	Exterior side	Intact	Green	NEG	0.01
111	Mammoth	SHAW	B	Room 114	Cabinet	Wood	Inside	Intact	Red	NEG	0
112	Mammoth	SHAW	A	Room 116	Wall	Drywall		Intact	White	POS	1.83
113	Mammoth	SHAW	B	Room 116	Wall	Drywall		Intact	White	NEG	0.05
114	Mammoth	SHAW	C	Room 116	Wall	Drywall		Intact	White	NEG	0
115	Mammoth	SHAW	D	Room 116	Wall	Drywall		Intact	White	NEG	0
116	Mammoth	SHAW	D	Room 116	Ceiling	Drywall		Intact	White	NEG	0
117	Mammoth	SHAW	A	Room 116	Door	Wood	Door	Intact	White	POS	31.28
118	Mammoth	SHAW	A	Room 116	Door	Wood	Casing	Intact	White	POS	14.9
119	Mammoth	SHAW	A	Room 116	Door	Wood	Jamb	Intact	White	POS	7.26
120	Mammoth	SHAW	C	Room 116	Door	Wood	Casing	Intact	White	NEG	0.03
121	Mammoth	SHAW	D	Room 116	Wall	Wood	Baseboard	Intact	White	NEG	0
122	Mammoth	SHAW	C	Room 116	Closet	Wood	Shelf	Poor	White	NEG	0.78
123	Mammoth	SHAW	B	Room 116	Closet	Wood	Shelf	Intact	White	NEG	0
124	Mammoth	SHAW	D	Room 116	Closet	Wood	Shelf	Intact	White	NEG	0.02
125	Mammoth	SHAW	A	Room 115	Wall	Drywall		Intact	White	POS	1.83
126	Mammoth	SHAW	B	Room 115	Wall	Drywall		Intact	White	NEG	0.01
127	Mammoth	SHAW	C	Room 115	Wall	Drywall		Intact	White	NEG	0
128	Mammoth	SHAW	D	Room 115	Wall	Drywall		Intact	White	NEG	0
129	Mammoth	SHAW	D	Room 115	Closet	Wood	Shelf	Intact	White	NEG	0
130	Mammoth	SHAW	D	Room 115	Ceiling	Drywall		Intact	White	POS	1.77
131	Mammoth	SHAW	A	Room 113	Wall	Drywall		Intact	White	POS	1.55

BUILDING M-2
MAMMOTH, YELLOWSTONE NATIONAL PARK

No	Site	Insp	Side	Room	Source	Sub	Feat	Cnd	Clr	Result	Pbc
133	Mammoth	SHAW	B	Room 113	Wall	Drywall		Intact	White	POS	0.96
134	Mammoth	SHAW	C	Room 113	Wall	Drywall		Intact	White	POS	1.05
135	Mammoth	SHAW	D	Room 113	Wall	Drywall		Intact	White	POS	1.32
138	Mammoth	SHAW	D	Room 113	Wall	Metal	Heater	Intact	White	NEG	0.03
139	Mammoth	SHAW	A	Room 113	Wall	Wood	Baseboard	Intact	White	NEG	0.14
140	Mammoth	SHAW	A	Room 113	Door	Wood	Casing	Intact	White	NEG	0.06
141	Mammoth	SHAW	C	Room 113	Door	Wood	Casing	Intact	White	POS	20.42
142	Mammoth	SHAW	B	Room 113	Door	Wood	Casing	Intact	White	NEG	0.29
143	Mammoth	SHAW	B	Room 113	Window	Wood	Sill	Intact	White	NEG	0.18
144	Mammoth	SHAW	A	Room 113	Cabinet	Wood	Door Out	Intact	White	POS	18.43
145	Mammoth	SHAW	A	Room 113	Cabinet	Wood	Shelf	Intact	White	POS	6.92
148	Mammoth	SHAW	A	Room 113	Cabinet	Wood	Inside	Intact	White	POS	10.89
147	Mammoth	SHAW	A	Room 113	Cabinet	Plaster	Wall	Intact	White	NEG	0.15
149	Mammoth	SHAW	B	Room 110	Wall	Drywall		Intact	White	POS	1.34
150	Mammoth	SHAW	C	Room 110	Wall	Drywall		Intact	White	POS	1.44
151	Mammoth	SHAW	D	Room 110	Wall	Drywall		Intact	White	NEG	0.62
153	Mammoth	SHAW	D	Room 110	Ceiling	Drywall		Intact	White	NEG	0.92
154	Mammoth	SHAW	A	Room 110	Door	Wood	Casing	Intact	White	POS	24.55
155	Mammoth	SHAW	A	Room 110	Door	Wood	Door	Intact	White	NEG	0.41
158	Mammoth	SHAW	A	Room 110	Door	Wood	Jamb	Intact	White	POS	22.63
157	Mammoth	SHAW	B	Room 110	Door	Wood	Casing	Intact	White	NEG	0.28
158	Mammoth	SHAW	B	Room 110	Door	Wood	Jamb	Intact	White	NEG	0.21
159	Mammoth	SHAW	B	Room 110	Door	Wood	Door	Intact	White	NEG	0.23
160	Mammoth	SHAW	C	Room 110	Door	Wood	Casing	Intact	White	NEG	0.17
161	Mammoth	SHAW	A	Room 110	Window	Wood	Casing	Intact	White	POS	17.33
162	Mammoth	SHAW	A	Room 110	Window	Wood	Casing	Intact	White	POS	17.87
163	Mammoth	SHAW	A	Room 110	Window	Wood	Sash	Intact	White	POS	36.53
164	Mammoth	SHAW	A	Room 110	Window	Wood	Sill	Intact	White	POS	20.39
166	Mammoth	SHAW	D	Room 110	Window	Wood	Sill	Intact	White	NEG	0.22
167	Mammoth	SHAW	D	Room 110	Window	Wood	Sill	Intact	White	NEG	0.05
168	Mammoth	SHAW	D	Room 110	Window	Wood	Casing	Intact	White	NEG	0.28

**BUILDING M-2
MAMMOTH, YELLOWSTONE NATIONAL PARK**

No	Site	Insp	Side	Room	Source	Sub	Feat	Cnd	Clr	Result	Pbc
169	Mammoth	SHAW	D	Room 110	Window	Wood	Sash	Intact	White	NEG	0.08
170	Mammoth	SHAW	D	Room 110	Window	Wood	Mullion	Intact	White	NEG	0.08
171	Mammoth	SHAW	D	Room 110	Window	Metal	Heater	Intact	White	NEG	0.09
172	Mammoth	SHAW	D	Calibrate						POS	1.29
173	Mammoth	SHAW	D	Calibrate						POS	1.66
174	Mammoth	SHAW	D	Calibrate						NEG	0
175	Mammoth	SHAW	D	Calibrate						NEG	0.41
176	Mammoth	SHAW		Shutter Cal 1						...	NA
177	Mammoth	SHAW		Calibrate						POS	1.19
178	Mammoth	SHAW		Calibrate						POS	1.71
179	Mammoth	SHAW		Calibrate						NEG	0
180	Mammoth	SHAW	A	Room 111	Wall	Drywall		Intact	White	POS	1.01
181	Mammoth	SHAW	B	Room 111	Wall	Drywall		Intact	White	POS	1.68
182	Mammoth	SHAW	C	Room 111	Wall	Drywall		Intact	White	NEG	0.55
183	Mammoth	SHAW	D	Room 111	Wall	Drywall		Intact	White	NEG	0.84
184	Mammoth	SHAW	D	Room 111	Ceiling	Drywall		Intact	White	NEG	0.44
185	Mammoth	SHAW	D	Room 111	Wall	Wood	Baseboard	Intact	White	NEG	0.22
186	Mammoth	SHAW	A	Room 111	Window	Wood	Casing	Intact	White	POS	15.08
187	Mammoth	SHAW	A	Room 111	Window	Wood	Sill	Intact	White	POS	28.52
188	Mammoth	SHAW	A	Room 111	Window	Wood	Sill	Intact	White	POS	11.95
189	Mammoth	SHAW	A	Room 111	Window	Wood	Sash	Intact	White	POS	14.18
190	Mammoth	SHAW	A	Room 111	Window	Wood	Mullion	Intact	White	POS	15.45
191	Mammoth	SHAW	C	Room 111	Window	Wood	Casing	Intact	White	POS	12.65
192	Mammoth	SHAW	C	Room 111	Window	Wood	Sash	Intact	White	POS	11.87
193	Mammoth	SHAW	C	Room 111	Window	Wood	Sill	Intact	White	POS	15.8
194	Mammoth	SHAW	C	Room 111	Window	Wood	Sill	Intact	White	POS	14.63
195	Mammoth	SHAW	C	Room 111	Window	Wood	Mullion	Intact	White	POS	10.05
196	Mammoth	SHAW	B	Room 111	Door	Wood	Casing	Intact	White	NEG	0.17
197	Mammoth	SHAW	D	Room 111	Door	Wood	Casing	Intact	White	NEG	0.26
198	Mammoth	SHAW	D	Room 111	Closet	Wood	Door	Intact	White	NEG	0.55
199	Mammoth	SHAW	D	Room 111	Closet	Wood	Casing	Intact	White	NEG	0.45

**BUILDING M-2
MAMMOTH, YELLOWSTONE NATIONAL PARK**

No	Site	Insp	Side	Room	Source	Sub	Feat	Cnd	Clr	Result	Pbc
200	Mammoth	SHAW	D	Room 111	Closet	Wood	Baseboard	Intact	White	POS	1.17
201	Mammoth	SHAW	D	Room 111	Closet	Wood	Ceiling	Intact	White	NEG	0.02
202	Mammoth	SHAW	D	Room 111	Closet	Wood	Shelf	Intact	White	NEG	0.03
203	Mammoth	SHAW	D	Room 111	Closet	Wood	Wall	Intact	White	POS	1.13
204	Mammoth	SHAW	B	Room 111	Closet	Wood	Wall	Intact	White	NEG	0.49
205	Mammoth	SHAW	B	Room 111	Closet	Metal	Coat Rod	Intact	White	NEG	0.17
206	Mammoth	SHAW	C	Room 111	Wall	Metal	Heater	Intact	White	NEG	0.11
207	Mammoth	SHAW	B	Room 112	Wall	Metal	Heater	Intact	White	NEG	0.16
208	Mammoth	SHAW	B	Room 112	Window	Wood	Casing	Intact	White	NEG	0.57
209	Mammoth	SHAW	B	Room 112	Window	Wood	Sash	Intact	White	NEG	0.66
210	Mammoth	SHAW	B	Room 112	Window	Wood	Sill	Intact	White	NEG	0.85
211	Mammoth	SHAW	A	Room 112	Window	Wood	Trough	Poor	White	POS	1.42
212	Mammoth	SHAW	B	Room 112	Window	Wood	Mullion	Intact	White	POS	5.49
213	Mammoth	SHAW	C	Room 112	Window	Wood	Mullion	Intact	White	NEG	0.23
214	Mammoth	SHAW	C	Room 112	Window	Wood	Casing	Intact	White	NEG	0
215	Mammoth	SHAW	C	Room 112	Window	Wood	Sash	Intact	White	NEG	0.16
217	Mammoth	SHAW	B	Room 112	Wall	Wood	Baseboard	Intact	White	NEG	0
218	Mammoth	SHAW	B	Room 112	Door	Wood	Casing	Poor	White	NEG	0.25
219	Mammoth	SHAW	B	Room 112	Door	Wood	Jamb	Poor	White	NEG	0.59
220	Mammoth	SHAW	B	Room 112	Ceiling	Drywall		Intact	White	NEG	0.04
221	Mammoth	SHAW	B	Room 112	Wall	Metal	Heater	Intact	White	NEG	0.12
222	Mammoth	SHAW	A	Room 108	Wall	Drywall		Intact	White	POS	2.5
223	Mammoth	SHAW	B	Room 108	Wall	Drywall		Intact	White	NEG	0.17
224	Mammoth	SHAW	C	Room 108	Wall	Drywall		Intact	White	POS	1.8
225	Mammoth	SHAW	D	Room 108	Wall	Drywall		Intact	White	POS	1.87
226	Mammoth	SHAW	D	Room 108	Ceiling	Drywall		Intact	White	NEG	0.32
227	Mammoth	SHAW	C	Room 108	Wall	Wood	Baseboard	Intact	White	NEG	0.11
228	Mammoth	SHAW	A	Room 108	Door	Drywall	Casing	Intact	White	NEG	0.42
229	Mammoth	SHAW	A	Room 108	Door	Drywall	Casing	Intact	White	NEG	0.14
230	Mammoth	SHAW	A	Room 108	Door	Drywall	Casing	Intact	White	NEG	0.32
231	Mammoth	SHAW	C	Room 108	Wall	Metal	Heater	Intact	White	NEG	0.11

**BUILDING M-2
MAMMOTH, YELLOWSTONE NATIONAL PARK**

No	Site	Insp	Slide	Room	Source	Sub	Feat	Cnd	Cir	Result	Pbc
232	Mammoth	SHAW	C	Room 108	Window	Wood	Casing	Intact	White	POS	5.46
235	Mammoth	SHAW	C	Room 108	Window	Wood	Sash	Intact	White	POS	1.66
236	Mammoth	SHAW	C	Room 108	Window	Wood	Sill	Intact	White	POS	3.85
237	Mammoth	SHAW	C	Room 108	Window	Wood	Sill	Intact	White	NEG	0.33
238	Mammoth	SHAW	C	Room 108	Window	Wood	Mullion	Intact	White	POS	13.25
239	Mammoth	SHAW	C	Room 108	Door	Wood	Casing	Intact	White	NEG	0.18
240	Mammoth	SHAW	C	Room 108	Door	Wood	Door	Intact	White	NEG	0.8
243	Mammoth	SHAW	C	Room 108	Door	Wood	Jamb	Intact	White	NEG	0.83
244	Mammoth	SHAW	C	Room 102	Closet	Wood	Casing	Intact	White	NEG	0.06
246	Mammoth	SHAW	C	Room 102	Closet	Wood	Jamb	Intact	White	NEG	0.08
247	Mammoth	SHAW	C	Room 102	Closet	Plaster	Ceiling	Intact	White	NEG	0.3
248	Mammoth	SHAW	C	Room 102	Closet	Wood	Baseboard	Intact	White	NEG	0.3
249	Mammoth	SHAW	A	Room 102	Closet	Plaster	Wall	Intact	White	NEG	-0.13
250	Mammoth	SHAW	B	Room 102	Closet	Plaster	Wall	Intact	White	NEG	-0.22
251	Mammoth	SHAW	C	Room 102	Closet	Plaster	Wall	Intact	White	NEG	0.16
252	Mammoth	SHAW	D	Room 102	Closet	Plaster	Wall	Intact	White	NEG	0.2
253	Mammoth	SHAW	D	Room 102	Door	Wood	Casing	Intact	White	NEG	0.1
254	Mammoth	SHAW	A	Room 102	Closet	Wood	Shelf	Intact	White	NEG	0.03
255	Mammoth	SHAW	B	Room 102	Closet	Wood	Shelf	Intact	White	POS	5.2
256	Mammoth	SHAW	C	Room 102	Closet	Wood	Shelf	Intact	White	NEG	0.07
257	Mammoth	SHAW	C	Room 102	Closet	Wood	Shelf	Intact	White	NEG	0.3
258	Mammoth	SHAW	C	Room 102	Shelf Support	Wood		Intact	White	NEG	0.11
259	Mammoth	SHAW	B	Room 108	Bookcase D	Wood	Frame	Intact	White	NEG	0.12
260	Mammoth	SHAW	B	Room 108	Bookcase D	Wood	Frame	Intact	White	NEG	0.32
261	Mammoth	SHAW	B	Room 108	Bookcase D	Wood	Shelf	Intact	White	NEG	0.27
262	Mammoth	SHAW	A	Room 105	Closet	Wood	Casing	Intact	White	NEG	0.06
263	Mammoth	SHAW	A	Room 105	Closet	Wood	Casing	Intact	White	NEG	0.32
264	Mammoth	SHAW	A	Room 105	Closet	Wood	Jamb	Intact	White	NEG	0.07
265	Mammoth	SHAW	A	Room 105	Closet	Wood	Baseboard	Intact	White	NEG	0.09
266	Mammoth	SHAW	A	Room 105	Closet	Wood	Ceiling	Intact	White	NEG	0.22
267	Mammoth	SHAW	A	Room 105	Closet	Wood	Shelf	Intact	White	NEG	0.01

BUILDING M-2
MAMMOTH, YELLOWSTONE NATIONAL PARK

No	Site	Insp	Side	Room	Source	Sub	Feat	Cnd	Cir	Result	Pbc
268	Mammoth	SHAW	A	Room 105	Closet	Wood	Shelf	Intact	White	NEG	0.03
269	Mammoth	SHAW	A	Room 105	Closet	Wood	Wall	Intact	White	NEG	0.05
270	Mammoth	SHAW	B	Room 105	Closet	Wood	Wall	Intact	White	NEG	0.37
271	Mammoth	SHAW	C	Room 105	Closet	Wood	Wall	Intact	White	NEG	0.05
274	Mammoth	SHAW	D	Room 105	Closet	Wood	Wall	Intact	White	NEG	0.23
275	Mammoth	SHAW	D	Room 104	Closet	Wood	Casing	Intact	White	NEG	0.08
276	Mammoth	SHAW	D	Room 104	Closet	Wood	Casing	Intact	White	NEG	0.08
277	Mammoth	SHAW	D	Room 104	Closet	Wood	Jamb	Intact	White	NEG	0.33
278	Mammoth	SHAW	D	Room 104	Closet	Wood	Baseboard	Intact	White	NEG	0.04
279	Mammoth	SHAW	D	Room 104	Closet	Wood	Ceiling	Intact	White	NEG	0.29
280	Mammoth	SHAW	D	Room 104	Closet	Wood	Shelf	Intact	White	NEG	0.14
281	Mammoth	SHAW	D	Room 104	Closet	Wood	Shelf	Intact	White	NEG	0.09
282	Mammoth	SHAW	D	Room 104	Closet	Wood	Shelf	Intact	White	NEG	0.07
283	Mammoth	SHAW	A	Room 104	Closet	Wood	Wall	Intact	White	NEG	0.03
284	Mammoth	SHAW	C	Room 104	Closet	Wood	Wall	Intact	White	NEG	0.09
285	Mammoth	SHAW	D	Room 104	Closet	Wood	Wall	Intact	White	NEG	0.22
286	Mammoth	SHAW	A	Room 109	Wall	Drywall	Wall	Intact	White	NEG	0.03
287	Mammoth	SHAW	B	Room 109	Wall	Drywall	Wall	Intact	White	NEG	0.02
288	Mammoth	SHAW	C	Room 109	Wall	Drywall	Wall	Intact	White	NEG	0.14
289	Mammoth	SHAW	D	Room 109	Wall	Drywall	Wall	Intact	White	NEG	0.02
290	Mammoth	SHAW	B	Room 109	Wall	Wood	Baseboard	Intact	White	NEG	0.1
291	Mammoth	SHAW	B	Room 109	Ceiling	Drywall		Intact	White	NEG	0.11
292	Mammoth	SHAW	C	Room 109	Door	Wood	Casing	Intact	White	POS	14.96
293	Mammoth	SHAW	C	Room 109	Door	Wood	Casing	Intact	White	NEG	0.17
294	Mammoth	SHAW	C	Room 109	Door	Wood	Jamb	Intact	White	NEG	0.16
295	Mammoth	SHAW	A	Room 109	Window	Wood	Casing	Intact	White	POS	16.04
296	Mammoth	SHAW	A	Room 109	Window	Wood	Casing	Intact	White	POS	14.12
297	Mammoth	SHAW	A	Room 109	Window	Wood	Sash	Intact	White	POS	16.86
298	Mammoth	SHAW	A	Room 109	Window	Wood	Mullion	Intact	White	POS	15.12
299	Mammoth	SHAW	A	Room 109	Window	Wood	Sill	Intact	White	POS	16.61
300	Mammoth	SHAW	A	Room 109	Window	Wood	Apron	Intact	White	POS	14.43

**BUILDING M-2
MAMMOTH, YELLOWSTONE NATIONAL PARK**

No	Site	Insp	Side	Room	Source	Sub	Feat	Cnd	Clr	Result	Pbc
301	Mammoth	SHAW	A	Room 109	Window	Wood	Trough	Intact	White	POS	13.08
304	Mammoth	SHAW	D	Room 109	Wall	Metal	Heater	Intact	White	NEG	0.13
305	Mammoth	SHAW	A	Room 108	Wall	Drywall		Intact	White	NEG	0.18
308	Mammoth	SHAW	B	Room 108	Wall	Drywall		Intact	White	NEG	0.03
307	Mammoth	SHAW	C	Room 108	Wall	Drywall		Intact	White	NEG	0.08
308	Mammoth	SHAW	D	Room 108	Wall	Drywall		Intact	White	NEG	0.13
308	Mammoth	SHAW	C	Room 108	Door	Wood	Casing	Intact	White	NEG	0.45
310	Mammoth	SHAW	C	Room 108	Door	Wood	Casing	Intact	White	NEG	0.42
311	Mammoth	SHAW	C	Room 108	Door	Wood	Jamb	Intact	White	NEG	0.18
312	Mammoth	SHAW	A	Room 108	Window	Wood	Casing	Intact	White	POS	14
313	Mammoth	SHAW	A	Room 108	Window	Wood	Sash	Intact	White	POS	14.31
314	Mammoth	SHAW	A	Room 108	Window	Wood	Mullion	Intact	White	POS	13.72
315	Mammoth	SHAW	A	Room 108	Window	Sill	Apron	Intact	White	POS	14.99
316	Mammoth	SHAW	A	Room 108	Window	Wood	Apron	Intact	White	POS	17.24
317	Mammoth	SHAW	A	Room 108	Ceiling	Drywall		Intact	White	NEG	0.17
318	Mammoth	SHAW	D	Room 108	Wall	Metal	Heater	Intact	White	NEG	-0.84
319	Mammoth	SHAW	D	Room 107	Closet	Wood	Casing	Intact	White	NEG	0.24
321	Mammoth	SHAW	D	Room 107	Closet	Wood	Jamb	Intact	White	NEG	0.07
322	Mammoth	SHAW	B	Room 107	Closet	Wood	Baseboard	Intact	White	NEG	0.09
323	Mammoth	SHAW	B	Room 107	Closet	Plaster	Ceiling	Intact	White	NEG	0.2
325	Mammoth	SHAW	C	Room 107	Closet	Plaster	Wall	Intact	White	NEG	-0.41
326	Mammoth	SHAW	D	Room 107	Closet	Plaster	Wall	Intact	White	NEG	0.37
327	Mammoth	SHAW	A	Room 107	Closet	Wood	Shelf	Intact	White	NEG	0.01
328	Mammoth	SHAW	A	Room 107	Closet	Wood	Door	Intact	White	NEG	0.24
329	Mammoth	SHAW	C	Room 107	Closet	Wood	Shelf	Intact	White	NEG	0.03
330	Mammoth	SHAW	C	Room 107	Closet	Wood	Shelf	Intact	White	NEG	0.01
333	Mammoth	SHAW	A	Room 103	Wall	Drywall		Intact	White	NEG	0
334	Mammoth	SHAW	B	Room 103	Wall	Drywall		Intact	White	NEG	0
335	Mammoth	SHAW	C	Room 103	Wall	Drywall		Intact	White	NEG	0
336	Mammoth	SHAW	C	Room 103	Ceiling	Drywall		Intact	White	NEG	0.14
337	Mammoth	SHAW	C	Room 103	Wall	Wood	Baseboard	Intact	White	NEG	0

**BUILDING M-2
MAMMOTH, YELLOWSTONE NATIONAL PARK**

No	Site	Insp	Side	Room	Source	Sub	Feat	Cnd	Clr	Result	Pbc
338	Mammoth	SHAW	C	Room 103	Door	Wood	Casing	Intact	White	NEG	0
339	Mammoth	SHAW	C	Room 103	Door	Wood	Casing	Intact	White	NEG	0
341	Mammoth	SHAW	C	Room 103	Door	Wood	Casing	Intact	White	NEG	0.1
342	Mammoth	SHAW	A	Room 103	Window	Wood	Casing	Intact	White	NEG	0
343	Mammoth	SHAW	A	Room 103	Window	Wood	Casing	Intact	White	NEG	0.41
344	Mammoth	SHAW	A	Room 103	Window	Wood	Sash	Intact	White	NEG	0.2
345	Mammoth	SHAW	A	Room 103	Window	Wood	Mullion	Intact	White	NEG	0.35
346	Mammoth	SHAW	A	Room 103	Window	Wood	Sill	Intact	White	POS	1.72
347	Mammoth	SHAW	A	Room 103	Window	Wood	Apron	Intact	White	NEG	0
349	Mammoth	SHAW	A	Room 100	Wall	Drywall		Intact	White	NEG	0.47
350	Mammoth	SHAW	B	Room 100	Wall	Drywall		Intact	White	NEG	0.58
351	Mammoth	SHAW	C	Room 100	Wall	Drywall		Intact	White	NEG	0.29
352	Mammoth	SHAW	D	Room 100	Wall	Drywall		Intact	White	NEG	0.23
354	Mammoth	SHAW	D	Room 100	Ceiling	Drywall		Intact	White	NEG	0.2
355	Mammoth	SHAW	A	Room 100	Window	Wood	Casing	Intact	White	NEG	0.14
356	Mammoth	SHAW	A	Room 100	Window	Wood	Casing	Intact	White	NEG	0.11
357	Mammoth	SHAW	A	Room 100	Window	Wood	Sash	Intact	White	NEG	0.13
358	Mammoth	SHAW	A	Room 100	Window	Wood	Mullion	Intact	White	NEG	0.19
359	Mammoth	SHAW	A	Room 100	Window	Wood	Trough	Intact	White	NEG	0.08
360	Mammoth	SHAW	A	Room 100	Window	Wood	Sill	Intact	White	NEG	0.02
361	Mammoth	SHAW	A	Room 100	Window	Wood	Apron	Intact	White	NEG	0.15
362	Mammoth	SHAW	B	Room 100	Wall	Metal	Heater	Intact	White	NEG	0.1
363	Mammoth	SHAW	B	Room 101	Wall	Plaster		Intact	White	NEG	0.36
364	Mammoth	SHAW	B	Room 101	Wall	Plaster		Intact	White	NEG	0.33
365	Mammoth	SHAW	C	Room 101	Wall	Plaster		Intact	White	NEG	0.36
366	Mammoth	SHAW	D	Room 101	Wall	Plaster		Intact	White	NEG	0.37
368	Mammoth	SHAW	D	Room 101	Closet	Wood	Baseboard	Intact	White	NEG	0.07
369	Mammoth	SHAW	D	Room 101	Closet	Wood	Shelf	Intact	White	NEG	0.18
370	Mammoth	SHAW	B	Room 101	Closet	Wood	Shelf	Intact	White	NEG	0.04
372	Mammoth	SHAW	B	Room 101	Closet	Wood	Casing	Intact	White	NEG	0.15
373	Mammoth	SHAW	C	Room 101	Closet	Wood	Shelf	Intact	White	NEG	0.1

BUILDING M-2
MAMMOTH, YELLOWSTONE NATIONAL PARK

[illegible]

BUILDING M-2
MAMMOTH, YELLOWSTONE NATIONAL PARK

No	Site	Insp	Side	Room	Source	Sub	Feat	Cnd	Cir	Result	Pbc
405	Mammoth	SHAW	D	Outside	Grounds	Metal	Conduit	Intact	Grey	NEG	-0.52
408	Mammoth	SHAW	D	Cellar	Grounds	Concrete	Conduit	Poor	Grey	NEG	0.04
407	Mammoth	SHAW	D	Cellar	Door	Metal	Door	Poor	Grey	NEG	0.43
408	Mammoth	SHAW	D	Cellar	Door	Metal	Door	Poor	Grey	NEG	0.48
408	Mammoth	SHAW	D	Porch	Porch	Wood	Floor	Poor	Grey	NEG	0
410	Mammoth	SHAW	D	Porch	Porch	Wood	Columns	Intact	Brown	NEG	0.02
411	Mammoth	SHAW	D	Porch	Porch	Wood	Columns	Intact	Brown	NEG	0
412	Mammoth	SHAW	D	Porch	Porch	Metal	Pipes	Intact	Brown	NEG	0.4
413	Mammoth	SHAW	D	Porch	Porch	Wood	Lattice	Intact	Brown	NEG	0.24
414	Mammoth	SHAW	A	Roof	Beam	Wood	Unlisted	Intact	Brown	POS	1.07
415	Mammoth	SHAW	A	Roof	Support	Wood	Unlisted	Intact	Brown	NEG	0.43
416	Mammoth	SHAW	A	Roof	Overhang	Wood	Unlisted	Intact	Brown	NEG	0.43
418	Mammoth	SHAW	A	Roof	Beam	Wood	Unlisted	Intact	Brown	NEG	0.34
420	Mammoth	SHAW	D	Roof	Beam	Wood	Unlisted	Intact	Brown	NEG	0.66
421	Mammoth	SHAW	D	Roof	Support	Wood	Unlisted	Intact	Brown	NEG	0.52
423	Mammoth	SHAW	D	Roof	Overhang	Wood	Unlisted	Intact	Brown	NEG	0.41
424	Mammoth	SHAW	C	Roof	Beam	Wood	Unlisted	Intact	Brown	NEG	0.35
425	Mammoth	SHAW	C	Roof	Support	Wood	Unlisted	Intact	Brown	NEG	0.02
426	Mammoth	SHAW	C	Porch	Overhang	Wood	Unlisted	Intact	Green	NEG	0
427	Mammoth	SHAW	A	Porch	Porch	Wood	Columns	Intact	Brown	NEG	0.76
428	Mammoth	SHAW	A	Porch	Porch	Wood	Columns	Intact	Brown	NEG	0.62
429	Mammoth	SHAW	A	Porch	Porch	Wood	Rail cap	Poor	Brown	NEG	0.48
430	Mammoth	SHAW	A	Porch	Porch	Wood	Celling	Intact	White	POS	6.64
431	Mammoth	SHAW	A	Porch	Porch	Wood	Rail Lwr	Poor	Brown	NEG	0.03
432	Mammoth	SHAW	A	Porch	Porch	Wood	Rail Lwr	Intact	Brown	POS	1.31
433	Mammoth	SHAW	B	Porch	Porch	Wood	Rail Lwr	Poor	Brown	NEG	0.86
434	Mammoth	SHAW	A	Porch	Porch	Wood	Rail cap	Intact	Brown	NEG	0.2
435	Mammoth	SHAW	A	Porch	Porch	Wood	Trim Lwr	Poor	Brown	NEG	0
436	Mammoth	SHAW	B	Roof	Beam	Wood	Unlisted	Intact	Brown	NEG	0.65
437	Mammoth	SHAW	B	Roof	Support	Wood	Unlisted	Intact	Brown	NEG	0.17
438	Mammoth	SHAW	B	Roof	Overhang	Wood	Unlisted	Intact	Brown	NEG	0.18

**BUILDING M-2
MAMMOTH, YELLOWSTONE NATIONAL PARK**

No	Site	Insp	Side	Room	Source	Sub	Feat	Cnd	Clr	Result	Pbc
438	Mammoth	SHAW	B	Outside	Ext Wall	Concre	Foundation	Poor	Grey	NEG	0.31
440	Mammoth	SHAW	B	Outside	Window	Wood	Sill	Poor	Green	POS	29.39
441	Mammoth	SHAW	B	Outside	Window	Wood	Sill.	Poor	Green	POS	5.1
442	Mammoth	SHAW	B	Outside	Window	Wood	Casing	Poor	Green	POS	31.08
443	Mammoth	SHAW	C	Outside	Window	Wood	Casing	Poor	Green	NEG	0.15
444	Mammoth	SHAW	C	Outside	Window	Wood	Casing	Poor	Green	POS	10.37
445	Mammoth	SHAW	C	Outside	Window	Wood	Mullion	Poor	Green	POS	16.56
446	Mammoth	SHAW	C	Outside	Ext Wall	Wood	Trim Lwr	Poor	Green	NEG	0.25
451	Mammoth	SHAW	D	Outside	Floor 2	Wood	Shingles	Intact	Brown	POS	3.11
453	Mammoth	SHAW	B	Outside	Floor 2	Wood	Shingles	Intact	Brown	POS	5.35
454	Mammoth	SHAW	A	Outside	Floor 2	Wood	Shingles	Intact	Brown	POS	1.17
455	Mammoth	SHAW	D	Outside	Window	Wood	Casing	Poor	Green	NEG	0.38
457	Mammoth	SHAW	D	Outside	Window	Wood	Casing	Poor	Green	POS	29.21
458	Mammoth	SHAW	D	Outside	Window	Wood	Casing	Poor	Green	NEG	0.65
459	Mammoth	SHAW	D	Outside	Window	Wood	Casing	Poor	Green	POS	28.85
460	Mammoth	SHAW	D	Outside	Window	Wood	Sash Ext	Poor	Green	POS	13.22
461	Mammoth	SHAW	D	Outside	Window	Wood	Mullion	Poor	Green	NEG	0.48
462	Mammoth	SHAW	D	Outside	Window	Wood	Sash Ext	Intact	Green	NEG	0.33
463	Mammoth	SHAW	D	Outside	Window	Wood	Sash Ext	Intact	Green	NEG	0.67
464	Mammoth	SHAW	B	Outside	Window	Wood	Sash Ext	Intact	Green	POS	23.12
465	Mammoth	SHAW	B	Outside	Window	Wood	Mullion	Intact	Green	POS	16.12
466	Mammoth	SHAW	B	Outside	Window	Wood	Casing	Intact	Green	POS	8.19
467	Mammoth	SHAW	B	Outside	Window	Wood	Sill	Poor	Green	POS	1.85
468	Mammoth	SHAW	B	Outside	Window	Wood	Sill	Poor	Green	POS	5.1
471	Mammoth	SHAW	B	Outside	Window	Wood	Casing	Poor	Green	POS	2.48
472	Mammoth	SHAW	B	Outside	Window	Wood	Sash Ext	Poor	Green	POS	10.12
473	Mammoth	SHAW	B	Outside	Window	Wood	Mullion	Intact	Green	POS	10.11
474	Mammoth	SHAW	D	Outside	Window	Wood	Mullion	Poor	Green	POS	13.49
475	Mammoth	SHAW	D	Outside	Window	Wood	Casing	Poor	Green	POS	5.04
476	Mammoth	SHAW	D	Outside	Window	Wood	Casing	Poor	Green	NEG	0.86
477	Mammoth	SHAW	D	Outside	Window	Wood	Trough	Poor	Green	NEG	0.82

**BUILDING M-2
MAMMOTH, YELLOWSTONE NATIONAL PARK**

No	Site	Insp	Side	Room	Source	Sub	Feat	Cnd	Clr	Result	Pbc
478	Mammoth	SHAW	D	Outside	Roof	Wood	Shingles	Intact	Green	NEG	0
479	Mammoth	SHAW	D	Outside	Roof	Metal	Flashing	Poor	Brown	NEG	0.04
480	Mammoth	SHAW	D	Outside	Roof	Wood	Shingles	Intact	Green	NEG	0
481	Mammoth	SHAW	D	Outside	Roof	Metal	Flashing	Poor	Green	POS	1.88
482	Mammoth	SHAW	D	Outside	Roof	Metal	Flashing	Poor	Green	POS	1.79
483	Mammoth	SHAW	A	Room 117	Wall	Plaster	Flashing	Intact	Grey	NEG	0.12
484	Mammoth	SHAW	C	Room 117	Wall	Wood		Intact	Tan	NEG	-0.03
485	Mammoth	SHAW	D	Room 117	Wall	Plaster		Intact	Grey	NEG	-0.39
486	Mammoth	SHAW	D	Room 117	Wall	Plaster		Intact	Other	NEG	0.12
487	Mammoth	SHAW	D	Room 117	Wall	Plaster		Intact	Other	NEG	0.09
488	Mammoth	SHAW	D	Room 117	Wall	Plaster		Intact	Other	NEG	0.09
489	Mammoth	SHAW	C	Room 117	Wall	Wood		Intact	Tan	NEG	0.03
490	Mammoth	SHAW	C	Room 117	Ceiling	Wood		Intact	White	NEG	0.18
491	Mammoth	SHAW	C	Room 117	Door	Wood	Door	Intact	White	POS	36.81
492	Mammoth	SHAW	C	Room 117	Door	Wood	Casing	Intact	Tan	NEG	0.25
493	Mammoth	SHAW	C	Room 117	Door	Wood	Jamb	Intact	Tan	POS	3.75
494	Mammoth	SHAW	C	Room 117	Stairs	Wood	Baseboard Ins	Intact	Tan	NEG	0.01
495	Mammoth	SHAW	A	Room 200	Wall	Wood		Intact	Tan	NEG	0.01
496	Mammoth	SHAW	B	Room 200	Wall	Wood		Intact	Tan	NEG	0.06
497	Mammoth	SHAW	B	Room 200	Wall	Wood		Intact	Tan	NEG	0.12
498	Mammoth	SHAW	C	Room 200	Wall	Wood		Intact	Tan	NEG	0.12
499	Mammoth	SHAW	D	Room 200	Wall	Wood		Intact	Tan	NEG	0.2
500	Mammoth	SHAW	D	Room 200	Ceiling	Wood		Intact	White	NEG	0.08
501	Mammoth	SHAW	C	Room 200	Door	Wood	Casing	Intact	Tan	NEG	0.17
502	Mammoth	SHAW	D	Room 200	Door	Wood	Casing	Intact	Tan	NEG	0.06
503	Mammoth	SHAW	A	Room 200	Door	Wood	Door	Intact	Tan	POS	34.66
504	Mammoth	SHAW	A	Room 200	Door	Wood	Jamb	Intact	Tan	POS	36.38
505	Mammoth	SHAW	D	Room 200	Wall	Wood	Baseboard	Intact	Tan	NEG	0.04
506	Mammoth	SHAW	D	Room 200	Door	Wood	Door	Intact	Grey	POS	11.79
507	Mammoth	SHAW	D	Room 200	Door	Wood	Casing	Intact	Tan	NEG	0.44
508	Mammoth	SHAW	B	Room 200	Cabinet	Metal	Door Out	Intact	Tan	NEG	0.02

**BUILDING M-2
MAMMOTH, YELLOWSTONE NATIONAL PARK**

No	Site	Insp	Side	Room	Source	Sub	Feat	Cnd	Clr	Result	Pbc
508	Mammoth	SHAW	B	Room 200	Cabinet	Metal	Door Out	Intact	Tan	NEG	0
510	Mammoth	SHAW	B	Room 200	Cabinet	Metal	Door Ins	Intact	White	NEG	0
511	Mammoth	SHAW	B	Room 200	Cabinet	Metal	Inside	Intact	White	NEG	0.02
512	Mammoth	SHAW	B	Room 200	Cabinet	Metal	Shelf	Intact	White	NEG	0
513	Mammoth	SHAW	B	Room 200	Window	Wood	Casing	Intact	Tan	NEG	0.33
514	Mammoth	SHAW	B	Room 200	Window	Wood	Sash	Poor	Grey	NEG	0.2
515	Mammoth	SHAW	B	Room 200	Window	Wood	Sash	Poor	White	NEG	0.31
516	Mammoth	SHAW	B	Room 200	Window	Wood	Mullion	Poor	White	NEG	0.18
517	Mammoth	SHAW	B	Room 200	Window	Wood	Sill	Poor	White	NEG	0.42
518	Mammoth	SHAW	A	Room 201	Wall	Wood		Intact	Tan	NEG	0.03
519	Mammoth	SHAW	B	Room 201	Wall	Wood		Intact	Tan	NEG	0.01
520	Mammoth	SHAW	C	Room 201	Wall	Wood		Intact	Tan	NEG	0.01
521	Mammoth	SHAW	D	Room 201	Wall	Wood		Intact	Tan	NEG	0.04
522	Mammoth	SHAW	D	Room 201	Ceiling	Wood		Intact	White	NEG	0.01
523	Mammoth	SHAW	D	Room 201	Ceiling	Wood		Intact	White	NEG	0.28
524	Mammoth	SHAW	D	Calibrate						POS	1.28
525	Mammoth	SHAW	D	Calibrate						NEG	0
526	Mammoth	SHAW	D	Calibrate						NEG	0.37
528	Mammoth	SHAW	D	Calibrate						POS	1.64
529	Mammoth	SHAW	A	Room 201	Door	Wood	Door	Intact	Grey	POS	28.42
530	Mammoth	SHAW	A	Room 201	Door	Wood	Casing	Intact	Tan	NEG	0.06
531	Mammoth	SHAW	A	Room 201	Door	Wood	Jamb	Intact	Tan	POS	34.53
532	Mammoth	SHAW	B	Room 201	Window	Wood	Casing	Intact	Tan	NEG	0.21
533	Mammoth	SHAW	B	Room 201	Window	Wood	Sash	Intact	Green	NEG	0.22
534	Mammoth	SHAW	B	Room 201	Window	Wood	Mullion	Intact	Green	NEG	0.25
535	Mammoth	SHAW	B	Room 201	Window	Wood	Sill	Intact	Tan	NEG	0.32
536	Mammoth	SHAW	D	Room 201	Window	Wood	Sill	Poor	Tan	NEG	0.2
537	Mammoth	SHAW	D	Room 201	Window	Wood	Casing	Intact	Tan	NEG	0.19
538	Mammoth	SHAW	D	Room 201	Window	Wood	Sash	Intact	Green	NEG	0.18
539	Mammoth	SHAW	D	Room 201	Window	Wood	Mullion	Intact	Green	NEG	0.22
540	Mammoth	SHAW	B	Room 201	Window	Wood	Baseboard	Intact	Tan	NEG	0.23

**BUILDING M-2
MAMMOTH, YELLOWSTONE NATIONAL PARK**

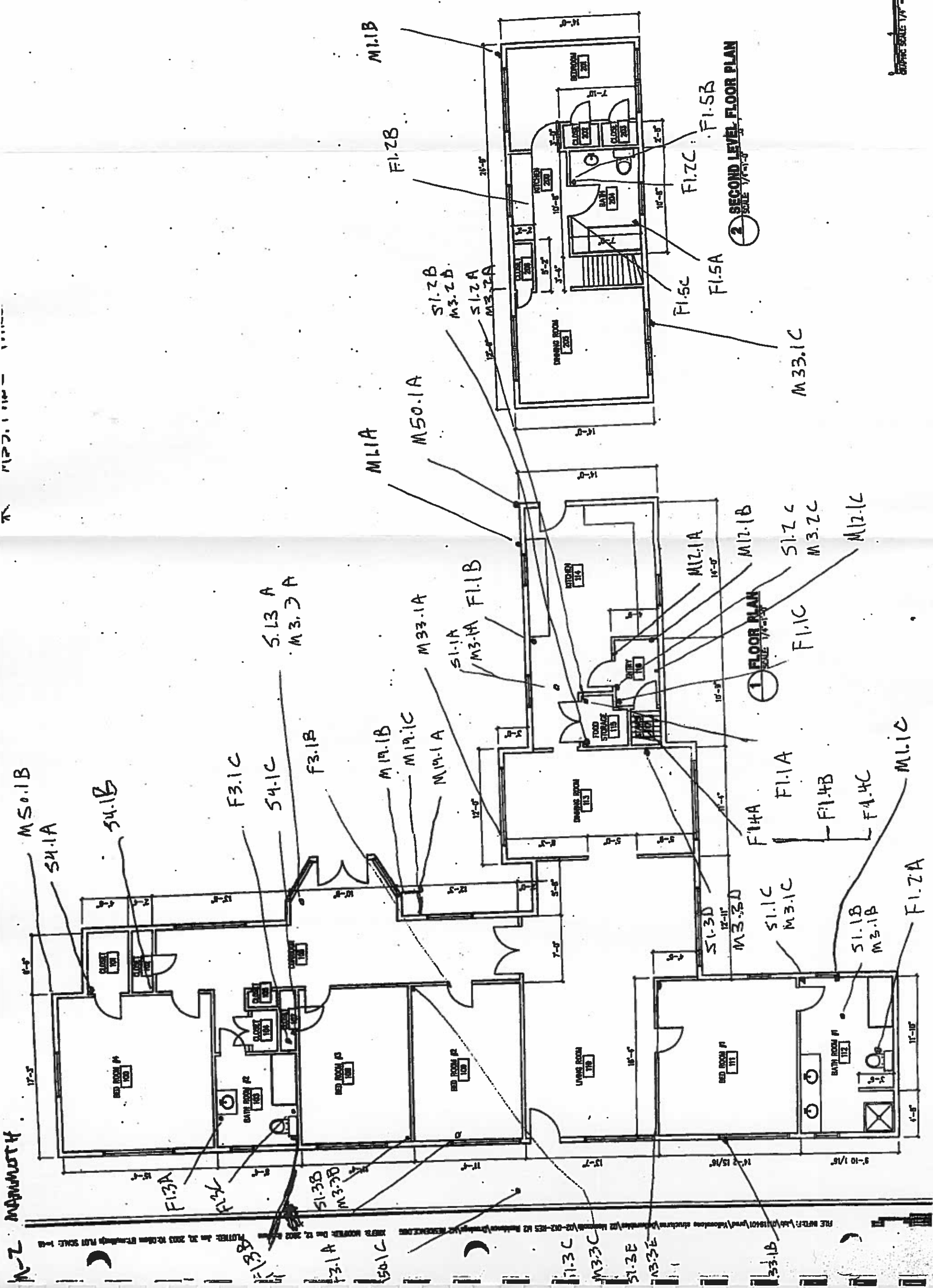
No	Site	Insp	Side	Room	Source	Sub	Feat	Cnd	Clr	Result	Pbc
541	Mammoth	SHAW	B	Room 202	Closet	Wood	Door	Intact	White	NEG	0.06
542	Mammoth	SHAW	C	Room 202	Closet	Wood	Door	Intact	White	NEG	0.13
543	Mammoth	SHAW	A	Room 201	Closet	Wood	Door	Intact	Grey	NEG	0.39
544	Mammoth	SHAW	A	Room 201	Closet	Wood	Door	Intact	Grey	NEG	0.04
545	Mammoth	SHAW	C	Room 202	Closet	Wood	Door	Intact	White	NEG	0.1
546	Mammoth	SHAW	C	Room 202	Door	Wood	Casing	Intact	Tan	NEG	0.17
547	Mammoth	SHAW	C	Room 202	Door	Wood	Jamb	Intact	Tan	POS	42.19
548	Mammoth	SHAW	C	Room 202	Door	Wood	Casing	Intact	White	NEG	0.05
549	Mammoth	SHAW	A	Room 202	Wall	Wood		Intact	White	NEG	0.02
550	Mammoth	SHAW	B	Room 202	Wall	Wood		Intact	White	NEG	0.04
551	Mammoth	SHAW	C	Room 202	Wall	Wood		Intact	White	NEG	0.02
552	Mammoth	SHAW	D	Room 202	Wall	Wood		Intact	White	NEG	0.06
553	Mammoth	SHAW	D	Room 202	Ceiling	Wood		Intact	White	NEG	0.06
554	Mammoth	SHAW	D	Room 202	Wall	Wood	Baseboard	Intact	White	NEG	0.11
555	Mammoth	SHAW	D	Room 202	Wall	Wood		Intact	White	NEG	0.14
556	Mammoth	SHAW	C	Room 203	Door	Wood	Door	Intact	White	NEG	0.21
557	Mammoth	SHAW	C	Room 203	Door	Wood	Casing	Intact	White	NEG	0.22
558	Mammoth	SHAW	C	Room 203	Door	Wood	Jamb	Intact	White	NEG	0.22
559	Mammoth	SHAW	A	Room 203	Wall	Wood		Intact	Tan	NEG	0.02
560	Mammoth	SHAW	B	Room 203	Wall	Wood		Intact	White	NEG	0.15
561	Mammoth	SHAW	C	Room 203	Wall	Wood		Intact	White	NEG	0.06
562	Mammoth	SHAW	D	Room 203	Wall	Wood		Intact	White	NEG	0.03
563	Mammoth	SHAW	D	Room 203	Ceiling	Wood		Intact	White	NEG	0.05
564	Mammoth	SHAW	D	Room 203	Wall	Wood	Baseboard	Intact	White	POS	16.81
565	Mammoth	SHAW	D	Room 203	Wall	Wood	Baseboard	Intact	White	POS	38.56
566	Mammoth	SHAW	A	Room 203	Wall	Wood	Baseboard	Intact	White	NEG	0.14
567	Mammoth	SHAW	B	Room 202	Wall	Wood	Baseboard	Intact	White	POS	14.44
568	Mammoth	SHAW	A	Room 204	Wall	Wood		Intact	Tan	NEG	0
569	Mammoth	SHAW	B	Room 204	Wall	Wood		Intact	Tan	NEG	0.8
570	Mammoth	SHAW	C	Room 204	Wall	Wood		Intact	Tan	NEG	0.66
571	Mammoth	SHAW	D	Room 204	Wall	Wood		Intact	Tan	POS	1.01

**BUILDING M-2
MAMMOTH, YELLOWSTONE NATIONAL PARK**

No	Site	Insp	Side	Room	Source	Sub	Feat	Cnd	Clr	Result	Pbc
572	Mammoth	SHAW	D	Room 204	Wall	Wood	Baseboard	Intact	Tan	POS	1.1
573	Mammoth	SHAW	D	Room 204	Wall	Wood		Intact	Tan	NEG	0.23
574	Mammoth	SHAW	D	Room 204	Ceiling	Wood		Intact	White	POS	1.28
575	Mammoth	SHAW	B	Room 204	Door	Wood	Door	Intact	Grey	POS	17.33
576	Mammoth	SHAW	B	Room 204	Door	Wood	Casing	Intact	Tan	NEG	-0.13
577	Mammoth	SHAW	B	Room 204	Door	Wood	Jamb	Intact	Tan	POS	12.7
578	Mammoth	SHAW	D	Room 204	Window	Wood	Casing	Intact	Tan	NEG	0.03
579	Mammoth	SHAW	D	Room 204	Window	Wood	Sash	Poor	Green	NEG	0.41
580	Mammoth	SHAW	D	Room 204	Window	Wood	Mullion	Poor	Green	NEG	0.08
581	Mammoth	SHAW	D	Room 204	Window	Wood	Trough	Poor	Green	POS	3
582	Mammoth	SHAW	D	Room 204	Window	Wood	Trough	Poor	White	NEG	0.58
583	Mammoth	SHAW	D	Room 204	Window	Wood	Casing	Poor	White	NEG	0.18
584	Mammoth	SHAW	A	Room 204	Cabinet	Wood	Shelf	Intact	White	NEG	0.18
585	Mammoth	SHAW	A	Room 204	Cabinet	Wood	Shelf	Intact	White	NEG	0.08
586	Mammoth	SHAW	A	Room 204	Cabinet	Wood	Wall	Intact	White	NEG	0.05
587	Mammoth	SHAW	A	Room 204	Cabinet	Wood	Door Out	Intact	Tan	NEG	0
588	Mammoth	SHAW	A	Room 204	Wall	Wood		Intact	White	NEG	0
589	Mammoth	SHAW	A	Room 205	Wall	Wood		Intact	Tan	NEG	0.11
590	Mammoth	SHAW	B	Room 205	Wall	Wood		Intact	Tan	NEG	0.14
591	Mammoth	SHAW	C	Room 205	Wall	Wood		Intact	Tan	NEG	0.02
592	Mammoth	SHAW	D	Room 205	Wall	Wood		Intact	Tan	NEG	0
593	Mammoth	SHAW	D	Room 205	Wall	Wood	Baseboard	Intact	Tan	NEG	0.22
594	Mammoth	SHAW	D	Room 205	Ceiling	Wood		Intact	White	NEG	0.07
595	Mammoth	SHAW	A	Room 205	Door	Wood	Door	Intact	Grey	NEG	0.04
596	Mammoth	SHAW	A	Room 205	Door	Wood	Casing	Intact	Tan	NEG	0.11
597	Mammoth	SHAW	A	Room 205	Door	Wood	Casing	Intact	Tan	NEG	0.15
598	Mammoth	SHAW	A	Room 205	Door	Wood	Jamb	Intact	White	NEG	0.03
599	Mammoth	SHAW	C	Room 205	Door	Wood	Casing	Intact	Tan	NEG	0.48
600	Mammoth	SHAW	C	Room 205	Door	Wood	Jamb	Intact	Tan	NEG	0.28
601	Mammoth	SHAW	B	Room 205	Window	Wood	Casing	Intact	Tan	NEG	0.5
602	Mammoth	SHAW	B	Room 205	Window	Wood	Casing	Intact	Tan	NEG	0.27

**BUILDING M-2
MAMMOTH, YELLOWSTONE NATIONAL PARK**

No	Site	Insp	Side	Room	Source	Sub	Feat	Cnd	Clr	Result	Pbc
603	Mammoth	SHAW	B	Room 205	Window	Wood	Sash	Intact	Green	POS	6.87
604	Mammoth	SHAW	B	Room 205	Window	Wood	Mullion	Intact	Green	POS	5.01
605	Mammoth	SHAW	B	Room 205	Window	Wood	Apron	Intact	Tan	NEG	0.07
606	Mammoth	SHAW	B	Room 205	Window	Wood	Trough	Poor	Tan	POS	1.81
607	Mammoth	SHAW	D	Room 205	Window	Wood	Trough	Poor	Tan	NEG	0.71
608	Mammoth	SHAW	D	Room 205	Window	Wood	Casing	Intact	Tan	NEG	0.08
609	Mammoth	SHAW	D	Room 205	Window	Wood	Sash	Intact	Green	POS	8.38
610	Mammoth	SHAW	D	Room 205	Window	Wood	Mullion	Intact	Green	POS	7.81
611	Mammoth	SHAW	D	Room 205	Window	Wood	Apron	Poor	Tan	NEG	0.03
612	Mammoth	SHAW	D	Room 205	Window	Wood	Sash Ext	Intact	Green	NEG	0.07
613	Mammoth	SHAW	B	Room 206	Wall	Wood		Intact	White	NEG	0.05
614	Mammoth	SHAW	C	Room 206	Wall	Wood		Intact	White	NEG	0.08
615	Mammoth	SHAW	D	Room 206	Wall	Wood		Intact	White	NEG	0.14
616	Mammoth	SHAW	D	Room 206	Ceiling	Wood		Intact	White	NEG	0.05
617	Mammoth	SHAW	D	Room 206	Wall	Wood	Baseboard	Intact	White	POS	2.11
618	Mammoth	SHAW	A	Room 206	Door	Wood	Door	Intact	Tan	NEG	0
619	Mammoth	SHAW	C	Room 206	Closet	Wood	Shelf	Intact	White	NEG	0.02
621	Mammoth	SHAW		Calibrate						POS	1.2
622	Mammoth	SHAW		Calibrate						NEG	0
623	Mammoth	SHAW		Calibrate						NEG	0.35
624	Mammoth	SHAW		Calibrate						POS	3.45





215 SW 153rd Street Burien, WA 98166
OFFICE: (206) 988-1746 FAX: (206) 988-1978
EMAIL: nihinc@eschelon.com
NVLAP# 200511-0

Bulk Asbestos Analysis Report

Northern Industrial Hygiene, Inc.
201 South 30th Street
Billings, MT 59101-
Project Location: *Tompkins Residence*

NIH Batch Number: 08-00120
Client Job Number:
Turn Around Time: 5 Day
Samples Analyzed: 1

Client Sample Number: M6.1A	Lab Sample Number: 08-00120.0001
Client Sample Description: 1'X1' Ceiling Tile	
Client Sample Location: Floor 2, Closet	
Sample Comments: Materials distinguishable but inseparable	Checked If Sample Not Analyzed <input type="checkbox"/>

Various colors of paint on light brown compressed fibers		
Asbestos Fibrous Components: No Asbestos Detected	Non-Asbestos Fibrous Components: 60% Cellulose	Non-Fibrous Components: 40% Paint

Sampled by: Kevin Oliver
Received by: Jude Cummings
Reviewed by: Jude Cummings

2/7/2008
2/23/2008
2/29/2008

Jude Cummings, Laboratory Manager

Quirk Consulting Service

J. Thomas Quirk, Ph.D., Wood Technologist

Federal ID# 39-1538482

March 5, 2008

**CTA
ATTN. Lesley Gilmore
1143 Stoneridge Drive
Bozeman, MT 59718**

Re: Tompkins HSR

Wood identifications;

- E 1 - Batten #1 - Western Yellow Pine**
- E 2 - Batten #2 - Western Yellow Pine**
- E 3 - Wood roof shingle - center roof - Western Yellow Pine**
- E 4 - Wood roof shingle east extension - Redwood**
- IW 1 - Interior baseboard - Western Yellow Pine**
- IW 2 - Interior door - Western White Pine**
- IW 3 - Interior window trim - Western Yellow Pine**
- IW 4 - Interior window casement - Western Yellow Pine**
- IW 5 - Attic floor joist - Douglas fir**
- IW 6 - Rafter - West end. (east part) - Douglas fir**
- IW 7 - Rafter East end. (west part) - Douglas fir**
- IW 8 - Rafter center roof - Douglas fir**

**Remit to: J. Thomas Quirk, Ph.D.
117 N. Franklin Avenue
Madison, WI 53705**

Terms: payment in full required in 30 days.

Phone/FAX (608) 238-2225

E-mail TANDBQUIRK@AOL.COM