Feasibility Study for

*Solitude*

at Virginia Polytechnic Institute and State University

Blacksburg, Virginia

2007

Prepared by

Commonwealth Architects

101 Shockoe Slip

Richmond, Virginia
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Chapter I: Executive Summary

The Virginia Polytechnic Institute and State University commissioned Commonwealth Architects to compile a feasibility report for rehabilitation of Solitude in December 2006. As the only property at Virginia Tech listed on historic registers (Virginia Landmarks Register / 1988; National Register of Historic Places / 1989), its importance as an institutional symbol is well established. Yet its present unkempt condition indicates a need to make that importance manifest. The intention to continue using the building as a component of the institution’s educational mission in the form of the Center for Appalachian Studies strengthens the undertaking even more.

The property known as Solitude comprises the two-story house of that name plus two outbuildings, a small wood building, variously called a dwelling or a domestic support structure, and a springhouse of stone and wood. The three sit beside a duck pond in the northwest region of the campus, at the foot of a hill below the presidential residence named The Grove. Trees and a parking lot are the only other site features of note in the immediate area. Viewed by passing pedestrians and motorists, the site appears to be an oasis of rustic calm amidst a bustling campus built almost entirely of stone. Yet this early harbinger of a great university was built of wood and plaster, neither of which has fared well in the overly moist soil on which it rests. Dampness has invaded the wood. Settlement has severely compromised fragile plasterwork. Indeed the structural condition of Solitude is the most troubling of its many needs. To quote structural engineering consultants from Robert Silman Associates: “…we do not believe that Solitude is structurally adequate to support the proposed academic and office uses in its current condition.” With respect to other needs, serial modifications have not always been of suitable or lasting quality, and a variety of stabilization and restoration responses are needed to regain aesthetic intent and prevent further decay. Additionally new building systems must replace the old ones to allow use throughout the year. The aim should be returning this historically important building to a condition of which Virginia Tech can be proud.

Another aim for this study is quantification of the monetary need that attends rehabilitation. Absent fully developed architectural and engineering design documents and detailed pricing in the marketplace, estimation of that need is preliminary in nature. But this forecast will enable the institution to approach funding issues realistically.

We commend Virginia Polytechnic Institute and State University for undertaking this historic initiative. As architects and engineers devoted to good stewardship of built legacies, we are honored to support this demonstration of cultural responsibility.
Chapter I:  Team Organization & Methodology

The team for this feasibility study effort comprised representatives of four firms:

Commonwealth Architects, Richmond, Virginia  ARCHITECTS
Dunlap & Partners, Richmond, Virginia  MECHANICAL, ELECTRICAL & PLUMBING ENGINEERS
Robert Silman Associates, Washington, DC  STRUCTURAL ENGINEERS
Faithful + Gould, Williamsburg, Virginia  COST CONSULTANTS

Each firm has worked extensively in the realm of historic buildings. They have also shared joint commissions, allowing them good knowledge of the methodologies of one another. Team members were:

Commonwealth Architects: Bryan Townes, James Murray Howard, PhD, FAIA, Bryan Green, PhD and Richard L. Ford, Jr., AIA
Dunlap & Partners: Warren Reed, PE and Paul Brooks, PE
Robert Silman Associates: Kirk Mettam, PE, John Mateo, PE and Brandon Rossetti, PE
Faithful + Gould: Michael Krebs and Malcolm Booth

Physical assessment of Solitude included all three structures, with intensive study for the two-story house and cursory assessment of the two outbuildings. At the house, investigators examined both exterior and interior conditions including all surfaces and all spaces that could be reached. No destructive testing was carried out since physical circumstances were exposed to view or already exposed to study due to recent construction activity. That recent activity, while only partially completed, was extremely useful for showing degenerative conditions. Key maps for easy reference are given immediately prior to the written text.

Documentary materials consisting of writings, drawings and photographic images were available from University archives. Especially helpful were previous writings containing insights regarding alterations between first construction and the present day.

Present conditions have been extensively photographed in electronic format for use in this study and for future reference.
Chapter I: Acknowledgements

We would like to acknowledge the following parties whose assistance during the preparation of this report contributed substantially to its value:

Ms. Salinda A. Arthur / University Development
Ms. Lynn Eichhorn / Office of Contracts and Campus Renovation Services
Professor Elizabeth Fine / Appalachian Studies Center
Ms. Ginger Reid / Office of Contracts and Campus Renovation Services
Mr. Gibson Worsham / Architect
Mr. Jun Zhu / Graduate Student / Virginia Polytechnic Institute and State University
Office of Contracts and Campus Renovation Services / Virginia Polytechnic Institute and State University
Rare Books Collection / Virginia Polytechnic Institute and State University
Chapter II:  Building History

The house named Solitude is associated in its early years primarily with the Preston family, several generations of whom lived there throughout the 19th century. It is composed of four segments:

- a one-room log structure (c. 1801)
- a two-story log addition atop and to the southeast side of the older segment (c. 1834)
- a lean-to addition to the northeast of the second segment (after 1834)
- transformation into a much larger Greek Revival house facing northwest (c. 1851 or 1859)

The original building is situated on land patented to ancestors of Philip Barger, Jr., and sold to James Patton Preston, who would become a governor of Virginia, in 1803. Whether the building had been built by Barger or a member of the Preston family is not clear, though research has indicated a date of 1801 for felling of logs still in place. It is possible that the log pen was moved here as late as the 1830s, though the facts are vague on this matter. Preston sold the land to his uncle, Granville Smith, in 1807 but repurchased it at some time between 1822 and 1850. By 1834 Preston’s son Robert was living there with his family, and it was he who trebled the early volume with additions above and beside it, variously reported as having been done in 1851 or 1859. Log buildings were often covered with clapboards in Virginia, for protection of the inner materials, to fend off wind infiltration and as a matter of finesse. As cultural life and regard for the stature implied by property ownership developed in the region, more refined exteriors and interiors developed accordingly. By mid-century, when the house was radically altered to face toward the northwest, both clapboarding and a broad front porch suggested a house of some importance. The new entry hall, with its imposing winding stair and massive door casings, shows without doubt a yearning for beauty and a measure of elegance. Incorporation of the earliest segment with new, more spacious neighboring rooms resulted in a peculiar adaptation on the second floor. There, the room above the original first floor volume was reached by steps leading down from the foyer balcony. Thus it is also taller than the others. Its windows facing northwest exhibit pairs of sashes atop a wood dado panel, which in turn sits atop a small hinged-top cabinet. Only the sashes are visible on the exterior, appearing to be duplicates of the other windows on the newly created 1850s principal façade. That unique upper room is envisioned today as the repository of The Palmer Collection of 19th century Appalachian artifacts.

The building passed into public ownership as a college farm for Virginia’s Morrill Act Land Grant institution in 1872, though still lived in by the Preston family until 1881. Thereafter it was adapted serially for use as an infirmary (1883-1886) and residential quarters for faculty families until the 1940s, when it became a clubhouse for the influx of former World War II soldiers reaping the educational benefits of that era. Soon professors and their families returned and began to share space with The Hokie Club until the mid 1970s. Other uses followed, including a nutrition lab, interior design studios, offices for the College of Human Resources and, most recently, as a office and teaching spaces for the Appalachian Studies program. Since the transfer of Solitude to institutional ownership in 1872, the house has been subjected to piecemeal adaptations as occupants and functional requirements have changed. Some building components have been altered or relocated. Building systems, especially heating, electrical services and plumbing have been added and extended, yet none is suitable today. Excavation in the former crawl space to accommodate utilities has created new maintenance issues. Structurally the building is clearly in a compromised state requiring intervention before further safe use can be assured. Altogether the record of successive physical changes remains largely intact.
Only two of the 19th century outbuildings remain – a wood building near the house to the east and a stone-and-wood springhouse at the pond to the west. Both appear to have received remedial care, the authenticity of which is difficult to assess without having seen the prior conditions.

Since the last written report of 1997, the wood outbuilding, referred to in records as “the log building,” seems to have had many of its more deteriorated exterior wood materials replaced. Having begun as a log structure and sheathed with clapboards then or later, it was enlarged to the northeast with a board-and-batten frame addition at an undetermined date. A simply framed wood porch to the northwest spans the original segment only. Standing-seam metal roofing covers both segments, though it is not known whether or not the first roofing material was metal or wood. The exterior appearance is markedly pristine, particularly at the porch, where very new unblemished wood members have been installed. Raised above grade on small piers of stacked stones, the original segment has avoided some of the deterioration evident along the base of the addition. Interior plaster wall surfaces are obviously of recent date and incorporate new electrical service outlets. Undated drawings in University archives, probably prepared for recent remedial work, suggest that logs remain within the clapboard and plaster encasement of the original segment. Yet the drawing does not distinguish between existing and new materials, giving the impression of a substantial rebuilding effort. We commend the fact that the idea of the building has been retained, perhaps with some of its earliest fabric, though we regret the sense of material inauthenticity and sterility resulting from such extensive reworking. The general absence of patina belies the suggestion that the building is truly representative of its humble origins or that the craft of building as it was known prior to the machine age was once employed here. This approach may well have been the only effective alternative to complete loss of the outbuilding, which is believed to have been in ruinous condition by the late 1990s. This building is said to have been used lately for instructional purposes. Future work at the main house should consider the approach employed here to be a cautionary example in regard to aggressive replacement of early building fabric.

The springhouse also appears to have been partially rebuilt, though with somewhat less aggressive interventions and a greater sense of material authenticity. The upper zone of wood seems a reuse of heavy timber construction to which some plaster lathing remains attached. The stone base is of crude construction using irregular stones shaped only enough to produce walls that are essentially flat inside and out. Stone sizes and coursing is inconsistent from one wall to another. On the interior two spaces were created by insertion of wood planking on heavy rough-cut wood beams and joists. The upper space, with its floor approximately two feet above the porch floor level, was surrounded by chinked logs and had no windows. Below, a zone showing remnants of a plastered ceiling stands in water about one foot in depth with windows now absent what must have been glazed panels of some description. Water enters from the pond through a damaged wall to the southwest. Further research would be needed to determine the original conditions explaining placement of this building relative to a spring, which presumably surfaced inside, as well as the pond, which could have changed as the nearby landscape has been altered over the years. Given its perilous location, the springhouse seems surprisingly stable, though without a present-day use.

* This study has benefited substantially from reporting compiled in 1997 for Virginia Tech by architect Gibson Worsham, of Christiansburg, Virginia.
Chapter III: Survey Reference Maps and Plans

- Virginia Tech Main Campus Map
- Solitude Site Map
- Simplified Reference Plans for Solitude
Chapter III: Site Conditions

*Solitude* stands at the heart of a site of great importance to Virginia Tech. Arriving from the west along Duck Pond Drive, one enters a bucolic atmosphere of lakes and rolling landscape. Through the trees *Solitude* and its nearby springhouse seem as much a part of the water as the rising ground behind them, institutional buildings to the east and the much taller hill to the south upon which stands The Grove, official residence of the president. At closer range the cloud of trees gives way to a large grassy expanse once occupied by outbuildings, now unclaimed except by *Solitude* and its two small outbuildings, the pond, and a parking lot. It is from that lot that many visitors receive their first close view, as the low rise descends gradually to water’s edge. One sees the back of the main house first, accompanied by the rebuilt rear outbuilding to the right. Beyond and blocked from view is the springhouse. Other outbuildings and probable fencing have disappeared.

At first glance the immediate context prompts concern. Both *Solitude* and the springhouse lie very close to the ground, so close that the risk of termite infestation is a near certainty. Edge conditions at the north and east ends of *Solitude* also show the effects of saturated soil near a wood structure. The ground itself seems soft, leading one to wonder about drainage characteristics and the probability of unrelieved levels of saturation just below the ground surface. Vegetation thrives in the moist, fertile ground.

Photographs of the small rear outbuilding prior to rebuilding show a log structure *in extremis*. Base components of both wood and stone have dislocated and crumbled. Walls tilt and the eave line sags a foot or more below the horizontal. Vines have easily overtaken portions of the log and clapboard structure. Since that building is situated on slightly higher ground that the main house, *Solitude*’s need for constant caretaking is fully demonstrated.

At the main house a first impression of overall stability is somewhat undercut by examination of the wood siding. Clapboards on southeast and southwest façades show that vertical movement of wall planes has occurred. Such movement could be owing to problems with footings or decay of wood sills. Conditions in the partially excavated basement confirm both. However, exposed soil in the remaining crawl spaces is not as damp as might be feared, albeit a condition that surely varies across wet and dry seasons. But evidence of recent episodes of water intrusion through the below-grade entry door and of standing water, despite the presence of a small floor drain inlet, reconfirm suspicions that the building rests uneasily in the equivalent of a floodplain.

Briefly stated, the site possesses a host of characteristics that do not bode well for wooden buildings. Such buildings must be cared for on a continual schedule of more than routine maintenance. More important still is the need for them to be inhabited throughout the year, keeping interior climates within manageable spectra of heat and humidity levels.
Chapter III: Architectural Conditions - Exterior

The house named Solitude presents to passersby three rather different impressions. The front, facing northwest, gives an impression of stability and graceful simplicity. Viewed from the southwest, it expresses additive change, for there one sees each of the three building epochs – 1801, 1834 and the 1850s – clearly expressed but unified as a neat and compact assemblage. But from the east, which is probably the most frequent approach, the composition seems to be a mixture of random parts indifferently kept. The pastoral surroundings, especially toward the west, are both handsome and unsettling, the latter because of close proximity to a large pond. Placement of a timber structure on what would seem to be saturated soil provokes concern about attack of both masonry and wood. Fortunately the house is not crowded by many trees or shrubs, allowing air and sunlight to partially mitigate the considerable ambient moisture and potential sources of decay, such as mildew. That a house built in the fragile manner of Solitude has survived over two centuries is remarkable, even more so in this location.

Foundations

Foundation materials at Solitude were stone and brick. Stone was used in the form of rock piers and more regular continuous stone support walls beneath heavy wood sills and lighter porch construction at the 1801 and 1834 segments. Previous reporting suggests that this collection of stone might have been rearranged as enlargement and piecemeal modifications occurred. The change to brick foundation materials in the 1850s, both for piers and subsequent haphazardly executed closure panels, is a simple fact without explanation. Today the entire building gives the appearance of having a continuous foundation wall, though inspection shows that the continuity was achieved in many phases. This variety in materials is not especially obvious since the house sits so low to the ground plane, which slopes diagonally across the building, from east to west.

Placement near the pond gives rise to concern about settlement. On the exterior, the principal evidence for such dislocation is on the southwest façade at the small porch. Declination of clapboarding is severe to the left of the doorway. This door opens into the passageway created in 1834 when the first expansion of the early log pen was built. Similar vertical dislocation is evident at the south end of the building, where the 1834 extension meets the lean-to. At the north corner of the 1850s segment, a solid mastic material has been applied to soil against the foundation to the right of the brick chimney. This odd feature might represent an attempt to forestall entry of water through the foundation, but one fears that water is trapped inside both masonry and wood materials inside. Extensive wood replacement just to the interior in recent years suggests that result as well. Shrubbery at this same location and in a few other locations should be discouraged due to the certainty that root systems will invade foundations, especially when foundations contain lime-rich mortar.
Exterior walls

Wood clapboarding might have been used here as early as 1801 to sheathe the less refined log construction of the one-room pen. If not then, soon after it did come to represent the public face of Solitude. Continuous clapboarding hides the joint between 1801 and 1834 segments facing southwest in the same manner that it blends 1801 and 1850s facades to the northwest. The single conclusion that can be drawn from the two-story clapboard facades facing northwest and southwest is that clapboarding was installed across both at the same time to marry all three segments. Whether or not some planking was reused would require further investigation. Vertical planks hide seams between different eras of clapboarding where rear extensions abut taller segments and at the rear porch, where the 1834 interior hallway/passageway is defined on the exterior. Thus one can surmise with some confidence that those rear extensions and the hallway/passageway closure were of later date. Near grade, the lowest planks show some distress from splashing of rainwater and expectable decay processes reinforced by the climate. Similar degradation is apparent where one-story porch roofs encourage splashing against adjacent walls and wood trim. Paint accretion on clapboards is considerable. Successive episodes of scraping and repainting have seriously damaged much of the edge beading on each plank, making visual conclusions about wood replacements difficult. Archival photographs show the building painted usually in light tones except for use of dark paint on entablature and porch trim as well as shutters from time to time. Exterior walls appear to be in fair condition with the exception of localized areas of rot. Bacteria and fungal growths are present on the northeast façade, which is not abnormal but should be washed away. The presence of many irregularly cut planks is not deemed undesirable, but instead contributes to the sense of authenticity that should exist here.

Roofing

Roof types at Solitude are of five types:

1. a single gable roof spanning the 1801 and 1934 segments at the second floor;
2. a 4-sided hipped roof on the taller 1850s segment;
3. a 3-sided hipped roof atop the front porch;
4. simple shed roofs atop the one-story rear porches and room extensions; and
5. a simple gable roof atop the small porch on the southwest façade.

Current materials are metal, probably terne-coated steel, said to be of post-1900 vintage. Dimensions between standing seams and between lateral flat seams, on upper roof panels, accord with such dating. Lower edges of the upper panels show evidence of having been lifted temporarily for installation of gutters, of half-round profile and recent vintage, secured by metal straps nailed into roof decking beneath the roofing metal. Roofing panels used on the two porches are newer than those on the upper roofs. All roofing is painted dark gray or black. All available archival photographs show standing-seam roof coverings except one, which seems to show a much more textured roof surface, likely to have been wood shingles. A roof hatch is located on the rear slope of the topmost roof near its west end. Roofing, thought rusting in spots, appears to be in fair condition, but wood planks serving as counter-flashing along porch roofs are more severely deteriorated in some areas. Rainwater should be collected at grade and led far from the building to reduce soil dampness immediately adjacent to this wood building.
Selected Features

Covered porches provide entry from three directions:

1. a rear porch allowing entry to the 1850s main foyer and, potentially, the 1834 hallway/passageway and the small rear extension to the 1850s segment – probably the most often used of the three porches;
2. a front porch facing northwest, certainly the most impressive and comfortable of the three; and
3. a small side porch facing southwest, the least handy of the three due to its height above grade.

The rear porch is built of tongue-and-groove planking on wood joists, all of which are encrusted with gray paint. Its south end spans a stairway descending to a basement entry created sometime during the 20th century. Written reports indicate that the basement was partially excavated prior to 1925 for installation of heating apparatus. But presence of concrete blockwork in some areas shows that later basement modifications have been made. How these periods of activity relate to construction of the stair is unclear, though it does appear to be of the same vintage as abutting concrete sidewalks. The wood porch edge protrudes over the stair about one inch farther than to the north, but for no obvious reason. The single wood column and two pilasters have planar shafts, blocky caps composed of three stacked bands and tall rectangular base trim (at the pilaster only). These features are similar to those used at front-porch columns. This rear porch is situated at the base of a gentle slope from parking lots to the east and is very close to grade. For those reasons, it might offer the most direct and inviting path for persons with disabilities. Since it opens directly into the principal interior foyer, albeit from the back door rather than the front, it is possible that rehabilitation of the building could render this otherwise secondary entry the effective principal entry with respect to ADA considerations.

The front porch has been reconstructed recently, of simple unpainted planks (not tongue-and-groove) atop plain joists painted gray. Its columns and pilasters are essentially the same as found at the rear porch, except that pilasters have an additional vertical block extension between upper cap and ceiling. These columns and pilasters are clearly related to the Greek Revival woodwork vocabulary used at the front entry doors and for major interior spaces created in the 1850s. Also related to the interior is the use of plaster on the façade in a zone extending from a low paneled wood dado to the porch ceiling. The measure of elegance is extremely subtle, yet effective. The new porch floor and fascia boards below rest upon two types of supporting wall. The portion directly in front of the 1801 log pen is of stone; the remainder to the north, is of brick. Whether this demarcation of earlier and later zones was purposeful or accidental is not presently known. Routing of rainwater down the column fronts detracts substantially from the elegance of the front porch.

The small side porch facing southwest has recently been given a new plank floor, detailed in the manner of the new front porch floor and also unpainted. It has a simple though massive wood railing with vertical square pickets. Columns at this porch only have a recessed vertical panel the full length of each face. While the porch floor and roof structure appear to be horizontal, clapboarding on the building betrays substantial vertical movement of foundation and wall members, as mentioned above under Foundations.
Brick chimneys are located at each end of the front block and at the south end of the rear wing, where there are two. Three of the four are tall, red brick structures extending beyond the topmost roof ridges, clearly meant to serve a two-story building. The fourth is shorter and served only the shed-roofed one-story extension of the 1834 segment; it is also in poorer surface condition due to awkward repairs. Brickwork on the four is somewhat irregular, with header courses occurring at various heights, separated by four to seven intervening stretcher courses. The chimneys have not been investigated internally, which is best done with video cameras. Given their age and the known history of the building, one can safely assume that each has needs for cleaning and possible repairs before any attempt to reuse them. External mortar shows some decay and therefore one can assume even greater decay internally, where bituminous constituents in smoke form wood or coal attacks mortar. Common results are degradation of mortar joints, possibly to the extent of allowing leakage, and dislocation of bricks serving as flue liners. Built-up creosote can ignite and cause explosive flue fires. Each chimney shows some deflect in the upper few feet, which arises from two sources. One is “jacking,” which refers to incremental expansion of mortar constituents repeatedly exposed to extremes of heat and cold in the presence of moisture. The effect is exacerbated by heating from the sun. The second factor derives from the action of smoke rising through a flue in spiral fashion, which eventually pulls a spindly chimney sideways and helically. Such deflections need to be addressed before they chimney becomes unstable enough to topple. Each chimney shows some migration of water and mineral salts through the bricks to their faces, where dried salts appear as a white film or crust. Such migration cannot be avoided since the naturally absorptive bricks sit in relatively damp earth. The two chimneys on the southeast façade have metal caps, unlike the other two which have none.

Windows at Solitude are similar though not absolutely identical to one another. The most typical form is a double sash with muntins subdividing each sash orthogonally. The largest windows, found on the northwest façade, are of the six-over-six type. Their generous size is typical of more important country houses of the first half of the 19th century in Virginia. One that same façade, thin vertical lights composed of four panes flank the first-floor entry doors and the central second-floor window illuminating the upper stair balcony. Similar double sash windows occur at the ends of the 1850s segment and along its rear wall, with one exception at the southwest end, where the upper window opening was lengthened with a wood panel to be in better accord with the interior space, which has a depressed floor level. Similar but smaller sash windows occur on the 1834 segment, on the west rear-porch wall, and on the one-story rear extension of the 1850s segment. Some sashes, distorted by movement of surrounding building components, should only be disturbed if the surrounding walls are being forced back into position, which is unlikely. Air leakage is chronic, especially where casings have shifted; piecemeal storm window solutions are ineffective and distracting.

Exterior doors are, in all six cases, of panel construction with varying numbers of panels, depending on doorway size. Three incorporate glass inserts. Two have fixed transoms. Most exhibit moderate to heavy wear. Hardware is generally iron for housings and hinges, but locksets have been modified or replaced to accept modern keys.
Chapter III: Architectural Conditions – Interior

Interior conditions at the house named Solitude are currently in transition. First and second floor spaces have served a variety of purposes and been altered according to the need of the moment over the past two centuries. The partially excavated earthen basement zone, which houses equipment and stored materials, has been modified once or more times with installations of concrete, brick and concrete block as retaining walls and water barriers. While the surrounding soil does not seem as sodden as would be expected from the presence of a pond nearby, the basement floods easily during heavy rains when the floor drain is inadequate to sudden load and also clogs with ease. The attic of the house is windowless and essentially unused. Only recently has the building received more than cursory attention to preservation issues. Evidence of that nascent concern is shown by replacement of wood flooring in the first-floor main foyer and north parlor, exposing of plaster by removal of wallpapers and paints, and removal of finishes on doors as well as door and window casings in those same spaces. Those actions have exposed extensive fracturing of plaster, along with which one can expect corresponding breakage of plaster keys that serve to hold plasterwork against wood lath. Building movement witnessed on the exterior walls is even more apparent inside. The upper stair landing in the entry foyer has deflected downward along its curved interior edge so markedly that one senses the need to lean away from the railing to keep from falling over it. Deterioration of wood is most evident in the adjoining north parlor, where decayed flooring has recently been supplanted by very fine heart pine planking. Oral reports indicate that flooring and lower wall conditions were subjected to rot and termite infestation. Some evidence of those conditions remains in lower wall areas where interior wall materials remain exposed. Removal of heavily encrusted paint from doors and trim in the same two spaces has been very aggressive, deforming molding profiles with metal scrapers. By contrast the curved wood handrail at the main stair still exhibits a tolerable accretion of thin varnishes, and spindles appear so undamaged and lightly finished as to suggest that they are of recent vintage. Work in these two spaces has been discontinued until a more comprehensive program for rehabilitation of the entire building can be instituted. Paint analysis has not been conducted.

The following general observations apply to all spaces. Floors and walls are of early to mid 19th-century wood construction. Walls of the earliest segment (c. 1801) were of logs made more presentable with interior and exterior sheathing materials. Walls of the 1834 segment, which are of similar thickness, are probably similar, an idea that should be verified when disassembly of walls there is permitted. Elsewhere, walls are thinner and of lighter wood stud construction though also filled with material similar to noggin, probably for insulation. Presently walls and ceilings are typically plastered. Fireplaces are few, none usable at this time; prior reporting indicates some mantel relocation. Wood trim varies in size and profile, the most distinctive being the generously scaled door and window casings of the 1850s. This style of trim was introduced into the older portion of the composite building to give the main architectural mass a sense of internal unity, belied only by the change in floor level upstairs in the south room located atop the 1801 log pen. Within some 19th-century spaces, subdivision has occurred, first as the 1801 log pen was enlarged, later as changing needs provoked localized modifications, such as bathroom facilities. Such episodic change has produced a measure of disharmony as walls were altered or added and as doors or windows were correspondingly adapted or relocated. Door types are erratic, giving an impression of making do with whatever was at hand. Amidst that cacophony, several interior door casings incorporate a single row of muntined lights above the door to allow light into a windowless space. Basic iron locksets and hinges of the 19th and early 20th centuries are common, as are new bolt mechanisms.
BASEMENT:

Use: Most equipment for heating, electrical and plumbing systems is located here. The single most useful item of protective equipment, a functioning sump pump, is absent. Temporary props offer added support for first-floor joists, which are a combination of large logs roughly dressed on upper and lower faces and later timbers sawn on all four sides. Wood members show evidence of whitewashing, presumably to protect the wood and to brighten this windowless zone; some may also be host to white mold.

Floors: Concrete with one floor drain.

Walls: Retaining walls of concrete, brick and concrete block, seemingly of more than one era, hold back earth still indicating the shallow crawl space depth of approximately three feet or less under the 1850s segment. Brickwork infill between brick piers is of notably irregular coursing.

Doors: The single panel door [2-over-2 wood panels] at the bottom of a steep flight of concrete steps appears to be the principal entryway for rainwater.

Other Observations: Flooding is a constant threat, dependent upon an untrustworthy floor drain.
FIRST FLOOR:

ROOM 1

Use: This former lean-to was either walled at the time it was built or later. Spoken of as a former kitchen space during the early 20th century, no remnants of that usage survive. The southeast wall has been severely damaged by water to a height of five feet at the position of the shorter chimney on the southeast façade. Delaminated paint the full height of that wall indicates water transmission roughly in the shape of the chimney. The adjacent window is oddly placed relative to the chimney and the adjacent interior wall to the west, and its installation is crudely executed. Modern doors, exposed fluorescent lighting, and surface applied metal electrical conduits detract from the otherwise bare country aesthetic of the space.

Floors: Embossed cushioned sheet vinyl floor covering in various terra cotta shades has been installed over wood flooring reportedly replaced in the mid 20th century.

Walls: Painted plaster with wood trim at door, window and floor.

Doors: Old glazed and paneled exterior door [1 large square light over 3 lateral raised wood panels] with recent hardware used at exit to site. Modern aluminum screen-and-glass storm door. Modern flush wood door with new residential hardware opens to Room 2.

Windows: One 6-over-9 double-sash window on southeast wall with wood panel beneath window. Sashes are badly distorted by movement of surrounding wall materials and/or poor installation. Below the window a panel closure suggests that the opening might have been a doorway for a time, as does a pair of vertical cut lines on exterior clapboarding. A smaller 6-over-6 double-sash window is located northwest of the entry door on the northeast wall.

Other Observations: Ceiling height is low and vertical clearance even lower.
**ROOM 2:**

**Use:** This area has been office space until recently and is the most serviceable room in the 1834 segment on first floor. Very recent electrical services are surfaces-mounted. Radiator heating is similarly exposed to view. Walls are in noticeably better condition than elsewhere. Current use for storage of artifacts in open shelving indicates that this room is still in active use.

**Floors:** Narrow recent planking, perhaps part of the reported replacement of floor materials in the mid 20th century.

**Walls:** Painted plaster with wood trim at door, window and floor plus a chair rail extending to either side of the window at windowsill height.

**Doors:** Modern flush wood doors with new residential hardware open to Rooms 1 and 4.

**Windows:** One 6-over-9 double-sash window on southeast wall and a second on the southwest wall.
ROOM 3

Use: This former porch or passageway area is one of the later spaces to have been enclosed. This fact is clear from the manner in which the clapboarding on the northeast wall was applied. Other evidence of openness is the doorway to Room 4, which incorporates a glazed over-door panel, just as the exterior door opposite in Room 4. Both would have allowed light to enter an otherwise windowless space from the exterior. Remnant equipment attests to conversion of the room to laboratory use, reportedly in the 1970s.

Floors: Square vinyl asbestos tile flooring in poor condition installed atop wood flooring reportedly replaced in the mid 20th century.

Walls: Plastered walls show widespread surface delamination and other evidence of water retention. Located near the floor, the causes of this degradation are not altogether clear at this time, but it is likely that both wall and sealed floor conditions are factors.

Doors: Old paneled door [2-over-2 raised wood panels] painted light green.

Windows: A pair of small double-sash windows flanking the exterior entry, one 2-over 2 and the other 4-over-4. Both are crudely installed.

Other Observations: Segments of door and window casings are missing from the northeast wall, without explanation. Installation of equipment and electrical services are particularly awkward.
ROOM 4:

Use: This entry married the 1801 and 1834 segments at first-floor level and also provided access upstairs via a single flight of steps, the lower few turning in fan fashion at first floor. A tiny closet with its own small window occupies the west corner.

Floors: Narrow recent planking, perhaps part of the reported replacement of floor materials in the mid 20th century. The floor plane is not perfectly horizontal, due either to deflection of lateral support members or vertical piers or both. This deflection is mirrored more obviously by clapboards on the southwest façade beneath the porch roof. Present wood flooring might be part of the reported replacement of floor materials in the mid 20th century.

Walls: Plaster in moderate condition. Ceiling indicates past problems with water penetration, possibly from plumbing above. Remnant evidence of clapboarding on the northwest wall references the earliest years here, when clapboarding covered the original log pen.


Windows: Closet has one fixed 6-pane muntined window

Other Observations: Extremely simple stair woodwork appears little changed for many years. Surface-applied electrical and radiator heating equipment are of recent vintage.
ROOM 5:

Use: This space of the building is the oldest, though changed in appearance. Its thick log walls remain within sheaths of plaster and clapboarding. Two features make this space unique: a relatively low ceiling and a pair of closets with over-door glazed panels. The former, which would appear less oppressive if the suspended modern ceiling were removed, has implications for Room 12 above. The latter seem in keeping with similar doorways in Room 4 at an abstract level, though odd for closets and not repeated elsewhere in the building. Their presence and manner of construction suggest that the closets are of later vintage than surrounding building fabric, especially the use of 6-panel doors.

Floors: Planking of the type one would expect to find in such houses in mid-19th-century Virginia.

Walls: Plaster walls are in moderate condition, but extent of damage to ceiling plasterwork awaits removal of the modern suspended acoustical ceiling with recessed light troffers.

Doors: Pair of old paneled doors [2 raised vertical wood panels each] opens to Room 6. One old paneled door [2-over-2 raised vertical wood panels] opens to Room 4. Two paneled doors [2-over-2-over2 raised wood panels] at the closets. Hardware changes are evident, though this room might contain some of the oldest extant pieces.

Windows: Three 6-over-6 double-hung sash windows, presumably of the 1850s when this early space was modified for the second time. Casings incorporate short dado panels beneath the sashes. Further examination when the suspended ceiling apparatus is dismantled will show whether casings are identical or just similar to those in neighboring 1850s spaces.

Other Observations: The chimney in this room, as elsewhere has been closed, leading one to assume that flue conditions could be compromised and unsafe. Present closures prevent close examination of early hearth and firebox conditions. Wood casings and base materials have been modified to harmonize with the design ethic introduced in the 1850s in adjacent rooms to the north. Previous reporting suggests a change in chimney location to the southwest wall in the 1850s and notes the similarity of mantel detailing from this room to the 1834 segment. It is also similar to mantel detailing in Room 7. It would thus appear that all three were installed new in the 1850s to unify the three building segments. The simplicity of their design is also in keeping with the Greek Revival ethic used elsewhere in the 1850s segment.
ROOM 6:

Use: This two-story entry space was built in the 1850s as the central feature of an almost symmetrical plan with parlors to either side. To the left was a new parlor; to the right was the 1801 segment, which was adapted to harmonize with the new intent. Its size is good for a gracious entry hall.

Floors: Original floor planks have recently been removed. Temporary OSB panels have been installed atop extant wood joists.

Walls: Plaster walls, covered with wallpaper until recently, are severely damaged due to movement of building fabric to which lathing is attached. Remnants of some wallpaper remain in the east corner.

Doors: Raised panel wood doors of differing proportions occur at each doorway. Each leaf of the principal entry pair exhibits three stacked panels, while each leaf of the pair opening to Room 5 has two. Single doors to Room 7, the basement and the rear porch exhibit a 2-over-2 arrangement. Hardware, some of which is probably original to this space, is remarkably simple, of iron and surface-mounted.

Windows: Mantined sidelights, each composed of 4 stacked panes, provide natural light in the absence of first-floor windows. A 6-over-6 double-sash window atop a raised wood dado panel illuminates the intermediate landing to the southeast.

Other Observations: Woodwork is used emphatically in this entry space. Wood bases material is very tall for the proportions of the space. Doorways are surrounded by plain banded casings which, where space allows, have a depressed gable shape (plus a central block at the principal entry) emblematic of mid 19th-century Greek Revival taste in the American South. Stair woodwork, on the other hand, recalls the Georgian ethic in Virginia. The curved handrail appears to be old, possibly of the 1850s, while supporting turned spindles exhibit no similar patina. Perhaps the spindles are replacement pieces. Removal of encrusted finishes from all woodwork except the stair balustrade has been very aggressive and seems to have dulled some of the molding profiles.
ROOM 7:

Use: Used until recently as a classroom and meeting room, this space was the first-floor parlor added in the 1850s. To the rear a small darkroom occupies the north end of the rear porch.

Floors: Original floor planks have recently been replaced by very good wide planking, still unfinished. Protective fibrous boards now in place should be replaced by less absorptive protective materials lest bacterial growths infest the unprotected wood.

Walls: Construction was of the braced stud type to which brick-and-mortar noggin was added. Atop that was wood lathing and plaster. Remaining plaster has been seriously damaged by moisture and movement and/or vibration of building fabric to which lathing is attached. Wood members in walls near the floor and early floor materials, now replaced, have evidenced severe decay from rot and termite infestation. It is not clear whether replacement wood has been effectively protected from further decay by adjustments to grade and runoff conditions in the immediate area of the northeast wall. This area is said to have been treated recently for termites.


Windows: Three windows light this space. Two are of the 6-over-6 type double-sash that predominates at Solitude, while the window in the northeast wall is of the 2-over-2 type. The reason for that difference is not known. Casings on the northwest wall incorporate short dado panels beneath the sashes and are crossetted. Again the casing on the northwest wall is dissimilar, having neither dado nor crossettes.

Other Observations: Wood casings and base materials are of the Greek Revival style adopted for the entry hall. Removal of encrusted finishes from all woodwork has been very aggressive and seems to have dulled some of the molding profiles. Detailing of the mantel matches that of the mantel in Room 5. Recent removal of ceiling plaster and lathing allows a view of 1850s floor/ceiling construction, which is absent clay “deadening,” an attempt to insulate sometimes found in Virginia houses of the period. Water seems to be entering the room from above, perhaps in connection with plumbing or vent lines.
**ROOM 8:**

**Use:** This small room, projecting from the rear of the main block at first-floor level only, may have been open, as part of the rear porch. Its exterior entry, having an over-door glazed panel, and two now-closed windows might indicate plausible use for one or more of the residential tenants who occupied Solitude over the years. It has been darkened with paint and temporary window closure panels for use as photographic darkroom, reportedly since the mid 1970s.

**Floors:** Square vinyl asbestos tile flooring in poor condition after long use.

**Walls:** Plaster.

**Doors:** One old paneled door [1-over-2-over-2 raised wood panels, alternating vertical and lateral orientations] opens to Room 7. One paneled door [2-over-2-over-2 raised wood panels] opens to the rear porch.

**Windows:** Two small 6-over-6 double-sash windows now darkened by interior panels.
SECOND FLOOR:

ROOM 9:

Use: This former bedroom of the 1850s has been reduced in size twice, first by creation of a bathroom and vestibule (Room 10), later by installation of a one-sided stud partition to create a narrow workroom and passageway (Room 9B). The remainder (Room 9A) is now cramped in proportions, both laterally and, due to modest ceiling height, vertically. A wood light baffle hides lighting along three sides of the room. A wood mantel located on the northeast wall is a less refined version of the first-floor mantels, but still essentially Greek Revival.

Floors: Planking of fairly uniform width, probably of the 1850s.

Walls: Plaster on original walls is in fair condition. The recent stud partition is faced with sheets of grooved paneling painted white on the side opposite the fireplace.

Doors: A modern unpainted flush-panel wood door separates Room 9A from Room 9B. A painted panel door [2-over-2 raised vertical wood panels] opens to Room 10. Door heights and door casings vary. Bull’s-eye corner blocks distinguish some of these casings from the much larger Greek Revival casings installed in the 1850s.

Windows: Windows are of the 6-over-6 type double-sash that predominates at Solitude and exhibit dadoed Greek Revival casings similar to those on first floor.

Other Observations: Radiator heating in this area is of very recent vintage.
ROOM 10:

Use: Room 10 was created out of Room 9 when plumbing was installed at Solitude. The small vestibule also serves as passageway between Room 9 and Room 11.

Floors: Planking of fairly uniform width, probably of the 1850s, in the vestibule. Square vinyl asbestos tile flooring in poor condition in the toilet room.

Walls: Patterned wallpaper in the vestibule, with a painted ceiling. Painted plaster above a painted wood wainscot, of flush vertical planking with a molded wood cap, and below a modern suspended acoustical ceiling with recessed fluorescent light troffer.

Doors: Painted wood panel doors [2-over-2 raised vertical panels] open from the vestibule to Room 9, the toilet room and the toilet room closet. A similar early door to Room 111 has been replaced by a flush wood door. Door heights and door casings vary. Bull’s-eye corner blocks distinguish some of these casings from the much larger Greek Revival casings installed in the 1850s.

Windows: Windows are of the 6-over-6 type double-sash that predominates at Solitude and exhibit dadoed Greek Revival casings similar to those in first floor 1850s spaces.

Other Observations: Absence of a tub and presence of a urinal suggest alteration from family bathroom to general use as a toilet only. Missing ceiling panel in toilet room reveals decayed wood ceiling joists above, perhaps the result of prior roof leakage. Radiator heating in this area is of very recent vintage.
ROOM 11:

Use: Room 111 is the upper-story extension of Room 6 below. It appears to be essentially unaltered, save for the loss of the door to Room 10, now replaced by a flush-panel wood door. The generously-sized second-floor landing is approached from below by an open stair of two flights joined by an intermediate landing along the southeast wall.

Floors: Planking of fairly uniform-width, probably of the 1850s, in the vestibule.

Walls: Plaster walls, covered with wallpaper until recently, are severely damaged due to movement of building fabric to which lathing is attached.

Doors: One old paneled door [2-over-2 raised vertical wood panels] opens to Room 12. A similar early door to Room 111 has been replaced by a flush wood door.

Windows: The principal window array on the northwest wall consists of one 6-over-6 double-sash unit identical to neighboring second floor windows but flanked by a pair of fixed vertical muntined sidelights, each having four stacked panes. The surrounding Greek Revival casing differs from those in neighboring windows by having a raised central segment. Dado panels are located beneath the central window and sidelights. A 6-over-6 double-sash window atop a raised wood dado panel illuminates the intermediate landing to the southeast. That window is raised to the height of other second-floor windows, thus requiring a much taller dado panel below.

Other Observations: The upper landing slopes alarmingly toward the center of the space. This condition must be carefully studied and rectified before the second floor is used again. This space appears to have had a ceiling-mounted light fixture prior to installation of the present fluorescent troffer unit. The curved handrail appears to be old, possibly of the 1850s, while supporting turned spindles exhibit no similar patina. Perhaps the spindles are replacement pieces. A wood handrail of recent vintage is attached to the wall along the full length of travel. Removal of encrusted finishes from all woodwork except the stair balustrade has been very aggressive and seems to have dulled some of the molding profiles.
ROOM 12:

Use: This space sits atop the original 1801 log pen. It was first built in 1834, when the segment to the east was added, then rebuilt in the 1850s when the taller block facing northwest was created. At that time, the 1834 floor level was retained for this room, lower by approximately twenty inches than neighboring 1851 rooms on the second floor. That offset remains, traversed by three steps from Room 11. [NOTE: The immediate change of elevation at the door between Rooms 11 and 12 would not seem to meet present code requirements, as a falling hazard.] The room has been used as a library, reportedly since the 1970s. Shelves and cabinetry of that time or later block a doorway that once connected Rooms 12 and 13.

Floors: Random-width planking.

Walls: Plaster in fair condition below a modern suspended acoustical ceiling with recessed fluorescent light troffer. The northwest wall and wood dado panels beneath windows there show evidence of water intrusion, probably from the upper edge of the adjacent porch roof.

Doors: One old paneled door [2-over-2 raised vertical wood panels] opens to Room 11.

Windows: Windows are of the 6-over-6 type double-sash that predominates at Solitude. Further examination when the suspended ceiling apparatus is dismantled will show whether casings are identical or just similar to those in neighboring 1850s spaces on the second floor. The dadoes are taller due to the lower floor of this space.

Other Observations: The decorative wood mantel is similar to that found in Room 15. The age of both is unclear, though prior reporting posits relocation from Room 105 when it was remodeled with a Greek Revival mantel. Wood hinged-top cabinets, approximately twenty inches tall, project from the window casings on the northwest wall. Some have surmised that they were installed to allow children to see over the unusually high sills of these two windows. Radiator heating in this area is of very recent vintage.
ROOM 13:

Use: The evolution of this small space is not yet clear with respect to walls that currently define the stair and Room 14. All four small spaces share a chair rail detail found only in the 1834 segment, yet interruption of that rail in Room 13 shows that some change has occurred. Currently Room 13 serves as a vestibule connecting the stair with Rooms 12, 14 and 15.

Floors: Painted planking of moderate and fairly uniform width. Stair treads are also painted.

Walls: Plaster with plaster ceiling.

Doors: Panel doors [2-over-2-over-2 raised wood panels] open to Rooms 12, 14 and 15. No door separates the vestibule from the stair and the casing there is atypical, lacking one vertical face.

Windows: One small 6-over-6 double-sash unit.

Other Observations: Radiator heating in this area is of very recent vintage.
ROOM 14:

Use: A toilet was reportedly installed here in the 1970s, presumably by subtraction from a larger Room 13.

Floors: Square vinyl asbestos tile flooring in moderate condition.

Walls: Plaster in good condition except for evidence of a roof leak that has damaged the ceiling.

Doors: One paneled door [2-over-2-over-2 raised wood panels] opens to Room 11.

Windows: One small 6-over-6 double-sash unit.

Other Observations: Radiator heating in this area is of very recent vintage.
ROOM 15:

Use: This former bedroom space has been used recently for academic purposes and storage of pieces from the collection of the Center for Appalachian Studies.

Floors: Painted planking of moderate and fairly uniform width.

Walls: Plaster in fair condition, showing evidence of stress and repair in wainscot and ceiling.

Doors: One panel door [2-over-2-over-2 raised wood panels] opens to Room 13. A smaller door opens to a closet in the west corner.

Windows: Two small 6-over-6 double-sash units.

Other Observations: Work to improve this room is very recent. The mantel is very similar to the one now located in Room 12, though slightly less elaborated with molding and panel variations.
ATTIC:

Comments: The attic of the main block is unused. The space beneath the hipped roof is framed with wood rafters to which wide planking, separated by open spaces approximately six inches wide, is attached as decking. Roofing materials are visible through the open spaces. Below, loose fill insulation fills the spaces between second-floor ceiling joists. Electrical conduits and cables lie atop rafters and insulation. The attic does not have a floor.

Water stains on decking indicate past roof leaks. Closer inspection from the exterior will be needed to determine if the metal roofing is compromised and in need of either repairs or replacement. Terne-coated metal roofing, probably the material in place here, can last many decades if carefully maintained.

The lower gable roof over the 1834 segment is thought to have similar conditions but has not yet been examined.
Chapter III: Structural Conditions

To assess the structural systems and components at Solitude, Commonwealth Architects engaged the engineering firm Robert Silman Associates, of Washington, DC, as consultant. Their due diligence report assesses present circumstances and predicts needs that can be surmised from the general understanding that the building is to be rehabilitated as a Center for Appalachian Studies, with offices, classrooms and presentation spaces.

For buildings of Solitude’s age and construction, some deterioration is to be expected. Given its location near the pond and close to the ground, that expectation is encouraged even more. We note the consultant’s conclusion that the building in its current state is structurally inadequate and that deeper analysis of its structural deficiencies to determine precise remedies is necessary. We do not see this message as a death blow to keeping and using Solitude, but instead it is a challenge to take the necessary measures now to ensure its survival.

The following Structural Investigation of Solitude was prepared by:

Robert Silman Associates / Structural Engineers
1053 31st Street, NW
Washington, DC 20007
INTRODUCTION

RSA conducted an on-site investigation and condition assessment of Solitude at Virginia Polytechnic Institute and State University on February 12, 2007. The purpose of our investigation was to identify the major structural systems of the building, assess its current condition, and comment on the feasibility of adapting this structure for future academic use.

Description

Solitude is a historic two story house located on the campus of Virginia Tech in Blacksburg, Virginia. Constructed in the early nineteenth century, it is listed on the National Register of Historic Places and the Virginia Landmarks Register of Historic Places.

According to the Historic Structures Report for Solitude prepared by Gibson Worsham, Architect, there are three primary periods of construction represented at Solitude. The original structure was built in 1801, and consists of log pen construction. The first additions were added in 1834, and consist of log pen and log lean-to construction. The final major addition was added in either 1851 or 1859, according to the source cited. The construction type for the 1859 addition is sawn timber framing and wood wall studs with brick nogging. In 1970 a section of the back porch was enclosed to form a darkroom.

There are two ancillary structures associated with Solitude. The first is the wood outbuilding, or log outbuilding, which is located to the northeast of Solitude and dates to approximately 1843. The second is the springhouse located to the southwest.

Observations and Conditions

Note: the First and Second Floor Plans shown in figures A1 and A2 (see Appendix A), and the room designations used in this report are based on the Historic Structures Report prepared by Gibson Worsham, Architect, and documents and drawings prepared by Mr. Zhu  and reformulated by Mr. Bryan Townes.

Site Observations

The site topography on the south and east faces of Solitude pitches towards the building. The grading is likely contributing to moisture problems, water infiltration issues, and differential settlement in the building.

1 Heikkenen, Herman J., “The Year of Construction of Solitude Dependency, as Derived by Key-Year Dendrochronology,” by Dendrochronology, Inc. 1990.


General Interior Observations

Significant wall movements were noted in many locations. These are likely due to settlement of the foundations, and deterioration of the wood sill and wall studs from rot and termite attack leading to crushing of the remaining wood and subsequent deformation.

The original building framing at the first floor appears to have sustained extensive deterioration from rot and termites. The sills that were observed showed signs of varying degrees of deterioration. Crushing of the wood in the deteriorated sills is likely contributing to the movement and settlement observed in the walls (see below).

The second floor framing for the structure was not visible, except in Room 7 where the ceiling finishes have been removed. Please see below.

FOUNDATIONS/BASEMENT

The foundations of Solitude consist of stone and multi-wythe brick construction. The western section of the north foundation wall and the west foundation of Room 5 have been reinforced with a partial height concrete masonry unit wall within the basement. The subgrade located in the crawlspace beneath Room 7 appears to be retained by a concrete masonry unit kneewall (Fig. 1).

The foundations appear to have undergone considerable settlement and physical deterioration, likely due to water infiltration caused by poor site drainage, and possibly exacerbated by clayey subgrade soils that are common to the region (Fig. 2).

FIRST FLOOR AND FIRST FLOOR FRAMING

Room 1

Room 1 is part of the 1834 addition and consists of log lean-to construction. There is extensive evidence of movement, with cracking in the plaster walls and ceiling and highly visible racking in the south window (Fig. 3). The south wall is leaning outward noticeably, especially at the window, possibly the result of deterioration of the sill and/or the log framing. There are also signs of water damage at the former location of the fireplace, which is still intact on the exterior but has been removed on the interior of the building (Fig. 4).

Room 2

Room 2 is part of the 1834 addition and consists of log lean-to construction. There are signs of significant movement and distress in this section, most notably in the south wall adjacent to Room 1. There is widespread cracking in the plaster ceiling and walls and severe racking in the south window (Fig. 5). The south wall is leaning outward significantly, with the most significant movement occurring at the wall adjacent to Room 1 (Fig. 6).

Room 3

Room 3 was constructed as part of the 1834 addition and consists of log lean-to construction. There is evidence of moisture intrusion in this area, including peeling paint, and staining and cracking in the plaster (Figs. 7 and 8).
Room 4

Room 4 was constructed as part of the 1834 addition and consists of log pen construction. The exterior wall near the west doorway is sagging visibly, likely the result of foundation settlement or deterioration of the logs framing the pen. The plaster walls are cracked, especially over the doorways. The stairway to the second floor is leaning sharply towards the interior of the room (Fig. 9).

Room 5

Room 5 represents the original log pen that was constructed in 1801. The room appears to be in fairly good condition overall. A large sag in the floor was noted near the east wall of the room (Fig. 10 and 11). Some cracking was present in the wall and ceiling plaster.

The first floor framing in Room 5 consists of log joists spanning to wood sills. The existing framing has been shored using wood beams and posts, steel lally columns, and a wood stud kneewall built-up on the partial height concrete masonry unit wall on the interior of the north foundation wall. The log joists and the wood shoring beam have deflected noticeably (Fig. 12).

Room 6

Room 6 is part of the 1859 addition and consists of sawn timber studs with brick nogging. There is extensive cracking in the plaster walls, and signs of significant movement and distress. The east and west walls appear to have settled, the ceiling is sagging, and the doorways are distorted (Figs. 13 and 14). The exposed portions of the sill show signs of deterioration due to rot and/or termite attack (Fig. 15). The bottoms of the west wall studs that are exposed to view are completely deteriorated at their bases, and have been cut off in some cases (Figs. 16 and 17).

The original framing in Room 6 consists of log joists spanning between sill supported by the foundation walls. A large notch is cut into each log at the sill. The log joints show signs of severe deterioration due to rot and termite attack. The original framing has been shored using wood beams and posts, and more recently by installing what appear to be temporary floor framing to supplement the original framing. The temporary framing consists of 2x10 joists placed in between the original log joists. A built-up girder supports the joists at the center of the room. The joists are not continuous over the girder; two joists are placed adjacent to each other that overlap at the girder. The joists are supported at the exterior walls by metal joist hangers connected to the sill. The girder is supported by a series of steel lally columns. The lally columns and the wood shoring posts bear on the basement slab (Figs. 18-20).

The floor decking in room 6 has been removed and replaced with 7/16" OSB panels. The framing and the OSB panels deflect noticeably when subjected to load (Fig. 21).

The wall between Rooms 6 and 7 is supported on a timber beam at the first floor level. The wood beam appears shored by an additional timber beam placed beneath the original beam. This beam is in turn supported at mid-span by an 8"x16" concrete masonry unit pier, and is shored by a series of wood posts and steel lally columns bearing on the basement floor slab. The concrete masonry unit pier appears to be undersized, and does not appear to bear on an adequate footing. The beam has deflected significantly, which is likely contributing to the extensive cracking and movement noted in the walls above (Figs. 22 and 23).

Room 7

Room 7 is part of the 1859 addition and is constructed using sawn timber studs with brick nogging. Much of the structure of Room 7 is visible, as large sections of the plaster wall and ceiling finishes have been removed. The wall studs are severely deteriorated by rot and termite attack in several locations, especially at the southeast corner. The brick nogging has fallen out where the studs have deteriorated (Figs. 24-26).
The original framing for the first floor in Room 7 appears to have been removed and replaced with new wood joists. The joists are supported exterior wall sill by metal joist hangers, and bear on a built-up girder in the center of the span. The joists are not continuous over the girder; two joists are placed adjacent to each other that overlap at the girder. The girder is supported by steel lally columns, which appear to be out of plumb.

The second floor framing visible in Room 7 appeared to be in good condition overall, with no signs of rot or deterioration visible. The floor joists are typically 2 ¼" wide and 9 ½" to 10" deep, spaced 20 to 26" o.c. with wood x-bracing at midspan. The joists span north-south approximately 19 feet between the exterior walls. Blocking between the ends of the joists, which is often provided by the brick nogging, is missing in some locations. The flooring for the second level is wood decking, which appears to be in good condition (Fig. 27).

The second joist from the west wall of Room 7 has an 8" deep notch cut into it near the south wall. The notch has significantly weakened the joist, which is sagging significantly. The three joists adjacent to this joist each have three notches cut into them; one 4"x4" notch, and two 2"x2 ½" notches each (Fig. 28).

There is a vent to the upstairs bathroom in the southwest corner of the room. This vent is open to the elements, and appears to be a source of ongoing water intrusion into the building.

Room 8

Room 8 was originally part of the rear porch for the 1859 addition. Part of the porch was enclosed in 1970 to form a darkroom. Cracking was noted in the plaster ceiling, as well as the plaster walls over the doors.

SECOND FLOOR AND SECOND FLOOR FRAMING

Rooms 9A and 9B

Rooms 9A and 9B are part of the 1859 addition. These rooms appear to be in good general condition. Cracks were noted at the corner of the fireplace in Room 9A, as well as a long, single crack running down the center of the ceiling in 9A and 9B.

Room 10

Room 10 is part of the 1859 addition. The floor in this area sags noticeably from a high point in the hallway to a low point in the bathroom due to the notches cut in the floor joists to accommodate plumbing fixtures.

Room 11

Room 11 is part of the 1851 addition. This area shows severe signs of distress. There is extensive cracking in the walls and ceilings, with significant cracks opening between the east and west walls, and the ceiling. The floor is sagging sharply away from the north wall and towards the balcony. The doorways are significantly distorted (Figs. 29-34). The movement is likely associated with adjacent bearing wall settlement along with the effects of overstress in the stair framing and/or connections between framing members.
Room 12
Room 12 is part of the original 1801 log pen construction, and was modified during the 1859 addition. Cracking in the plaster was noted on the north and east walls over the windows, and over the fireplace on the west wall (Fig. 35).

Room 13
Room 13 is part of the 1834 addition. The room appeared to be in generally good condition. A large crack was noted in the plaster wall at the northeast corner of the 1834 addition. A smaller crack was located at the head of the stairs (Fig. 36).

Room 14
Room 14 is part of the 1834 addition, and appeared to be in generally good condition.

Room 15
Room 15 is part of the 1834 addition. The south wall is out of plumb and leaning out, especially at the southeast corner. The wall at the northeast corner is sagging, and the doorway located there is distorted. Cracking was noted in the plaster at the fireplace on the south wall, and in the ceiling (Fig. 37), possibly due to movements in the wall below.

General Exterior Observations
The standing seam metal roof of Solitude appeared to be deteriorating in several locations. This may be a source of water intrusion into the building, and could be contributing to the rot and termite issues noted on the interior of the building.

North Elevation – Exterior
Mildew growth was noted on the bases of the posts supporting the roof of the front porch. Closer investigation revealed extensive rot at each post. The pattern of the mildew growth suggests that the downspouts for the gutters may be malfunctioning and contributing to the moisture issues (Figs. 38 and 39).

The stone and brick foundation walls at the front and sides of the porch appeared to be intact; however approximately 1/3 of the foundations along the northern elevation need re-pointing (Fig. 40).

The large stone steps at the front entrance have tilted back towards the building, indicating differential settlement in the subgrade. As the stones are flanked by downspouts from the porch roof gutters, and mildew buildup suggests that the downspouts are not functioning properly, the settlement may be due to poor drainage and moisture issues in the vicinity of the stones (Fig. 41).

West Elevation – Exterior
The standing seam metal roof appears to be damaged in this area, and may be a source of moisture intrusion into the structure. This may in turn be contributing to the issues noted below. It is likely that roof framing adjacent to the damaged areas will be suffering deterioration; however access to the roof framing was not available at the time of this visit to confirm this.
Large areas of damp brick as well as some spalled brick were noted at the chimney at the west end of Room 5. This is likely caused by damaged flashing at the roof/chimney interface, or other water intrusion issues caused by deterioration of the roof (Fig. 42).

The building wall is sagging visibly from the north and south towards the north edge of the west porch doorway. The sag begins at the edge of the chimney on the north side, and the edge of the porch on the south side.

The outside ends of the decking on the west porch are weathered and bowing. The nails have pulled out of the framing below in many instances, and the decking is coming loose (Fig. 43).

**South Elevation – Exterior**

Severe sagging was observed in the building wall, with the low point in the sag occurring at the joint between the 1834 log pen and the 1834 log lean-to. There is clear evidence of ongoing water intrusion and extensive rot at this location. The wall is bowing outward noticeably, and the windows are highly racked and distorted (Figs. 44 and 45), likely due to deterioration of the sill and/or the log walls of the pen and lean-to.

Large areas of damp and spalled brick were noted on the two chimneys located on the south elevation. Mortar is missing from the joints in several locations. The issues at the chimneys are likely caused by damaged flashing and/or roofing at the roof/chimney interface (Fig. 46).

The plywood decking that makes up the rear porch is weathered and sagging in some locations, but appears to be in fair condition.

**East Elevation – Exterior**

Deterioration and rot was noted at the exterior of Room 7 corresponding to the extensive termite and rot damage noted on the interior. Areas of rot were also noted at the base of the exterior of Room 8.

Distress was noted on the chimney at the east end of Room 7. Spalling and extensive cracking in the brick and mortar joints was observed, as well as evidence of multiple repairs and re-pointings in the past. The patterns of the cracking, repairs and deformation in the masonry suggest that the outermost one-half of the chimney is settling. This is probably due to poor site drainage leading to softening and settling of the subgrade under the chimney foundations (Figs. 47-49).

**Wood Outbuilding or Log Outbuilding**

The Log Outbuilding was constructed ca. 1843, and represented typical log pen construction. According to available documentation, the Outbuilding had greatly deteriorated by the late 1990’s, and only the core of the original construction remained.

The Log Outbuilding has been recently reconstructed, and appears to be in generally good condition. The surviving original portion of the Outbuilding is distinguishable from the new construction, as the door and window on the front of the Outbuilding are distorted with respect to the new clapboard siding (Fig. 50).

The first floor of the Outbuilding consists of new wood joists spanning between timber sills and intermediate girders. The sills and girders are supported on what appears to be dry-stacked stone piers. The remainder of the Outbuilding structure was not visible for observation.
Springhouse

The springhouse is a log structure with stone foundations and a standing seam metal roof located on the edge of the Duck Pond. The structure appears to have been well maintained, and appears to be in good condition. The foundations show signs of recent re-pointing. While the ends of the logs are weathered, they appear to be generally sound. The corner v-notches and the chinking between the logs appear to be intact (Figs. 51-53).


RECOMMENDATIONS

Foundations

Solitude appears to have ongoing foundation settlement issues that seem to be related to poor site drainage and water intrusion into the building and the foundation subgrade. As modifying the site grading to permit water to drain away from the walls on all sides of the building may not be practical, RSA recommends installing a french drain around the perimeter of the building to help alleviate the water issues. We recommend installing a 4” perforated PVC pipe wrapped in filter fabric at the base of the foundation walls, embedded in a granular drainage blanket or tied in to a drainage board placed against the foundation walls. The french drain should be tied in to the storm drain system, or daylighted away from the building if outfall is available.

RSA recommends conducting an investigation with a qualified geotechnical engineer to determine the properties of the subgrade soils, ascertain the likely causes of the observed foundation settlements, and establish options to address the foundation issues.

RSA further recommends re-pointing and possible localized rebuilding of interior and exterior masonry foundation walls. Masonry repair work should be implemented in coordination with exposure of the foundations for drainage treatments.

First Floor Framing

The original framing for much of the first floor has deteriorated as a result of termite attack and rot. Many of the original members are not suitable for use without repairs or reinforcing.

Temporary shoring and framing has been installed at different times to supplement and reinforce the original framing; however the temporary shoring is not adequate for the new use that has been proposed for the structure.

RSA recommends thoroughly investigating the first floor framing to better gauge how much of the existing framing is suitable for repair and re-use. Existing members should be repaired and reinforced where possible to preserve the historic fabric of the structure, and new framing should be added where required for the floor framing to meet the requirements of the proposed use. Based upon the initial survey, we estimate that approximately 60% of the existing framing requires replacement or sistering.

The wood sills that bear upon the perimeter masonry walls appear to suffer from varying levels of rot and deterioration. The lowest levels of siding and exterior finish should be removed to expose the exterior face of the sill to assess the extent of the deterioration. Based on the initial survey, we estimate that approximately 40% of sills require replacement. Sill replacement requires temporary

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shoring of bearing walls in a phased sequence. Sill replacement materials can be built-up pressure treated materials to match the original sill dimensions.

The beams supporting the wall between Rooms 6 and 7 should be reinforced to prevent further deflections and distress in the wall above. This is typically achieved by sistering new lumber with through-bolted connections to the existing members. The central pier supporting the beams should be reinforced or replaced with an adequately sized pier bearing on a properly designed footing. The pier replacement will require temporary shoring of the existing framing.

All new wood framing and all existing timber members to remain should be treated with preservatives to prevent future deterioration due to insect attack and rot.

**Second Floor Framing**

The second floor framing was only exposed for observation in Room 7, which is part of the 1859 addition. Our analysis indicates that the existing framing is inadequate for classroom or office use. Additionally, the notches in the joists at the west end of the room have weakened the joists sufficiently that they must be reinforced. Reinforcing will likely consist of sistering new wood members or steel side plates to the existing members to restore the capacity lost when the joists were notched.

RSA recommends reinforcing the joists in Room 7 to meet the strength and serviceability requirements for the proposed use. Reinforcing methods typically include sistering new members to the existing members, and adding new members in between the existing members. Alternately, species identification and timber grading procedures may be used to attempt to justify increasing the allowable strengths of the existing members.

The framing at the top of the main stairway (Room 11) is sagging and deflecting significantly. The finishes are currently in place, and the structure is not visible. RSA recommends that probes be opened in the ceiling at this location to verify the size and layout of the framing, and to evaluate the extent of the damage to the structural members. Based on the observed deflections, it is likely that the framing around the stair opening and its connections will require reinforcement by means of sistering and the addition of new joint hangers at connections. Given the magnitude of movement observed, it will likely be necessary to lift the existing landing and stair construction upward, closer to a horizontal level, as part of the repair process.

The framing for the remainder of the second floor is hidden by finishes. RSA recommends that a series of probes be conducted to verify the sizes and layout of the structural framing members, to evaluate the extent of deterioration present, if any, and to allow a determination of the live load capacity.

**Roof Framing**

RSA recommends that access be provided to the attic spaces in the 1801 log pen, 1834 log pen, 1834 log lean-to, and 1859 timber framed sections to permit evaluation of the roof framing members in these locations.

**Walls**

RSA recommends that multiple probes be opened in the interior plaster and exterior clapboard finishes to investigate the wall sills and sagging sections of the walls. Logs, timber sills, and sawn timber studs that are deteriorated due to termite attack or rot should be repaired or replaced as required. Brick nogging should be repaired and replaced after the wall stud repairs are complete. Given the extent of the observed bearing wall shifting and deterioration, it is likely that in addition to the sill deterioration noted above, the base of some studs and the logs forming the walls of the log pen and log lean-to sections will require repair or replacement. As a
preliminary assumption, repairs may be considered to include the replacement of the bottom 2'-0" of 25% of the studs in the 1859 addition and 30% of the logs in the 1801 log pen and 1834 additions with new timber and/or logs, respectively, half-lapped with the existing intact material to remain. Laps will require epoxy and lag screw connections at interfaces between new and existing materials.

**Chimneys**

Solitude has four chimneys; all of them require re-pointing and replacement of spalled brick. Damp brick was noted on all of the chimneys. RSA recommends that the flashing between the roof and the chimneys be inspected to ensure that water is not infiltrating into the chimney from the roof.

The foundation and subgrade for the chimney on the east face of Room 7 should be included in the geotechnical scope of work to determine the causes of the differential settlement and distress observed.

**CONCLUSIONS**

Based on our observations, we do not believe that Solitude is structurally adequate to support the proposed academic and office uses in its current condition. Additional investigation is required to determine the extent of the repairs needed to bring the building to the desired level of performance. RSA is confident that with careful planning, the structure can be repaired and reinforced in a way that preserves the historic fabric and maintains the character of Solitude, while achieving sufficient structural capacity for the proposed future use.
Chapter III: Condition of Building Systems

To assess the condition of mechanical, electrical and plumbing systems at Solitude, Commonwealth Architects engaged the engineering firm Dunlap & Partners, of Richmond, as consultant. Their due diligence report assesses present circumstances and predicts needs that can be surmised from the general understanding that the building is to be rehabilitated as a Center for Appalachian Studies, with offices, classrooms and presentation spaces.

Noteworthy among this consultant’s ideas is the possibility of choice, especially in regard to twelve-month use, as contrasted with a segmented pattern, and the degree to which a curatorial interior climate is to be maintained for artifacts in the collection of the Center for Appalachian Studies. For buildings of Solitude’s age and construction, sealing exterior from interior climates can lead to unwelcomed stresses on building fabric. When air-conditioning and air containment are factors in the equation, one expects dew points to shift, raising the possibility that moisture will collect in walls floors and attics in new ways, creating new pathologies that may be unhealthy to both building and occupants. Humidity levels are also of concern, particularly in the basement. In Solitude’s damp surroundings, such considerations must not be taken lightly.

The following MEP Due Diligence Report for Solitude was prepared by:

Dunlap & Partners / Engineers
2112 West Laburnum Avenue – Suite 205
Richmond, VA 23227

SCOPE OF SYSTEMS ANALYSIS

Dunlap & Partners has been tasked by Commonwealth Architects to evaluate the existing mechanical, electrical, and plumbing (MEP) systems serving Solitude. This analysis will provide an overview of the existing MEP systems serving the building, a general assessment of their condition, and a recommendation on systems suitable for the facility’s proposed restoration and use.

Our analysis only covers the MEP systems within the building. The estimates do not cover the costs of any work outside of the building that may be required to upgrade building services. Site lighting is not considered as part of this analysis.
EXECUTIVE SUMMARY

Solitude is the oldest building on the Virginia Tech campus. The building was built in 1801 and enlarged around 1859. The building is on the National Register of Historic Places. The building is to be restored, and will be used for offices, classroom space, and a space to display Virginia Tech’s Appalachian Life artifacts. To what degree the building will function in each of these uses is still to be determined. The use of the building and the overall preservation goals of the project will greatly impact the HVAC system design. The final use mix will also impact the plumbing and electrical system design, but to a lesser degree.

The MEP systems installed in the building are basic, aged, and in poor condition. The best course of action would be to completely remove all of the existing systems and install new systems that are compatible with and appropriate to the new use of the building. The existing radiators should be tested, cleaned and stored for re-use.

We recommend replacing the existing boiler and radiant piping system and re-installing the radiators for heating. The heating system should be zoned, one zone per floor. Space heating and dehumidification are recommended for the basement.

Given the age and condition of the building, the climate, and if expected building use would allow, it would be worth considering meeting space cooling and ventilation needs naturally.

If mechanical cooling is desired, basic space cooling and ventilation needs for office space and other lightly populated spaces can be met by using two 3 ton split system Direct Expansion (DX) units, one serving the second floor from the attic, the other serving the first floor from the basement. This type of system will require the least amount of building envelope sealing, but will not be able to closely control temperature or humidity levels in the building.

If the building is to have dedicated classroom and assembly spaces, or spaces dedicated and conditioned for the display of artifacts, a more sophisticated cooling system will be required to provide code required ventilation air and to allow for precision control of temperature and humidity. The limited ancillary space available for air handlers, duct runs, and piping would make the installation and maintenance of this type of system challenging. A balance of building use and overall curatorial needs of the structure and its contents will need to be reached to determine best overall HVAC strategy for Solitude.

The building will require a minimum of 2 water closets, 2 lavatories, and a drinking fountain. These fixtures and a small kitchenette for staff use will require water distribution piping, a limited sanitary system that ties into the existing 4” building waste, and a 40 gallon water heater.

The building will require a fire alarm and fire protection system. We believe that a fire pump will not be required. However, an analysis of the water distribution system for this part of the campus will need to be performed before a final decision can be made on the need for a fire pump.

The facility electrical needs can be met with a 240 volt, single phase, 400 amp service. An emergency generator is not required. All emergency egress and exit lighting will utilize batteries for a back-up source of power.

OVERVIEW

MECHANICAL

The building is heated with a 2 zone hot water radiant heating system. Radiators are located along the exterior walls. The heating water is supplied by a 304 MBH residential gas fired boiler (figure 1). The boiler’s gas supply is from a 1 ¼” gas line. There are no cooling, ventilating or exhaust systems serving the building.

ELECTRICAL

The building has (2) 240 Volt, single phase 200 amp services. Each service is distributed though a 200 amp, 40 pole panel board (figures 5 & 6). The mechanical equipment, lighting, and electrical outlets are served from both panel boards. There is a limited phone and data system installed in the building.

PLUMBING

The building water is supplied by a 3/4” line. Hot water is provided by a 50 gallon electric water heater (figure 2). There are two bathrooms on the second floor. One bathroom has a Water closet, Urinal, and lavatory (figure 3). The other bathroom has a water closet and (2) lavatories (figure 4). The basement has a drain sump. Waste from the building is conveyed by a 4” sanitary line. The building does not have a sprinkler system.

In general, the building’s MEP systems are basic, aged, and in poor condition. If the building is to be completely restored, we recommend the complete remove all of the existing systems and install new systems that are compatible with and appropriate to the new use of the building.

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1 Virginia Tech Magazine, Winter 2007
EVALUATION OF EXISTING SYSTEMS

MECHANICAL

The existing boiler and heating water distribution system should be removed. The expected life of a boiler is 25 years. The boiler is nearing the end of its useful life. The piping system may still be useful, but in our opinion it would be more cost effective to remove and replace the piping system than to attempt to re-use and work around the piping system to renovate the building.

The radiators, although old and past their useful life expectancy of 25 years, but may be of historic value. The radiators should be removed, pressure tested, cleaned, repainted, and stored for re-use. Any radiators not suitable for re-use should be replaced with a similar style radiator.

ELECTRICAL

The electrical and communication systems should be entirely removed. It would not be cost effective to attempt to reuse the existing conductors, outlets, or the phone and data jacks. The existing conduit is corroded and requires replacement.
PLUMBING

The existing plumbing fixtures and piping should be entirely removed. The plumbing fixtures are old, stained, and of no historical value. The piping may be useful, but in our opinion is will be more cost effective to remove and replace the piping than to attempt to re-use the piping systems. A final decision on what piping to re-use and what should be removed will depend on the final space layout of the facility.

The 4" building waste line is adequate to serve the building. The line should be visually inspected and scoped to determine if the line can be re-used. If the line is deteriorated, it will need to be replaced. The existing sump drain line in the basement should be cleaned and scoped to determine if the piping requires replacement.

The existing ¾" water supply line is inadequate to supply domestic water and fire protection for this building. An analysis of the water distribution system for this part of the campus will need to be performed before a final decision can be made on the required water supply pipe size. We assume that a 2" maximum supply line will be sufficient.
MECHANICAL  [Heating / Ventilating / Air Conditioning]

A. Basic Mechanical Needs:

An HVAC system that will adequately serve the building will be determined by several factors. The use of the facility and the overall curatorial needs of the building and its contents will need to be determined to finalize a system design. We recommend replacing the existing boiler and radiant piping system and re-installing the radiators for heating. The heating system should be zoned, one zone per floor. The basement and communicating crawl spaces require a dehumidification unit and a space heater to keep the basement area suitably dry for any ancillary storage, and for any mechanical, plumbing and electrical equipment in the space. Given the age and condition of the building, the climate, and if expected building use would allow, it would be worth considering meeting space cooling and ventilation needs naturally.

B. Cooling Option 1:

If mechanical cooling is desired, basic space cooling and ventilation needs for office space and other lightly populated spaces can be met by using two 3 ton split system Direct Expansion (DX) units, one serving the second floor from the attic, the other serving the first floor from the basement. Code required ventilation air can be introduced through the split systems. This type of system will require the least amount of building envelope sealing, but will not be able to closely control temperature or humidity levels in the building.

C. Cooling Option 2:

If the building is to have dedicated classroom and assembly spaces, or spaces dedicated and conditioned for the display of artifacts, a more sophisticated cooling system will be required to provide code required ventilation air and to allow for precision control of temperature and humidity. The limited ancillary space available for air handlers, duct runs, and piping would make the installation and maintenance of this type of system challenging. This type of system could easily double the cost budget of the HVAC system. It will have a cost impact on the electrical and plumbing systems, and will require the installation of insulation and vapor seals. The installation of insulation and vapor seals may have a negative impact on the building.

ELECTRICAL

Basic Electrical Needs:

We believe that the facility electrical needs can be met with a 240 volt, single phase, 400 amp service. Two distribution panels, one for lighting and convenience outlets; and one for mechanical equipment, are suggested. All emergency egress and exit lighting will utilize batteries for a back-up source of power. General lighting requirements will be determined by space usage. There should be sufficient capacity to provide power for basic site lighting. A phone and data system will be required for this building.

A. Fire Alarm Protection:

A basic fire alarm system is recommended for personnel and facility protection.
PLUMBING

A. Basic Plumbing Needs:

This facility will require a minimum of 2 water closets, 2 lavatories, and a drinking fountain. Assuming these fixtures and a small kitchenette, the existing 4" sanitary line serving the building is sufficient. Domestic hot water can be provided by a 40 gallon gas fired or electric water heater.

The 4" sanitary line should be visually inspected and scoped to determine if the line can be re-used. If the line is deteriorated, it will need to be replaced. The existing sump drain in the basement should be cleaned and scoped to determine if the piping requires replacement. A sump pump for the basement is recommended.

An analysis of the water distribution system for this part of the campus will need to be performed before a final decision can be made on the required water supply pipe size to serve both the domestic and fire protection systems. Our previous experience working on the Virginia Tech campus lead us to believe that a fire pump will not be required for this facility, but a an analysis will need to be performed to make a final determination. We believe that a 2” maximum supply line will be sufficient to provide both domestic and fire protection for Solitude.

B. Sprinkler Protection:

The building will require a sprinkler system for fire protection. We believe a fire pump will not be required. A final analysis of the water distribution system for this part of the campus will need to be performed before a final decision can be made on the need for a fire pump.
Chapter IV: Recommendations

The foregoing data by Commonwealth Architects, Dunlap & Partners, and Robert Silman Associates defines the present state of the house called Solitude and, for observational purposes only, two attendant structures, a springhouse at the pond’s edge and a small wood building to the rear. We encourage retention of all three, though the purpose of this report has been specifically directed to potential rehabilitation of the main house only and the following detailed recommendations apply only to it. The following recommendations are for architectural matters, referencing engineering matters only in reference to specific recommendations by the two engineering consultants. Please see Chapter III for detailed engineering recommendations under the headings “Structural Conditions” and “Condition of Building Systems.” Site work should go hand-in-hand with requisite archaeological investigation and documentation.

SITE RECOMMENDATIONS

A. Drainage:

For the long-term security of Solitude we recommend that the immediate site receive a thorough civil engineering investigation. Such study should answer several bothersome questions:

- Is the building subject to flooding?
- If so, under what circumstances?
- If so, with what frequency?
- If so, would elevating the structure be useful? [NOTE: Relocation of buildings is generally deemed a violation of the historic context attendant to historic buildings and should be avoided whenever possible.]
- If so, to what elevation?

B. Pathways:

For continued use as a public facility Solitude must provide access that can serve both the able-bodied and persons with disabilities. In view of the relationship between a parking area and the building, entry to the building is most direct from the west. From that direction one reaches the rear porch and four exterior doorways, one of which opens into the foyer opposite the pair of doors comprising the principal [northwest] entry. The rear porch is very close to grade and could be easily modified for wheelchair use. At that same location the present concrete walkway is in less than immaculate condition. Thus one strategy might be to establish the rear foyer doorway as the primary entry for all visitors, or perhaps as one of two equally important entries that bring one immediately to the foyer. Should that not be deemed suitable for addressing ADA matters, an alternative approach would be to the north end of the front porch. There, too, adaptations would be required, not only with regard to a roadway/ramp surface but perhaps for handrails to prevent one from going over the edge of the porch deck also.
C. Terrace:
A brick terrace installed to the west of the long west façade is in deteriorated condition. It could be rebuilt if desired, though any such recreation should include a proper foundation strong enough to resist upward migration of root systems from nearby vegetation.

D. Lighting:
Site lighting is currently provided by general-purpose high-intensity lights on tall wood poles, fed by aerial wiring. We recommend removal of those elements and installation of lighting more subtle illumination suitable for this historic precinct, fed by underground wiring.

E. Signage:
The site could benefit from an information program to explain the place to visitors. This program could address both the value of this site in the history of the institution and the Center for Appalachian Studies, a fitting modern-day echo of the relationship between past and present regional cultures.

F. Vegetation:
Fortunately the building is not closely bound by neighboring trees, often a source of problems due to the spread of root systems or acids stemming from decay of leaves. Large shrubs can also present problems. Their root systems can, if sufficiently large and aggressive, destabilize support conditions. If located near walls, they can prevent air circulation and promote build-up of biological agents, such as mildew and lichens, that are harmful to building materials, especially wood. Consideration should be given to removal of shrubs abutting exterior walls and porches. Perhaps the very large specimens along the southwest façade could be transplanted to a less threatening location.

EXTERIOR RECOMMENDATIONS

A. Foundations:
As indicated above, some portions of the L-shaped structure are not elevated above grade adequately to prevent direct entry of water and insects to wood members. In conjunction with study of site drainage issues, more sustainable relationships between grade and wood wall components should be established. The most cost effective way to do that could be site regarding, perhaps combined with installation of effective drainage fields that lead water away from the foundations. We doubt that elevation of the building is feasible, given probable financial constraints, nor perhaps desirable, since the creation of new visible foundation conditions could markedly alter one’s perception of this low-lying country house.
B. Walls:

As an overall statement for building materials at any historic building, we say that one’s best efforts should always be made to retain historic building fabric and to treat it as gently as possible. Those materials may be the only surviving evidence of early conditions and of subsequent changes, absent other documents. *Solitude* seems to have retained a considerable percentage of its fabric. The exterior clapboarding is noteworthy in that its irregularities show the state of craftsmanship at various times and as well as dislocation of materials and alterations. We recommend keeping all such material evidence in place except where decay or dislocation cannot be addressed with more passive means than removal and replacement. Chemical consolidation of wood is sometimes effective if the cause for decay has also been addressed. Otherwise, such extreme measures to preserve may be of little value. One such case at *Solitude* may be decayed clapboards located very near the grade and along the porch roof flashings. In those areas replacement is perhaps inevitable. Otherwise painted exterior wood is heavily encrusted with paint and many beaded clapboards have been damaged by aggressive scraping. Paint should be removed to the bare wood surface from all exterior wood, followed by proper priming and application of new paint. [NOTE: In an inconspicuous area leave a small area, approximately one foot square, unstripped as a testing zone for future paint analysts through the years.]

C. Roofing:

Present standing-seam metal roofing must be partially dismantled to determine the condition of the reverse face. Such faces visible from the attic of the main block, where roofing is reported to be relatively new, do not show great cause for concern about rusting; the same cannot be said for the rear wing roof and porches, where reverse faces are not visible. If found to be free of rust penetration, the most logical response would be simple spot repairing, followed by priming and painting with products formulated specifically for metal roofing. Such painting can prolog metal roof life indefinitely if conscientiously carried out. The cycle between painting may be no longer than four years, depending on local atmospheric conditions and air-borne acidity. A second issue related to roofing is management of rainwater. Metal gutters, primarily half-round in profile, collect water along eaves and disperse it to downspouts, primarily round in cross section. Conceptually those two elements are fine. But all gutters need to be evaluated to make sure they are handling the loads they must carry, not spilling over onto clapboarding. Of particular note is clapboard deterioration along porch roofs, where planking extends to the roof surface atop flashing metal. The esthetic effect is good, but the wood cannot survive the immersion that must occur during snows and heavy rains. Gutter spillage could be exacerbating this problem. In any event the gutters should be checked and the flashing detail should be reconsidered.

D. Porches:

Front and side porches (northwest and southwest, respectively) have been rebuilt in whole or in part in recent years. Unpainted porch flooring is particularly obvious, not in keeping with the customary painting of porches in more refined Virginia farmhouses similar to *Solitude*. New planking has eased edges, thus lacing the expectable square corners that allow the appearance of single flat planes of wood. If desired, such planking might be replaced with suitable square-edged tongue-and-groove pieces and painted. Plank width should also be reevaluated at that time. The rear porch may have some further utility, unless ADA modifications lead to complete resurfacing. In any case, the inexplicable offset along the leading edge over the basement stairway should be rectified. The single stone front step is broken into three segments which are settling unevenly; it should be repaired. Post feet are rotting at downspouts.
E. Chimneys:

The four chimneys should be thoroughly inspected for safety. This concern takes several forms. Whether or not chimneys are to be used again, the upper portions of two stacks are noticeably dislocated from the vertical and slightly twisted; they should be stabilized as they are or partially rebuilt. The lowest chimney, adjacent to room 1, appears to be suffering from trapped water that is discoloring exterior brickwork and destroying interior plaster. The source of leakage should be corrected and the chimney mass evacuated of built-up moisture. That chimney as well as the other three require varying degrees of repointing, though mortar joints at the other three are in generally better condition. As a public building used only a portion of each day, Solitude is probably not a good candidate for use of its fireplaces since twenty-four-hour fire surveillance would not be possible. Also, heat loss and ventilation characteristics could compromise more controllable heating, ventilation and, if used, cooling systems. Nevertheless opening fireboxes and remaking hearths at existing mantels should be considered, as current hasty closures detract considerably from interior spaces that will become handsome once again in all other respects. Chimney flues need not be restored unless fireplaces are to be used; indeed they should be closed to avoid unwanted drafts, inflowing and outflowing. Chimneys should be capped with slate sheets to prevent downward migration of snow, ice and water and to prevent nesting by birds or other small animals.

F. Windows:

Most windows are in fair condition and probably reusable if repaired. Where eccentric window types exist they should be left in place unless there is a compelling reason for change. All windows should be made operable, freed from excessive paint and reinstalled with proper sash cords, weights and hardware. Retain old glass insofar as possible. Where sashes cannot close properly due to dislocation of adjacent materials, modification of sashes and/or other materials may become extensive in order to allow plausible resolution of the competing flaws. Exterior storm windows should be removed. If storm windows are necessary, new ones should be installed on the interior. Screens can be used in either location. The goal should be to present the exterior faces of windows free of any latter-day features that would not have been original. Early photographs of Solitude show shutters. These can be recreated, but that action should only be adopted if the result will be heavy-duty shutters that can withstand the rigors of seasonal stress. Materials must be fully seasoned to prevent warpage.

G. Doors:

Exterior doors appear to be of some age, except at Room 9, and should be retained. Heavy paint encrustation should be carefully removed and the doors refinished. Hardware should be repaired or replaced with suitable pieces, neither strikingly new nor artificially old or out of character with the building. Hardware may have to be adapted at one or more exterior doors to satisfy exiting requirements. The most troublesome restoration problem at doors is likely to be keying, probably subject to institutional security protocol at Virginia Tech.
INTERIOR RECOMMENDATIONS

A. General:

In addition to specific notes given below, we note that major work to rehabilitate Solitude will necessarily include conformance with best practices and applicable codes. Addressing structural conditions and weather tightness are the essential first steps. Among the issues that can be anticipated for a building of this age and type are problems of decay and insect infestation, both of which must be eradicated, and resolution of material and safety hazards, such as asbestos. Fire alarming, alerting of fire authorities and fire suppression are essential considerations and involve institutional policies other than just at Solitude. The same is true of utilities and area drainage matters. Accessibility needs are very important if the building is to return to routine institutional use.

With respect to room usage patterns, we comment that the first floor of building has a great degree of inherent flexibility. Most spaces can serve one or another of many functions, except for public amenities such as toilets. But the same cannot be said for the second floor rooms. Access between the grand stair and the rear stair passes through a major occupied space, not a corridor, and is blocked by closure of a former doorway, producing implications for the function of that space and for emergency exiting. The difference in floor level between Rooms 11 and 12 may be problematic due to the closeness of steps to the door way between them, a potential code issue. A desire to recreate early conditions in selected rooms presents only the problem of proving what those early conditions were, for alterations have been several and removal of early finishes is extensive. The response might have to be more general in nature than specific to in situ evidence.

B. Basement:

The basement of Solitude must be rendered secure from flooding at a minimum. Exterior and interior drainage must be able to evacuate water at all times. Sump pumping maybe necessary as an emergency device. If this zone is to be used only for equipment, but not for storage or habitation, its temperature and humidity levels should be moderated to acceptable levels for optimum equipment performance. For storage, more refinement may be needed; for habitation, yet more. Due to height limitations, we do not recommend that the basement be considered habitable space.

Control of climate in the basement could influence conditions on the first floor. Installation of ceiling materials to seal the plane between the two floors might be necessary to prevent mildew-laden air from rising through floorboards,, perhaps not if humidity levels in the basement can be controlled adequately. [NOTE: Historic buildings often do not respond well to ex post facto attempts to seal walls and floors. New moisture conditions are usually established, often causing new problems with bacterial growth and material decay. In general, allow the building to “breathe” as much in the manner to which it has been accustomed as possible.]

C. First and Second Floors:

Continued use of Solitude by the public demands that it be accessible to all persons. ADA guidelines cite the need for all persons to be able to get to all programs offered within a building. Since Solitude has two stories, and since it would be an exceedingly difficult candidate for refitting with an elevator, the first floor is the more plausible location for any publicly offered functions. Suitable programming of the spaces is therefore of great importance. The two most
The structural systems require attention. See Chapter III: Structural Conditions above for relevant recommendations. Of extreme concern is the condition of the grand stair and its upper landing and railing. The slope there is so severe that one feels immediately unsafe. Those elements must be stabilized, repositioned and rendered safe to allow continued use of the stairway and upper floor. See Chapter III: Condition of Building Systems above for relevant recommendations regarding electrical, fire alarm and control, heating, ventilation, humidity and possible cooling systems.

Extant interior materials of wood and plaster require several types of preservation and/or rehabilitation care. Wherever possible the oldest materials should be retained as well as any features that can be defined as “character-defining.” The latter term would include such elements as distinctive wood moldings, casework, doors and windows which set the aesthetic tone for the building. Such elements may be one of the few means by which one building era is distinguishable from another, thus showing that several successive periods could be deemed important. At Solitude the character-defining interior features are wood, of which the most noteworthy are the large-scaled trim members used as door and window casings and baseboard in the 1859 era. Also important in this regard is the curved wood banister at the main stair and the simpler banister at the secondary stair at Room 4. Wood flooring is also important. Complete replacement of decayed and termite weakened planks has already occurred in Rooms 6 and 7. Elsewhere in the main block early materials remain, showing the patina of wear and evidence of past alterations. That remaining flooring should remain unless its condition cannot be stabilized. Overly aggressive rehabilitation, such as sanding, should not be employed, as that would eradicate the patina and undercut the value of the preservation effort as a whole. Where replacement may be necessary, extraction of single planks or the even less aggressive use of dutchman repairs is recommended. Floor finishing depends on both existing finish(es) and intended use after completion. Existence of 19th and 20th-century varnishes or paints prove nothing about early planking, which was also left unfinished in Virginia during the time of Solitude’s creation. For interior and exterior painted surfaces, we recommend at least basic paint analysis to determine early colors and finish types where possible. When removing built-up finishes, we also recommend retaining small sampling areas in inconspicuous locations so that future investigators will have adequate remnant evidence for study as research methodologies change.

Approximately fifty percent of Solitude’s plaster wall material is seriously fractured owing to movement of the wooden structure into which it is keyed. If practicable the early plaster should be secured against existing wood studs and lath and restored. If that potential remedy proves to be unfeasible, the more damaged areas may have to be replaced, again using existing wood if possible. Any such repairs can only proceed after any problems of instability have been addressed. In Room 7 we understand that a suggestion has been made to leave exposed one or more small areas where recent investigation and repair work gives a clear view to the unusual combination of wood and nogging inside first-floor walls of the 1859 period. If deemed desirable by the institution, such an idea may be feasible if properly curated to prevent unintended damage by those who use the space.

Wood panel doors and window sashes are, in most cases, heavily encrusted with paint. They should be carefully relieved of such build-up, with care taken to avoid defacement of wood profiles, and refinished. Recent aggressive scraping and/or stripping has abraded wood surfaces and profiles in the 1859 main block; those need to be restored to
the extent possible. The single example of wood that should remain in its present condition is the curved handrail at the grand stair. It should be cleaned and, where marred, carefully repaired and/or refinished. Turned spindles supporting that rail seem to have few coats of a relatively new finish and show little evidence of wear and damage, leading one to wonder about their age and authenticity. Cabinet casework, closets and bathroom facilities have been installed at Solitude, usually not to good effect. These features should be removed. Exceptions might be the small closets in Rooms 5 and 14. Where casework has led to closing of a former door between Rooms 12 and 13, that doorway should be restored, in part to assist in building evacuation during an emergency. The serial compartmentalizing of Rooms 9A, 9B and 10, should be eliminated with the aim of reestablishing that area as a single volume.

Past use of modern storm windows at Solitude suggests that air leakage and thermal loss have been problematic. If those issues cannot be resolved otherwise, the most important preservation goal should be to save the existing wood sashes and, where possible early undamaged glass. Replacement glass should be of restoration quality and character even if recently produced. Replace failed glazing putty as required. Double-paned thermally sealed glass units could replace each pane of glass, but that approach requires intensive measurement and fabrication probably too costly. If storm window panels of some type are unavoidable, they should be installed inside rather than outside, so that the important visual relationship between window types and façades is preserved. The reflective nature of exterior storm windows would damage perception of that characteristic. If installed inside, the storms should be removable or made of sliding panels, so that sashes can be opened in good weather. If sashes are to be operable, use of screening will also need to be considered. Insertion of insulation materials into wall cavities and/or application of new wall layers to improve thermal characteristics is not recommended since they can lead to creation of new bacterial conditions, especially in damp climates.

Fireplaces are unattractively closed with masonry and wood materials which should be removed. Ideally early hearth and firebox conditions should be reestablished if they can be accurately determined. Where that is possible, the thought of using the fireplace again should be examined thoroughly. The idea is attractive but carries with it problems of life safety, building security, ventilation and possible damage to contents by smoke, fire or water. Routine cleaning of the flue would be essential. Building usage as well as oversight for the building at all times for a publicly used, non-residential property such as this probably augur against active use of fires. If the decision is to restore physical conditions but not reuse the fireplace, the flue should be secured in a closed position to prevent undesirable drafts, loss of conditioned air and possible intrusion by birds and other small animals.

D. Attic:

The attic space is currently unused and should continue so, with the possible exception of use as space for portions of heating, cooling, ventilation and possible sprinkler equipment. If equipment is located there, access hatches for its installation and servicing must be created. Protective catch pans must be installed beneath any equipment subject to line stoppage and flooding. Walkways must be installed to allow safe navigation of the attic since it has no floorboards atop the second-floor ceiling joists. The manner of installation of walkways and equipment must not stress ceiling joists now or in the future, which could lead to plaster key breakage and collapse. Any asbestos-bearing insulation must be replaced. Installation of insulation on the underside of roof decking is not recommended, since moisture retention and/or entrapment could lead to wood decay.
Chapter V: Cost Analysis

Preservation and rehabilitation of Solitude will assure retention of the most important structure at Virginia Tech attesting to the institution’s physical origins. Such work requires clear goals, among which are the following:

- presentation to the public as an object of true value and importance;
- usefulness to programs that express the institution’s educational and cultural missions;
- financial responsibility in rehabilitating the property; and
- institutional commitment to long-term care that will protect against repeated physical decline.

The scope of work can range from modest rehabilitation to more thorough and exacting preservation. Scope can only be determined by the institution as it assesses goals in the context of financial resources. To assist in evaluation of such a commitment, we have analyzed potential segments of rehabilitation work with the aim of quantifying costs. Order-of-magnitude opinions of cost are more feasible for some items than others at this early stage. Definitive cost figures must await detailed design pricing activities that occur after the commitment to a defined strategy has been made. But early professional projection of costs should allow the institution to know more clearly how the financial aspects of the rehabilitation should develop and also enable fund-raising to proceed with confidence. The following cost data has been developed in concert with cost consultants Faithful & Gould, of Williamsburg, Virginia.

ASSUMPTIONS

The following assumptions formed the background for cost analysis of construction costs required to rehabilitate Solitude to a state of complete usefulness as for classrooms, offices and public spaces:

- The level of intensity for rehabilitation of Solitude is assumed to be less demanding than would be expected for an iconic one-of-a-kind museological restoration, and thus more suited to the purposes envisioned for this property within the Virginia Tech family.
- Figures presented represent ORDER-OF-MAGNITUDE costs for the year 2007.
- The building edge is the limit for cost estimation purposes, with the exception of a brief list of site modifications and repairs immediately adjacent to it, listed under the heading Site.
- We believe that alterations to service systems, such as electricity, water supply and drainage networks, could be required. Since Virginia Tech may prefer to incorporate those infrastructure modifications within other institution-wide infrastructure projects, those peripheral costs whose scope cannot yet be determined have not been included here.
- These cost figures do not include professional fees for design and construction administration.
- These cost figures do not include administrative costs within Virginia Tech for the rehabilitation program.
- Archaeological studies are a potential need of unknowable scope; thus no figures for that are included.
ESTIMATED COSTS FOR REHABILITATION OF Solitude

ARCHITECTURAL

• Building Exterior
  o Foundations & regrade of area  10,000
  o Walls  100,000
  o Roofing  80,000
  o Porches  15,000
  o Rebuilding of 2 chimneys  15,000
  o Windows  50,000
  o Doors  5,000

• Building Interior
  o General, also including hazardous material abatement  75,000
  o Basement  10,000
  o 1st floor & 2nd floor  250,000
  o Attic  5,000

• Site
  o Limited underground drainage to perimeter  40,000
  o Pathways & ADA issues  10,000
  o Terrace reconstruction  25,000
  o Lighting  15,000
  o Signage  5,000
  o Vegetation  5,000

MECHANICAL

• Basic Needs
  o Heating & limited basement dehumidification  25,000

• Cooling
  o Per Cooling Option 2 of Dunlap & Partners report  65,000

ELECTRICAL

• Basic Needs  35,000
• Fire Alarm Protection  15,000

PLUMBING

• Basic Needs  30,000
• Sprinkler Protection  20,000

STRUCTURAL

• Foundation
  o Subsoil investigation and/or archaeology  0
  o Repairs & repointing of foundation walls  75,000

• First Floor
  o Sills (assume 40% affected)  15,000
  o Framing (assume 60% affected)  40,000
  o Beams (Rooms 6 & 7)  7,500
  o Protective & repair treatments  7,500

• Second Floor
  o Framing  45,000
  o Stairway (Room 11)  15,000

• Roof
  o Attic (hatches only)  5,000

• Walls
  o General repairs  30,000

• Chimneys
  o Repairs, repointing and reflashing  10,000
  o Rebuilding of foundation to chimney at Room 7  10,000

SUBTOTALS

• Architectural  325,000
• Mechanical  90,000
• Electrical  50,000
• Plumbing  50,000
• Structural  260,000

TOTAL  1,165,000

• Construction Contingency  174,750

GRAND TOTAL  $1,339,750
Appendix: Maps and Measured Drawings

Site Maps showing Solitude and its Outbuildings

Plan of Basement
Plan of First Floor
Plan of Second Floor
Plan of Roof
Elevations

NOTE: The measured drawings record Solitude as it exists in early 2007. They are based in part on extant drawings by architect Gibson Worsham, with field verification, modification and supplementation by Bryan Townes.
NORTHWEST ELEVATION