

EQUESTRIAN BARN AT AVENEL

CONDITION ASSESSMENT REPORT

EXECUTIVE SYNOPSIS/EXECUTIVE SUMMARY

Potomac, Maryland

June 2024

GANNETT FLEMING PROJECT NO.: 068805 Task 14 | WSSC JOB NO. 63203316A

Prepared for:
WSSC Water



Executive Synopsis

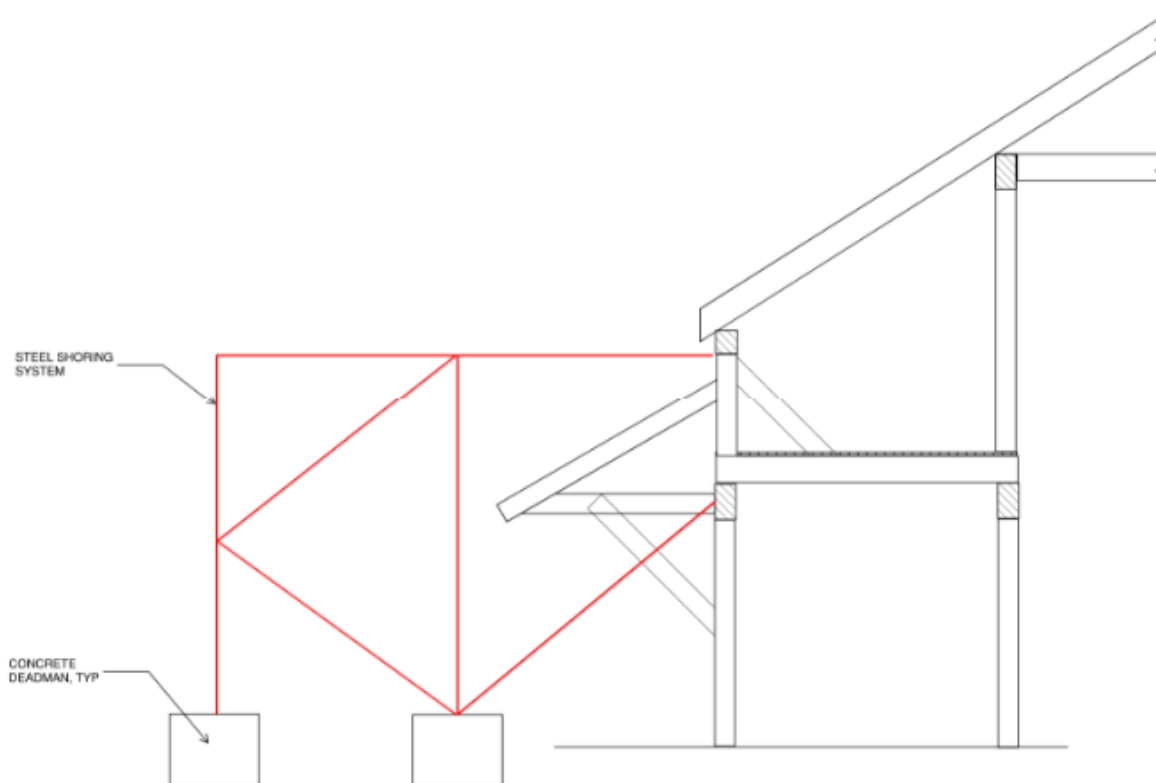
The existing Equestrian Center at Avenel (barn) was inspected by Gannett Fleming (GF) during the January-February 2024 timeframe. The project's scope was to perform a condition assessment of the barn structure, provide conceptual repair details and an Engineer's Opinion of probable costs for the conceptual repairs for bringing the barn to a usable condition. As a result of the condition assessment, the barn was found to be in an unsafe condition. The southwest corner of the barn showed significant structural deterioration. GF alerted WSSC as soon as the unsafe locations were observed. The inspection team recommended the Barn Manager move the horses from the barn. The barn leans to the south between 3 and 7 degrees. Age, water damage and vegetation infiltration have compromised the barn.



ES Figure 1 – Google Earth Image of Barn

The barn should be braced and shored to prevent further movement; work that would need to be done before any repairs could be undertaken. Many areas of the barn are structurally compromised but the southwest corner of the barn was noted to have significant structural deterioration, which prompted the inspection team to move the Barn Manager's horses and eventually recommend restricting access to the barn. The roof system and facade deterioration and openings/windows/doors allow infiltration from rainwater, which has continued to aid in the barn structure's deterioration. Retrofits to the barn have been made over the past 75+ years, some of which are sound and some of which need to be replaced. The existing lateral support system of the barn is compromised and requires significant repair. Construction repairs would require careful sequencing to provide structural stability to the barn during and after construction activities.

The barn would not be plumb or level after renovations. Permanent exterior steel frames to brace the barn must be installed at each column line location on the north and south faces of the barn, which could restrict vehicular traffic flow around it. The permanent exterior steel frames would create a visual impact to the existing barn. A concept for the bracing system is shown below in ES Figure 2 (REF Detail 1: Building Shoring/Bracing Appendix E)



ES Figure 2 – Conceptual Exterior Building Bracing Scheme (cross section)

Permanent interior cable ties would need to be installed in the hayloft to prevent the barn from separating under roof thrust loads.

Three levels of repair are used in conjunction with the barn's condition assessment: Repairs necessary for occupancy, Intermediate, and Aesthetic.

Repairs necessary for occupancy: The interior barn renovations would require temporary shoring for all hayloft and roof members and a temporary work platform on the hayloft level. Interior structural repairs include roof rafter repair and replacement; roof beam repair and replacement; roof purlin repair and replacement; hayloft bracing repair and replacement; hayloft column repair and replacement; hayloft flooring repair and replacement, hayloft beam repair and replacement, hayloft stringer repair and

replacement; ground floor column repair and replacement; roof replacement; façade replacement, and repair of the existing electrical panel board.

Intermediate Repairs: Windows and doors replacement, additional structural non-urgent repairs, and electrical lighting modifications.

Aesthetic Repairs: Minor structural repairs, masonry repairs and floor slab repairs.

The Opinion of Probable Cost for the above repairs to the shell of the building as provided by Gannett Fleming internal cost estimators is \$5.6M. The Opinion of Probable Cost for this project is a cost estimate to facilitate budgetary or feasibility determinations.

Equestrian Barn at Avenel Repair – Opinion of Probable Cost - Summary

Repairs	Cost
Repairs necessary for occupancy	\$4.7M
Intermediate	\$510K
Aesthetic	\$30K
TOTAL Construction Cost (based on OPC)	\$5.3M
Engineering/Architectural Fee (high level, estimate based on noted repairs)	\$300K
Estimated Yearly Engineering Review Cost (after construction is complete)	\$10K (1)
TOTAL Project Cost	\$5.6M

- (1) Total project does not include yearly engineering review costs, any new repairs or replacements or ongoing maintenance costs.
- (2) The Opinion of Probable Cost does NOT include interior repairs to the stalls, interior cabinets, or floor; upgrades; or repair/modification of barn appurtenances.
- (3) ES Figure 3 is a summary of the Opinion of Probable Cost shown in Appendix C
- (4) OPC developed based on April 2024 Cost Data. No inflation factors for future work are included.

The barn is in an unsafe condition and would require significant repairs to maintain operations.

Executive Summary

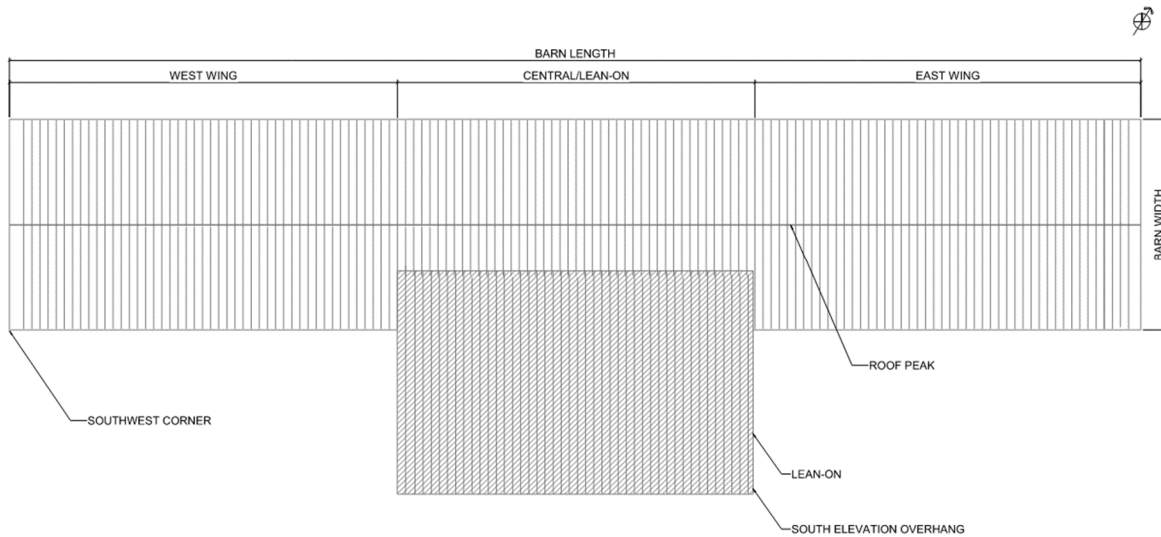
Gannett Fleming, Inc (GF) was contracted by the Washington Suburban Sanitary Commission (WSSC Water) to provide a condition assessment, development of conceptual repair details and Engineer's Opinion of probable cost for the repairs for the barn structure at the Avenel Equestrian Center in Potomac, Maryland. The repair details developed are not for construction of the repairs but for determining the cost of the repairs. Additional engineering work will be required to develop detailed drawings for the repair construction. The existing barn was noted to have significant deterioration. The southwest corner was deemed unsafe. The horses were removed from the barn and a protection fence was installed around the barn.

The GF team consisted of professionals from the following disciplines:

- Architectural
- Structural
- Electrical
- Geotechnical
- Hazardous Materials
- Construction Management
- Cost Estimating

A LiDAR scan -- a method for determining ranges by targeting a surface with a laser and measuring the time for the reflected light to return to the receiver -- of the barn was conducted. Team members spent multiple days reviewing the existing barn structure and components. The assessment results shown below are a summary of the GF findings and needed repairs. More detailed information and documentation can be found in the full report and appendices.

The Equestrian Center at Avenel will be referred to as 'barn' or 'the barn' hereafter for ease of communications. Due to the level of damage to the southern projection of the barn, the area to the south is called the 'lean on' area'. It appears both the barn and lean on area were constructed at the same time. The barn will remain the term for the overall structure.



ES Figure 4 is a reference plan of the barn.



ES Photo 1: General View of the Equestrian Center Barn (REF Photo G-1: Appendix B1)

ASSESSMENT RESULTS:

Overall Barn Condition –

The barn was reportedly constructed in the 1940s and was purchased by WSSC Water in 1988. The exact time of construction is not known. The barn has undergone normal wear from its use as a cattle barn/Equestrian Center but has undergone significant deterioration from normal wear and tear, rain, wind, and water damage. Modifications or renovations to the barn in addition to the documents provided by WSSC have been

made to the barn over the years. The modifications have not been documented and some modifications are detrimental to the overall barn structure such as the spreader beam supporting the roof.

The barn has had to withstand all weather conditions as well as use. Wood support structures of barns are to be protected from wind driven rain and water leaking by the roof and exterior wood façade. The barn has holes in the roof and façade, allowing water to penetrate the structure for years. Water infiltration into the barn such as rain and snow has initiated much of the damage to the barn structure. Roots of vegetative growth are also a factor leading to deterioration. The roots find places to attach to the wood surface as the vines grow. As the vines continue to grow the root system gets deeper into the wood structure. The vines also prevent the wood structure from drying out.



ES Photo 2: Heavy Vegetation pushing up roof deck along southwest corner (REF Photo S113)

Barn Roof and Supporting Structure –

The roof system of the barn structure is leaking. Pin holes in the metal roof were noted at many locations. The main barn roof appears to be a different metal roof than the lean-on structure. The lean-on structure roof appears to be in much worse condition. Roof leaks are much more prevalent allowing water to pond on the hayloft area. Roof purlins and rafters around the leak locations are deteriorating and, in some cases, failing. Roof overhang rafters are in poor condition and in some cases failing (most of the damage is on the south side of the barn). The roof overhang rafters appear to have been repaired previously and the repairs are deteriorating. In some cases, the repairs

have become ineffective or were ineffective from the time of construction. In some locations, wood beams are not bearing and have no attachment to the support columns. Some existing roof beams exhibit excessive rot and water damage; as a result, significant deterioration on the south wall (in the east west direction) has occurred. The barn is leaning to the south. It is not known if the barn was constructed plumb. Significant deterioration continues to occur.



ES Photo 3 Rotting rafters (REF Photo S10 – Appendix B2)

Due to wood deterioration and water infiltration, the lateral force resisting system of the exterior walls (especially the south wall) is compromised. The roof to the hayloft leans to the south. There are numerous ineffective or missing braces along the south wall. The roof beams supporting the rafters are failing and have rotated since the bracing has become ineffective.



ES Photo 4 – Perimeter Roof Rot (REF Photo S21 – Appendix B2)

The interior roof support structure above the hayloft has consistent connection deterioration between the braces and the support posts. Deterioration noted at the joints includes failing brace connections or braces no longer connected. It is not known whether the condition noted is an existing condition from the original construction or deterioration from other damage to the barn. There are three locations where the north/south braces have been removed. It is not known when or why these modifications were performed. These removed braces are north of the two load transfer spreader structures and could have been removed to facilitate hay storage.



ES Photo 5 – General view of the load spreader beam structures in hayloft (REF Photo G10 – Appendix B1)

Hayloft –

The hayloft floor, especially at the lean on section, is in poor condition due to water damage. The floor of the hayloft is generally uneven throughout the barn. In the lean on area, tarps are draped over some floor areas. At floor depression locations such as holes in the floor planks or 'soft spots' in the planking, ponding of water is occurring as well as wet hay sitting directly on the existing floor planking. Consistent rot was noted in the floorboards throughout the structure with the worst damage in the lean on area. In addition, the floor stringers (floor joists) are damaged with water staining but remain in satisfactory condition. Some of the stringers in the south area have been repaired over the years. It is not known when the repairs were undertaken. There are few stringers exhibiting significant rot, primarily on the south side where repairs have been performed, and the repairs are failing. The lean on hayloft area is deteriorated and unsafe.

In other locations of the hayloft outside the lean on area, beams supporting the hayloft show deterioration along the exterior and interior. This is primarily due to water damage. Beams are leaning, with one support column or girder lower than the other. Many beams have at least half of the wood-to-wood bearing missing. In some locations there are gaps between the wood at the bearing locations. Several beams in the north south direction are significantly damaged.



ES Photo 6 – Hayloft looking southwest – post has been added to east existing column., north brace and wind girt are not connected to the post and the east brace is missing. The floorboards adjacent to the column are rotting. (REF Photo S42- Appendix B2)



ES Photo 7 – Hayloft from below – typical rotting/broken/missing floorboards – Lean on structure (REF Photo S68 – Appendix B2)

Two beams on the southwest corner of the structure have extreme (approximately 90%) section loss and are in serious risk of failure. Other beams exhibit significant wood section loss. Upon review of this area, the inspection team alerted WSSC Water to have the occupants of the barn moved.



ES Photo 8 – Critical finding at hayloft floor beam – west end of beam has approximately 90% section loss – (REF Photo S81 – Appendix B2)



ES Photo 9 – Severe rot at floor beam – west end has significant section loss – (REF Photo S82 – Appendix B2)

Columns/Structural Support –

The main floor columns supporting the structure and the hayloft lean south but less than the columns from the hayloft to the roof. Column caps are deteriorated. Some columns exhibit bearing loss at the base, meaning the column is not fully resting on the supporting structure/foundation. Bearing loss can contribute to column and structure tilt. Other non-structural wood members such as the horse stalls may be contributing to the barn's existing structural stability.

One column in the southwest corner could not be investigated due to the unsafe conditions described above, boards/other debris in the path of observation and exterior vegetation blocking access. What could be observed was a column rotting and deteriorating its full height. This is significant because this column supports a portion of the hayloft and roof structure. Loss of this column would mean the collapse of nearby internal structural elements, potentially propagating throughout the barn as other structural members take on additional loading.



ES Photo 10 – Siding at southwest corner has holes – column appears to be rotting throughout its height – heavy vegetation (REF Photo S114 – Appendix B2).

In 2022, WSSC Water hired an outside engineer to provide construction details for damage to the northwest face of the barn and review the barn’s overall condition. The retrofit framing was not installed plumb, but the framing modifications incorporated the existing tilt in the barn.



ES Photo 11 – New repairs on Northwest corner (REF Photo S100 - Appendix B2)

A few columns were replaced inside the barn at an unknown time. It can be assumed the columns exhibited significant damage to warrant replacement. The replaced columns are in addition to the work WSSC Water recently completed on the northwest face of the barn.

Columns were removed along the north wall to enlarge door openings or create new door openings. Door jambs were installed to supplement the removed columns.

In some locations consisting of the structural bracing between the ground floor and the hayloft, the bracing is partially engaged or not engaged at all. Some braces have been removed in the past to facilitate column replacement in both the north-south and east-west direction.

The south elevation overhang is a wood framed area without exterior columns. The overhang is framed back to the existing building. Braces are broken or missing. This is another area where collapse is possible.



ES Photo 12 – Overhead support diagonal is disconnected at the base and overhang is leaning (REF Photo S140 Appendix B2)

The slab on grade is cracked and failing. In some locations the slab has settled several inches.

Barn Façade --

The building envelope is failing. Water damage to the façade is allowing rain and wind driven rain to enter and impact the barn structure. There are many openings in the existing structure. Originally there were silos at the site with a connector from the silos to the barn. When the silos were demolished and the connector structure removed (before WSSC Water purchased the property), the opening in the barn was not replaced.

The windows consistently remain open, allowing wind driven rain to enter the barn. Some wind girts on the barn are disconnected and/or failing.

Vegetation on the barn's exterior is contributing to its damage. Vegetation has taken over significant areas of the barn on its south and southwest elevations. The vegetation has infiltrated the gutter system and prevents adequate drainage of the roof leading to additional damage to the roof and gutter system. The bottom of the rainwater leaders, when present, are not terminating to reasonable means to adequately get the water away from the structure unless the grade is naturally sloped away from the building. The stables inside the barn are non-structural (non-structural: the stable structures were not intended to support the building).



ES Photo 13 – Sections of lifted metal roof panels and missing fascia boards (REF Photo A3- Appendix B3)



ES Photo 14 – Gutter clogged with vegetation, deteriorated boards and discontinuous rain leader (REF Photo A14 – Appendix B3)

The gutter system and façade of the barn needs to be replaced. These elements cannot be cost effectively salvaged. Windows and doors appear to be the originals. The doors may be newer due to the retrofitted column installed on the north side of the building. Doors have significant decay from water damage.

Ancillary Reviews --

The electrical review documented unprotected lighting on the second floor and exposed breakers at the exterior panelboard.

Geotechnical exploration for the project showed nothing unusual and was as expected for the area.

A hazardous materials survey was also completed. Caulk, noted in a visual inspection, is likely to include asbestos-containing material (ACM). Lead based paint is likely on the surface of the structure (interior and exterior). Electrically, the ceiling mounted lights require a protection guard, the panel board is missing a knockout which could allow accidental contact with live electrical parts.

NEEDED REPAIRS:

Repairs necessary for occupancy – Structure Stabilization –

Structural repairs are required to the barn. Three levels of repairs have been designated to be undertaken based on the severity of the conditions: Repairs necessary for occupancy, Intermediate and Aesthetic.

The barn **must** be stabilized as the first step of the Repairs necessary for occupancy since the structure is leaning. Proposed steel frames would need to be erected at each column on the barn's exterior to prevent further movement of the structure. The exterior steel frames would need to remain a permanent part of the barn. The frames would **not** be removed after the internal reconstruction has been completed.

A total structure temporary building shoring system to support the roof and hayloft would need to be implemented to retrofit the existing barn (global shoring system). The building shoring system could include pump jacks to temporarily support the existing hayloft and roof during the barn reconstruction. In addition to the global shoring system, additional shoring would be required at specific repair locations due to the complexity of the damage to the barn.

Once the shoring is in place, a steel cable system should be used to support the building laterally at each column line in the hayloft area. The cable system would hold the building together laterally because the missing roof braces are allowing the structure to move and shift due to the sloped roof thrust forces. The barn cannot be brought back to plumb. It is not known if the barn was ever plumb. The cables would prevent further movement of the structure even after the repairs are completed. The cables would remain in the hayloft.

Once the building is stabilized with frames and cable system, the hayloft would need to be totally vacated so the existing condition of the top of the floor decking could be exposed. A temporary working surface would need to be installed over the work area. The vegetation covering the exterior and interior portions of the barn must be carefully removed. Coordination of shoring installation, cable installation and vegetation removal must be carefully coordinated. If any additional deterioration is discovered after removal, additional similar repairs described in this report may be required.

The existing structural system is not performing as intended due to the deficiencies noted. The horse stalls are not supposed to be structural elements, but there is evidence they are contributing (in some capacity) to the stability of the barn. The horse stalls should not be removed until the lateral and global shoring systems have been installed.

Repairs necessary for occupancy – Structural Repairs and Replacements --

The hayloft floor beam and columns in the southwest corner need to be replaced. The beam and columns support the roof, façade, exterior cantilever roof on south side and hayloft including their structure. The local area at each damaged beam, stringer or girder would need to be shored in addition to the building shoring to remove and replace the existing beam, stringer and/or columns as required.

Main roof rafters exhibiting damage need to be replaced. Vertical shoring from the ground level to the new members need to be sistered to the sound portion of the rafter. Previously sistered rafters from older repairs would need to be sistered again. Rotted wood would need to be removed. Split columns must be repaired but some columns exhibit severe splitting and must be fully replaced. Bearing locations must be repaired as needed for full wood bearing on the support structure. Roof beams along the perimeter of the barn (especially on the south side) are twisting and should be replaced in kind. These beams support the rafters and require significant shoring to support the existing structure during the removal and reinstallation process.

Many lateral bracing structural members in the hayloft have become disconnected, disengaged, or are missing. These supports would need to be reinstalled and reconnected to the existing structure. Hayloft columns and braces should be reconnected, and lateral brace connectors installed at each column. Some bracing at grade level has become disengaged, disconnected, or is missing. Missing bracing should be replaced. Disconnected and disengaged bracing should be reconnected. A knee brace stabilizer is proposed to be installed at locations designated in the report.

The two hayloft spreader beam structures should have a new column post inserted in the location of the previously removed column with additional strapping. Disconnected wind girts in the hayloft should be reattached.

Selected columns require bearing modification or replacement due to rot, deterioration, modification over time or separation from the foundation. Existing columns with no bearing on the foundation structure should be shimmed or otherwise modified to provide full bearing on the foundation. Also, straps and clips to provide positive connection should be installed. Selected sill plates should be replaced under the exterior bearing walls.

The roof and façade (board and batten vertical wall panels) of the building should be replaced. The purlin system should be repaired as needed to support the roof. The girt system supporting the façade should be replaced. Gutters and downspouts should be replaced. Drainage should be directed away from the building.

The site-mounted panelboards are unsafe and should be brought to safe conditions.

Intermediate Repairs –

Intermediate repairs consist of column-to-column connections not imminently failing, wall to curb connections not affecting the lateral stability of the building or wall system, and uneven floor beam to column cap connections.

The windows and doors of the structure are to be repaired or replaced. New framing is required at each window. Door framing surrounding the doors should be replaced. Window and door head flashing should be installed as part of the work.

Hayloft lighting should be replaced with guards to protect the bulbs.

Aesthetic Repairs –

Aesthetic repairs include repair of the concrete spalls on the concrete pedestals supporting the columns and repairing or replacing missing masonry in the foundation walls.

Post Repairs --

If the proposed barn repairs are constructed and verified, the barn would require frequent structural inspections (every year) to review for new damage to the existing structure. Additional degradation of the structure will continue after the repairs are made. The barn lean or tilt will not be corrected but stability would be preserved with the steel frame system. The permanent exterior bracing would need to be painted every 10 years. The floor slab of the barn is cracked, and future deferred maintenance items would include flooring with traction for horses.

COST ESTIMATE:

An Opinion of Probable Cost was developed by internal GF cost estimators for the project based on the needed repairs.

Equestrian Barn at Avenel Repair – Opinion of Probable Cost – Summary by Area

Repairs	Cost
Repairs necessary for occupancy – Stabilization/Shoring/Vegetation Removal	2.78M

Repairs necessary for occupancy – Critical Finding Hayloft Floor Beam	\$20K
Repairs necessary for occupancy – Roof and Roof Structure	\$1.08M
Repairs necessary for occupancy – Hayloft	\$119K
Repairs necessary for occupancy – Grade Level	\$436K
Repairs necessary for occupancy – Wall Assembly, Gutter, Downspouts	\$293K
Repairs necessary for occupancy – Electrical	1.5K
Repairs necessary for occupancy - TOTAL	\$4.7M
Intermediate	\$510K
Aesthetic	\$30K
TOTAL Construction Cost (based on OPC)	\$5.3M
Engineering/Architectural Fee (high level, estimate based on noted repairs)	\$300K
Estimated Yearly Engineering Review Cost (after construction is complete)	\$10K (1)
TOTAL Project Cost	\$5.6M

- (1) Total project does not include yearly engineering review costs, any new repairs or replacements or ongoing maintenance costs.
- (2) The Opinion of Probable Cost does NOT include interior repairs to the stalls, interior cabinets, or floor; upgrades; or repair/modification of barn appurtenances.
- (3) ES Figure 3 is a summary of the Opinion of Probable Cost shown in Appendix C
- (4) OPC developed based on April 2024 Cost Data. No inflation factors for future work are included.

The report does not address the stalls and storage lockers inside the barn. The report does not address any site or grading issues or the ancillary structures on the south side of the barn lean-on structure.

The existing conditions have indicated the barn is unsafe in its current state. Access to the barn is to be restricted until the barn can be stabilized. The inspection of the barn was conducted in the January/February 2024 timeframe; additional damage continues to occur to the barn structure. The order of construction operations is to be carefully considered in order not to cause additional structural distress to the existing barn.