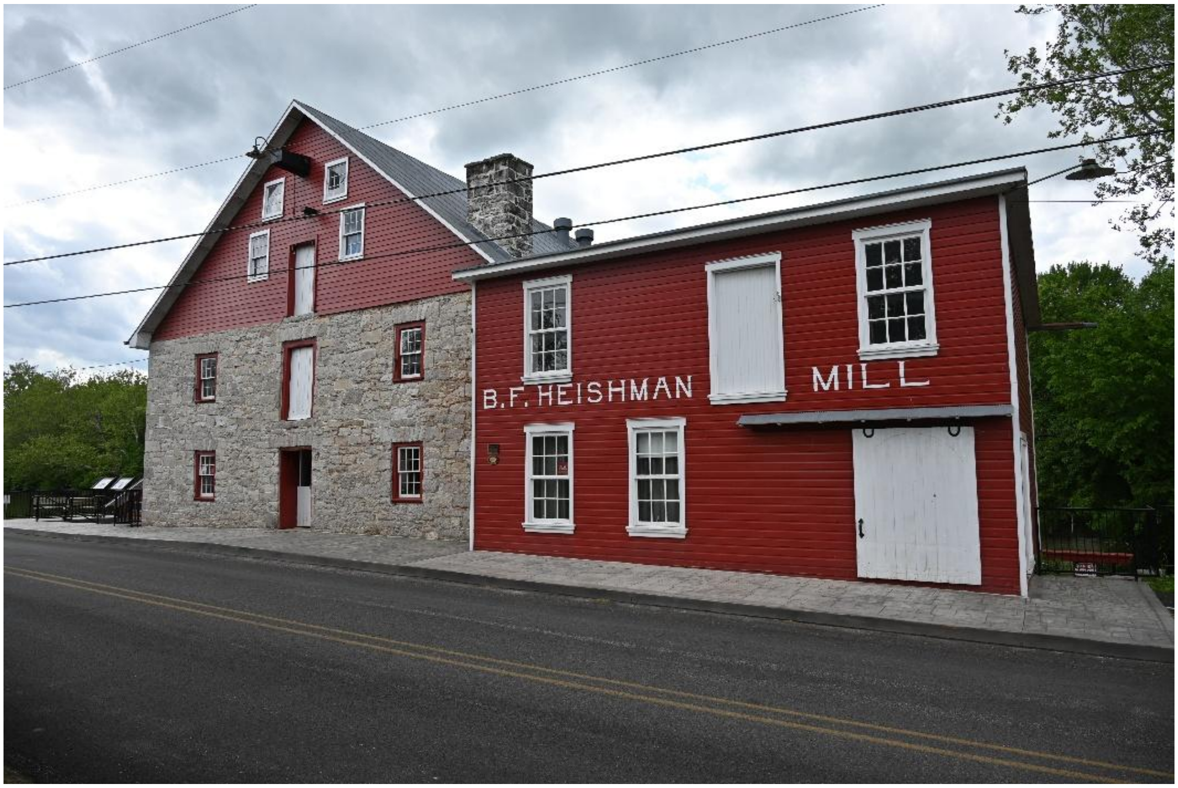
A Report on the Feasibility of Opening the Historic Diller-Heishman Mill As A History and Education Center



By Tony Shahan of T-C Historical Consulting with
Rick Frunzi of Richard Frunzi Historical Services

Prepared for Friends of Historic Heishman's Mill who
gratefully acknowledge our funders on the following page.

An Acknowledgement and Thank You to Our Funders

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Introduction

The Historic Diller-Heishman Mill has been an intersection point both in the past and present, making it ideal for telling the stories of the community and region. With this convergence of cultural history, nature, and recreation, the Diller-Heishman Mill is a valuable location for developing a gathering point in the community. The desire of the Friends of Historic Heishman's Mill (FHHM) is to create a history/education center within the mill. The FHHM engaged the services of Tony Shahan of T-C Historical Consulting, LLC working with Rick Frunzi of Richard Frunzi Historical Services, LLC to conduct a study to determine 1) what would be necessary to open the building to the public; 2) what would be necessary to interpret and potentially operate the equipment; 3) and what stories could be told in the space.

To answer these questions, the study consisted of surveying the mill to identify structural issues; reviewing the composition and condition of the milling machinery; examining potential layout and space design; public accessibility, and interpretive stories. We held two meetings with stakeholders to collect and incorporate ideas about community needs, individual visions, interpretive topics, and potential uses. This report is divided into three sections that address the specific questions asked of the study.

Organizational Goals

The FHHM's goals of converting the mill into a history/education center or other adaptive reuse and making the first floor accessible for regular public visitation and use are attainable. Attaining these organizational goals will require both long-term and short-term structural work, cleaning and restoring the mill equipment, and developing an interpretive plan that is engaging, welcoming, and comprehensively tells the stories of the Diller-Heishman Mill and its community. The findings and recommendations in this report should eventually be included in a strategic plan that provides a reasonable timeline for funding and implementation based on a realistic analysis of resources and support in the community. The three areas of structural work, milling equipment, and interpretation can be worked on simultaneously depending on available financial resources. There will need to be consideration given to sequence for some tasks but much of the structural and machinery work could be built into the interpretation to generate public support for the project.

Structural Work - The Historic Diller-Heishman Mill is not in immediate danger of collapse, but work should be completed to stabilize the building and begin to correct issues that will make public access easier and safer while preserving the mill for future generations. Work should be staged to reduce the impact on public access and make steady progress as financial resources become available. The purpose of the structural survey is to understand the current condition of the building and why the issues exist. It will then provide recommendations that address the structural concerns identified in the survey. The recommendations focus on the steps necessary to make the building accessible to the public as well as its long-term preservation. While the structure is not in immediate danger, it faces threats from natural disasters that could exacerbate existing conditions or even cause a catastrophic loss if left unaddressed.

Milling Machinery – The collection of machinery in Diller-Heishman Mill is relatively complete for multiple operations that were being carried out in the mill – grain receiving, a gradual reduction flour process, and an animal feed process which could also make cornmeal. The survey examined the machines with a focus on what they did, their interpretation, making them operational, and determining if they could make a product. The machinery is in fairly good condition and could be made to operate and make a product.

Interpretation – Diller-Heishman Mill provides abundant opportunities for interpretation, programming, and special events. We discussed interpretive themes and techniques for interpretation during meetings with board members and stakeholders which are reflected in the Interpretation section. The focus of this section of the report was on features identified during the survey that enhance interpretation and types of themes that were suited to the mill based on its character and history. The remainder of this section of the report was focused on how to best use the mill as an interpretive space while understanding its limitations.

For best results, the organization should develop a plan that allows FHHM to show progress in structural stabilization, opens the mill to public access, and highlights the machinery. A unified approach will illustrate progress, encourage funder support, and provide opportunities for engagement of volunteers, members, and the public. Most importantly, it will allow for public access that also encourages the community to be involved in the process of historic preservation and restoration.

<u>Overview of the Historic Diller-Heishman Mill</u>

The Diller-Heishman Mill is listed on the National Register of Historic Places and described as the “Best preserved mill in the western half of Cumberland County” according to the Cumberland County Historic Resource Study. The mill is named after Franz Deiller (Diller) who built the mill between 1793-1805 and Benjamin F. Heishman, who purchased and upgraded the mill in 1920. There were an additional thirteen owners between and after these two before it closed operation in 1958. The building was a grist, feed, and plaster mill, and supported a distilling operation. A sawmill was attached where the current office is located but was removed in 1902 and eventually replaced with an office and storage facility. The mill measures 44 feet by 57 feet with a mix of wall construction types. The east and south walls are made of limestone masonry in basement and two floors above. The west and north walls are a mix of limestone masonry and wooden drop siding over timber framing. The west wall consists of limestone masonry in the basement floor except in the arch section over the millrace and the remaining floors are frame construction. The north basement wall was originally all limestone masonry but was partially replaced after flood damage. The remainder of the wall is a combination of masonry and frame construction. The two gables both consist of frame construction. The mill is built on the Conodoguinet Creek next to the mill dam, which would have reduced the capital investment required to build a long millrace but exposes the mill to a greater risk of flooding. The dam consists of wooden crib construction filled with stone and later encapsulated in concrete. It is reported to be the last crib dam in central Cumberland Valley. The dam provided water for waterwheels, tub wheels, and turbines. Eventually a brick addition was added to house an auxiliary engine.

The Diller-Heishman Mill is an example of a typical water-powered gristmill that served its community as a source of food, feed, building supplies, and a gathering place. As a community hub, the mill was a place to learn the latest news, meet neighbors, and exchange ideas. Its role as a nexus of activity either led to or was partially the result of the store and post office it once contained. The mill’s uniqueness is derived from its survival amid the evolving markets, changing technologies, national trends, natural disasters. The adaptations in the equipment and products and a series of repairs required by flooding and daily use have shaped the character of the mill. As a survivor, the mill reflects its 150 years of operation in its architecture and machinery. Its unusual mixed wall construction (mentioned above) reflects the repairs and maintenance history. The machinery that remains in the mill is from the early 20th century upgrade. However, several features of the mills’ earlier history can be found throughout the building. The holes in the floor, stone cranes, bales, and a fragment of a millstone are remnants of when millstones were used to make flour and plaster in the mill. Two walls in the basement were the supports for a hurst frame and gear pit for the drive train for millstone. The machinery in the mill represents the large number of Pennsylvania mill machinery manufacturers. These machines are typical for flour, cornmeal, and animal feed production. The flour packer for small barrels or casks is a rare survival.

The story of Diller-Heishman Mill is a reflection of the context in which it operated and includes connections to notable events and people in the community. Grain milling, feed production, and plaster milling provides direct connects with agricultural trends. Franz Diller was part of the Mennonite migration movement. The mill was built to serve Diller's distillery, which connects it to Pennsylvania's historic whiskey industry. This is one of the few documented examples of a mill built specifically for already operating stills. Diller built the mill, and a short time later rented it to a miller, probably to ensure a source of ground grain for his two stills. The Diller-Heishman Mill also has a connection with Wilhelm Schimmel, an itinerant woodcarver who became famous for his wood carvings. Schimmel made the mill a base for his activities and may have sourced materials from the sawmill.

The breadth of the Diller-Heishman Mill's history, architecture, adaptations and changes over time, and its tradition as a community gathering place make it ideal for telling a broad range of stories as community history/education center.

Structural Survey and Recommendations

During discussions with various members of the board and stakeholders of FHHM, it was made apparent that the structural condition of the mill is a significant concern of the organization. After studying the structure, it is clear there is no single issue causing the mill's current state but a cumulation of factors. Examining the mill's structural condition within the context of the building's history revealed a story of repeated damage and subsequent repairs to the structure. A brief description of these damages and repairs is included in the summaries below. The damages were caused by natural disasters, water infiltration into the building, and the moisture that is expected in water powered mills after centuries of operation. The combination of the damage, repair strategies, and attempts to stabilize the building have led to the current conditions.

The structural issues identified during the survey of Historic Diller-Heishman Mill seem significant due to the resulting deflection in beams, sunken floors, rotten timbers, and crumbling masonry, but subsequent installation of new timbers, the addition of supports, and removal of equipment halted further deterioration of the structure. However, the repairs stabilized the damage but did nothing to restore the mill's previous condition. Continued deterioration of timbers has caused further damage to the mill. Attempts at repairs and stabilization often dealt with the immediate problem rather than addressing larger issues. This is not a criticism of past owners or tradespeople who were working to preserve this structure with limited resources and possibly limited experience working in mills. Their efforts should be commended because without them the Diller-Heishman Mill would not have survived or been preserved.

Issue #1 – Unsupported Timbers

Causes- Significant damage occurred to the gable end of the mill over the millrace. during Hurricane Agnes. It appears from photographs, structural analysis, and oral tradition that a majority of that end of the building was replaced or repaired after the devastating flood. When this work occurred, a new framed wall was constructed on the masonry walls which were also repaired/replaced. While structurally stable, this new framed wall does not align with the main framing bents of the mill. The west bent remains unconnected to the outer wall. The end timber post does not align with the timber below leaving it hanging in the basement. The timber on the first floor is cantilevered from the nearest support post to carry the load. Because of the unusual alignment, the timbers on the first and second floors also lean in opposite directions. The second instance of an unsupported post is also in the west bent. A post is leaning because it is not under compression because the basement timbers and first floor timbers sagged at different rates.

Recommendations for Connecting Unsupported Timbers – The unsupported timbers (see accompanying drawings and photographs) should be supported and tied to the outer wall's framing. The most efficient method to connect them to the framing is with metal brackets. L-brackets and plates bolted in place can firmly connect the timbers and return the load to the outer wall. These metal brackets are consistent with other repairs throughout the building so it will not be introducing new strategies. The second issue will be addressed when the sagging floor is addressed by raising the floors. Care should be taken to realign the post prior to any lifting.

Issue #2 – Basement Support Structure

The main supports over the millrace and basement floors are at the core of many of the mill's structural issues because they support the entire framing structure for one third of the building. The timbers in this section are subject to damage from regular moisture exposure, periodic flooding, and catastrophic floods like Agnes. The timbers in this area are a mix of repairs often using recycled timbers. It is unclear if any timbers are original because so many of the timbers are recycled from other areas of the mill or even other buildings. While these timbers and floors are connected, this report divides them into sections for ease of discussion.

Supports Over Millrace – The supports for the basement and much of the rest of the building consist of 6 timbers and one I-beam spanning the millrace. These timbers span the millrace and connect to the walls with socketed ends in the masonry on the north wall and resting upon the top of the masonry on the south wall. The wooden timbers show significant deflection, cracking, and water damage. After Agnes, significant repairs were made to this area of the mill including the addition of concrete, timber replacements, and most likely the addition of the I-beam. There is a combination of replacement and what may be original timbers. A combination of rotten timbers and the weight from machinery on the floor above and the turbines hanging from their shafts caused much of the deflection and sagging on the floors above. Three of the seven main support timbers are supported by metal posts supported on plates in the millrace. One main support timber is supported by a jack, one a short post, and another a metal beam. The inspection of the supports was mostly accomplished from the millrace.

Recommendations for Supports Over Millrace – Five of the timber supports should be replaced with new timbers of in-kind dimensions. These timbers support the mill's framing system above and will require additional temporary supports to stabilize upper timbers while the replacements are being made. Prior to installation, the new timbers should be treated with a borate solution to help protect them from future moisture and fungal damage. The two end timbers look sound but one is being supported by a metal post and the other a metal beam so they should be examined at the time the others are replaced. The replacement of the main support timbers may require masonry work to reestablish appropriate supports for some of the timbers where masonry has collapsed. It may also be necessary for the partial or complete removal of the floor and floor supports over the millrace. See below for more details. Supporting the framing structure may require jacking up the timbers to provide clearance so this task will most likely be done in conjunction with raising the timbers as discussed below.

Basement Floor – The basement floor over the millrace consists of three sections – turbine hurst frame, middle, and tailrace. The upstream section consists of the turbine hurst frame which has been significantly altered. The middle section is mostly missing with the remaining timbers rotted in half, cracked and broken, or otherwise compromised. However, these timbers appear to be recycled and the result of past repairs. The temporary flooring over this area was removed during the survey for better access. The tailrace section is the only section with a viable floor, despite it being supported by recycled timbers. Based on the damage caused by Agnes to the gable end and the archway for the millrace, it is conjectured that the entire basement floor and supports were damaged and replaced after the hurricane. This is supported by the presence of recycled timbers. The three sections of flooring will be treated separately because they appear to each represent a different phase of later repairs.

Turbine Hurst Frame Section of Basement Floor – This section of floor supports (there is no floor) in the turbine hurst frame area consist of fragments of what appear to be either framing of a previous hurst frame or timbers from earlier mill framing that have been modified to form the bay. A series of seven large timbers that act as a support for where a floor would be. One end of these timbers rests on the west wall timber which is resting on a metal beam socketed into the masonry at each end. The other end of the two outer timbers rest on different supports. The east end of the northern outer timber is supported by a short post resting on the concrete wall below. The southern outer timber rests on the main support timber. Another metal beam rests on top of the two outer timbers at that end. The remaining five timbers are suspended from the metal beam with threaded rod and metal brackets. The middle of these five timbers is also supported by a metal post resting on a plate in the millrace.

Based on the presence of bearings and gears, this was intended to act as a hurst frame for turbines that had been installed by Will Foshag. The hurst frame is the structure that houses the drivetrain of a mill or the gears and shafts that transfer power from the wheel/turbine to the mill machinery. The purpose of the hurst frame is to absorb vibrations from the running drivetrain and transfer them into the foundations and away from the greater structure. The current configuration of timbers is integrated into the building's structure and would not perform the function of transferring vibrations away from the building. It appears that pieces of the hurst frame were used in their original location, or close to it, but the structure is not free standing and has sections with pieces cut out and some framing pieces are missing.

Recommendations for Turbine Hurst Frame Section – The timbers are in relatively good condition, except for the main support timber. If the main support is replaced on the downstream side, it should be able to support all the timbers so the metal beam and hanging brackets can be removed. Removal of the beam will reduce the load on the remaining timbers. If FHHM intends to operate the mill equipment with turbines in the future, the hurst frame will need to be reconstructed to operate properly and protect the structure from vibration damage.

Middle Section of Basement Floor – This section of the basement floor is the most problematic area. When a makeshift collection of planks was removed during the survey, it was revealed that most of the timbers in that section of the floor were rotted, damaged, or missing. There are timbers in this area, but they are not tied to the support structure and appear to be added more recently using recycled pieces from the mill and milling equipment. There are three shafts with pulleys either supported by the floor or timbers resting on the floor or floor supports. The shafting to the south side of the basement is connected to the auxiliary power system from the attached engine room. The middle shafts are later installations probably associated with Will Foshag's turbine installation. The northern shaft and pulleys, the largest and most extensive, is related to the roller mills on the floor above. Some of the shafting does not show up on the floor plans provided by FHHM. Typically, most machinery installed in the basement of mills is hung from the rafters because of flooding, all three shafts were mounted on or near the floor suggesting they were later additions.

Recommendations for Middle Section of Basement Floor – One of the first steps will be to remove or suspend the shafts and pullies before they collapse into the millrace. This might need to be done after replacement of the main support over the millrace to make supporting the weight during movement easier. All floor supports should be replaced in this section before a new floor can be installed. Thicker flooring should be considered but the material should remain white oak for its strength and resistance to rot. Timbers and other modern installations should be evaluated as to whether they have a purpose and should remain. The bank of elevators will need to be supported from above and possibly the boots, or bottom of the elevators, removed to make it easier to replace the floor supports. Masonry repairs may be necessary to provide support for the outer-floor timbers. FHHM should consider the value of leaving the flooring off of the middle section in the basement for interpretive purposes since it is the best location to view the turbines, turbine box, and tailrace. It would require installing guardrails but could add to the interpretation of the building.

The Tailrace Section of Basement Floor – The tailrace section remains the only viable floor in the basement over the millrace. At this point it is the only safe access to the rest of the basement. It consists of recycled timbers with an oak floor over them. Three sets of timbers and posts exist in this section of the basement. The first set of timbers set above main support timber 6 and stretches between the south and north walls with the timbers socketed into the masonry at each end. It has posts resting above the main support timber, two walls of the water wheel gear pit, and on the mortared/cement floor in the southern part of the building. The second or middle set of timbers in this section has its north end socketed into the masonry wall and is supported by posts on the two water wheel gear pit walls. Its south end is cantilevered off the south post ending over the mortared/concrete floor. The third timber over the east wall support is socketed into the masonry on the north end and then supported by one large timber post and a series of smaller posts over the tailrace arch. The north end of the timber rests on concrete walls poured along the east wall.

Recommendations for Tailrace Section of Basement Floor – This section of the basement floor could remain with some minor repairs to the floorboards. It may be necessary to temporarily remove the floor and timbers when replacing the main support timbers. If the removal is necessary, this would be a good time to replace these timbers while everything is staged to accomplish the work. If new timbers are installed, consider replacing them with smaller timbers to reduce the overall load. It would be recommended to replace the floorboards if they must be removed but this action could wait until later if cost prohibitive.

Issue #3 – Sagging floor and deflection in support timbers - Sagging floors and deflection in the support beams has resulted in some support timbers on the upper floors to be loose and not under compression. At some point the floors sagged, probably due to a combination of forces including weight of the machinery and deteriorated timbers in the basement. A more significant impact seems to have come from two turbines that were once hanging on shafting and whose weight exerted significant force that led to much of the sagging and deflection seen today. These turbines have been released so this force no longer exists. The addition of new timbers in the basement and metal supports in the tailrace appear to have stopped further sagging and deflection.

The deflection in the timbers measures as much as 17” and the floor sags as much as 16.25”. This number may be deceptive since it is based on a level baseline from the front (south side) to the back (north side) of the building. However, it appears the north end of the timbers were set at a lower elevation than the south end when the repairs were made after Hurricane Agnes. The framing assemblages that connect together throughout the floors are called bents. There is an east and west bent in Diller-Heishman Mill as well as a single story bent added during renovations in the basement. The two first story stringer timbers of the bents were both set 14.5” lower on the north end than the south end. On the second floor, the west bent stringer timber is 13.75” lower and the east bent stringer timber is 9.5” lower. The means that correcting the sagging floor will require less lift because the ultimate goal will be achieving a slope rather than a flat plane.

Recommendations for the Sagging Floor and Deflection in the Support Timbers – The problems that caused these issues have been addressed to keep them from worsening. The fixes were all based on stopping the problem from getting worse, not on fixing the issue. Once the main support timbers over the millrace are replaced, the stringer; timbers can be lifted using jacks. The lift should be able to raise the beams between 3”-6” to improve both the sagging and deflection. Spacers will then be installed under the timbers where necessary to support the lift height. The estimated amount of lift is based on visible gaps between the floor and machinery.

Issue #4 – Millrace Masonry Repairs – The millrace at the Diller-Heishman Mill consists of the flume area from the gates to the turbine box, the turbine box, and the tailrace. The millrace extends the length of the water channel under the mill and is bounded on both sides by masonry walls. The entire millrace has seen deterioration over the years.

Millrace – Above the Gates – The retaining wall above the gates is also eroded by water flow. During low water, water was observed running into/under the wall. This area also is regularly inundated with trees and debris floating down the creek.

Recommendations for Area Above the Gates – Any sandbag or coffer dam barriers should be constructed above the retaining wall so this can be fixed at the same time. It should be expected to use pumps because the water table probably extends behind the wall and under the mill. The walls should be pointed or a concrete wall poured in front of the lower section with the erosion. An investigation should be conducted to determine the best method of diverting trees and debris away from the mill, such as booms, additional trash rack, or other installations.

Millrace – Flume Section - The gates have been covered with boards to close off and divert the water away from the mill. Only the outline of the structure and fragments of the trash rack remain of the original gates. The area around the gates shows significant signs of decay and leakage. On the north side of the gate a large section of masonry has collapsed and threatens to undermine that side of the gate as well as the upstream end of the exterior wall. The threatened area is next to the concrete pier installed by Will Foshag. He installed piers at each end of the wall and a concrete wall between them. This encapsulated the original stonework in concrete on both the inside and outside of the outer wall. The combination of water flow and freezing has eroded the concrete along the bottom of the walls. Water is flowing out of the walls on both sides of the flume section. The leakage under the south wall is probably the result of water flowing around the gate and behind the wall. The opposite side is water leaking through or beneath the wall caused by erosion on both sides. The erosion has exposed the original stonework, but the stones remain intact. Additional concrete repairs have been made more recently on the north side walls along with concrete work on top of the wall to support timbers. Several areas show patching, some with the pattern of the plywood forms still visible.

Recommendations for Millrace Flume Section – The flume section has masonry repairs that must be completed to halt additional deterioration and future failures. The washout near the gate should be formed and filled with concrete and the pier strengthened with additional concrete. In addition, the areas of erosion at the base of the walls should be repaired with concrete. A series of sandbag dams or other barriers along with pumps will be needed to accomplish these repairs. Because of the potential for water infiltration, hydrological concrete should be considered in these repairs.

Millrace – Turbine Box Section – The turbine box is the area that housed the turbines. This was a box with concrete sides that are still visible in the side and back walls. There is no evidence of the front wall which may indicate it was originally made of wood. The bottom appears to have been wooden on timber frame supports, some of which survive. The turbine pit remains open so care should be taken by anyone in the millrace working around the turbines. Further research is necessary to determine the exact configuration of the turbine box and flume for the mill. The current structure is severely deteriorated. The back wall is now an arch due to the effects of flooding and freezing. The current configuration is probably not the original turbine box since the back wall has shafting and couplers in the concrete as reinforcing. Oral recollections by Kevin Hollowell revealed that the back wall was intact in the 1970s when they had to swim under the wall while working in the millrace. The valuable source of information also suggested that the two turbines in the millrace were installed by Will Foshag. The framing in the turbine hurst frame reinforces this information. Like other sections of the millrace, the bottoms of the concrete walls have been eroded, and water is entering the tailrace from under the outside wall.

Recommendations for the Turbine Box Section of the Millrace – The eroded areas of the walls should be repaired with concrete to protect the stone masonry from being undermined. If the water level is lowered during these repairs, FHHM should take the opportunity to map the turbine pit. The data is important historical information that can inform understanding of the mill's history and operations, interpretation, future restoration, and engage the public in the process of history and preservation. This mapping should occur whenever the water level is lowest in the tailrace, whether that is during millrace repairs, gate repairs, or during drought conditions that naturally lower water levels.

Millrace – Tailrace Section – The tailrace section consists of stone masonry on the south side and stone masonry encapsulated in concrete on the north side. The south section of the millrace is the only section that survives in its original stone configuration without concrete modifications. The stonework has been repointed with a dash style pointing on the upper sections of the wall, but the base has no mortar remaining. Both sides of the tailrace section have erosion damage at the base. The north side has had concrete repairs at the top. An area of stone appears to have collapsed but it has corners in the masonry so may have been an opening that has been filled in and now deteriorating. This is a section that supports two main support beams so it needs to be repaired.

Recommendations for the Tailrace Section of the Millrace – The erosion at the base should be repaired. Concrete should be used to repair the north side of the millrace. Since the opposite side is the only untouched section of the original walls, FHHM will need to decide whether to focus on repointing the walls, installing concrete, or a combination of both. Concrete is an established material in the millrace, so concrete repairs are acceptable. Since this section of the wall is the only remaining untouched stonework in the millrace, it would be desirable to preserve this section as it was originally built. Repointing the walls will require the same temporary barriers to dewater the area as the concrete work and patching a few areas with mortar loss in the upper section. If repointing the wall proves prohibitive, a short concrete wall can be installed at the base to protect from normal water flow and the remaining wall can be pointed to match the existing. The repairs at the base of the south wall should include weep holes where known leaks exist. The water table around the mill runs behind the wall and under the mill. Weep holes would help reduce any pressure on the walls created by the water table or leaks behind the walls. In this case, you will not be able to stop the water so the best option is to control it in a way that reduces damage.

Millrace – Exterior Wall – As mentioned above, Will Foshag implemented major repairs of this wall that included pouring concrete piers at each end of an earlier concrete wall that connects them. These piers and wall are in good condition except near the waterline. Erosion has washed away the concrete at the base of the wall allowing water to run through the stonework below.

Recommendations for the Exterior Wall of the Millrace – The eroded area should be repaired with concrete. Attempts should be made to make sure the concrete bonds with the bedrock in the creek to help avoid future leaks and undermining of the wall. At low water, bedrock ledges are visible in this area. Once the concrete is poured, stones should be placed along the base of the wall to lessen the impacts of flowing water.

Millrace – Earthen Section – The earthen section of the tailrace starts where the water leaves the mill and continues until it rejoins the creek. The north side of the tailrace probably consisted of stacked stones that later formed the current island or may have utilized an existing island. Stone jetties are usually constructed on the upstream side of tailrace sections where they meet the streams. These jetties keep the water from eddying back into the channels and depositing silt that blocks water flow. There is a partial jetty at the northeast corner of the mill near a breach. This section of the earthen tailrace has been breached in multiple locations where the creek washed out materials. The other side of this section of the tailrace consists of a steep bank up to the road.

Recommendations for the Earthen Section of the Millrace - If the earthen section of the millrace is not repaired, it could eventually undermine the back corner of the mill. Restoring this area of the tailrace will push water away from the mill and provide additional protection. Typically, the breach would be repaired with large boulders carefully stacked to create a strong barrier. However, access may not make this option possible so the option of a concrete wall should be considered. If the aesthetics are a concern, stones can be piled up around it or mortared as a veneer covering.

<u>Issue #5 – Control Gates –</u> Control gates regulate the water flow from the creek to the millrace. The control gates at the Diller Heishman Mill may have also acted as the flume gate as well. The current gates have been blocked attempting to divert the water away from the mill using timber planks and metal sheeting. The current structure has leaks through, under, and around it. The exact design of the gates is unclear based on the existing structure.

Recommendations for Control Gates - A sandbag or other type of temporary dam may be necessary above the gates to accomplish the repairs in the millrace, especially those around the gate. If a temporary dam is necessary, work on the gates should be undertaken at that time to avoid the expense of rebuilding a temporary dam later. The gates will need to be addressed at some point but can be considered a long-term need if the temporary dam is not needed. When addressing the gate project, FHHM will need to choose between rebuilding the structure as it is currently designed to keep water out or restoring the gates to a working condition. The former option will consist of replacing the current timber structure with iron sheets in-kind, so the water is diverted away from the millrace. The latter option will require reconstructing gates and lifting mechanisms to replace the current structure. The gates are only necessary if the organization plans to restore the mill to a working condition, but they provide other benefits. Gates can be used in the same way as the current structure as a static barrier or be maintained as functional gates. Rebuilding the gates will add a level of authenticity to the mill, providing a visible element of a working mill. It can also be used as incentive for fundraising if the organization decides to restore turbines or wheels to operate the mill. Both structures will have approximately the same lifespan, but gates will require additional maintenance in the form of lubrication to keep them operational. Further research into photographic and documentary sources will be necessary to create appropriate gate designs.

Issue #6 – Water Wheel Hurst Frame – The age of the mill means it would have been powered by a water wheel during its early history. The wheel(s) would have been replaced later with turbines. While it was initially thought that no evidence specifically related to the water wheel era had survived, the stone support walls for the water wheel hurst frame and gear pit were identified during the survey. The supports consist of two walls running parallel to the millrace. One wall makes up one side of millrace, and the other wall is set seven feet away. The two form a pit opening that would have once been the gear pit for the hurst frame. The gears of the drivetrain would have turned in this open space as they transformed the potential energy in the creek into mechanical energy for the millstones and other equipment. The stonework contains sections along its top that are loose and the walls are collapsing in places. These walls support the main support beams and several timbers in the main support structure. The pit is currently filled with sandy silt and lots of debris from flooding and attempts to shore up the floor above it. The floor above the pit and its support timbers have seriously deteriorated. Several of the timbers have collapsed and the floor is unsafe.

Recommendations for Water Wheel Hurst Frame – While the structure no longer functions as a hurst frame support it has been incorporated into the support structure for the mill and millrace. Stabilizing these walls is important for the preservation of the mill. The debris should be removed from the pit, but the sand should be left to help stabilize the walls. If the sand is raked flat, the walls can be rebuilt in the places where they are collapsing and to be pointed in the others. Areas that support timbers and the tops of the walls that support the floor timbers should be carefully rebuilt to achieve those functions. This work may need to be completed before or in conjunction with the support beam replacement depending on the sequence established by contractor and if the walls can support lifting of the beams in their current condition.

Issue #7 – Roof Supports – Water infiltration affected a small number of rafters during a past leak, before the current roof was installed. Several rafters suffered from water infiltration which caused dry rot, fungal growth, and have visibly failed particularly where there are joints. The damaged rafters were not repaired when the roof was replaced. The damaged rafters pose no immediate threat to the building but should be addressed when possible

Recommendations for Roof Supports – As mentioned above, there are rafters that need to be replaced or repaired. It is difficult to replace rafters while the roof is in place. The easiest method to repair these members would be to either "sister" new members onto them or use steel plates to strengthen the damaged areas.

<u>Other Recommendations for the Diller-Heishman Mill</u>

Cleaning the Building – As someone who saw the condition of the mill two years ago, I understand the incredible work that has been accomplished in clearing out the mill. There are a few things that will provide additional help in preserving the structure including cleaning. Cleaning the upper floors to remove accumulated dirt and animal feces will improve conditions in the building overall while keeping floors and machinery from further deterioration. A regular cleaning schedule should be established for the entire mill. If performing this with FHHM volunteers, be sure everyone involved wears appropriate protective equipment to protect people's eyes and respiratory systems. Non-usable materials and non-mill related items should be removed from the mill to aid in maintenance and the restoration. An exception would be the treadle lathe on the second floor. While it is not mill related, it is a historical piece and may be of benefit for later interpretation. The other item to take care with is the historic work bench on the first floor. This may have originated from the original construction of the mill.

Basement Floor – The side of the basement floor not over the millrace should be carefully cleaned and cleared of debris. During the survey, it was discovered that this section of the basement had a concrete or mortar floor. The floor is covered in 1-2" of fine silt, probably the remains of past floods. This should be removed while being careful to collect any objects hidden in the silt. Exposing this floor will help to understand the condition of this feature, make the area healthier to work in, and make it more presentable for VIP and funder tours.

Cataloging Mill Items – All non-structural items in the mill should be photographed and cataloged (flour bags, tools, mobile equipment, milling parts, etc.). This will provide a good record of each item, its location, condition, and how it might have been used. If original photographs are displayed in the mill, a copy should be made for display and the original stored in an archivally sound method and location.

Oral History Project – Much of the recent history of the Diller-Heishman Mill is preserved in individual memories. During the survey process, I spoke with board members, people who worked on the mill, and others with knowledge of its history. These individuals should be identified and interviewed to formally collect those recollections and preserve them. If possible, the interview should be captured on digital video or at least digital sound recordings and timely transcriptions completed. This allows for future use in interpretation but also provides backup for digital recordings. Timely transcriptions allow follow up questions and clarification of the initial recordings if necessary.

Pest Management – Some form of pest management should be implemented to protect the structure and those things being housed in it. It does not have to be an expensive service of monthly treatment, but bait and/or glue boards should be used to monitor conditions and determine if treatment is necessary. There is at least one floor joist that shows signs of termite damage, although it is not necessarily recent.

Safety – Any areas deemed unsafe should be marked so volunteers understand where they should avoid. There are no places on the first floor but some weak spots on the floors above. Barriers should be placed around the machinery to restrict access to protect the public and the machines. See more details below in the interpretation section.

Wiring – The Diller-Heishman Mill contains active knob and tube wiring throughout the building which is in good condition. We recommend replacing the exposed wire with sheathed wire made for this purpose. It will retain the historic look while reducing risk of injury or damage to the mill by fire.

Trash Boom – Historically, booms consisting of logs connected with ropes, cables, or chains were sometimes stretched across the opening to millraces. The water system configuration at the Diller-Heishman Mill would benefit from a trash boom. It would keep trees and other large debris from floating into the gates and upstream pier of the mill. It would also reduce access to the mill from water traffic.

Store Floor Markings – A secondary floor has been installed over the earlier floor in the south end of the first floor. During the survey, this was described by multiple people as the area of the store that was once located in the mill. The edges of the floor are irregular representing what were probably shelving and a ramp into the mill. The sloping ramp would have been important for moving bags and barrels with a hand cart. The irregular edges could be a tripping hazard since the transition between the floors is abrupt except at the ramp. Effort should be made to preserve this feature of the mill. From an interpretive perspective, it is a physical representation of something that no longer exists and unless a photograph can be found is the only evidence remaining of the store. Some strategies to mitigate the tripping hazard could be to mark the edges with colored tape or paint. If this is not sufficient, additional floor can be extended from the store floor and tapered to match the slope of the ramp. The new floor should be left unfinished, and no attempt should be made match the color of the store floor. This will create contrast that highlights the store's configuration and preserves its interpretive value while removing the tripping hazard.

Diller-Heishman Mill Machinery Survey and Recommendations

Summary of Milling Equipment - The milling machinery in the Diller-Heishman Mill is representative of late 19th and early 20th century equipment and was obtained mostly from Pennsylvania manufacturers. The equipment was manufactured by Sprout Waldron Company of Muncy, PA (1866), August Wolf & Company of Chambersburg, PA (1879), Thomas Robinson and Son Manufacturing Co. of Muncy, PA (1883), Hertzler & Zook Company of Belleville, PA (1899), and S. Morgan Smith of York, PA (1877). The corn mill was obtained from Meadows Mills Company of North Wilksboro, NC (1900) and one of the cyclone dust collectors was from The Knickerbocker Company of Jackson, MI (1885). This equipment was available for ordering through the company catalogs and represents Pennsylvania's role in milling equipment manufacturing.

The equipment in the Diller-Heishman Mill is divided into three systems – receiving, gradual reduction flour, and feed and cornmeal. Each system is clustered in their own area and vertically arranged throughout the floors of the mill to use gravity. The receiving system is focused on the front of the mill with an opening for grain to flow to a receiving hopper just inside the door, a bin scale to measure the incoming grain, elevators to lift the grain to a receiving separator, a routing head or distributor, and the storage bins above. There are two large storage bins labeled as elevators on the floor plans. There is also a rope hoist for lifting and lowering grain and products. The feed system is focused on the left side of the room next to the bin scale. It consists of the corn grinder, elevators to lift product, a feed mixer, and a screw conveyor with bagging chutes which might also have been used for cornmeal. There is also a platform in the basement for what appears to have been a cob crusher, a machine used for chopping corn stalks and cobs for making animal feed. The gradual reduction flour operation is located at the north end of the mill and consists of three roller mills, a gyrating sifter, a bank of ten elevators, middlings mill, middlings purifier, separating and scouring machine, wheat scourer, bolter, flour dresser, exhaust fans, dust collector cyclones, product and inspection bin, and flour packer.

The three systems of machinery are complete and reflect common aspects of milling from the later 19th and early 20th centuries. This equipment could have been, and probably was, ordered from a mail order catalog. The machinery is typical of a mill that survived into the 20th century making flour, animal feed, and probably cornmeal for the local community. The only unique machine is the flour packer set up for packing casks instead of bags. This is an unusual survival that warrants extra care and attention. The only evidence for earlier generations of machinery can be found in the water wheel hurst frame walls, the cut outs for the millstones, and stone cranes found throughout the building. The machines are in relatively good condition and deserve to be cleaned and restored.

Recommendations for the Diller-Heishman Mill Machinery – The machinery is in relatively good condition and can be made presentable for interpreting to the public. The work can be accomplished in series of stages depending on available funding. The stages would be based on opening the space to the public with the machines as they are, cleaning and stabilizing the machines, restoring the equipment, making some of the machines operate, and making a product. There is no requirement that the machines become operational or make a product but these accomplishments will enhance the mill's ability to attract visitors. The cleaning and restoring processes can be part of public programming to generate interest in the mill.

Opening to the Public – The machines are capable of being presented to the public as they are. While there are some concerns about accessibility and security that need to be addressed, the machinery could be interpreted now during special events, private rentals, or regular public days. For this to work, certain areas need to be secured (basement, 2nd floor, office and storage area) from public access. We recommend installing a series of moveable railings that would go around the machinery, creating a horseshoe configuration for public access. This will feature the machinery as the central exhibit in the building, allowing total viewing of the equipment while keeping the public far enough away for their safety and the security of the equipment. By making the equipment and building accessible immediately, the organization can raise additional awareness of the mill, funding through donations, and build community support. It promotes the organization's ability to achieve it goals. Each subsequent project will show improvement and engage the public in the process of history and preservation.

Cleaning and Stabilizing the Equipment – The next step in presenting the machines to the public and protecting them would consist of cleaning each machine, elevator, bin, and chute. Obviously, the process would start with those machines on the first floor but should include machinery on all floors. This will help to preserve the machines and protect them from pest and mold damage from product that might still be in them. Cleaning the machines will improve their appearance and show progress to the public, which will encourage more engagement and support from volunteers and donors.

Restoration of Individual Machines – The third stage of making the equipment presentable would be to restore individual pieces of equipment in preparation for making them functional. This would require checking bearings, lubrication, installing belting, and making sure the shafts and parts are functioning. Parts may need to be located or manufactured for some machines. First floor equipment is well suited for this with the flour packer, roller mills, and corn mill. This will not only require working on the machines but researching operational specifications and maintenance requirements. Like cleaning in the previous stage, this work will be a visible example of the organization's progress and should attract support from volunteers, members, and donors.

Making the Machines Work – Making the equipment functional will most likely be a phased process. The first step will be to make individual machines partially operational such as the bagger or roller mills. The technique will be to install a motor or motors in the basement or on the floor above to operate a roller mill, corn mill, and/or the bagger. Motors have the advantage of being less expensive than recreating the mill's water system and they provide a ready source of power with the flip of a switch. The disadvantages are associated with the need for new electrical service in the mill and the operational costs of electricity.

Making a product – The next step would be to restore an entire system so a product can be manufactured. Of the possible options, the most likely system would be the manufacture of cornmeal. The gradual reduction flour process requires three roller mills and multiple sifters to be restored and functional to produce a product. The feed/cornmeal system would require fewer machines to operate while producing a product. The product to be sold could be bird feed, animal feed, or cornmeal. If cornmeal is sold, regular inspections will need to be made by the appropriate agencies in your area. Other requirements may be necessary such as stainless-steel liners in chutes, cleaning all areas the project contacts with bleach before grinding, directly collecting product in food safe storge equipment, and a storage freezer for the final product. The appropriate regulatory agency will provide guidelines upon request.

Restoring the Mill's Power System – There are several options for returning the mill to a historical system of operation since the mill had multiple power systems during its centuries of operation. Each has its benefits and drawbacks, but each has a place in Diller-Heishman Mill history so would be appropriate. There are three documented possible power systems in the form of turbines, water wheel, and engine power. None of these are wrong but FHHM will need to determine which best suits the story it wants to tell and the resources available to support the system chosen.

Water Turbines – Turbine power is what the system last operated with as we discussed above. Remnants of the turbine box and hurst frame exist but other than the turbines nothing is usable and will need to be reconstructed. The turbines will need to be removed, checked for damage, and restored. A new penstock and gates will also need to be constructed. There should be adequate water flow to support turbines, and they produce more than enough power to operate the machinery. The drawbacks of turbines include the expense of installation, they are easily impacted by low water, and they operate in a big box out of sight of the public. The current hurst frame and power take-off will need to be reconstructed to be operational.

Water Wheels – There is little information about the type of water wheel used at Diller-Heishman Mill, but the current conditions suggest it would have been an undershot or low breast/pitchback wheel. This assumption is based on the elevation of the water and height of the hurst frame supports. There is no evidence remaining of the size of the wheel as all evidence was destroyed when the turbines were installed. Wooden water wheels have a lifespan of approximately 25 years but metal water wheels last considerably longer. It is also common to use a combination of metal spokes and rims with wooden paddles or buckets. Water Wheels spark the public imagination as visible representations of our American industrial past. Building a wooden water wheel requires acquiring wood several years ahead to season it before construction begins and requires regular reconstruction. Metal or hybrid wheels require less maintenance and are comparable in cost to construct.

Engines – Like many other mills, the Diller-Heishman Mill was equipped with an auxiliary engine to power the machinery when the waterpower was unavailable. This often happened after turbines were installed in mills. It was discovered that turbines are much more efficient than water wheels, but they require higher flow rates to operate than water wheels. During low water periods, turbines are not as efficient so mill owners installed engines as backup power sources. The engine shed and motor mount already exist as does the shaft and drive pulleys for the auxiliary power source. The main expense would be acquiring an appropriate engine to operate the mill and regular maintenance of the engine. There are plenty of engine related organizations in Pennsylvania that could assist in locating and perhaps maintenance of the engine. The biggest drawbacks of an engine are making sure it is protected against flooding and the cost of fuel to operate it.

Overall Thoughts on Power Sources – The easiest way to make the machinery operate is with electric motors driving individual machines. This cuts down on power transmission (belts and pulleys) through the mill, which is traditionally responsible for injuries in mills. However, there is nothing like seeing the power source creating energy to power the machines, hearing the splashing of water (or the engine) and running of pulleys turned by belting, and feeling the building vibrate with all the motion. An operating mill comes to life in a way that static mills cannot. While an expensive and therefore long-term objective, the impact of a working power system and milling equipment should not be underestimated. These projects capture the public's imagination and lead to increased participation by members and donors. Much like in the past, working mills become focal points in their community. The actual construction project can create opportunities for educational programming and craft training.

Historical Interpretation and Programming

We were instructed to focus more of our time on the structural analysis at the beginning of the project. Therefore, we have limited the Interpretation and Programming to the most important things to think about when implementing this part of the organization's goals.

Mills are particularly well suited for adaptive reuse since they are designed to adapt to changing markets and technologies. The Diller-Heishman Mill specifically is well designed to be a place to tell stories of the mill, its landscape, and its community. Unlike many mills, the layout of the Diller-Heishman Mill provides the opportunity to highlight the machinery and still have space for other interpretation, special events, or gatherings.

During our discussions, several ideas were mentioned concerning how and what to interpret for the public. The chosen methods should focus on what works best for the organization, the circumstances in the mill, and what is sustainable with available resources. This will most likely mean a phased approach, doing what is possible until resources (people and funding) are available to take the next step. Below are recommendations and observations for interpretation and programming.

Interpretive Planning – While the Diller-Heishman Mill is well suited to be an history/education center or other adaptive reuse facility, it does have some challenges that must be addressed. The first is narrowing down the options for interpretive themes and then determining the best options for presenting them. The second is making the site welcoming and inviting for visitors. These can be as simple as keeping the building clean and cobweb free but will also entail finding solutions to restroom and parking challenges. FHHM should work to create an interpretive plan that will outline themes, methods of presentation, exhibit designs, visitor flow through the building, and visitor services. This is usually most effective if completed with an outside facilitator with exhibit design and museum educational experience.

Interpretive Methods – Our discussions generated ideas about how to present interpretation in the Diller-Heishman Mill including self-guided experiences, display panels, docents/interpreters, and audio-visual equipment. These are all acceptable and proven methods, but each requires consideration. Self-guided tours are the easiest but will require the ability to secure all areas except the first floor of the mill and barriers to protect the machinery and the public. This is a method that could be implemented once security issues are addressed and some limited interpretive signage is installed to help people understand what they are seeing. It is also important to explain who FHHM are and what you are trying to do. This can be an opportunity for more public exposure, recruitment of volunteers and members, and soliciting donations. Self-guided tours require the building to be open at set times and be inviting and welcoming to the public. Open hours would likely be limited to weekends initially.

Self-guided tours are often accompanied by personnel to welcome visitors, answer questions, help them explore the interpretive materials, and act as monitors for the site. A combination of open hours with both monitored and unmonitored times could be an additional option. Once there are personnel on site, it is a small step to training them so they can provide guided tours. Tours would likely be limited to weekends in the beginning to accommodate the irregular nature of visitation. As visitation becomes more regular, set tour times might make it easier.

Panel displays are often used to create a context and present themes and stories that are not easily told in the mill and its machinery. There are several methods for panel displays so choose one that best suits the mill's needs. Panels should be durable and able to withstand being in the non-climate-controlled environment of the mill. They should be able to adjust to the uneven floors, so they do not lean. Care should be taken if attaching panels to the walls to not damage original fabric in the historic structure. The best choice will be one that is flexible and can be moved to accommodate special events or private occasions in the mill. Often private events can generate important funding, so you want to be flexible and be able to protect the panels by moving or removing them. Panels can also be effective barriers to control access and traffic flow in the room.

As mentioned above, a working mill creates a dynamic experience for the visitor. However, static mills can recreate part of this experience with audio visual assistance. Video and/or audio recordings of working mills can recreate some of that experience for visitors. Video of parts of the mill that are inaccessible can provide a more complete experience and understanding for the visitor. It also provides opportunities to use oral histories and professional video productions to enhance the visitor's experience. Care will need to be taken in selecting and storing equipment to be used because of the dampness in the building. Security will also be a concern if the building is left unmonitored for self-guided tours.

The use of special events is an effective tool to generate interest in preservation projects, especially if they connect with the themes presented in the mill. The recent Wilhelm Schimmel wood carving event is a good example of telling a regional story with connections to the mill and promoting important themes of craft and handmade skills. Other events should be considered, especially with partners who can further FHHM's goals and bring the preservation project to new audiences.

Interpretation of the Milling Equipment – The focal piece of the mill will be the milling equipment so it should be presented in a clean and clear manner. Access to the milling equipment should be restricted but not restrictive, meaning that good lighting and open views should be always maintained. Signage should identify and explain the purpose of the equipment but be done so as not interfere with viewing or photography. This will most likely mean a set of movable barriers around the equipment with any display panels set next to the mill's walls. Identifications of the equipment can be attached to the barriers. Movable barriers create flexibility for special events and offer the option of opening them during tours or special events, creating the feeling of being welcomed behind the scenes for a special opportunity.

Layout and Traffic Flow - The horseshoe layout appears to be the most effective for viewing the machinery and exhibit panels in this space. It also would allow access prior to completing the structural work of lifting the floors. The current plan is to only open the first floor for visitors for many reasons including ingress and egress requirements, public safety, and security. However, the basement could be made accessible with work on the stairway and better access to the doors on either the east or west side of the building. This would provide another opportunity for the public to have a behind-the-scenes experience.

Interpretive Themes – The Diller-Heishman Mill is a typical mill of its kind but also has unique qualities that are specific to its location and history. These regional features should be the focus of interpretive themes. The fact that the distillery predated the mill makes it most likely built for the distillery as well as to serve community flour needs. The current interest in whiskey and whiskey history would make this a good story to tell. You could also be a destination on the whiskey trail if you have interpretive materials describing this part of the mill's history. The mill's connection to the landscape is a part of its history of power and could be an introduction to the nature goals discussed. The mill and its equipment are obvious interpretive themes telling why the mill is here and what it did. The story of the conversion to gradual reduction flour milling and the feed milling business connect the present equipment with how it survived into the 21st century and agricultural changes in the region. The machinery also provides an opportunity to discuss Pennsylvania's role in milling equipment manufacturing. The concept of survival was also mentioned intending to describe the business adaptations the mill underwent throughout its history, the threats to the historic preservation of mills, and the people who have fought and are fighting to preserve the Diller-Heishman Mill for the future. Other themes might include the process of sleuthing the clues to understanding past equipment and processes.

<u>Notes on the Attached Budget Estimate</u> – The Budget Estimate attached to this report is meant to be for planning and fundraising purposes only and should not be considered a bid. The numbers are estimates based on how the surveyors would approach the tasks,

current costs, and resources known to them. While we believe the costs are accurate according to our present knowledge, the final costs of the various projects are subject to changing costs of materials, availability and cost of local sub-contractors (such as concrete, lifting equipment, timbers, etc.), and permitting requirements.

Summary of the Survey of the Historic Diller-Heishman Mill

The survey of the Historic Diller-Heishman's Mill illustrates that the FHHM's goal of creating a history/education center is quite feasible. The survey and this report identified the primary structural issues and provided recommendations for what should be done. While the building is structurally stable at this time, there are issues that should be addressed. Some need more immediate attention like replacing main support timbers and lifting the sagging floor and timbers. It is also important that these be done first because other repairs depend on them being completed first. Other structural issues are independent of the rest. While not emergencies, the longer these repairs are postponed the more expensive they will become and there is a greater chance of additional damage. However, the steps in preparing the machinery to be interpreted and beginning to develop the interpretive stories can proceed consecutively with the structural work. Together the recommendations for the structural, machinery, and interpretive work provide a list of what the organization needs to open the Diller-Heishman Mill first floor to the public. If desired, we are willing to help the organization develop a sequence of projects that meet their goals and resources.

Attachments

Budget Estimates
Photographic Survey
Field Sketches
- East Bent Framing Plan
- West Bent Framing Plan
- Basement Framing Plan
- Deflection Plan for 1st Floor Timbers
- Deflection Plan for 2nd Floor Timbers