



Improve Visitor Safety and Mitigate Rockfall Hazards in the Paw Paw Tunnel Hollow Chesapeake & Ohio Canal National Historical Park

Environmental Assessment

June 2020

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and Developing and Producing this EA: \$50,000



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PURPOSE AND NEED

The National Park Service (NPS) proposes to mitigate safety concerns associated with rockslides at the downstream entry of the Paw Paw Tunnel. The Paw Paw Tunnel is in a remote area of Allegany County in an area prone to rockslides. A towpath closure in the tunnel or areas immediately upstream or downstream of the tunnel requires a lengthy and strenuous detour over a mountain. The tunnel is the only emergency access route to the towpath on the downstream end of the tunnel. The tunnel also has historical significance as one of the most significant works of the Chesapeake and Ohio Canal, and typically receives more than 30,000 visitors each year.

The purpose of this project is to remove debris from the canal prism deposited in a 2016 rockslide and to stabilize the rock face adjacent to the canal for 1,000 feet north of the Paw Paw Tunnel. The project would also replace in-kind the wooden boardwalk that serves as the towpath for 750 feet of this stretch. This project is needed to improve visitor safety and to prevent disruptions to towpath continuity that may result from future landslides. This project would also allow the park to address visitor safety and access issues at the Paw Paw Campground parking lot and on its entrance road. The campground parking lot is not currently large enough to accommodate the number of visitors to the area; when the existing parking lot fills, visitors park along State Route 51, creating a safety hazard. This project would provide the opportunity to use removed rock material to expand the existing parking lot and to widen the entrance ramp off of State Route 51 from one lane to two lanes, thus reducing the possibility of collision between cars entering and exiting the campground.

This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended, and implementing regulations, 40 Code of Federal Regulations (CFR) Parts 1500-1508, NPS Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision-making, and the accompanying NEPA Handbook. Compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, is being conducted concurrently with the NEPA process.

BACKGROUND AND PROJECT AREA

The project area stretches from a proposed spoil location at the end of Outdoor Club Road at mile marker 153.5, to the proposed staging area at the parking lot of the Paw Paw Campground located off State Route 51 at mile marker 156 (Figure 1). Most of the project would be focused in the Tunnel Hollow where the rock stabilization activities would take place (Figure 2) but would also include the area in the immediate vicinity of the towpath along the entire length. The project area also includes portions of Tunnel Hill Road and Tunnel Hill Trail. Tunnel Hill Road runs from Malcolm Road, over Tunnel Hill, intersects with Tunnel Hill Trail, and continues south into the Maryland State lands of the Paw Paw Bends. Tunnel Hill Trail begins near the southern portal of the Paw Paw Tunnel, climbs Tunnel Hill, intersects Tunnel Hill Road at the summit and continues down the north side of Tunnel Hill to the towpath in the Tunnel Hollow. The main historical features in the project area are the tunnel itself, the cuts to the north and south, and the structures in the Tunnel Hollow Complex in the hill cut 2,000 ft north of the downstream tunnel portal of Paw Paw Tunnel.

The Paw Paw Tunnel was constructed by the C&O Canal Company to cut across the Paw Paw bends of the Potomac River, thus reducing the six miles of canal necessary to follow the river around the four meanders of the bends to one and a half miles. It is located between mile markers 155 and 156 on the canal near the town of Paw Paw, West Virginia; the tunnel, the town, and the bends all derive their name from the paw paw tree, which grows abundantly in this area. Construction on the tunnel began in 1836 and continued until 1842 when funding for the project was exhausted; construction eventually resumed in 1847 and the tunnel was finally completed in 1850. The project was delayed by a shortage of skilled laborers, strikes, the remoteness of the work area, frequent rockslides, and an underestimation of the time and money needed to complete the project which, unfortunately, coincided with financial issues within



the company. The Paw Paw Tunnel remained an operational part of the canal until 1924 when the C&O Canal Company ceased commercial navigation.

Rockslides have been a documented problem in the Tunnel Hollow since construction began. The character of the rock is such that exposure to weathering leads to fracturing and rockfall. Landslides in the cuts have been noted by NPS throughout the history of the park with major slides occurring in 1968, 1969, 1974, 1975, 1976, 1977, 1997, 2013, and 2016. Most of these occurred on the western slope of the northern cut. NPS has made previous attempts to address these hazards, notably in 1956, 1979, the mid 1990s, and 2018. In 1956, portions of the tunnel vault brick work, the towpath, and the towpath boardwalk were repaired and rockfall debris was removed from the canal. In 1979, the tunnel portals were cleared of vegetation and repointed, and rockfall debris was removed from the canal. In 2018, scaling was used to remove unstable rock from the eastern slope of the north cut, the scaled material was placed against the side of the canal. Rock bolts and shear blocks were installed to prevent further destabilization, and draped mesh was placed over select areas to catch further rockfall.

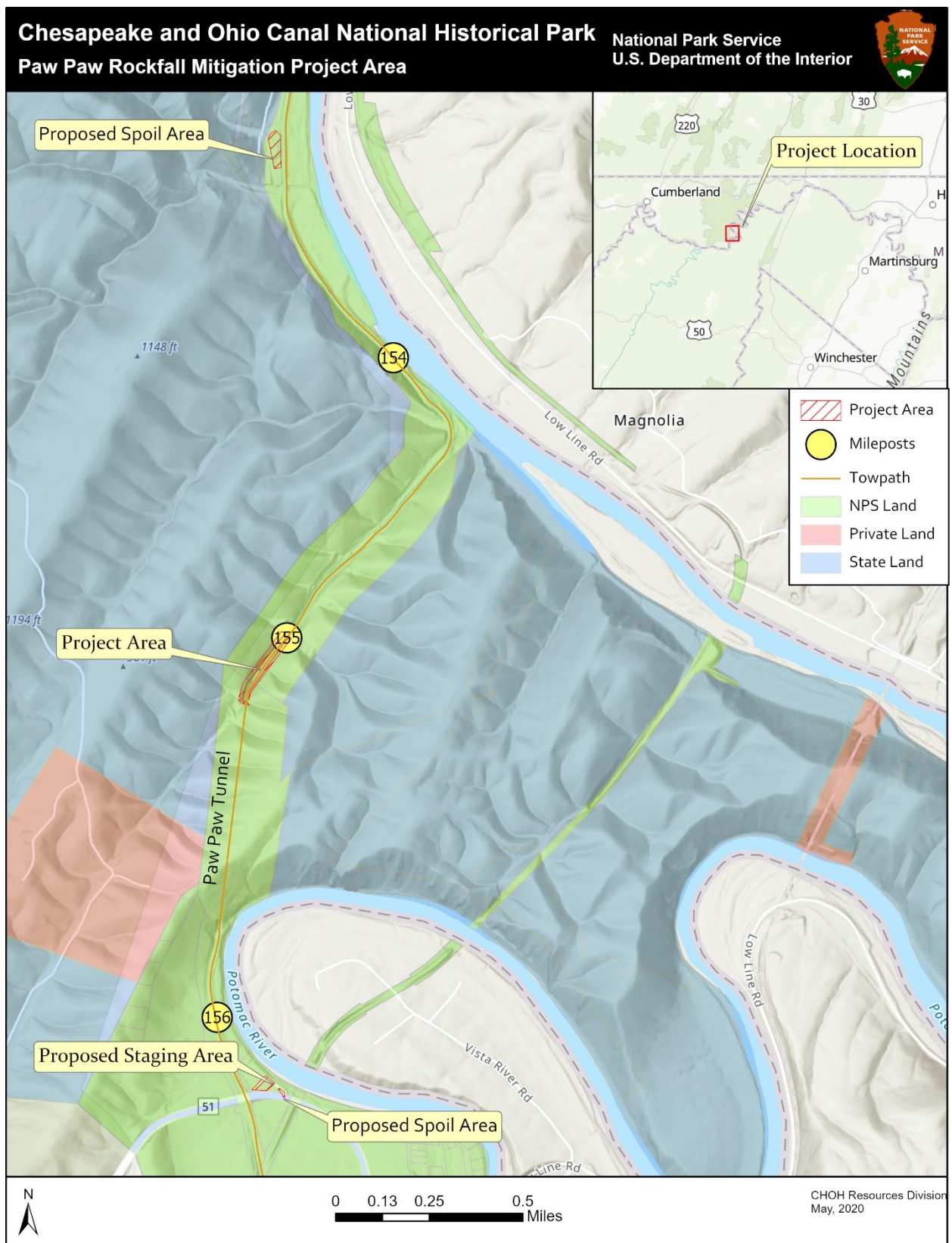


Figure 1: Project area.

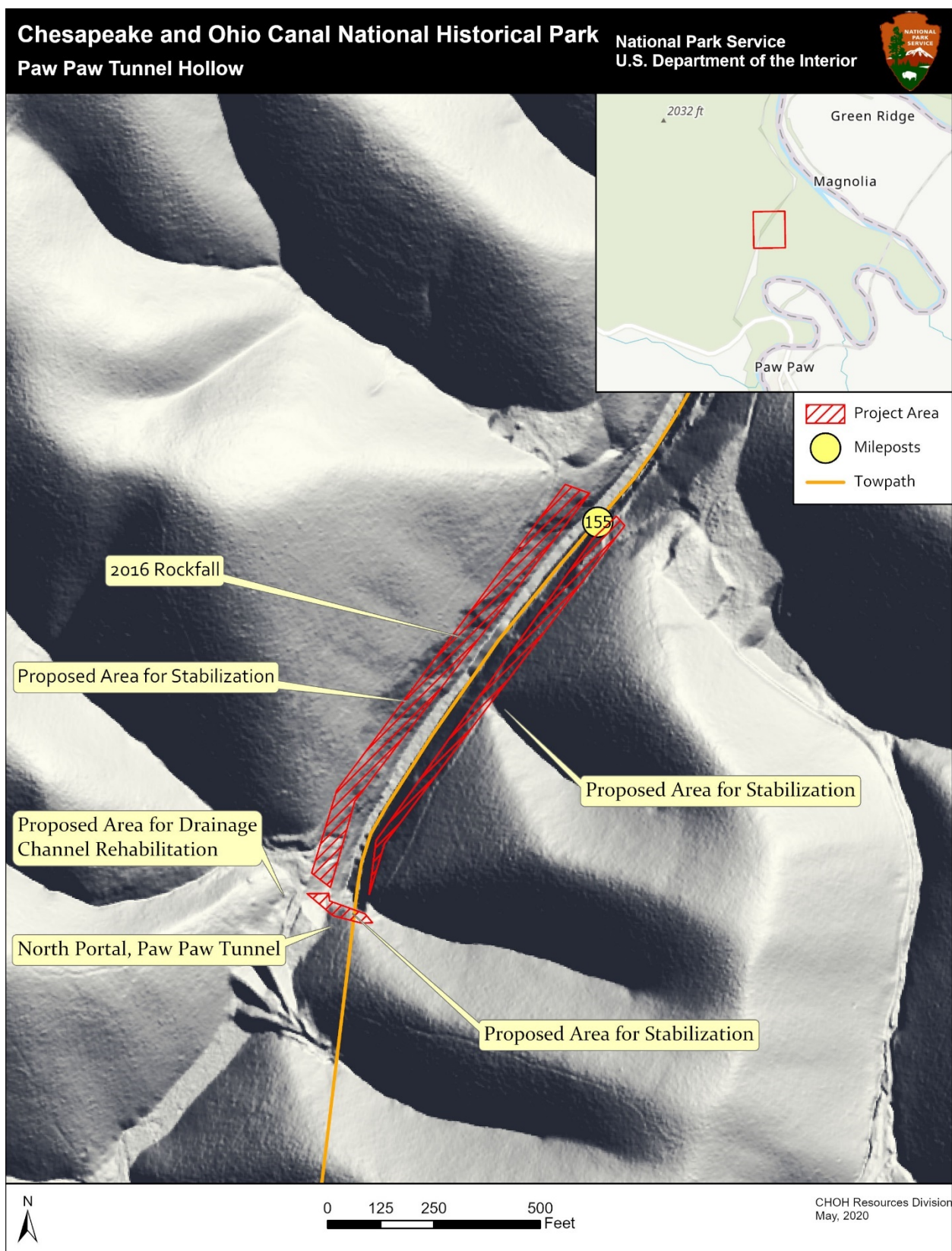


Figure 2: Paw Paw Hollow.



ISSUES AND IMPACT TOPICS RETAINED FOR ANALYSIS

This section describes project issues or concerns identified during scoping that were determined by the project team to warrant a more detailed analysis.

Visitor Use, Experience, and Safety – This project would necessitate a visitor detour of approximately 0.65 miles through steep, arduous, and isolated trails. The windy detour trail would consist of 1.45 miles with an elevation gain of over 400'. This detour would be in place for the duration of the project, which is expected to last 12-18 months. This section of the towpath is also part of the Potomac Heritage National Scenic Trail, the Greater Allegheny Passage, and the American Discovery Trail. This project may result in temporary visitor impact by forcing a reroute but would preserve trail continuity by addressing safety issues in the Tunnel Hollow chokepoint; currently, this is the only bicycle passage through the mountains of Western Maryland.

Historic Structures – There are numerous historic structures within the project area, and all are associated with the C&O Canal. The boardwalk is a 1970s re-creation of the boardwalk that was historically located in the same location and has been repaired and replaced in several sections due to damage from rockfall and normal degradation. This project proposes to replace the boardwalk with similar materials to eliminate safety hazards while maintaining the cultural landscape.

Archeology – This area is rich in prehistoric and historic archeological resources. A historic archeological site associated with the construction of the tunnel and the Paw Paw Superintendent's House is located near the proposed expansion of the Paw Paw Campground Parking Lot. The entirety of the Tunnel Hollow is a historic archeological site and the canal and towpath likely contain archeological resources. An additional archeological site was discovered in May 2020; however, the site is outside of the project limits and will not be disturbed as part of this project.

Cultural Landscape – The cultural landscape in the project area has not been evaluated for National Register eligibility. However, the Paw Paw Tunnel and Tunnel Hollow offer a unique viewscape that has been a popular attraction since construction was completed. Additionally, a significant number of features remain on the landscape from the construction of era of Tunnel Hollow.

Vegetation, Wildlife, and Special Status Species – The project area is within a globally rare Appalachian shale barren community, with steep, shale slopes. NPS conducted surveys of the project site for State-listed rare plants between summer 2019 and spring 2020. Seven rare, threatened, or endangered (RTE) plant species within the project area were identified.

ISSUES DISMISSED FROM FURTHER ANALYSIS

This section provides brief descriptions of issues and concerns identified during scoping that were determined to not warrant further consideration, as well as a brief justification for the dismissal of each issue.

Geologic Resources – The proposed scaling would expedite the natural erosive forces currently acting on this stone-faced cliff. However, being carved out when the Canal was established, this stone face is not natural. In addition, the scaling process would be removing rock that would fall from the cliff face naturally, and as a result, geologic resources were not an issue covered under this EA.

Wetlands – Wetlands found within the canal prism would be temporarily impacted during the scaling operations as well as the temporary storage of the overburden materials. Due to the contracting mechanism for this project, the final design has not been completed and the extent of the impact to wetlands is not yet known. As more information becomes available, NPS will continue to consult with Maryland Department of the Environment (MDE) and the United States Army Corps of Engineers (USACE) to conduct wetland delineations and obtain appropriate permits. Practical steps to avoid and minimize potential adverse impacts on wetlands would be taken and wetlands damaged by the actions



ALTERNATIVES

This EA documents the analysis of environmental consequences of two alternatives: the no-action alternative and the proposed action/preferred alternative. Under the action alternative are three options for access to the project area. The elements of these alternatives are described in detail herein. Impacts associated with the actions proposed under each alternative are outlined in the “Affected Environment and Environmental Consequences” section of the EA.

NO ACTION ALTERNATIVE

Under the No Action Alternative, the rockfall from the 2016 landslide would be left in place within the canal prism. NPS would not undertake rock stabilization efforts and the risk of landslides and rockfall would continue to be a threat to visitors as the exposed rock continued to weather and degrade. Since the canal, which acts as a rock catchment area, is currently filled, future landslides and rockfall will likely impact the existing wooden boardwalk where visitors are most likely to be. It is possible that a landslide could destroy a portion of the boardwalk, breaking towpath continuity. Future landslides would be removed as they occurred, if extent of rock material was minor, but mobilization and funding for removal of large rock debris would likely be a multiyear process. The boardwalk would continue to undergo regular maintenance and repair/rehabilitation of the boardwalk would be addressed in the CHOH 5 year plan and addressed in a future project.

ACTION ALTERNATIVE: STABILIZE TUNNEL HOLLOW AND REMOVE SPOILS (NPS PREFERRED)

Under this Alternative, a staging area would be established at the Paw Paw Campground, the wooden boardwalk would be replaced in-kind, the cliff faces in the Tunnel Hollow would be stabilized, and the 1,600 cubic yards of rockfall from 2016 would be removed along with all material produced by the proposed stabilization efforts of this project.

The proposed staging area in the Paw Paw campground would be based around the existing parking lot and would likely involve an expansion of the parking lot to the east towards State Route 51. The current parking lot and area noted for parking lot expansion sit on a historic archeological site (18AG255) associated with the construction of the tunnel. Design and construction of the parking lot would be guided and monitored by an NPS archeologist.

The 750 foot long wooden boardwalk in the Tunnel Hollow was constructed in the 1970s and has degraded to the point of being a safety concern. The boardwalk would be removed during the initial phases of the proposed project and replaced in-kind when the rock stabilization and removal portions of the project have been completed.

Rock stabilization would include scaling, rock bolts, shear blocks, pinned mesh, and rock drains as needed. Scaling, rock bolts, and rock drains have been used by NPS in this area since the 1970s. Scaling involves manually or mechanically removing loose or fractured rock from the cliff faces until reaching a stable rock surface. Rock bolting involves drilling holes 10 to 15 feet deep into the rock face and inserting steel rods to restrain unstable rock mass. Shear blocks also involve drilling deep holes in the rock face; however, concrete blocks are attached to the ends of these bolts. Shear blocks are placed under unstable rock ledges to provide support. Pinned mesh is a combination of anchors and steel rockfall mesh; it is used to catch and retain rockfall against the face of the slope the slope instead of letting it fall or bounce away from the slope into areas that are more likely to have visitor traffic. Rock drains are used to relieve groundwater pressure between layers of rock and reduce the weathering of the rock from freeze-thaw cycles by drilling holes into the rockface and installing PVC pipe to drain water from areas with noted water infiltration.



Rockfall hazards would be addressed in priority order according to the 2019 geotechnical report. Draped mesh installed during the 2017-2019 emergency stabilization project would be removed. The slope under the removed mesh would be scaled and pinned mesh would only be added to the upper portions of the cliff where the rock planes lie perpendicular to the rock face. Rock bolts would be ineffective in these areas which experience differential weathering among the many different exposed rock planes.

This project also proposes to rehabilitate concrete drainage channels above the north portal of the Paw Paw Tunnel. These channels were installed by NPS in the 1970s and serve to drain surface water from the areas above the tunnel. Currently, the channels are silted in and damaged and do not function.

Three Options have been identified for the removal and spoiling of the rockfall material. Option 1 is preferred by NPS. It is also possible that a combination of these options would be needed to complete the proposed project (Figure 3). Spoiled material may be used in future projects to repave roads in the area.

Option 1: Under this option, rockfall material would be transported along the canal prism until out of the deep cut and then along the towpath downstream to an existing causeway over the canal between Culvert 210 and the southernmost end of Outdoor Club Road. The rockfall would be spoiled to the north and south of existing spoil piles which contain material removed from Tunnel Hollow in the 1970s and again in the 1990s, now overgrown with vegetation (Figure 4). This spoil may also be used to realign Twigg Run with the historic drainage which was excavated in the 1830s to redirect Twigg Run into Gross Run so that both streams would pass under the canal at Culvert 210, saving the expense of an additional culvert. If Outdoor Club Road is used to access the proposed spoil area for ingress or egress, a temporary stream crossing will be necessary to cross Gross Run.

Option 2: Under this option, rockfall material would be transported along the canal prism through the Paw Paw Tunnel and then along the towpath to the Paw Paw Campground. The material would be spoiled along the western edge of the campground entrance road where it meets State Route 51. Spoiling the material here would facilitate the expansion of the entrance road to two lanes, which would mitigate a long-standing safety issue of narrow access to and from the heavily used state route. Additional material may be spoiled on or around the existing parking lot or proposed staging area to permanently improve and expand the existing parking lot which would alleviate overcrowding seen in the existing parking lot (Figure 5).

Option 3: Under this option, rockfall material would be transported along Tunnel Hill Trail and Tunnel Hill Road. If Allegany County permits, as portions of the trail and road are on state land, the material would be spoiled on the trail and road to repair and improve the surface. Additional material may be spoiled on nearby roads managed by Allegany County in the Green Ridge State Forest. In order to use this route, Tunnel Hill Trail and Tunnel Hill Road would have to be widened in some areas to better accommodate vehicles. Excess rock material beyond that used on the Tunnel Hill Trail and Road would be used to expand the existing parking lot and entrance road at the Paw Paw Campground. The Paw Paw Campground parking lot is not large enough to accommodate the number of visitors to the area; when the existing parking lot fills, visitors park along State Route 51, creating a safety hazard. The single lane access road to the campground from State Route 51 is another safety hazard that this project is intended to address by expanding the road to two lanes, thus reducing the possibility of collision between cars entering and exiting the campground. Under this Option, we would plan to address these safety issues by using the removed rock material to expand the parking lot and widen the entrance ramp.

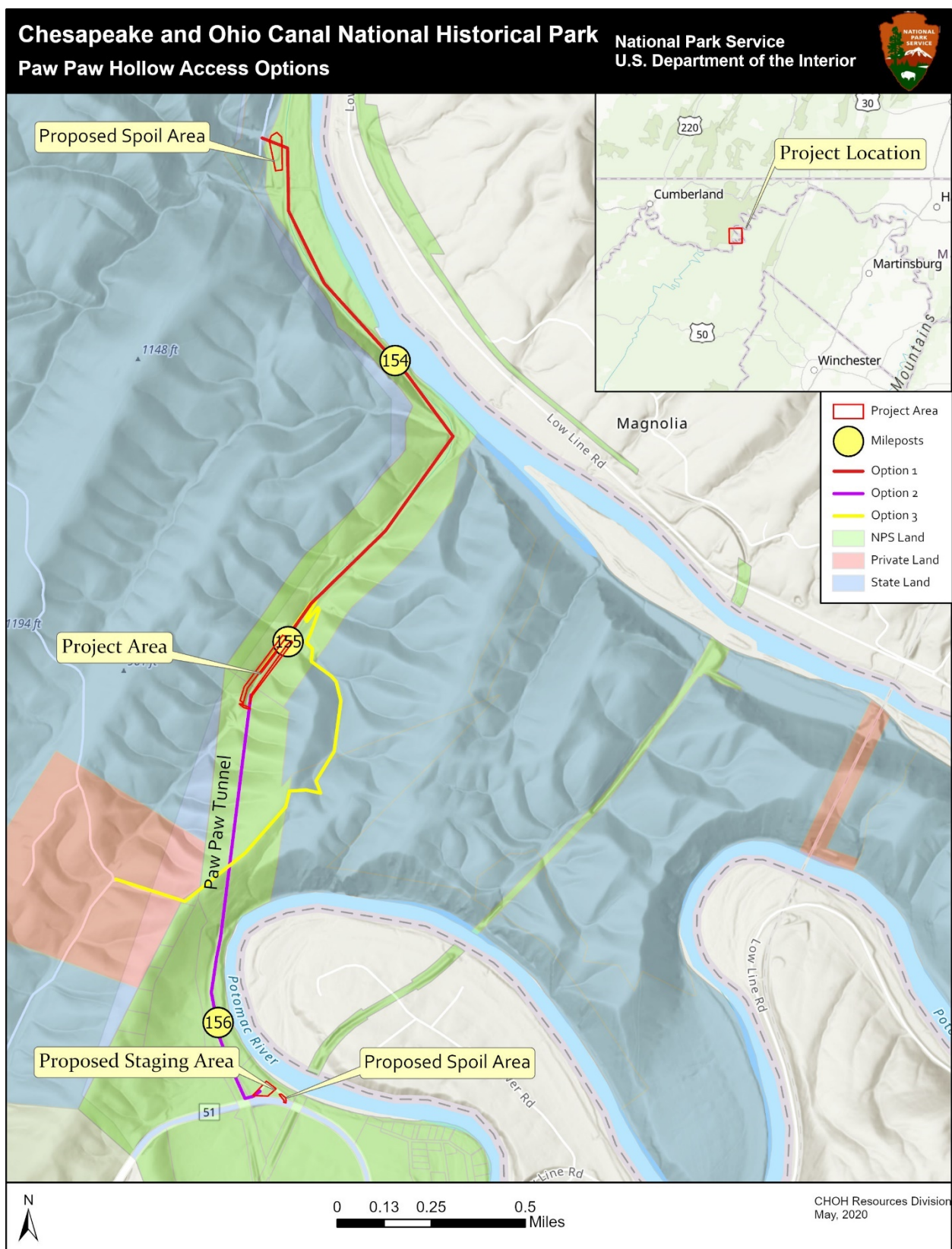


Figure 3: Action Alternative, Options 1, 2, and 3 for accessing the Paw Paw Tunnel Hollow.



would be restored as soon as is possible after the actions have occurred. All work that may affect wetlands in the proposed project would be done in accordance with Directors Order #77-1: Wetland Protection (DO #77-1). NPS will consult with NPS wetland scientists regarding whether an exception from the reporting requirements under DO #77-1 is appropriate for the proposed project or if the project will require a Wetland Statement of Findings and mitigation. Because wetland impacts are expected to be minimal and any impacts to wetlands would be mitigated after work is complete, this topic area is excluded from further analysis. If it is determined that a Wetlands Statement of Findings is necessary, it will be completed and appended to this Environmental Assessment.

Floodplains – The proposed spoil areas and Paw Paw Campground parking lot expansion area are within the FEMA 100-year floodplain. Any actions in these areas that would result in permanent changes to the floodplain must be permitted through MDE and USACE. NPS has begun coordinating with MDE to avoid or mitigate any impacts to these areas. Final determination of effects from MDE and USACE await the NPS permit application which will be based on final design specifications when they become available. NPS does not anticipate that the proposed project will significantly alter the 100-year floodplain in this area. All work that may affect floodplains in the proposed project would be done in accordance with Directors Order #77-2: Floodplain Management (DO #77-2).

The proposed parking lot expansion covers a small area and would not require a large amount of material. The proposed spoil location in the Paw Paw Campground is along the raised entrance road and should not affect river flow during times of flood. The volume of spoil would also be small relative to the size of the floodplain. The proposed spoil location near Culvert 210 is adjacent to the existing spoil pile. The new material would be deposited in a narrow and tall spoil pile in the shadow of the existing spoil to avoid any impacts to the river flow during times of flood, the volume of spoil is also very small relative to the size of the floodplain. If it is determined that the rockfall material should not be spoiled at the proposed locations, the material will be spoiled on non-NPS land in accordance with local, State, and Federal regulation. Because this project will not significantly affect the floodplain, this topic area is excluded from further analysis.



Figure 4: Proposed spoil area.

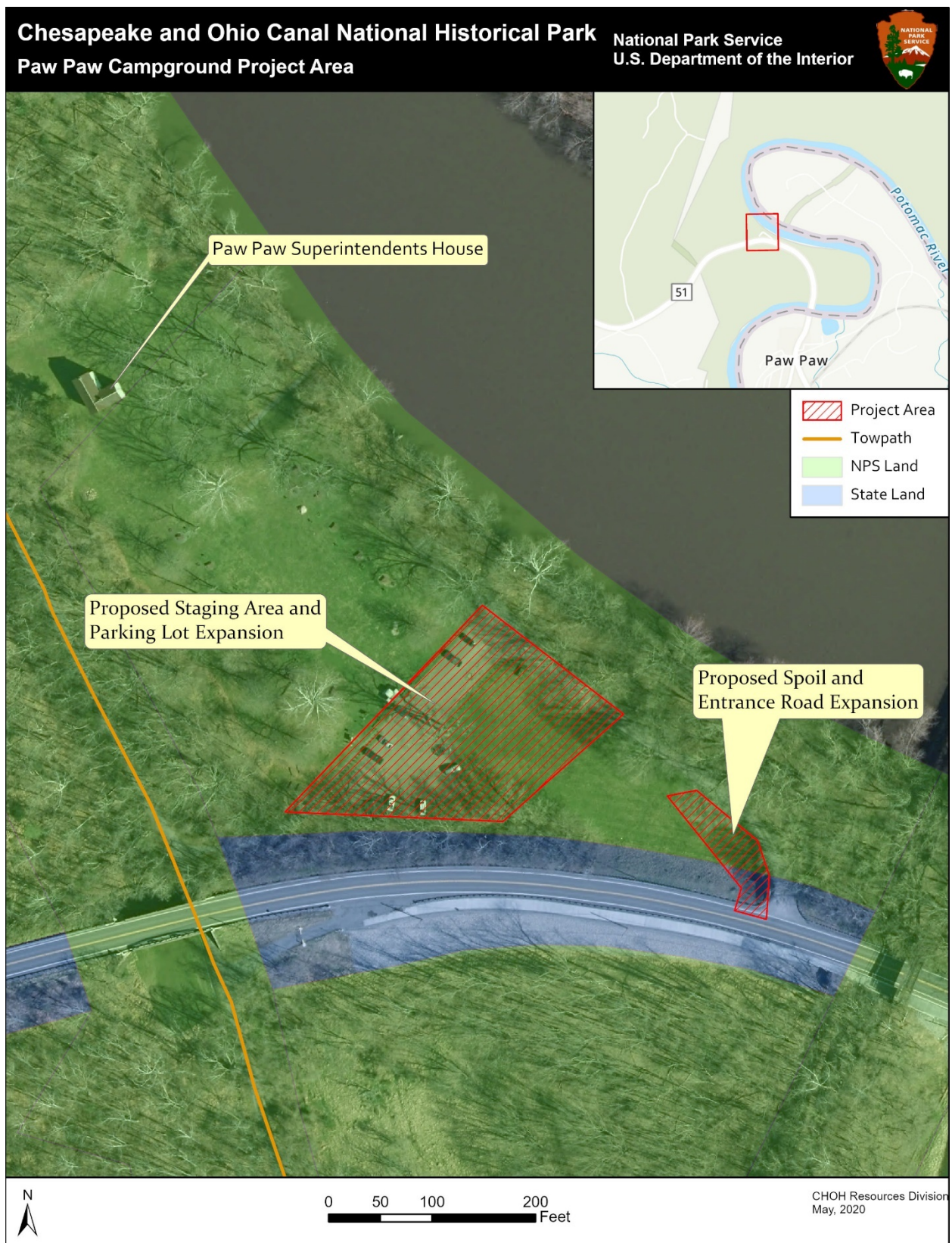


Figure 5: Proposed staging area and Paw Paw Campground parking lot expansion and entrance road spoil area.



MITIGATION MEASURES

Mitigation, according to NEPA (40 CFR 1508.20), includes the avoidance or minimization of impacts to resources. To minimize impacts related to the proposed alternative, the NPS would implement mitigation measures when and wherever feasible. Mitigation measures would include, but would not be limited to, the measures listed below:

Historic Structures Mitigations

- The contractor would be required to protect all historic structures in the project area. This would likely be accomplished by identifying historic structures, applying vibration monitors adjacent to vehicular paths, and maintaining low speeds while traveling along the towpath.
- High visibility material may be used to temporarily identify historic structures that are close to the proposed paths of travel and traffic delineators or boundary markers may be used to ensure vehicles do not stray from designated paths of travel.
- Gravel, geotextile, timber mats, or steel plates would be placed, as needed, over sensitive historic structures such as historic retaining walls, Culvert 210, and the wasteweir to more evenly distribute the weight of passing vehicles. If necessary, temporary bridges would be constructed over the structures to avoid damage.
- Cribbing or additional stabilization could be placed in locks if it is determined that the weight of heavy equipment may affect the lock walls.
- Vibration monitors and structural deformation monitors would be placed in the Paw Paw Tunnel. If the passage of vehicles creates unacceptable vibrations levels or if the structural deformation monitors indicate strain or damage, additional timber mats or other structural supports would be installed before work could continue. Monitoring devices will be mounted on mortar joints, not on masonry.
- Unless a means of ingress and egress can be identified that does not cause excessive vibrations under Action Alternative Option 2, vehicular access to the Paw Paw Tunnel would be limited to smaller equipment and only when necessary to reach the project site.

Archeological Resources Mitigations

- Any ground disturbance related to the parking lot expansion in the Paw Paw campground would be limited to the top six inches of soil, leaving a buffer of six inches before archeological features would be encountered. A CHOH archeologist would be present to monitor during any activities involving ground disturbance.
- Gravel and geotextile would be required in the staging area to distribute the weight of heavy equipment.

Cultural Landscape Mitigations

- The exterior portions of rock bolts and pinned mesh would be colored to match the surrounding rock face, if possible.
- The ends of the rock drains will be cut flush with the rock surface and would be painted to match the surrounding rock face.
- The existing draped mesh would be removed. Pinned mesh would be added at various locations along the slope but at higher elevations that would be less impactful to the cultural landscape.



- Contractor would be encouraged to develop designs to make shear blocks less apparent. Possible techniques may include coloring the concrete to match the surrounding rock face or shaping the concrete to appear more similar to the surrounding rock face.

Vegetation, Wildlife, and Special Status Species Mitigations

- No tree cutting would be allowed between June 1st and July 31st to protect tree-roosting bats.
- Travel restrictions for vehicles through the Paw Paw Tunnel will be set in coordination with Maryland Department of Natural Resources in an effort to protect any hibernating bats that may use the tunnel.
- RTE populations in the project area would be marked with high visibility flagging or paint so that the contractor can avoid impacts when possible. RTE populations on the cliff face will not be marked due to the danger of traversing the steep and unstable slope.



AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes current environmental conditions in and surrounding the project area. These conditions serve as a baseline for understanding the resources that could be impacted by implementing the project. In addition, this chapter would include an analysis of the environmental consequences of each alternative.

VISITOR USE, EXPERIENCE, AND SAFETY

The project area is located between mile 154.2 and 156.14 of the C&O Canal towpath and contains many visitor attractions including the 5-acre Paw Paw Campground, the Paw Paw Superintendent's house, the Paw Paw Tunnel, Locks 62, 63 1/3, 64 2/3, and 66, a wasteweir, Culvert 210, 3 miles of the towpath, the entirety of the Tunnel Hill Trail, and a 3-acre area of woodland north of Culvert 210. This area is owned by the Chesapeake and Ohio Canal NHP except for a portion of the Tunnel Hill Trail, which is owned by Allegany County and managed by Maryland Department of Natural Resources. A vehicle traffic counter at the entrance to the Paw Paw Campground estimates approximately 30,000 visitors per year. However, this estimate does not account for hikers and bikers traveling up or down the towpath from other areas. The Paw Paw Tunnel is an impressive engineering feat unique to the canal, the Paw Paw Tunnel Hollow Complex offers a completely manufactured historical landscape, and the lift locks in this area were constructed differently than many others on the canal.

A 2019 inspection of the Paw Paw Tunnel Hollow (Tunnel Hollow) by Terracon Consultants, Inc. revealed rockfall hazards throughout the deep cut on both the east and west sides of the canal prism. The inspectors divided the Hollow into zones and assigned each zone a risk score which was based on a number of factors including slope height, available catchment area, structural condition, volume of material, history of rockfall, and water activity. This analysis revealed moderate visitor safety risks in all of the zones except for the areas that had been stabilized during previous projects (Figure 6).



Figure 6: Rockfall Hazard Analysis of the Paw Paw Tunnel Hollow produced by Terracon Inc.



Impacts of No Action Alternative

Under this alternative, the current management of the area would continue. The rockfall from the 2016 landslide and the spoil from the 2018 scaling would remain, and NPS would not perform rockfall mitigation efforts in the deep cut of the Tunnel Hollow. The wooden boardwalk would continue to undergo regular maintenance and would eventually be replaced as part of the CHOH cyclic maintenance plan. If landslides continue, the towpath in the Tunnel Hollow may eventually need to be closed to mitigate safety concerns. Visitor traffic would be routed over the mountain along the 1.45-mile Tunnel Hill Trail. The Tunnel Hill trail is longer, steeper, and more rugged than the towpath through the tunnel and would not provide an equivalent visitor experience. If the Tunnel Hollow were closed to visitors, most of the tunnel would remain open but visitors would no longer be able to travel through to the north portal. Visitors would also be unable to see the deep cut of the Tunnel Hollow Complex which is unique on the canal. It is likely that visitation to this area would decrease if the north portal of the tunnel and towpath were closed.

Impacts of Action Alternative (NPS Preferred)

The the Paw Paw Tunnel and 3 miles of towpath and the associated canal structures would be closed to visitors for the duration of the project, which is expected to last from 12-18 months. The stabilization of the rockface would protect visitors and allow this section of the towpath to remain open. The 750 foot boardwalk would be reconstructed after the rockfall mitigation portion of the project was completed. The current boardwalk is aging, and its replacement would increase visitor safety and provide a more enjoyable visitor experience.

Option 1:

Under this option, the towpath closure would extend an additional 2 miles from the end of the Tunnel Hill Trail to the causeway north of Culvert 210. This closure would last for the duration of the project but would allow material to be safely transported along the towpath to the proposed spoil location.

Option 2:

Under this option, the Paw Paw Tunnel Campground and parking lot would be closed for the duration of the project, an estimated 12-18 months. Rockfall material would be spoiled along the Paw Paw Campground entrance road, widening it to two lanes. This would improve visitor safety for vehicles entering and leaving the Paw Paw Campground. Additional rock material would be placed directly adjacent to the existing Campground parking lot. The proposed parking lot expansion for the staging area in the Paw Paw Campground would remain to increase available visitor parking after the project has been completed.

Option 3:

Under this option, rockfall material would be spoiled on Tunnel Hill Road and Tunnel Hill Trail, improving visitor access along the Tunnel Hill Trail. This improvement would also improve emergency access to the Paw Paw Tunnel Hollow, which is difficult to reach by vehicle.

HISTORIC STRUCTURES

The project area encompasses the Paw Paw Campground, the Paw Paw Tunnel, and the Paw Paw Tunnel Hollow Complex, the proposed spoil area, and the area in the immediate vicinity of the towpath from the northern portal of the Paw Paw Tunnel 1.5 miles north along the towpath to a rubble causeway built across the canal north of Culvert 210. The entire project area is an historically significant and modified landscape associated with the Chesapeake and Ohio Canal. The project area also includes a portion of Tunnel Hill Road, between its beginning at Malcolm Road and its intersection with Tunnel Hill Trail at the summit of Tunnel Hill. Tunnel Hill Road continues out of the project area and into the Paw Paw



bends; the project area follows Tunnel Hill Trail from the intersection with Tunnel Hill Road to the towpath on the towpath in the Tunnel Hollow. The Hollow was excavated between 1836 and 1850 and contains canal infrastructure as well as the remains of structures associated with canal management and operations. The base of the Hollow is narrow and much of the available space is taken by the canal and towpath for which it was excavated. The remaining space was used for various maintenance, storage, and housing structures. The Tunnel Hollow Complex operated as a part of the canal from its completion in 1850 until the cessation of commercial navigation in this area in 1924. There are numerous historic structures listed on the NRHP that fall within the APE:

Structure	LCS Number	Mile Marker
Canal Prism	45702	153.0 – 154.0
Towpath	45703	153.0 – 154.0
Culvert 210	11737	153.46
Canal Prism	45704	154.0 – 155.0
Towpath	45705	154.0 – 155.0
Bypass Flume for Lock 62	12885	154.16
Lock 62	11738	154.17
Lockhouse Foundation at Lock 62	11739	154.18
Boat Basin at Sandy Flat Hollow	45638	154.21
Spillway and wasteweir	11740	154.29
Bypass flume for Lock 63 1/3	12866	154.48
Lock 63 1/3	11741	154.49
Lock 64 2/3	11742	154.61
Retaining Wall Ruins at Lock 64 2/3	45640	154.61
Bypass Flume for Lock 64 2/3	12877	154.62
Ruins at Lock 64 2/3	45641	154.63
Bypass Flume for Lock 66	17223	154.70
Carpenter's Shop Foundation at Lock 66	11744	154.71
Lock 66	45642	154.72
Towpath Boardwalk (Non-Contributing)	45631	154.95
Canal Prism	45706	155.0 – 156.0
Towpath	45707	155.0 – 156.0
Downstream Portal of Paw Paw Tunnel	45630	155.20
Paw Paw Tunnel	45629	155.70
Upstream Portal of Paw Paw Tunnel	45627	155.78
Canal Prism	45708	156.0 – 157.0
Towpath	45709	156.0 – 157.0
Paw Paw Superintendent's House	17224	156.16

Four additional historic structures have been identified on the Tunnel Hill Trail: a dry laid stone retaining wall, two collapsed spring houses, and the historic road that the trail follows.

The canal prism served as a waterway for canal boats which were specially designed to haul freight between Cumberland and Georgetown, the western and eastern termini of the C&O Canal. Along most of the canal, the prism was constructed to be just wide enough to allow two canal boats to pass. However, in the Tunnel Hollow, the canal prism is only wide enough to allow one-way traffic due to the difficulty and expense of excavating the tunnel and cut. The prism runs the length of the project area and is no longer actively maintained. The original clay liner which waterproofed the prism has been eroded away and pierced by vegetation in many areas. It is unlikely that a clay liner was needed in the areas where the



canal was cut into the rock. Natural seeps and springs in the area drain into the prism resulting in 1 to 2 feet of standing water. The water level has increased in recent years as drainage along the canal has been blocked by a landslide.

The towpath originally served as a pathway for the mules which towed the canal boats during canal operations. The towpath runs the length of the project area and is a defining feature of the park. It was originally built from spoil from the canal prism excavation and crushed local stone. However, the towpath in this area has been repaired or rebuilt many times and, except in the areas where it has been carved out of bedrock or consists of masonry, it likely lacks historic integrity.

The Paw Paw Superintendent's House was built in 1850 and served as the residence of the section superintendent from the construction of the canal until the cessation of commercial navigation on the canal in 1924. It is a two-story, L-shaped frame structure with a brick foundation.

The Paw Paw Tunnel is 3,118 feet long and runs roughly north-to-south, with the northern portal facing downstream. Masonry portals support each entrance while the tunnel vault is lined in brick. The towpath lies on an intentionally unexcavated stone bench faced with brick and timber. To the north and south of the tunnel are long cuts which were made to accommodate the canal where the surface elevation was not yet high enough to necessitate tunneling. The northern cut is approximately 1,000 feet long while the southern cut is about 200 feet long; the depths of the cuts vary, but in some areas are over 100 feet deep. Four vertical shafts were sunk to aid in the excavation of the tunnel and to provide ventilation for the tunnel miners. The shafts are located, two each, in the bottom of each of the two ravines above the tunnel, there being the shortest vertical distances to the tunnel. After the tunnel vault had been completed, the shafts were left empty and capped with brick, stone, and clay.

The boardwalk is a 750 foot long timber framed portion of the towpath running from the end of the Paw Paw Tunnel towpath, which sits on a ledge of unexcavated bedrock, north to the resumption of the earth and rubble towpath. During canal operations, a wooden boardwalk existed in the same footprint as the current boardwalk and served as the towpath. At some time during NPS ownership of the canal, the remnants of any extant boardwalk were removed and replaced by a causeway of fill and rockfall. In 1956, NPS removed the fill causeway and reconstructed the wooden boardwalk while performing repairs to the Paw Paw Tunnel. In 1976 and 1977, NPS removed 15,000 cubic yards of rockfall from the canal prism and again replaced the boardwalk. The boardwalk is listed as a non-contributing feature on the NRHP.

Lock 66 is a composite lift lock at mile 154.7 of the canal (Figure 7). Composite locks were the result of cost saving measures and differed in material and design from the other locks on the C&O Canal. The composite locks in the Tunnel Hollow were constructed with materials sourced from local quarries which produced stone inferior to the material typically used in locks. To further reduce costs, the facing of composite locks consisted of wood rather than stone. The contract for the construction of the locks in the Tunnel Hollow was awarded in 1837, but due to financial problems and the technical difficulty of excavating the tunnel and Hollow, the locks were not completed until 1850. The locks are approximately 100 feet long and have 15 foot chambers, which are the standard dimensions for lift locks on the canal. The composite locks in the Tunnel Hollow are masonry and wood structures on wooden foundations laid on bedrock. Lock 62 is a masonry and wood structure, but the foundation upon which it rests is unknown. However, due to the steep terrain and limited space, these locks lift the water level 10 feet, which is higher than the average lift of 8 feet across other canal locks. Lock 66 was constructed with red and grey sandstone from a quarry at Twigg Hollow north of Lock 61 and near the proposed spoil area, but the gate recesses were faced with concrete in 1910. The stone removed from the lock is piled on the river side of the towpath across from each lock gate. Currently, Lock 66 is in poor condition, with the wooden facing rotted away, leaving iron pins protruding from the stone walls. Portions of lock gate timbers and hardware can be found downstream, in the canal prism. A wooden footbridge has been constructed over the downstream end of the lock. The downstream river side wing wall of the lock interfaces with a 4 foot-high, 150 foot-long retaining wall, also constructed with red and grey sandstone, which supports the



towpath. There is also a depression between the lock and the towpath where a snubbing post was once located.

Lock 64 2/3 is a composite lift lock at mile marker 154.6. This lock was constructed of the same materials and in a similar fashion to Lock 66. Originally, four locks were planned for the Tunnel Hollow. To save money, the canal company canceled plans for the construction of Lock 65 and increased the lift on Locks 63 1/3, 64 2/3, and 66 to compensate. The fractions in the designations for Locks 63 1/3 and 64 2/3 were incorporated to preserve the lock numbering system as the locks upstream of 66 had already been completed. The wooden facing has almost entirely rotted away, and a few boards hang from one of the iron supports in the stone wall. The chamber walls of the lock consist of gray and red sandstone from Twigg Hollow Quarry. The gate recesses were replaced with concrete in 1910 and the stone from the lock is piled on the river side of the towpath. A wooden foot bridge has been constructed over the downstream end of the lock. The downstream river side wing wall of the lock interfaces with a 4 foot-high, 100 foot-long retaining wall, also constructed with brown and grey sandstone, which supports the towpath. There is also a depression between the lock and the towpath where a snubbing post was once located.

A coursed rubble retaining wall is located on the river side of the towpath at the downstream end of Lock 64 2/3. The structure associated with the retaining wall has collapsed but the retaining wall is intact. It was labeled as Feature H in the 1976 archeological survey of the Tunnel Hollow. Feature H incorporates the retaining wall, two mounds of brick rubble, and some white granite support stones. Most likely, this was a log structure on sill stones with a brick chimney. The dates of construction, occupation, and demolition of this structure are unknown.

Lock 63 1/3 is a composite lift lock at mile marker 154.5. This lock was constructed at the same time and in a similar fashion to Locks 64 2/3 and 66 and provides 10 feet of lift. The coursed rubble walls of the chamber are constructed from white and grey sandstone from Twigg Hollow. Similar to the other locks in the Tunnel Hollow, the gate recesses were replaced with concrete in 1910 and the original stone is piled on the river side of the towpath. The wooden facing has completely degraded leaving only the iron support bars, and the walls of the chamber have cracked and bulged on the downstream inland side of the lock. The upstream river side wing wall has cracked away from the lock and is collapsing into the prism. A wooden walkway has been constructed across the downstream end of the lock. The downstream river side wing wall of the lock interfaces with a 4 foot-high, 100 foot-long retaining wall, also constructed with white and grey sandstone, which supports the towpath. There is also a depression between the lock and the towpath where a snubbing post was once located. A masonry flanking wall extends from the upstream towpath wingwall, across the towpath to the base of the Tunnel Hollow slope.

A combination wasteweir and spillway is located at mile marker 154.1 near the downstream end of the Tunnel Hollow. A spillway is an area of the canal where the towpath has been lowered and hardened, providing an escape for floodwaters while preventing erosion. A wasteweir is a structure that controls the water level of the canal. In this wasteweir, water was kept in the canal with wooden boards fitted into masonry, and later, concrete slots. The boards could be removed or added as needed to alter the water level. The structure is 100 feet long, 16 feet wide, and was constructed in 1850 and consists of a wasteweir flanked by two spillways. The spillways and wasteweir feed into the same chamber which is lined in stone and concrete and built into a shale outcropping. At some time in the past, the spillways were filled in by towpath material, leaving only the flumes exposed. The wasteweir was constructed in this location to enable it to quickly drain floodwaters from the Sandy Flat Hollow drainage, to the west, in lieu of a culvert. The original construction was in coursed gray and red sandstone from the Twigg Hollow Quarry. The 3-gate, board insert, stone and concrete wasteweir was built into the center of the spillway in 1913.

Lock 62 is a composite lift lock at mile marker 154. The lock was constructed at the same time and in a similar manner to the locks in the Tunnel Hollow and provides 10 feet of lift. The lock chamber was constructed of gray and red sandstone from the Twigg Hollow quarry and was once face with wood. The



wood has rotted away, leaving only the iron pins which once held the wood in place. The gate recesses were faced with concrete in 1910 and the facing below the lower recess is concrete. A wooden footbridge has been constructed over the upstream end of the lock. The downstream river side wing wall of the lock interfaces with a 4 foot-high, 100 foot-long retaining wall, also constructed with grey sandstone, which supports the towpath.

The concrete foundation attributed to the Lock 62 lockhouse is located at mile marker 154 on the river side of the towpath, across from Lock 62. The lock houses were built by the C&O Canal Company to house lock tenders who were responsible for operating their lock. The structure is 26 feet long and 16 feet wide, has 8-inch thick walls, and its long axis is aligned parallel to the towpath. On the towpath side of the structure there are four concrete posts which once supported a porch. At one time, this foundation supported a frame structure, but any remains have been removed.

Culvert 210 is located at mile marker 153.4 and was constructed in 1849 to allow the passage of Gross Creek. Culverts were constructed to allow minor streams and drainages to flow beneath the canal prism. The barrel is made of brick with a 12 foot span and a 6 foot rise and has a 1 foot high parapet. The wing walls and parapet are constructed from red and grey sandstone; the berm side parapet is faced with concrete and intact, but the riverside parapet has collapsed, and bricks are eroding out of the vault. The poor condition of the riverside parapet was first noted in 1971.

Tunnel Hill Road is an unimproved road following its historic footprint over Tunnel Hill (Figure 8). The portion of the road within the project area stretches 3,000 feet from Malcolm Road to the intersection of Tunnel Hill Road and Tunnel Hill Trail. From this point, Tunnel Hill Trail would be used to access the Paw Paw Tunnel Hollow. The Trail stretches 4,300 feet long from the intersection with the towpath and its width varies between 7 and 14 feet. Both the road and the trail have existed since at least 1836 when construction began on the nearby tunnel, but it has been graded and improved many times and it is unclear whether it retains historic integrity. Portions of the road are in poor condition due to erosion and the portion nearest the Hollow, which consists of two narrow and steep switchbacks, has been undercut. There is some evidence that, at one time, a dry laid stone retaining wall supported the downhill side of the road, which is now being undercut. Neither the Tunnel Hill Road nor the Tunnel Hill Trail are listed in the NRHP.

A dry laid stone wall was noted at a point approximately 2,700 feet downhill from the NPS gate at the intersection of Tunnel Hill Road and Tunnel Hill Trail. The 18 foot long wall is 4.5 feet from the edge of the road and was built as a retaining wall for the road. The road is 8.5 feet wide in this location and the land slopes steeply up north of the road and steeply down south of the road.

Two collapsed spring houses are located approximately 4,240 feet downhill from the NPS gated road entrance, between the last switchback on Tunnel Hill Road and the towpath. They are dry laid constructions of spoil from the tunnel excavation, and they are built into a large pile of spoils. They are approximately 15 feet apart and there is water flowing through each springhouse.

Impacts of No Action Alternative

Historic structures within the APE would be unaffected. Regular maintenance would be performed on the boardwalk, but it would continue to decay as it is at the end of its structural life. The boardwalk would continue to be a safety hazard and would be vulnerable to future rockfalls and landslides. The boardwalk would continue to undergo regular maintenance and repair/rehabilitation of the boardwalk would be addressed in the CHOH 5 year plan and addressed in a future project.

Impacts of Action Alternative (NPS Preferred)

Under this Alternative, actions would be taken to avoid, minimize, and reduce impacts to historic structures within the APE. Heavy equipment would be transported into the project area by way of the Paw



Paw Tunnel which may damage the structure with vibrations, impacts, or exhaust fumes. Large equipment would be transported into the project area, where it would remain until the project ends, at which point it would be removed again through the Tunnel. Vibration monitoring equipment would be installed to ensure equipment transport does not cause adverse effects to the Tunnel. The boardwalk would be replaced with in-kind materials and within the same footprint of the current boardwalk. The canal prism would be restored as rock debris is removed.

Option 1:

Smaller heavy equipment, including dump trucks, would drive through the Tunnel to reach the project site, but would exit the Tunnel Hollow via the towpath heading downstream when loaded with removed rock material. There are many historic structures along the route from the rock stabilization area to the proposed spoil area. This route has been used before during similar options in the 1970s and 1990s with no known impacts to the historic structures. However, the potential exists for structures adjacent to the towpath, including stone retaining walls, to be affected by vibrations from passing trucks. Vehicles would drive down the towpath, which could be affected from the transportation of heavy loads of rock material. Similarly, the towpath and vehicular traffic would cross over the wastew weir at mile marker 154.1 and Culvert 210. During an interdisciplinary 2020 NPS site evaluation, it was determined that there was enough room along the towpath to avoid physically impacting stone structures along the length of this route. All structures would be marked, and traffic would be monitored to avoid damage. Temporary stabilization of structures may be needed if additional impacts are anticipated by the contractor and approved by NPS.

Option 2:

Smaller heavy equipment, including dump trucks, would drive through the Tunnel to reach the project site; however, if this option is chosen, removed rock material would pass back through the Paw Paw Tunnel via heavy equipment, vehicles, or by other means. The use and transport of heavy equipment loaded with rock material would greatly increase the risk of damage to the Tunnel from vibrations, accidental impacts, and engine exhaust. This option would only be selected if a method of rock material transport could be presented that would avoid vibration impacts to the Tunnel. If such methods are introduced, this route of rock material removal would not cause any impacts to historic structures.

Option 3:

In this option, rock material would be removed via the Tunnel Hill Trail and Tunnel Hill Road. The collapsed spring houses along the Trail may be damaged by vibrations or impacts from passing vehicles. It may be necessary to modify the historic switchbacks of the Tunnel Hill Trail near the towpath, which would alter the historic alignment of the Trail. The dry laid stone retaining wall found along the Tunnel Hill Trail could be damaged by repeated heavy vehicle traffic.

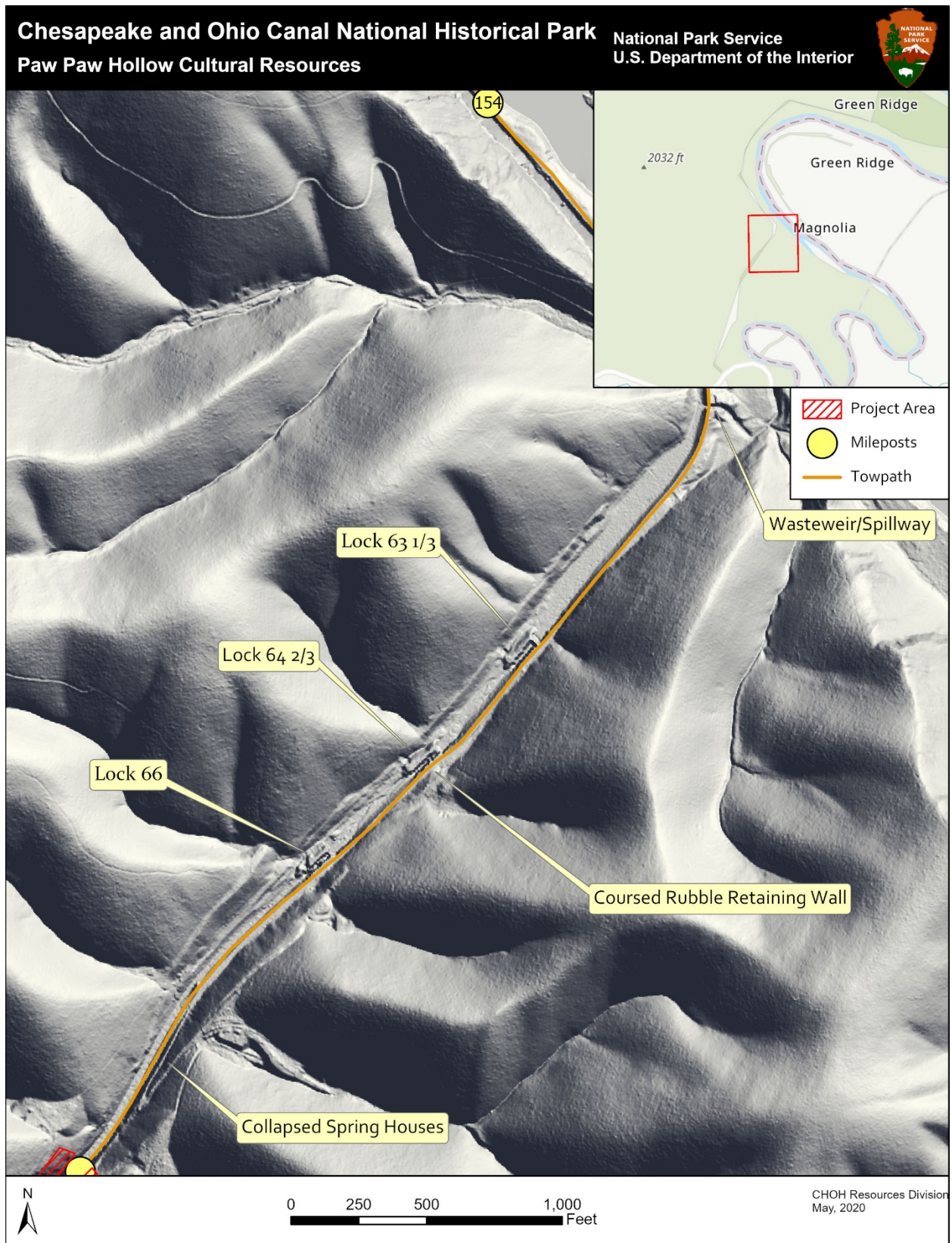


Figure 7: Paw Paw Hollow cultural resources.



Figure 8: Tunnel Hill Trail cultural resources.



ARCHEOLOGY

Several archeological investigations have identified cultural material within the project area. In 1976, an archeological survey of the Tunnel Hollow was completed, which identified several features and noted that the entire area is a manmade historic feature and is a listed archeological site. Between 2008 and 2010, a multi-year archeological survey of the western end of the park was conducted by The Louis Berger Group Inc., which identified a historic site in the Paw Paw Campground. This site is associated with the Paw Paw Superintendent's House and the brick works that were established here in an attempt to produce bricks for the construction of the Paw Paw Tunnel. In 2020, NPS archeologists conducted a standard baseline survey of the project area to identify the presence of new resources that could be impacted by the proposed project. No additional sites were identified and no new sites were identified within the proposed expanded spoil area. Review of historic material suggests the likely location of additional sites in the vicinity of the proposed spoil area and along Tunnel Hill Trail.

The portions of Tunnel Hill Road and Tunnel Hill Trail within the project area both follow historic road traces and have been regraded and graveled several times. A 2020 pedestrian survey of the Tunnel Hill Trail located several historic features, including a dry laid stone retaining wall, historic spoil piles, and a historic switchback. The switchbacks are cut into rock and may have historically had dry laid stone retaining walls along the downhill sides. Along these switchbacks, the trail comes to its narrowest width of seven feet.

Impacts of No Action Alternative

Archeological resources would remain unaffected.

Impacts of Action Alternative (NPS Preferred)

Under this Alternative, rock stabilization efforts are unlikely to damage archeological materials. The Tunnel Hollow is a historic feature and contains no prehistoric material. An appropriate mitigation plan would be prepared by NPS in coordination with the Maryland Historical Trust to address any significant subsurface resources inadvertently discovered during this project.

Option 1:

It is unlikely that any archeological resources would be damaged by transporting the rockfall material along this route. Work buffers have been defined so as to avoid any impact of the project to archeological resources.

Option 2:

It is unlikely that the expansion and improvement of the Paw Paw Campground parking lot would damage archeological resources. Ground disturbance related to the expansion of the parking lot would be limited to the top six inches of soil and gravel and geotextile would be used to evenly distribute the weight of heavy equipment in the staging area.

Option 3:

The Tunnel Hill Trail sits atop of historic spoils piles from the construction of the Paw Paw Tunnel. This Option would re-gravel and regrade the Trail; however, no ground disturbance or excavation would occur.

VEGETATION, WILDLIFE, AND SPECIAL STATUS SPECIES

The bare shale along the northern cut consists of Appalachian shale barrens, a globally rare plant community. This habitat is characterized by south-facing slopes of shale with very little soil and they are known to host several species of rare, threatened, or endangered plants (RTE). A botanical survey



conducted in summer and fall 2019 and spring 2020 confirmed the presence of seven RTE species along the western slope of the northern cut. The species included shale barren evening primrose (*Oenothera argillicola*), glade bluecurls (*Trichostema brachiatum*), low bindweed (*Calystegia spithamea*), whorled milkweed (*Asclepias verticillata*), sessile-fruited arrowhead (*Sagittaria rigida*), shale barren ragwort (*Packera antennariifolia*), and heart-leaved skullcap (*Scutellaria ovata*). Most of these species were found in pockets of soil in the shale on the western slope of the Paw Paw Tunnel Hollow while *S. rigida* was found in the shallow water of the canal prism. No species of concern have been identified in the Paw Paw Campground or in the proposed spoil area.

The canal in the project area typically holds between six inches and two feet of water and is inhabited by amphibians such as the eastern newt (*Notophthalmus viridescens*), American toad (*Anaxyrus americanus*), wood frog (*Lithobates sylvaticus*), and spring peeper (*Pseudacris crucifer*). The Paw Paw Tunnel serves as a bat hibernaculum for the big brown bat (*Eptesicus fuscus*) though neither *Myotis septentrionalis* nor *M. sodalis* have been observed there. Little brown bat (*Myotis lucifugus*) and the tri-colored bat (*Perimyotis subflavus*) have also been observed, but not in recent years.

Impacts of No Action Alternative

Under this alternative, there would be no immediate impact to natural resources. As future rockfalls naturally occur, individuals of the RTE species could be impacted, depending on the location of rockfalls.

Impacts of Action Alternative (NPS Preferred)

Under this alternative, the aquatic habitat would be impacted by the draining of the canal and its use as an access road for heavy equipment, by the construction of platforms from which the scaling activities can be conducted, and by the temporary spoiling of rockfall material until it can be removed to the proposed spoil area. Impacts to aquatic and semi-aquatic wildlife in the project area would be minimal, as suitable habitat exists up and downstream of the project area. Breeding amphibians would still be able to find suitable habitat. Impacts to amphibians and amphibian habitat are expected to be negative, but temporary, with populations likely to recolonize the area after the project ends. Temporarily lowered water levels may also affect *S. rigida*; however, the species is resilient and populations are likely to rebound (Chris Frye, Maryland Department of Natural Resources, pers. comm. Aug. 13, 2019).

Impacts to terrestrial special status plant species may occur during this project, though effects would be either minimal on the population and species as a whole or would be avoided. *P. antennariifolia* and *S. ovata* are found throughout the project area and while individuals would be impacted, it is likely that these species would recolonize the project area after work is complete. *O. argillicola* is similarly spread throughout the project area and would be affected by this project. The more densely populated area closer to the tunnel portal would likely be avoided. NPS previously informally consulted with the DNR State Botanist regarding unavoidable removal of two individual *A. verticillata* in the project area. Impacts would be minor, and the species may recolonize the habitat after the project is complete. *C. spithamea* was only observed growing within the rockfall debris that fell in 2016, and only a single specimen of *T. brachiatum* was discovered downstream of the rockfall. High visibility flagging, paint, or construction fencing will be used to mark RTE populations in the project area so that they can be avoided, if possible. Populations on the rockface will not be marked due to the danger of traversing the steep and unstable slope. Overall impacts to RTE species' habitat would be negative, but temporary, and would allow for recolonization after the project is complete.

Equipment and vehicles would not be allowed to travel through the tunnel during the winter to avoid disturbing hibernating bats. The park works closely with the Maryland DNR to survey these populations each winter.

Option 1:



Under this option, trees will be removed to clear an access route to the proposed spoil location, as well as the spoil location itself. NPS has completed formal ESA Section 7 consultation with the USFWS, which has indicated that tree removal associated with this spoils area will have No Adverse Effect on listed species (Appendix I). The proposed area for spoiling the rock material under this Option does not contain any plant species of concern.

Option 2:

Under this option, there will be no additional impacts.

Option 3:

Under this option, there will be no additional impacts.

CULTURAL LANDSCAPE

The cultural landscape in the project area has not been evaluated for National Register eligibility. However, the Paw Paw Tunnel and Tunnel Hollow offer a unique viewscape that has been a popular attraction since construction was completed (Figures 9 and 10). The rock scaling and reconstruction of the boardwalk would have only temporary impacts to this viewscape. The rock itself naturally fragments and falls as it weathers and rockfalls have been noted throughout history back to the excavation of the hollow. Rock bolts and pinned mesh would have lasting negative impacts on the cultural landscape. The rock pins and shear keys protrude several inches from the rock face and are very noticeable. The existing rock mesh in the hollow would be removed from the lower 18 feet of the rock face. Any new mesh would only be installed above this line, lessening the impact of the mesh on the cultural landscape.



Figure 9: The Paw Paw Tunnel Hollow, as seen from the North Portal of the Paw Paw Tunnel. West slope of Tunnel Hollow on left, canal in center left, boardwalk towpath in center right, east slope of Tunnel Hollow on right.



Figure 10: Undated picture of excursion trip on the Oak Spring at the north portal of the Paw Paw Tunnel.

Impacts of No Action Alternative

The cultural landscapes of the Paw Paw Campground and the Tunnel Hollow would remain as they are. The cultural landscape of the Tunnel Hollow would be marred by existing pinned mesh, rock bolts, and shear blocks. Without efforts to stabilize the rock faces, future rockfall is more likely. This rockfall would take time to remove and would affect the canal complex. The Hollow may become inaccessible to visitors due to rockfall or unsafe conditions, in which case, they would not be able to experience the landscape.

Impacts of Action Alternative (NPS Preferred)

The rock scaling and reconstruction of the boardwalk would have only temporary impacts to this viewscape. The rock itself naturally fragments and falls as it weathers and rockfalls have been noted throughout history back to the excavation of the Tunnel Hollow. Previously installed and new rock bolts, shear blocks, and pinned mesh would remain visible within the cultural landscape. The rock pins and shear blocks protrude several inches from the rock face and are noticeable (Figure 11). The existing pinned draped mesh would be removed. Pinned mesh would be added as needed at various locations along the slope, but at only on the upper portions of the slope to reduce its impact on the cultural landscape.



The cultural landscape of the Paw Paw Campground would be affected by any expansion of the parking lot. However, the proposed area of expansion is between the existing parking lot, the entrance road, and State Route 51. State Route 51 dominates the landscape in this area. The cultural landscape of the Paw Paw Campground as viewed from the parking lot, facing away from Maryland 51 would remain unaffected.

Option 1:

The existing spoil piles from the 1970s and 1990s are visible from the towpath and the proposed spoil pile would also be visible. By placing it adjacent to the existing spoil, it is hoped that the impact on the landscape would be minimal. The repair of the causeway crossing the canal north of Culvert 210 would have little impact on the cultural landscape. The canal is littered with rubble debris from the original causeway, which has been damaged by repeated flooding. The realignment of Twigg Run with Gross Run through the historic drainage excavated for the task would improve the historic landscape. Currently, Twigg Run drains directly into the canal; it is not known when Twigg Run stopped flowing through the historic drainage.

Option 2:

Rockfall material spoiled along the Paw Paw Campground entrance road would affect the cultural landscape of the area. However, the entrance road and State Route 51 are artificially raised in this area and a widening of the exiting entrance road would have minimal impact on a landscape that is already dominated by State Route 51.

Option 3:

Widening and resurfacing Tunnel Hill Trail with crushed rockfall material would not affect the majority of the cultural landscape of the historic road. The road has been graded and graveled repeatedly. The cultural landscape around the switchbacks where Tunnel Hill Trail meets the towpath would be adversely affected by any alteration of the road, but the overall integrity of the landscape would remain intact.



Figure 11: Rock bolts in the Tunnel Hollow from the 2018 stabilization.



CUMULATIVE IMPACTS

Impacts of the NPS proposed alternatives on visitor use, experience, and safety, historic structures, archeology, cultural landscapes, and vegetation, wildlife, and special status species have been identified above. Cumulative impacts were determined by combining the impacts of the NPS proposed alternatives with other past, present, and reasonably foreseeable future actions in the Paw Paw Tunnel Hollow. These cumulative actions include rock stabilization, the dismantling of the rubble causeway and construction of a boardwalk in 1956, rock stabilization and the reconstruction of the wooden boardwalk in 1976, the removal of rockfall in the 1990s, the removal of rockfall and rock stabilization in 2013, scaling and slope stabilization between 2017 and 2019.

In 1956, NPS initiated a project through Mission 66 to rehabilitate the Paw Paw Tunnel and Tunnel Hollow. NPS removed the rubble causeway in the Tunnel Hollow that had been built to replace the wooden boardwalk, constructed a wooden boardwalk, and repaired the towpath in the Paw Paw Tunnel and Tunnel Hollow. The 1976 project removed 15,000 cubic yards of rockfall from the canal prism from the landslide and rock scaling, installed rock bolts to stabilize the rock faces, and replaced the wooden boardwalk. The material from landslides and scaling activities was transported along the towpath and spoiled in a mound near Culvert 210 on the berm side of the canal. The spoil pile was then covered in three inches of soil to facilitate plant growth. In the 1990s, rockfall from a landslide in the Tunnel Hollow was transported along the towpath and spoiled on the north side of the existing spoil pile from the 1970s. In 2013, rockfall from a landslide was removed from the Tunnel Hollow and NPS installed rock bolts and draped mesh to stabilize the slope and protect visitors on the towpath. Between 2017 and 2019, NPS worked to address a 2016 landslide in the Tunnel Hollow as an emergency action to protect visitor safety. The most unstable portions of the rock slope were stabilized with scaling, rock bolts, shear blocks, and draped mesh. Scaled material was temporarily spoiled in the canal prism as project funding was exhausted before it could be removed.

The impacts of the past and reasonably foreseeable future actions, in conjunction with the NPS proposed alternatives, would not result in any cumulative impacts to visitor use and experience, historic structures, and cultural landscapes and historic districts.

No Action Alternative

The continued weathering of the un-stabilized cliff faces in the Paw Paw Hollow would likely result in more rockfall events. The boardwalk would be in increased danger of being damaged or destroyed by future landslides. Similarly, future rockfall events would impact visitor safety as pedestrians and cyclists travel through the area. Regular maintenance on the boardwalk would continue, and the boardwalk will eventually be replaced as part of the CHOH maintenance cycle. The 2016 rockfall and spoil from the 2017-2019 stabilization efforts would remain in the canal prism, degrading the cultural landscape, and filling the canal, which acts as a catchment basin for rockfall, stopping it before it can reach the towpath.

Action Alternative (NPS Preferred)

Stabilization of the cliff face will cause temporary disruptions to visitor access but would decrease the likelihood of future major landslides such as the one that blocked the north portal of the Paw Paw Tunnel. NPS has been attempting to stabilize the rock faces in the Hollow since the 1950s. The rock bolts, shear blocks, and pinned mesh have already added artificial elements to the cultural landscape and the proposed project will add additional but similar elements to the rock face.

Previous rock scaling efforts in 2017-2019 impacted individuals of the RTE plant species *P. antennariifolia*, and the proposed project will impact additional individuals. This project, in conjunction with the previous project, will not cause significant impacts to the population or species. *P. antennariifolia* is locally abundant and adjacent individuals are likely to recolonize the scaled rock areas after the project is complete. The 2017-2019 project also affected *S. rigida*; however, the previous project benefited the species. With the extent of *S. rigida* within the project area and the species' response to



disturbance, it is likely that the species will recolonize the aquatic sections of the canal once the proposed project is complete.

Option 1:

The large mound of spoil material near Culvert 210 is partially hidden by vegetation but is still visible. The addition of spoils in the 1990s and the proposed addition of spoils will further increase the extent of the spoils area. However, the impact of spoiling the material adjacent to existing spoil will be less than spoiling the material in another location on the park, particularly as the proposed project will fill in cavities and gaps in the existing topography.

Option 2:

The Paw Paw Tunnel has been used for vehicular access to the Paw Paw Hollow since the 1940s. It is unknown whether this vehicle traffic affected the tunnel. If this option is selected, vehicles and equipment would be carefully selected so as to avoid potential impacts to the Tunnel.

Option 3:

The portions of Tunnel Hill Road and Tunnel Hill Trail within the project area have been regraded in the past. However, the extent to which the trail has been regraded and manipulated is unknown. Although the actions proposed under this option mitigate possible damage to the historic spoils under the historic road trace, it is possible that continued maintenance of this trail and road could affect the integrity of the historic spoils. The historic switchbacks at the end of the Tunnel Hill Trail have been undercut by erosion and continued use may cause damage to the historic road.

CONCLUSIONS

The no action alternative would not cause any new impacts to natural or cultural resources but may have a negative effect on park visitor safety and experience in the Paw Paw area.

The action alternative would not cause any significant impacts to species of concern. The action alternative will have a temporary negative impact on visitor experience but will improve visitor safety and experience in the long term. The implementation of individual elements of the action alternative may have the potential to impact historic structures and archeological resources. However, because each element of the project will be implemented in strict accordance with the guidance set forth by the Secretary of the Interior's Standards for the Treatment of Historic Properties, and in close consultation with the Maryland Historical Trust and National Park Service staff, these potential impacts will be avoided or minimized. The extensive mitigation measures that would be employed by NPS and required of the contractor will further avoid or reduce impacts to park resources.

The adverse impacts to the cultural landscape can be mitigated but not avoided. As a result, under Section 106 of the National Historic Preservation Act, the National Park Service has determined that the overall implementation of the action alternative of this project will have an adverse effect on the cultural landscape of the C&O Canal National Historical Park.



CONSULTATION AND COORDINATION

AGENCY SCOPING

NPS consulted with multiple agencies during the development of this project. USFWS (Appendix I) and MD DNR (Appendix II) were consulted regarding potential impacts to natural resources in the project area. The Maryland State Historic Preservation Office (SHPO) was consulted (Appendix III) regarding potential impacts to cultural resources in the project area. If the SHPO agrees with the NPS assessment that this project will have an adverse effect on the cultural landscape of the project area, a Memorandum of Agreement between NPS and SHPO will be developed to memorialize the best methods of minimizing or mitigating the effects of this proposal. Consultation with USACE, MDE, and the NPS Water Resources Division regarding potential impacts to floodplains and wetlands in the project area will be ongoing throughout the duration of the project.



REFERENCES

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Brewer, H. W.

- 1894 Map of the Property of the Chesapeake & Ohio Canal Company from Sideling Hill Creek to Paw Paw Tunnel; Allegeny County, Maryland

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Luzader, John F.

- 1965 Historic Structure Survey Report: Tunnel; Chesapeake and Ohio Canal

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- 1976 Archeological Survey of Paw Paw Tunnel Hollow, Chesapeake and Ohio Canal National Historical Park

Quinn Evans Architects and McMullan & Associates Structural Engineers

- 2004 Condition Assessment and Preservation Planning; Paw Paw Tunnel; C&O Canal, NHP

Shelton, Kristen (NPS)

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Terracon Consultants, Inc.

- 2020 Rockfall Geohazard Evaluation Report: CHOH: Improve Visitor Safety and Remediate Rockfall Hazards; Oldtown, Maryland
- 2020 Tunnel Seepage Evaluation Report: CHOH: Improve Visitor Safety and Remediate Rockfall Hazards; Oldtown, Maryland
- 2020 Tunnel Condition Assessment Report: CHOH: Improve Visitor Safety and Remediate Rockfall Hazards; Oldtown, Maryland



Unrau, Harlan D.

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VHB, Inc.

2020 Improve Visitor Safety and Remediate Rock Fall Hazards at Milepost 155.5 (Paw Paw Tunnel); CHOH-241450: Draft Value Analysis Report

Wilderman, Michael

1979 Draft Environmental Assessment; Stabilization of Paw Paw Tunnel Portals; Chesapeake and Ohio Canal National Historical Park; Package No. 153



**APPENDIX I: UNITED STATES FISH AND WILDLIFE SERVICE CONSULTATION
LETTER, OFFICIAL SPECIES LIST, AND DETERMINATION OF NO ADVERSE EFFECT**



United States Department of the Interior

NATIONAL PARK SERVICE
C&O Canal National Historical Park
1850 Dual Highway, Suite 100
Hagerstown, Maryland 21740

IN REPLY REFER TO:
10. A (CHOH)

May 8, 2020

U.S. Fish and Wildlife Service
Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, Maryland 21401

RE: Proposed Project to Improve Visitor Safety and Mitigate Rock Fall Hazards in the Paw
Paw Tunnel Hollow at Chesapeake and Ohio Canal National Historical Park

To whom it may concern:

The National Park Service (NPS) is proposing to improve visitor safety and mitigate rockfall hazards in the Paw Paw Tunnel Hollow, located near towpath mile marker 155 on the north end of the Paw Paw Tunnel, north of Paw Paw, West Virginia (Figure 1). The National Park Service is preparing an Environmental Assessment, in accordance with the National Environmental Policy Act (NEPA), to identify and evaluate potential impacts to park resources and to incorporate public comment.

The proposed project consists of removing rockfall debris from the canal prism deposited from a 2016 rockslide, stabilizing the rockface above the towpath for approximately 1,000 feet north of the Paw Paw Tunnel, and replacing the wooden boardwalk which serves as the towpath along this length (Figure 2). To accomplish these goals, the canal in the Paw Paw Tunnel and Tunnel Hollow will be drained to allow ingress of equipment through the tunnel. The rockfall hazards will be stabilized with a combination of scaling, pinning, and rock netting. Previously deposited rock debris will be removed from the hollow by truck and transported two miles downstream along the towpath to a proposed spoil location on the berm side of the canal near the end of Outdoor Club Road.

This project is needed because of the danger posed to visitors by the recurring rock fall and landslides in this area. The towpath in this area travels through the Paw Paw Tunnel and Tunnel Hollow and a landslide in this area could block the path for months or years. The board walk in the Tunnel Hollow was constructed in the 1970s and has become a danger to visitors due to degradation over time.

The project area is within an Appalachian shale barren community, with steep, shale slopes (Figure 3). NPS conducted surveys of the project site for State-listed rare plants between June and August 2019 and we identified seven rare, threatened, or endangered plant species within the project area. We again surveyed the project area in Spring of 2020 to capture any spring ephemeral plant species, though no additional species were discovered beyond that which is noted in the report. Surveys did not result in observations of any Federally listed species.

The official species list, generated in IPaC on 8 May 2020, includes both *Myotis sodalis* (Indiana bat) and *M. septentrionalis* (Northern long-eared bat) (Attachment 1). The Paw Paw Tunnel occasionally serves as a hibernaculum, though neither *Myotis septentrionalis* nor *M. sodalis* have been observed there. The project may remove smaller trees growing in the rock face, but tree removal in this area is not anticipated. The proposed area for spoiling the rock material did not contain any State listed plant species but will require approximately 1.4 acres of tree removal. This area is downstream, northeast of the area to be scaled and pinned. Geospatial data associated with the entire project area can be seen in the attached shapefile (Attachment 2).

In accordance with Section 7 of the Endangered Species Act, we are requesting your consultation on the project. We have determined that this project may affect, but is not likely to adversely affect both the Northern long-eared bat and the Indiana bat and we request your concurrence with this determination. We are concurrently consulting with Maryland Department of Natural Resources for potential impacts to State listed species.

Your response on our determination of effect would be greatly appreciated. Thank you for your assistance with this project. If you have any questions, please contact Dr. Landsman at 301-739-6072 or Andrew_Landsman@nps.gov.

Sincerely,

A handwritten signature in cursive script that reads "Tina Cappetta".

Tina Cappetta
Superintendent

Attachment 1: Official species list
Attachment 2: Shapefile showing extent of project area

Figure 1. Map showing general location of the project area.

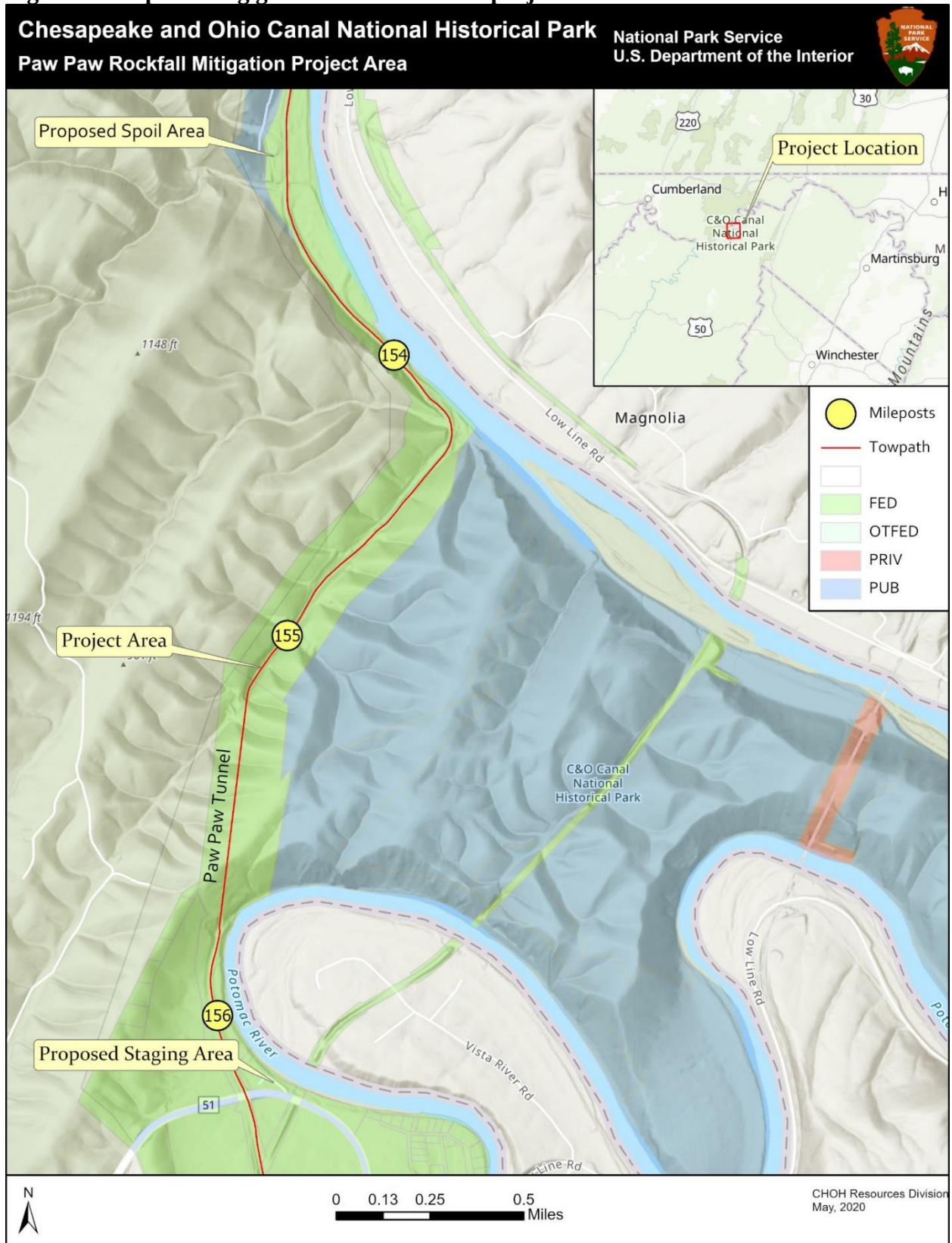


Figure 2. Project components, including scaling, pinning, or rock netting, will occur within red polygons. Area RF001 lies above the downstream portal of the Paw Paw Tunnel.



Figure 3. Typical conditions within the project area.





United States Department of the Interior



FISH AND WILDLIFE SERVICE
Chesapeake Bay Ecological Services Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
Phone: (410) 573-4599 Fax: (410) 266-9127

<http://www.fws.gov/chesapeakebay/>
<http://www.fws.gov/chesapeakebay/endsppweb/ProjectReview/Index.html>

In Reply Refer To:

May 08, 2020

Consultation Code: 05E2CB00-2020-SLI-1115

Event Code: 05E2CB00-2020-E-03038

Project Name: Paw Paw rock removal

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. This species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (<http://www.fws.gov/windenergy/>) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm>; <http://www.towerkill.com>; and <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
 - USFWS National Wildlife Refuges and Fish Hatcheries
 - Wetlands
-

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Chesapeake Bay Ecological Services Field Office

177 Admiral Cochrane Drive

Annapolis, MD 21401-7307

(410) 573-4599

Project Summary

Consultation Code: 05E2CB00-2020-SLI-1115

Event Code: 05E2CB00-2020-E-03038

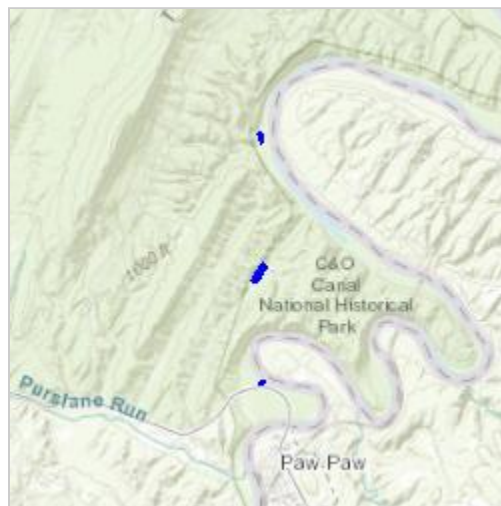
Project Name: Paw Paw rock removal

Project Type: ** OTHER **

Project Description: The proposed project consists of removing rockfall debris from the canal prism deposited from a 2016 rockslide, stabilizing the rockface above the towpath for approximately 1,000 feet north of the Paw Paw Tunnel, and replacing the wooden boardwalk which serves as the towpath along this length (Figure 2). To accomplish these goals, the canal in the Paw Paw Tunnel and Tunnel Hollow will be drained to allow ingress of equipment through the tunnel. The rockfall hazards will be stabilized with a combination of scaling, pinning, and rock netting. Previously deposited rock debris will be removed from the hollow by truck and transported two miles downstream along the towpath to a proposed spoil location on the berm side of the canal near the end of Outdoor Club Road. The area of rock spoils is demarcated by the northeast polygon. This area will have trees removed to allow for dumping of rock material.

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/place/39.544464513301605N78.4605013493926W>



Counties: Allegany, MD

Endangered Species Act Species

There is a total of 2 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 1 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Indiana Bat <i>Myotis sodalis</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: Projects with a federal nexus that have tree clearing = to or > 15 acres: 1. REQUEST A SPECIES LIST 2. NEXT STEP: EVALUATE DETERMINATION KEYS 3. SELECT EVALUATE under the Northern Long-Eared Bat (NLEB) Consultation and 4(d) Rule Consistency key Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Wetlands

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

RIVERINE

- [R5UBFx](#)
 - [R5UBH](#)
-



United States Department of the Interior



FISH AND WILDLIFE SERVICE

Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, Maryland 21401
<http://www.fws.gov/chesapeakebay>

May 15, 2020

National Park Service
1850 Dual Highway
Suite 100
Hagerstown, MD 21740

RE: SLI 1115 Paw Paw rock removal

Dear Andrew Landsman:

This responds to your letter, received May 8, 2020, requesting information on the presence of species which are federally listed or proposed for listing as endangered or threatened within the vicinity of the above referenced project area. We have reviewed the information you enclosed and are providing comments in accordance with section 7 of the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*).

This project as proposed will have “no effect” on the endangered, threatened, or candidate species listed on your IPaC species list because while the project is within the range of the species, it is unlikely that the species would occur within the project area that was submitted. Therefore, no Biological Assessment or further section 7 Consultation with the U.S. Fish and Wildlife Service is required. Should project plans change, or if additional information on the distribution of listed or proposed species becomes available, this determination may be reconsidered.

This response relates only to federally protected threatened or endangered species under our jurisdiction. For information on the presence of other rare species, you should contact Lori Byrne of the Maryland Wildlife and Heritage Division at (410) 260-8573.

An additional concern of the Service is wetlands protection. Federal and state partners of the Chesapeake Bay Program have adopted an interim goal of no overall net loss of the Chesapeake Bay’s remaining wetlands, and the long term goal of increasing the quality and quantity of the Chesapeake Bay’s wetlands resource base. Because of this policy and the functions and values wetlands perform, the Service recommends avoiding wetland impacts. All wetlands within the project area should be identified, and if construction in wetlands is proposed, the U.S. Army Corps of Engineers, Baltimore District, should be contacted for permit requirements. They can be reached at (410) 962-3670.



We appreciate the opportunity to provide information relative to fish and wildlife issues, and thank you for your interests in these resources. If you have any questions or need further assistance, please contact Trevor Clark at (410) 573-4527.

Sincerely,

A handwritten signature in blue ink that reads "G. LaRouche". The signature is written in a cursive style with a large, stylized "G" and "L".

Genevieve LaRouche
Supervisor



APPENDIX II: MARYLAND DEPARTMENT OF NATURAL RESOURCES CONSULTATION LETTER



United States Department of the Interior

NATIONAL PARK SERVICE
C&O Canal National Historical Park
1850 Dual Highway, Suite 100
Hagerstown, Maryland 21740

IN REPLY REFER TO:
10. A (CHOH)

May 8, 2020

Lori Byrne
Maryland Department of Natural Resources
Wildlife and Heritage Service
580 Taylor Avenue
Tawes Office Building E1
Annapolis, Maryland 21401

RE: Proposed Project to Improve Visitor Safety and Mitigate Rock Fall Hazards in the Paw Paw Tunnel Hollow at Chesapeake and Ohio Canal National Historical Park

Dear Ms. Byrne:

The National Park Service (NPS) is proposing to improve visitor safety and mitigate rockfall hazards in the Paw Paw Tunnel Hollow, located near towpath mile marker 155 on the north end of the Paw Paw Tunnel, north of Paw Paw, West Virginia (Figure 1). The National Park Service is preparing an Environmental Assessment, in accordance with the National Environmental Policy Act (NEPA), to identify and evaluate potential impacts to park resources and to incorporate public comment.

The proposed project would consist of removing rockfall debris from the canal prism deposited from a 2016 rockslide, stabilizing the rockface above the towpath for approximately 1,000 feet north of the Paw Paw Tunnel, and replacing the wooden boardwalk which serves as the towpath along this length (Figure 2). To accomplish these goals, the canal in the Paw Paw Tunnel and Tunnel Hollow will be drained to allow ingress of equipment through the tunnel. The rockfall hazards will be stabilized with a combination of scaling, pinning, and rock netting. Previously deposited rock debris will be removed from the hollow by truck and transported two miles downstream along the towpath to a proposed spoil location on the berm side of the canal near the end of Outdoor Club Road. The rock disposal site will require approximately 1.4 acres of tree removal. This project is needed because of the danger posed to visitors by the recurring rock fall and landslides in this area. The towpath in this area travels through the Paw Paw Tunnel and Tunnel Hollow and a landslide in this area could block the path for months or years. The board

walk in the Tunnel Hollow was constructed in the 1970s and has become a danger to visitors due to degradation over time.

The project area is within an Appalachian shale barren community, with steep, shale slopes (Figure 3). NPS conducted surveys of the project site for State-listed rare plants between June and August 2019 and we identified seven rare, threatened, or endangered plant species within the project area (Attachment 1). We again surveyed the project area in Spring of 2020 to capture any spring ephemeral plant species, though no additional species were discovered beyond that which is noted in the report. We identified evening primrose (*Oenothera argillicola*), glade bluecurls (*Trichostema brachiatum*), low bindweed (*Calystegia spithamea*), whorled milkweed (*Asclepias verticillata*), sessile-fruited arrowhead (*Sagittaria rigida*), shale barren ragwort (*Packera antennariifolia*), and heart-leaved skullcap (*Scutellaria ovata*). Most of these species were found in pockets of soil in the shale on the western slope of the Paw Paw Tunnel Hollow while *S. rigida* was found in the shallow water of the canal prism. *P. antennariifolia* and *S. ovata* are found throughout the project area and while individuals will be impacted, it is likely that these species will recolonize the project area after work is complete. *O. argillicola* is similarly spread throughout the project area and will be affected by this project. The more densely populated area closer to the tunnel portal will likely be avoided. NPS previously consulted with the DNR State Botanist regarding impacts to *S. rigida* and *A. verticillata* in the project area (Attachment 2). Impacts will be minor and the species may recolonize the habitat after the project is complete. *C. spithamea* was only observed growing within the rockfall debris that fell in 2016, and only a single specimen of *T. brachiatum* was discovered downstream of the rockfall. The proposed area for spoiling the rock material did not contain any State listed plant species.

The project area also provides habitat for various wildlife. The canal typically holds between six inches and two feet of water and is inhabited by amphibians such as the eastern newt (*Notophthalmus viridescens*), American toad (*Anaxyrus americanus*), wood frog (*Lithobates sylvaticus*), and spring peeper (*Pseudacris crucifer*). NPS held a pre-application meeting with Maryland Department of the Environment and the US Army Corps of Engineers to discuss potential project impacts to wetlands and floodplains and is currently working to submit the permit application. Impacts to amphibians and amphibian habitat are expected to be temporary, with populations likely to recolonize the area after the project ends. The Paw Paw Tunnel occasionally serves as a hibernaculum, though neither *Myotis septentrionalis* nor *M. sodalis* have been observed there. The park works closely with the DNR Western Region Ecologist to survey these populations each winter.

With this letter, we are requesting your consultation on State Rare, Threatened, and Endangered Species. Please advise if your agency is tracking any additional species of flora or fauna of special concern in this area. The MERLIN mapping web application indicates that portions of the project area fall within Review Area ID 609, a Group 1 area (Figure 4). We are concurrently consulting with the US Fish and Wildlife Service for federally listed species, per Section 7 of the Endangered Species Act.

Your response on this project would be greatly appreciated. If you have any questions, please contact Dr. Landsman at 301-739-6072 or Andrew_Landsman@nps.gov. Thank you for your assistance with this project

Sincerely,

Tina Cappetta

Tina Cappetta
Superintendent

Attachment 1: NPS rare plant survey report

Attachment 2: Informal consultation with DNR State Botanist Chris Frye regarding potential impacts to *A. verticillata* and *S. rigida*

Figure 1. Map showing general location of the project area.

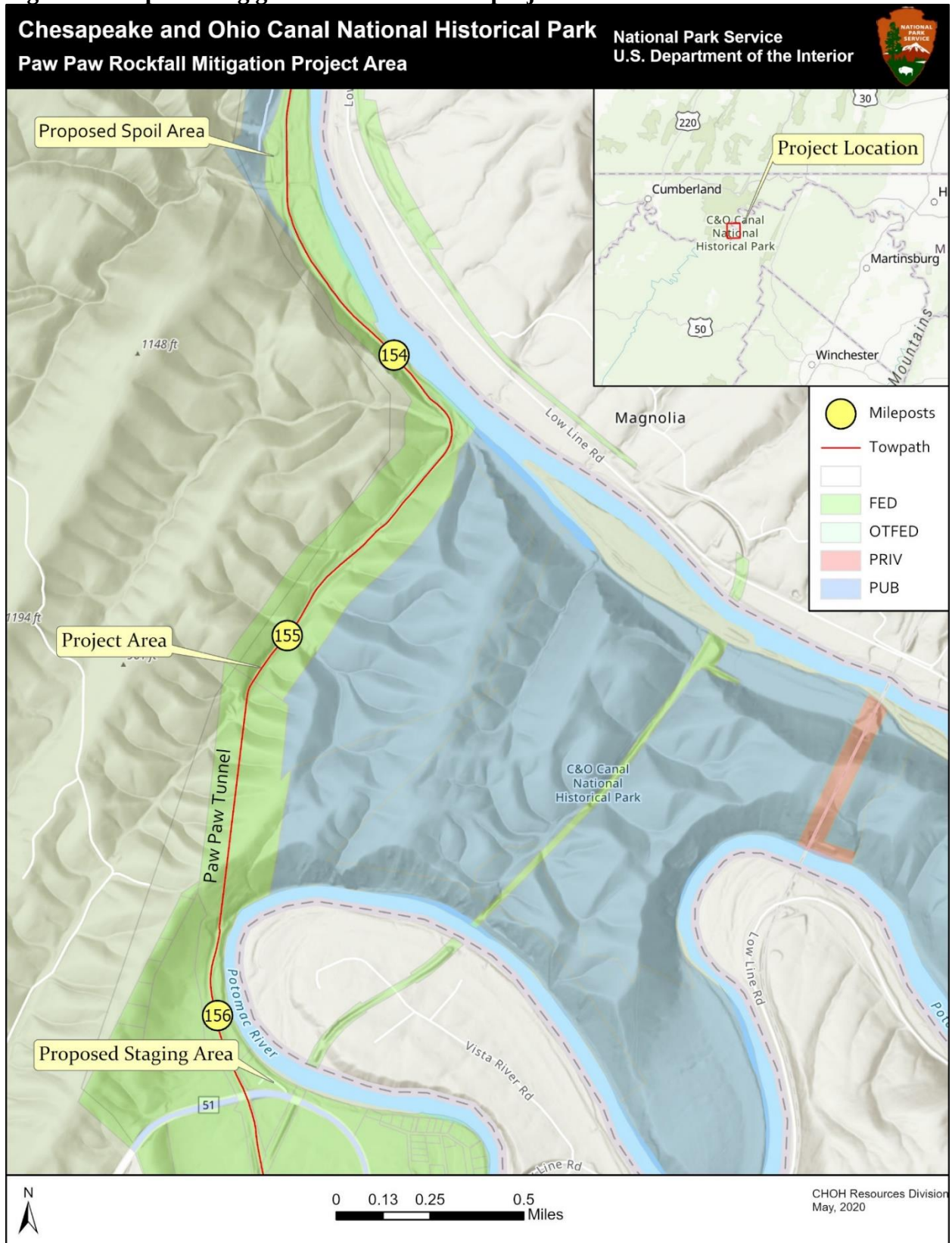


Figure 2. Project components, including scaling, pinning, or rock netting, will occur within red polygons. Area RF001 lies above the downstream portal of the Paw Paw Tunnel.



Figure 3. Typical conditions within the project area.



Figure 4. Screenshot from MERLIN showing project area, including Review Area ID 609.





APPENDIX III: MARYLAND HISTORICAL TRUST CONSULTATION LETTER AND ASSESSMENT OF EFFECT REPORT



United States Department of the Interior

NATIONAL PARK SERVICE
C&O Canal National Historical Park
1850 Dual Highway, Suite 100
Hagerstown, Maryland 21740

IN REPLY REFER TO:
1.A.2. (CHOH)

June 3, 2020

Ms. Elizabeth Hughes
State Historic Preservation Officer
Maryland Historical Trust
100 Community Place,
Crownsville, MD 21032

Subject: Proposed Project to improve visitor safety and mitigate rockfall hazards in the Paw Paw Tunnel Hollow within the Chesapeake and Ohio Canal National Historical Park, Washington County, MD

Dear Ms. Hughes:

The National Park Service (NPS), Chesapeake and Ohio Canal National Historical Park (CHOH) wishes to continue consultation with the Maryland Historic Trust (MHT) under Section 106 of the National Historic Preservation Act (54 U.S.C. 306108) regarding the mitigation of safety concerns associated with rockslides at the downstream entry of the Paw Paw Tunnel, in accordance with 36 CFR 800.3 of the regulations of the Advisory Council on Historic Preservation. This letter serves to inform the MHT of CHOH's determination that the proposed undertaking will result in an Adverse Effect to cultural landscapes.

Management Summary and Description of Undertaking

CHOH proposes to mitigate safety concerns associated with rockslides at the downstream entry of the Paw Paw Tunnel. The Paw Paw Tunnel is in a remote area of Allegany County in an area prone to rockslides. A towpath closure in the tunnel or areas immediately upstream or downstream of the tunnel requires a lengthy and strenuous detour over a mountain. The tunnel is the only emergency access route to the towpath on the downstream end of the tunnel. The tunnel is also one of the most significant works of the Chesapeake and Ohio Canal, and typically receives more than 30,000 visitors each year.

A 2019 inspection of the Paw Paw Tunnel Hollow (Tunnel Hollow) by Terracon Consultants, Inc. revealed rockfall hazards throughout the deep cut on both the east and west sides of the canal prism. The inspectors divided the Hollow into zones and assigned each zone a risk score which was based on multiple factors including slope height, available catchment area, structural condition, volume of material, history of rockfall, and water activity. This analysis revealed moderate visitor safety risks in all of the zones except for the areas that had been stabilized during previous projects.

Rockslides have been a documented problem in the Tunnel Hollow since its excavation began in 1837. The character of the rock is such that exposure to weathering leads to fracturing and rockfall. Landslides in the cuts have been noted by NPS throughout the history of the park with major slides occurring in 1968, 1969, 1974, 1975, 1976, 1977, 1997, 2013, and 2016. Most of these occurred on the western slope of the northern cut. NPS has made previous attempts to address these hazards, notably in 1956, 1979, the mid 1990s, and 2018. In 1956, portions of the tunnel vault brick work, the towpath, and the towpath boardwalk were repaired and rockfall debris was removed from the canal. In 1979, the tunnel portals were cleared of vegetation and repointed, and rockfall debris was removed from the canal. In 2018, scaling was used to remove unstable rock from the eastern slope of the north cut, the scaled material was placed against the side

of the canal. Rock bolts and shear blocks were installed to prevent further destabilization, and draped mesh was placed over select areas to catch further rockfall.

The purpose of the proposed project is to remove debris from the canal prism deposited in the 2016 rockslide and 2018 scaling and to stabilize the rock face adjacent to the canal for 1,000 feet north of the Paw Paw Tunnel. The NPS preferred action for the proposed project would stabilize the rockfaces with a combination of techniques including scaling, rock bolts, shear blocks, pinned mesh, and water drains. The scaled material would then be spoiled at an existing spoil area between Culvert 210 and the end of Outdoor Club Road on the berm side of the canal. The project would also replace in-kind the wooden boardwalk that serves as the towpath for 750 feet of this stretch after the rock stabilization and spoiling has been completed. The boardwalk is at the end of its operational life and will likely be further degraded by the proposed stabilization activities. The project would require a staging area be established at the Paw Paw Campground parking lot, which would be expanded for this purpose. After the project has been completed, the expanded parking lot will remain to accommodate more park visitors. This project is needed to improve visitor safety and maintain towpath continuity. A detailed description of the proposed undertaking can be found in the Action Alternative section of the attached Assessment of Effects.

Area of Potential Effect

The Area of Potential Effect (APE) stretches from a proposed spoil location near the end of Outdoor Club Road at mile marker 153.5, to the proposed staging area at the parking lot of the Paw Paw Campground located off State Route 51 at mile marker 156. Most of the project would be focused in the Tunnel Hollow where the rock stabilization activities would take place, but the APE would also include the area in the immediate vicinity of the towpath along the entire length. Also included are portions of Tunnel Hill Road and Tunnel Hill Trail. Tunnel Hill Road runs from Malcolm Road, over Tunnel Hill, intersects with Tunnel Hill Trail, and continues south into the Maryland State lands of the Paw Paw Bends. Tunnel Hill Trail begins near the southern portal of the Paw Paw Tunnel, climbs Tunnel Hill, intersects Tunnel Hill Road at the summit and continues down the north side of Tunnel Hill to the towpath in the Tunnel Hollow. Both are unimproved gravel roads that likely follow historical road traces. The main historical features in the project area are the tunnel itself, the cuts to the north and south, and the structures in the Tunnel Hollow Complex in the hill cut 2,000 ft north of the downstream tunnel portal of Paw Paw Tunnel. For more information please refer to the figures in the Assessment of Effect.

Identification of Historic Properties

The entire project area is an historically significant and modified landscape associated with the Chesapeake and Ohio Canal. Tunnel Hollow was excavated between 1836 and 1850 and contains canal infrastructure as well as the remains of structures associated with canal management and operations. The base of Tunnel Hollow is narrow and much of the available space is taken by the canal and towpath for which it was excavated. The remaining space was used for various maintenance, storage, and housing structures. The Tunnel Hollow Complex operated as a part of the canal from its completion in 1850 until the cessation of commercial navigation in this area in 1924. There are numerous historic structures listed in the National Register of Historic Places that fall within the APE, and the portion of CHOH in Allegany County is listed in Maryland's Inventory of Historic Properties as AL-I_C-086.

This area is also rich in prehistoric and historic archeological resources. A historic archeological site associated with the construction of the tunnel and the Paw Paw Superintendent's House (18AG255) is located near the proposed expansion of the Paw Paw Campground Parking Lot. The entirety of the Tunnel Hollow is a historic archeological site and the canal and towpath likely contain archeological resources. The Tunnel Hollow Complex is listed as site 18AG221. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

The cultural landscape in the project area has not been individually evaluated for National Register eligibility. However, the Paw Paw Tunnel and Tunnel Hollow offer intact historic features in a unique viewscape that has been a popular attraction since construction was completed.

Please review the attached Assessment of Effects for a more detailed description of the cultural resources within the APE and the adverse effects of the proposed project on the cultural landscape.

Consultation and Potential Effects to Historic Properties

Based on known information about Native American Groups in the study area, we have determined that there are no federally recognized tribes listed that might attach cultural or religious significance to the APE. Therefore, no consultation with Native American Groups is necessary. Additionally, it is not believed that this action will affect ethnographic resources or museum collections.

Aspects of the proposed project have the potential to impact historic structures and archeological resources. However, because each element of the project would be implemented in strict accordance with the guidance set forth by the Secretary of the Interior's Standards for the Treatment of Historic Properties, and in close consultation with the Maryland Historical Trust, these potential impacts would be avoided or minimized.

The adverse impacts to the cultural landscape can be mitigated but not avoided. As a result, CHOH has determined that the overall implementation of the Action Alternative of the project "Improve Visitor Safety and Mitigate Rockfall Hazards in the Tunnel Hollow" would have an adverse effect on the cultural landscape of the C&O Canal National Historical Park.

A list of mitigations to lessen the impact of the proposed project on cultural resources is included in the attached Assessment of Effects.

This letter is accompanied by the Assessment of Effects which identifies the location of the APE and additional details of the project. If you have any questions, please feel free to contact Jeri DeYoung, Chief of Resources Management, at 301-714-2210 or jeri_deyoung@nps.gov or Justin Ebersole, Archeological Technician, at 301-714-2224 or justin_ebersole@nps.gov.

Sincerely,

Tina Cappetta
Superintendent

Attachments

Assessment of Effects
Draft Schematic Design
2014 USGS Paw Paw Quadrangle
Photographs of APE

References

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Terracon Consultants, Inc.

- 2020 Rockfall Geohazard Evaluation Report: CHOH: Improve Visitor Safety and Remediate Rockfall Hazards; Oldtown, Maryland
- 2020 Tunnel Seepage Evaluation Report: CHOH: Improve Visitor Safety and Remediate Rockfall Hazards; Oldtown, Maryland
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- 2020 Improve Visitor Safety and Remediate Rock Fall Hazards at Milepost 155.5 (Paw Paw Tunnel); CHOH-241450: Draft Value Analysis Report

Wilderman, Michael

- 1979 Draft Environmental Assessment; Stabilization of Paw Paw Tunnel Portals; Chesapeake and Ohio Canal National Historical Park; Package No. 153

The Maryland Historical Trust concurs with the Chesapeake and Ohio Canal National Historical Park that the proposed project to Improve Visitor Safety and Mitigate Rockfall Hazards in the Tunnel Hollow within the Chesapeake and Ohio Canal National Historical Park, Washington County, MD will have an adverse effect on historic properties.

Signature:_____ Date:_____

The Maryland Historical Trust does not concur with the Chesapeake and Ohio Canal National Historical Park that the proposed project to Improve Visitor Safety and Mitigate Rockfall Hazards in the Tunnel Hollow within the Chesapeake and Ohio Canal National Historical Park, Washington County, MD will have an adverse effect on historic properties.

Signature:_____ Date:_____



**Improve Visitor Safety and Mitigate Rockfall
Hazards in the Paw Paw Tunnel Hollow
Chesapeake & Ohio Canal National Historical Park
PMIS – CHOH 241450**

Assessment of Effects
June 2020



*Improve Visitor Safety and Mitigate Rockfall Hazards in the Paw Paw Tunnel Hollow
Chesapeake & Ohio Canal National Historical Park
Assessment of Effects*

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Introduction

The National Park Service (NPS) proposes to mitigate safety concerns associated with rockslides at the downstream entry of the Paw Paw Tunnel. The Paw Paw Tunnel is in a remote area of Allegany County in an area prone to rockslides. A towpath closure in the tunnel or areas immediately upstream or downstream of the tunnel requires a lengthy and strenuous detour over a mountain. The tunnel is the only emergency access route to the towpath on the downstream end of the tunnel. The tunnel also has historical significance as one of the most significant works of the Chesapeake and Ohio Canal, and typically receives more than 30,000 visitors each year.

A 2019 inspection of the Paw Paw Tunnel Hollow (Tunnel Hollow) by Terracon Consultants, Inc. revealed rockfall hazards throughout the deep cut on both the east and west sides of the canal prism. The inspectors divided the Hollow into zones and assigned each zone a risk score which was based on a number of factors including slope height, available catchment area, structural condition, volume of material, history of rockfall, and water activity. This analysis revealed moderate visitor safety risks in all of the zones except for the areas that had been stabilized during previous projects.

The purpose of this project is to remove debris from the canal prism deposited in a 2016 rockslide and to stabilize the rock face adjacent to the canal for 1,000 feet north of the Paw Paw Tunnel. The project would also replace in-kind the wooden boardwalk that serves as the towpath for 750 feet of this stretch. This project is needed to improve visitor safety and maintain towpath continuity.

As a federal undertaking, the project is subject to Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, and its implementing regulations (36 CFR § 800) “Protection of Historic Properties”. This document has been prepared as part of the consultation between the NPS and the Maryland State Historic Preservation Office (SHPO).

In support of the “Improve Visitor Safety and Mitigate Rockfall Hazards in the Tunnel Hollow” Environmental Assessment, NPS has developed this Assessment of Effects to document the presence of historic properties, defined as those that are listed or eligible for listing in the National Register of Historic Places (NRHP), for the purposes of Section 106 review. Identification of historic buildings, structures, sites, objects, districts, and cultural landscapes was undertaken within the Area of Potential Effect (APE) established for this project.

As part of the National Environmental Policy Act (NEPA) process, the NPS developed one Action Alternative for the Rockfall Mitigation Plan with three Options identifying potential access routes to and from the Tunnel Hollow. The focus of this memorandum is on this Action Alternative.

Project Description

The project area stretches from a proposed spoil location at the end of Outdoor Club Road at mile marker 153.5, to the proposed staging area at the parking lot of the Paw Paw Campground located off State Route 51 at mile marker 156 (Figure 1). Most of the project would be focused in the Tunnel Hollow where the rock stabilization activities would take place (Figure 2) but would also include the area in the immediate vicinity of the towpath along the entire length. The project area also includes portions of Tunnel Hill Road and Tunnel Hill Trail. Tunnel Hill Road runs from Malcolm Road, over Tunnel Hill, intersects with Tunnel Hill Trail, and continues south into the Maryland State lands of the Paw Paw Bends. Tunnel Hill Trail begins near the southern portal of the Paw Paw Tunnel, climbs Tunnel Hill, intersects Tunnel Hill Road at the summit and continues down the north side of Tunnel Hill to the towpath in the Tunnel Hollow. The main historical features in the project area are the tunnel itself, the cuts to the north and south, and the structures in the Tunnel Hollow Complex in the hill cut 2,000 ft north of the downstream tunnel portal of Paw Paw Tunnel.



NO ACTION ALTERNATIVE

Under the No Action Alternative, the rockfall from the 2016 landslide would be left in place within the canal prism. NPS would not undertake rock stabilization efforts and the risk of landslides and rockfall would continue to be a threat to visitors as the exposed rock continued to weather and degrade. Since the canal, which acts as a rock catchment area, is currently filled, future landslides and rockfall will likely impact the existing wooden boardwalk where visitors are most likely to be. It is possible that a landslide could destroy a portion of the boardwalk, breaking towpath continuity. Future landslides would be removed as they occurred, if extent of rock material was minor, but mobilization and funding for removal of large rock debris would likely be a multiyear process. The boardwalk would continue to undergo regular maintenance and repair/rehabilitation of the boardwalk would be addressed in the CHOH 5 year plan and addressed in a future project.

ACTION ALTERNATIVE: STABILIZE TUNNEL HOLLOW AND REMOVE SPOILS (NPS PREFERRED)

Under this Alternative, a staging area would be established at the Paw Paw Campground, the wooden boardwalk would be replaced in-kind, the cliff faces in the Tunnel Hollow would be stabilized, and the 1,600 cubic yards of rockfall from 2016 would be removed along with all material produced by the proposed stabilization efforts of this project.

The proposed staging area in the Paw Paw campground would be based around the existing parking lot and would likely involve an expansion of the parking lot to the east towards State Route 51. The current parking lot and area noted for parking lot expansion sit on a historic archeological site (18AG255) associated with the construction of the tunnel. Design and construction of the parking lot would be guided and monitored by an NPS archeologist.

The 750 foot long wooden boardwalk in the Tunnel Hollow was constructed in the 1970s and has degraded to the point of being a safety concern. The boardwalk would be removed during the initial phases of the proposed project and replaced in-kind when the rock stabilization and removal portions of the project have been completed.

Rock stabilization would include scaling, rock bolts, shear blocks, pinned mesh, and rock drains as needed. Scaling, rock bolts, and rock drains have been used by NPS in this area since the 1970s. Scaling involves manually or mechanically removing loose or fractured rock from the cliff faces until reaching a stable rock surface. Rock bolting involves drilling holes 10 to 15 feet deep into the rock face and inserting steel rods to restrain unstable rock mass. Shear blocks also involve drilling deep holes in the rock face; however, concrete blocks are attached to the ends of these bolts. Shear blocks are placed under unstable rock ledges to provide support. Pinned mesh is a combination of anchors and steel rockfall mesh; it is used to catch and retain rockfall against the face of the slope the slope instead of letting it fall or bounce away from the slope into areas that are more likely to have visitor traffic. Rock drains are used to relieve groundwater pressure between layers of rock and reduce the weathering of the rock from freeze-thaw cycles by drilling holes into the rockface and installing PVC pipe to drain water from areas with noted water infiltration.

Rockfall hazards would be addressed in priority order according to the 2019 geotechnical report. Draped mesh installed during the 2017-2019 emergency stabilization project would be removed. The slope under the removed mesh would be scaled and pinned mesh would only be added to the upper portions of the cliff where the rock planes lie perpendicular to the rock face. Rock bolts would be ineffective in these areas which experience differential weathering among the many different exposed rock planes.

This project also proposes to rehabilitate concrete drainage channels above the north portal of the Paw Paw Tunnel. These channels were installed by NPS in the 1970s and serve to drain surface water from the areas above the tunnel. Currently, the channels are silted in and damaged and do not function.



Three Options have been identified for the removal and spoiling of the rockfall material. Option 1 is preferred by NPS. It is also possible that a combination of these options would be needed to complete the proposed project (Figure 3).

Option 1: Under this option, rockfall material would be transported along the canal prism until out of the deep cut and then along the towpath downstream to an existing causeway over the canal between Culvert 210 and the southernmost end of Outdoor Club Road. The rockfall would be spoiled to the north and south of existing spoil piles which contain material removed from Tunnel Hollow in the 1970s and again in the 1990s, now overgrown with vegetation (Figure 4). This spoil may also be used to realign Twigg Run with the historic drainage which was excavated in the 1830s to redirect Twigg Run into Gross Run so that both streams would pass under the canal at Culvert 210, saving the expense of an additional culvert. If Outdoor Club Road is used to access the proposed spoil area for ingress or egress, a temporary stream crossing will be necessary to cross Gross Run.

Option 2: Under this option, rockfall material would be transported along the canal prism through the Paw Paw Tunnel and then along the towpath to the Paw Paw Campground. The material would be spoiled along the western edge of the campground entrance road where it meets State Route 51. Spoiling the material here would facilitate the expansion of the entrance road to two lanes, which would mitigate a long-standing safety issue of narrow access to and from the heavily used state route. Additional material may be spoiled on or around the existing parking lot or proposed staging area to permanently improve and expand the existing parking lot which would alleviate overcrowding seen in the existing parking lot (Figure 5).

Option 3: Under this option, rockfall material would be transported along Tunnel Hill Trail and Tunnel Hill Road. If Allegany County permits, as portions of the trail and road are on state land, the material would be spoiled on the trail and road to repair and improve the surface. Additional material may be spoiled on nearby roads managed by Allegany County in the Green Ridge State Forest. In order to use this route, Tunnel Hill Trail and Tunnel Hill Road would have to be widened in some areas to better accommodate vehicles. Excess rock material beyond that used on the Tunnel Hill Trail and Road would be used to expand the existing parking lot and entrance road at the Paw Paw Campground.

AREA OF POTENTIAL EFFECT

The Area of Potential Effect for historic structures, archeological resources, and cultural landscapes is identical with the project area and extends from the Paw Paw Campground north to the proposed spoils area at the end of Outdoor Club Road. The entire project area is historically significant and is rich in cultural material.

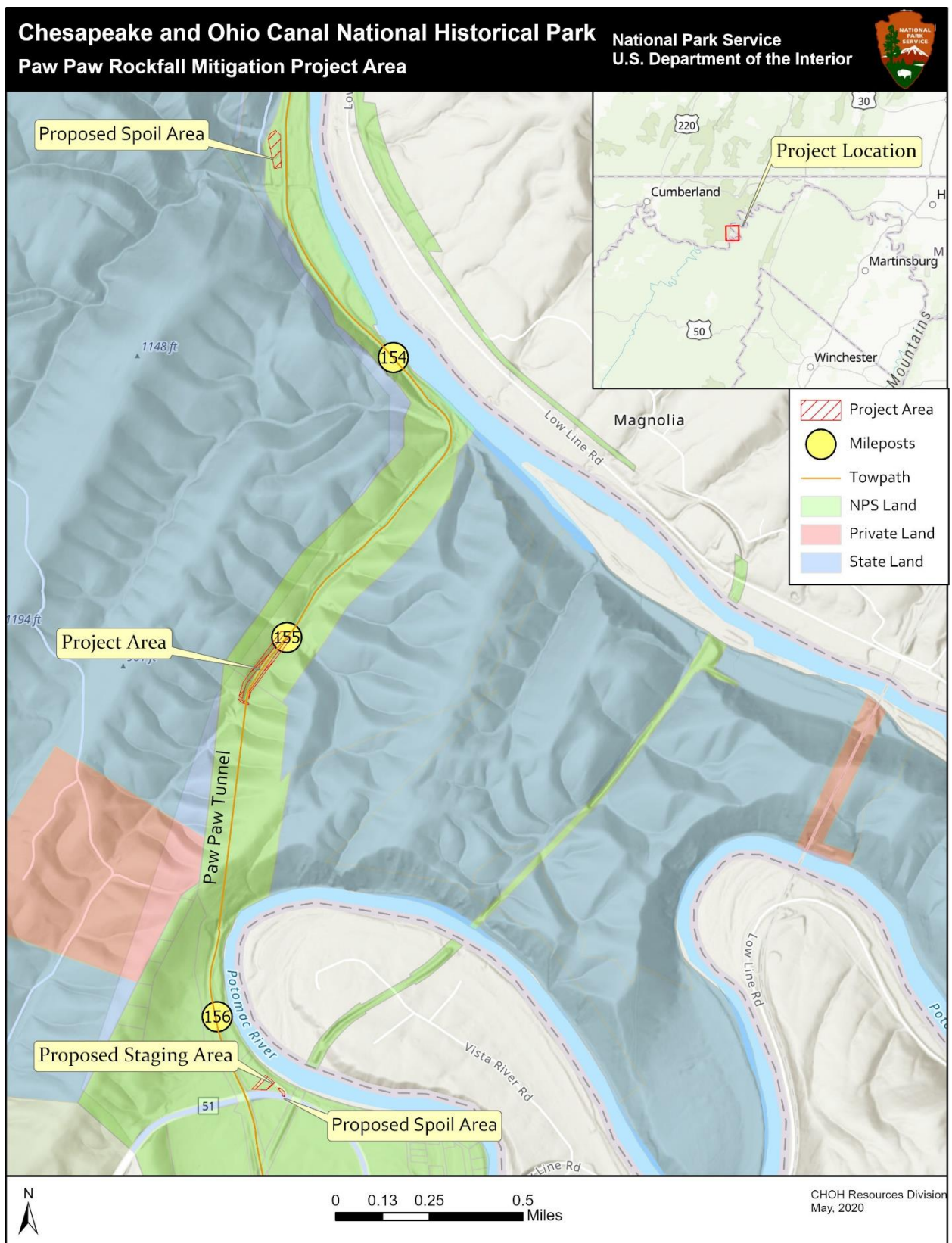


Figure 1: Project area.

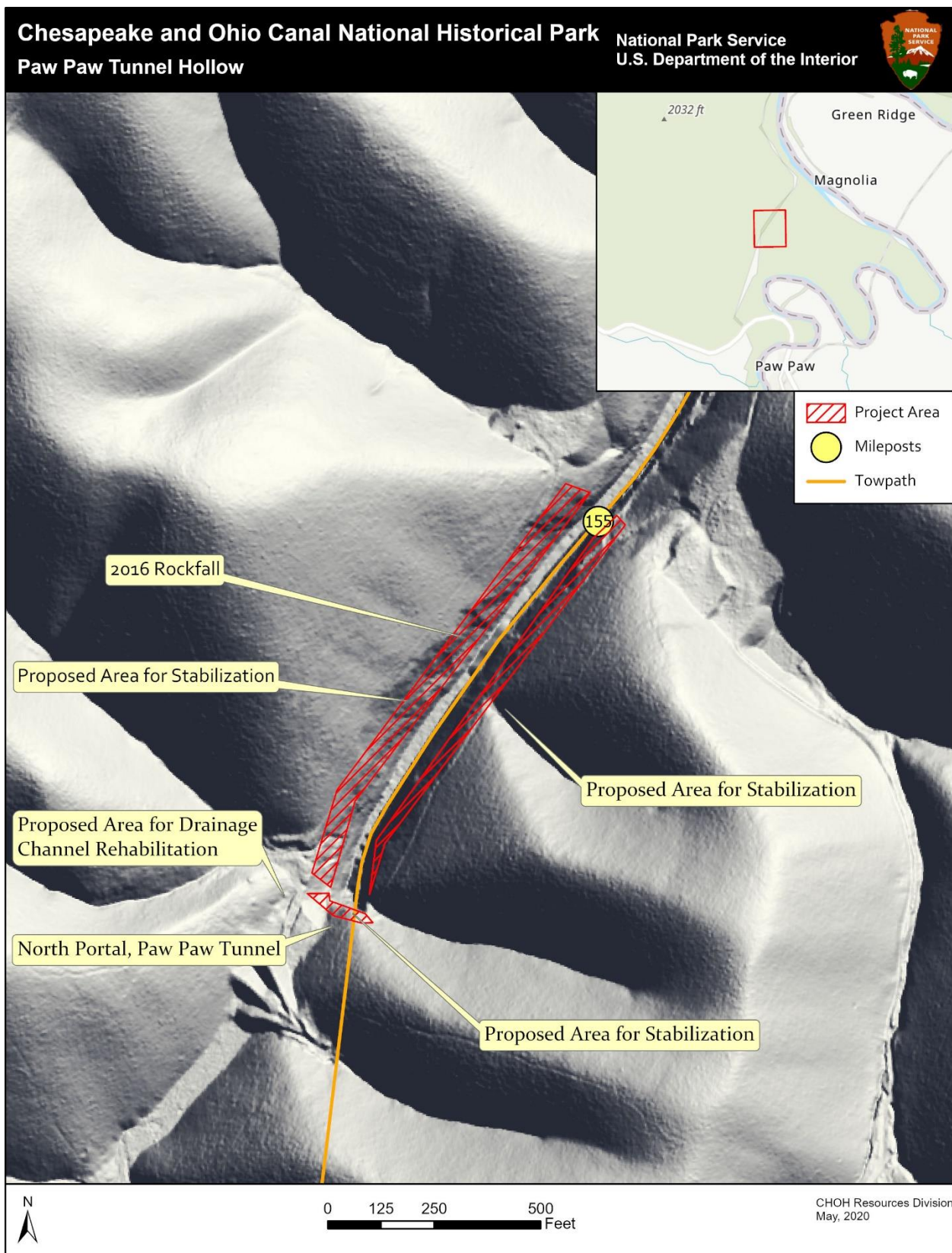
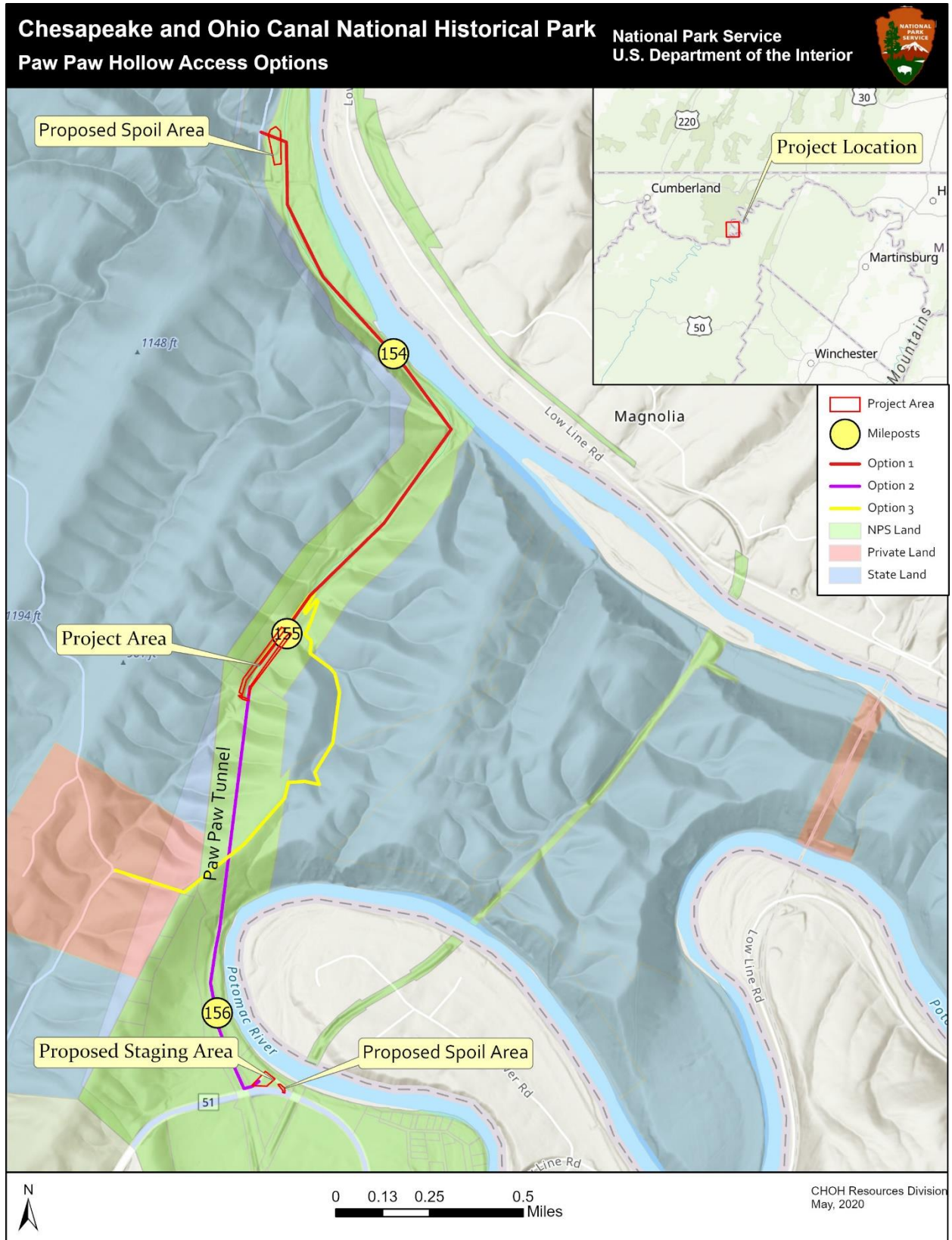


Figure 2: Paw Paw Tunnel Hollow.



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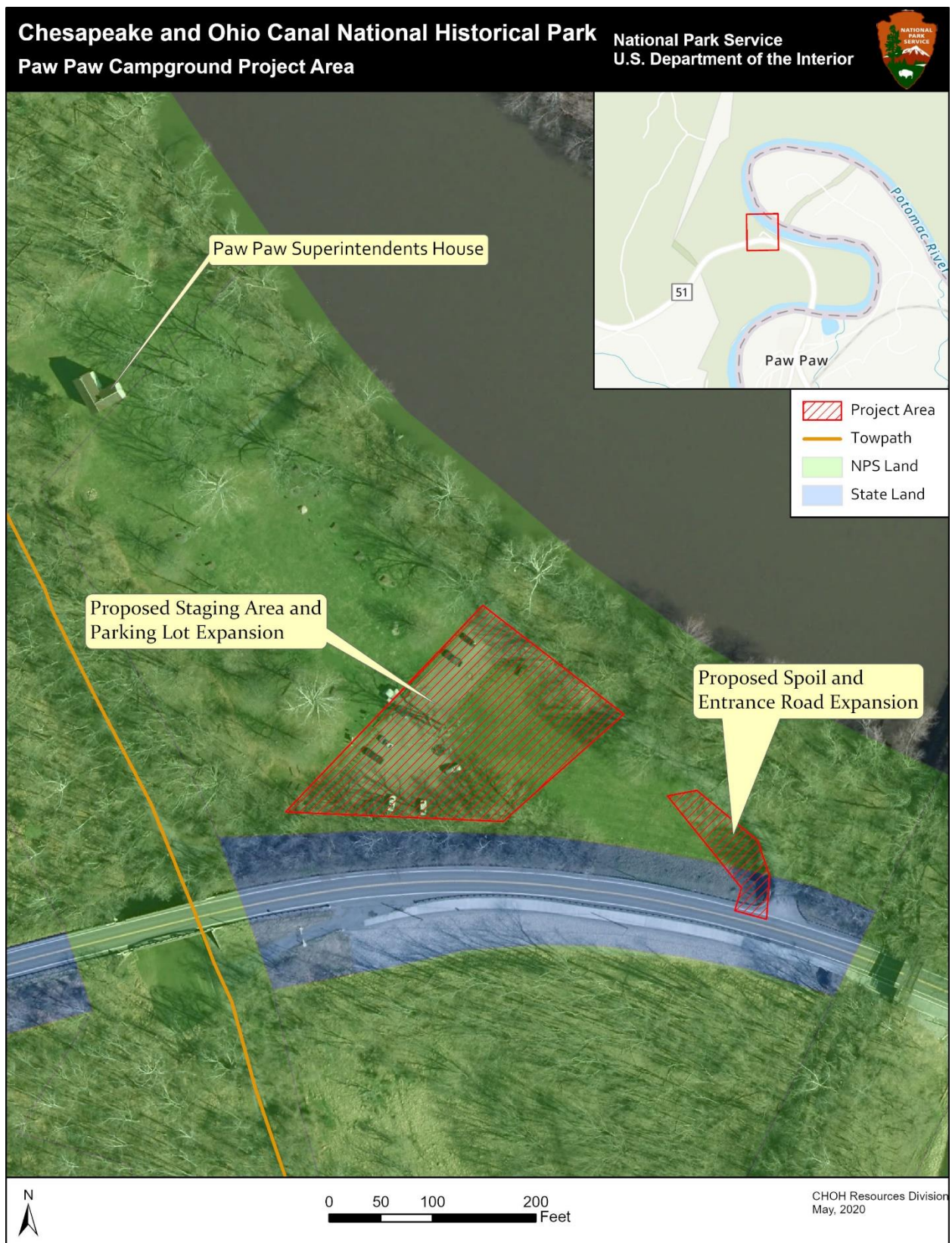
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Figure 3: Action Alternative, Options 1, 2, and 3 for accessing the Paw Paw Tunnel Hollow.



Figure 4: Proposed spoil area.



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Figure 5: Proposed staging area and Paw Paw Campground parking lot expansion and entrance road spoil area.



Historical Summary of Project Area

The Paw Paw Tunnel was constructed by the C&O Canal Company to cut across the Paw Paw bends of the Potomac River, thus reducing the six miles of canal necessary to follow the river around the four meanders of the bends to one and a half miles. It is located between mile markers 155 and 156 on the canal near the town of Paw Paw, West Virginia; the tunnel, the town, and the bends all derive their name from the paw paw tree, which grows abundantly in this area. Construction on the tunnel began in 1836 and continued until 1842 when funding for the project was exhausted; construction eventually resumed in 1847 and the tunnel was finally completed in 1850. The project was delayed by a shortage of skilled laborers, strikes, the remoteness of the work area, frequent rockslides, and an underestimation of the time and money needed to complete the project which, unfortunately, coincided with financial issues within the company. The Paw Paw Tunnel remained an operational part of the canal until 1924 when the C&O Canal Company ceased commercial navigation.

Rockslides have been a documented problem in the Tunnel Hollow since construction began. The character of the rock is such that exposure to weathering leads to fracturing and rockfall. Landslides in the cuts have been noted by NPS throughout the history of the park with major slides occurring in 1968, 1969, 1974, 1975, 1976, 1977, 1997, 2013, and 2016. Most of these occurred on the western slope of the northern cut. NPS has made previous attempts to address these hazards, notably in 1956, 1979, the mid 1990s, and 2018. In 1956, portions of the tunnel vault brick work, the towpath, and the towpath boardwalk were repaired and rockfall debris was removed from the canal. In 1979, the tunnel portals were cleared of vegetation and repointed, and rockfall debris was removed from the canal. In 2018, scaling was used to remove unstable rock from the eastern slope of the north cut, the scaled material was placed against the side of the canal. Rock bolts and shear blocks were installed to prevent further destabilization, and draped mesh was placed over select areas to catch further rockfall.

There are many historic structures in the project area, and all are associated with the C&O Canal. Historic structures within the project area that are judged to be at risk of damage by proposed activities would be monitored throughout the duration of the project. This project is not expected to negatively impact any historic structures. The boardwalk is a 1970s re-creation of the boardwalk that was historically located in the same location and has been repaired and replaced in several sections due to damage from rockfall and normal degradation. This project proposes to replace the boardwalk in-kind to eliminate safety hazards while maintaining the cultural landscape.

This area is rich in prehistoric and historic archeological resources. A historic archeological site associated with the construction of the tunnel and the Paw Paw Superintendent's House is located near the proposed expansion of the Paw Paw Campground Parking Lot. The entirety of the Tunnel Hollow is a historic archeological site and the canal and towpath likely contain archeological resources.

The cultural landscape in the project area has not been evaluated for National Register eligibility. However, the Paw Paw Tunnel and Tunnel Hollow offer intact historic features in a unique viewscape that has been a popular attraction since construction was completed (Figure 6).



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Figure 6: Undated picture of excursion trip on the Oak Spring at the north portal of the Paw Paw Tunnel.



Existing Conditions

HISTORIC STRUCTURES

The project area encompasses the Paw Paw Campground, the Paw Paw Tunnel, and the Paw Paw Tunnel Hollow Complex, the proposed spoil area, and the area in the immediate vicinity of the towpath from the northern portal of the Paw Paw Tunnel 1.5 miles north along the towpath to a rubble causeway built across the canal north of Culvert 210. The entire project area is an historically significant and modified landscape associated with the Chesapeake and Ohio Canal. The project area also includes a portion of Tunnel Hill Road, between its beginning at Malcolm Road and its intersection with Tunnel Hill Trail at the summit of Tunnel Hill. Tunnel Hill Road continues out of the project area and into the Paw Paw bends; the project area follows Tunnel Hill Trail from the intersection with Tunnel Hill Road to the towpath on the towpath in the Tunnel Hollow. The Hollow was excavated between 1836 and 1850 and contains canal infrastructure as well as the remains of structures associated with canal management and operations. The base of the Hollow is narrow and much of the available space is taken by the canal and towpath for which it was excavated. The remaining space was used for various maintenance, storage, and housing structures. The Tunnel Hollow Complex operated as a part of the canal from its completion in 1850 until the cessation of commercial navigation in this area in 1924. There are numerous historic structures listed on the NRHP that fall within the APE:

Structure	LCS Number	Mile Marker
Canal Prism	45702	153.0 – 154.0
Towpath	45703	153.0 – 154.0
Culvert 210	11737	153.46
Canal Prism	45704	154.0 – 155.0
Towpath	45705	154.0 – 155.0
Bypass Flume for Lock 62	12885	154.16
Lock 62	11738	154.17
Lockhouse Foundation at Lock 62	11739	154.18
Boat Basin at Sandy Flat Hollow	45638	154.21
Spillway and wasteweir	11740	154.29
Bypass flume for Lock 63 1/3	12866	154.48
Lock 63 1/3	11741	154.49
Lock 64 2/3	11742	154.61
Retaining Wall Ruins at Lock 64 2/3	45640	154.61
Bypass Flume for Lock 64 2/3	12877	154.62
Ruins at Lock 64 2/3	45641	154.63
Bypass Flume for Lock 66	17223	154.70
Carpenter's Shop Foundation at Lock 66	11744	154.71
Lock 66	45642	154.72
Towpath Boardwalk (Non-Contributing)	45631	154.95
Canal Prism	45706	155.0 – 156.0
Towpath	45707	155.0 – 156.0
Downstream Portal of Paw Paw Tunnel	45630	155.20
Paw Paw Tunnel	45629	155.70
Upstream Portal of Paw Paw Tunnel	45627	155.78
Canal Prism	45708	156.0 – 157.0
Towpath	45709	156.0 – 157.0
Paw Paw Superintendent's House	17224	156.16



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194 Four additional historic structures have been identified on the Tunnel Hill Trail: a dry laid stone retaining
195 wall, two collapsed spring houses, and the historic road that the trail follows.

196 The canal prism served as a waterway for canal boats which were specially designed to haul freight
197 between Cumberland and Georgetown, the western and eastern termini of the C&O Canal. Along most of
198 the canal, the prism was constructed to be just wide enough to allow two canal boats to pass. However, in
199 the Tunnel Hollow, the canal prism is only wide enough to allow one-way traffic due to the difficulty and
200 expense of excavating the tunnel and cut. The prism runs the length of the project area and is no longer
201 actively maintained. The original clay liner which waterproofed the prism has been eroded away and
202 pierced by vegetation in many areas. It is unlikely that a clay liner was needed in the areas where the
203 canal was cut into the rock. Natural seeps and springs in the area drain into the prism resulting in 1 to 2
204 feet of standing water. The water level has increased in recent years as drainage along the canal has been
205 blocked by a landslide.

206 The towpath originally served as a pathway for the mules which towed the canal boats during canal
207 operations. The towpath runs the length of the project area and is a defining feature of the park. It was
208 originally built from spoil from the canal prism excavation and crushed local stone. However, the towpath
209 in this area has been repaired or rebuilt many times and, except in the areas where it has been carved out
210 of bedrock or consists of masonry, it likely lacks historic integrity.

211 The Paw Paw Superintendent's House was built in 1850 and served as the residence of the section
212 superintendent from the construction of the canal until the cessation of commercial navigation on the
213 canal in 1924. It is a two-story, L-shaped frame structure with a brick foundation.

214 The Paw Paw Tunnel is 3,118 feet long and runs roughly north-to-south, with the northern portal facing
215 downstream. Masonry portals support each entrance while the tunnel vault is lined in brick. The towpath
216 lies on an intentionally unexcavated stone bench faced with brick and timber. To the north and south of
217 the tunnel are long cuts which were made to accommodate the canal where the surface elevation was not
218 yet high enough to necessitate tunneling. The northern cut is approximately 1,000 feet long while the
219 southern cut is about 200 feet long; the depths of the cuts vary, but in some areas are over 100 feet deep.
220 Four vertical shafts were sunk to aid in the excavation of the tunnel and to provide ventilation for the
221 tunnel miners. The shafts are located, two each, in the bottom of each of the two ravines above the tunnel,
222 there being the shortest vertical distances to the tunnel. After the tunnel vault had been completed, the
223 shafts were left empty and capped with brick, stone, and clay.

224 The boardwalk is a 750 foot long timber framed portion of the towpath running from the end of the Paw
225 Paw Tunnel towpath, which sits on a ledge of unexcavated bedrock, north to the resumption of the earth
226 and rubble towpath. During canal operations, a wooden boardwalk existed in the same footprint as the
227 current boardwalk and served as the towpath. At some time during NPS ownership of the canal, the
228 remnants of any extant boardwalk were removed and replaced by a causeway of fill and rockfall. In 1956,
229 NPS removed the fill causeway and reconstructed the wooden boardwalk while performing repairs to the
230 Paw Paw Tunnel. In 1976 and 1977, NPS removed 15,000 cubic yards of rockfall from the canal prism
231 and again replaced the boardwalk. The boardwalk is listed as a non-contributing feature on the NRHP.

232 Lock 66 is a composite lift lock at mile 154.7 of the canal. Composite locks were the result of cost saving
233 measures and differed in material and design from the other locks on the C&O Canal. The composite
234 locks in the Tunnel Hollow were constructed with materials sourced from local quarries which produced
235 stone inferior to the material typically used in locks. To further reduce costs, the facing of composite
236 locks consisted of wood rather than stone. The contract for the construction of the locks in the Tunnel
237 Hollow was awarded in 1837, but due to financial problems and the technical difficulty of excavating the
238 tunnel and Hollow, the locks were not completed until 1850. The locks are approximately 100 feet long
239 and have 15 foot chambers, which are the standard dimensions for lift locks on the canal. The composite



locks in the Tunnel Hollow are masonry and wood structures on wooden foundations laid on bedrock, Lock 62 is a masonry and wood structure, but the foundation upon which it rests is unknown. However, due to the steep terrain and limited space, these locks lift the water level 10 feet, which is higher than the average lift of 8 feet across other canal locks. Lock 66 was constructed with red and grey sandstone from a quarry at Twigg's Hollow north of Lock 61 and near the proposed spoil area, but the gate recesses were faced with concrete in 1910. The stone removed from the lock is piled on the river side of the towpath across from each lock gate. Currently, Lock 66 is in poor condition, with the wooden facing rotted away, leaving iron pins protruding from the stone walls. Portions of lock gate timbers and hardware can be found downstream, in the canal prism. A wooden footbridge has been constructed over the downstream end of the lock. The downstream river side wing wall of the lock interfaces with a 4 foot-high, 150 foot-long retaining wall, also constructed with red and grey sandstone, which supports the towpath. There is also a depression between the lock and the towpath where a snubbing post was once located.

Lock 64 2/3 is a composite lift lock at mile marker 154.6. This lock was constructed of the same materials and in a similar fashion to Lock 66. Originally, four locks were planned for the Tunnel Hollow. To save money, the canal company canceled plans for the construction of Lock 65 and increased the lift on Locks 63 1/3, 64 2/3, and 66 to compensate. The fractions in the designations for Locks 63 1/3 and 64 2/3 were incorporated to preserve the lock numbering system as the locks upstream of 66 had already been completed. The wooden facing has almost entirely rotted away, and a few boards hang from one of the iron supports in the stone wall. The chamber walls of the lock consist of gray and red sandstone from Twigg's Hollow Quarry. The gate recesses were replaced with concrete in 1910 and the stone from the lock is piled on the river side of the towpath. A wooden foot bridge has been constructed over the downstream end of the lock. The downstream river side wing wall of the lock interfaces with a 4 foot-high, 100 foot-long retaining wall, also constructed with brown and grey sandstone, which supports the towpath. There is also a depression between the lock and the towpath where a snubbing post was once located.

A coursed rubble retaining wall is located on the river side of the towpath at the downstream end of Lock 64 2/3. The structure associated with the retaining wall has collapsed but the retaining wall is intact. It was labeled as Feature H in the 1976 archeological survey of the Tunnel Hollow. Feature H incorporates the retaining wall, two mounds of brick rubble, and some white granite support stones. Most likely, this was a log structure on sill stones with a brick chimney. The dates of construction, occupation, and demolition of this structure are unknown.

Lock 63 1/3 is a composite lift lock at mile marker 154.5. This lock was constructed at the same time and in a similar fashion to Locks 64 2/3 and 66 and provides 10 feet of lift. The coursed rubble walls of the chamber are constructed from white and grey sandstone from Twigg's Hollow. Similar to the other locks in the Tunnel Hollow, the gate recesses were replaced with concrete in 1910 and the original stone is piled on the river side of the towpath. The wooden facing has completely degraded leaving only the iron support bars, and the walls of the chamber have cracked and bulged on the downstream inland side of the lock. The upstream river side wing wall has cracked away from the lock and is collapsing into the prism. A wooden walkway has been constructed across the downstream end of the lock. The downstream river side wing wall of the lock interfaces with a 4 foot-high, 100 foot-long retaining wall, also constructed with white and grey sandstone, which supports the towpath. There is also a depression between the lock and the towpath where a snubbing post was once located. A masonry flanking wall extends from the upstream towpath wingwall, across the towpath to the base of the Tunnel Hollow slope.

A combination wastew weir and spillway is located at mile marker 154.1 near the downstream end of the Tunnel Hollow. A spillway is an area of the canal where the towpath has been lowered and hardened, providing an escape for floodwaters while preventing erosion. A wastew weir is a structure that controls the water level of the canal. In this wastew weir, water was kept in the canal with wooden boards fitted into masonry, and later, concrete slots. The boards could be removed or added as needed to alter the water level. The structure is 100 feet long, 16 feet wide, and was constructed in 1850 and consists of a



wasteweir flanked by two spillways. The spillways and wasteweir feed into the same chamber which is lined in stone and concrete and built into a shale outcropping. At some time in the past, the spillways were filled in by towpath material, leaving only the flumes exposed. The wasteweir was constructed in this location to enable it to quickly drain floodwaters from the Sandy Flat Hollow drainage, to the west, in lieu of a culvert. The original construction was in coursed gray and red sandstone from the Twigg's Hollow Quarry. The 3-gate, board insert, stone and concrete wasteweir was built into the center of the spillway in 1913.

Lock 62 is a composite lift lock at mile marker 154. The lock was constructed at the same time and in a similar manner to the locks in the Tunnel Hollow and provides 10 feet of lift. The lock chamber was constructed of gray and red sandstone from the Twigg's Hollow quarry and was once face with wood. The wood has rotted away, leaving only the iron pins which once held the wood in place. The gate recesses were faced with concrete in 1910 and the facing below the lower recess is concrete. A wooden footbridge has been constructed over the upstream end of the lock. The downstream river side wing wall of the lock interfaces with a 4 foot-high, 100 foot-long retaining wall, also constructed with grey sandstone, which supports the towpath.

The concrete foundation attributed to the Lock 62 lockhouse is located at mile marker 154 on the river side of the towpath, across from Lock 62. The lock houses were built by the C&O Canal Company to house lock tenders who were responsible for operating their lock. The structure is 26 feet long and 16 feet wide, has 8-inch thick walls, and its long axis is aligned parallel to the towpath. On the towpath side of the structure there are four concrete posts which once supported a porch. At one time, this foundation supported a frame structure, but any remains have been removed.

Culvert 210 is located at mile marker 153.4 and was constructed in 1849 to allow the passage of Gross Creek. Culverts were constructed to allow minor streams and drainages to flow beneath the canal prism. The barrel is made of brick with a 12 foot span and a 6 foot rise and has a 1 foot high parapet. The wing walls and parapet are constructed from red and grey sandstone; the berm side parapet is faced with concrete and intact, but the riverside parapet has collapsed, and bricks are eroding out of the vault. The poor condition of the riverside parapet was first noted in 1971.

Tunnel Hill Road is an unimproved road following its historic footprint over Tunnel Hill. The portion of the road within the project area stretches 3,000 feet from Malcolm Road to the intersection of Tunnel Hill Road and Tunnel Hill Trail. From this point, Tunnel Hill Trail would be used to access the Paw Paw Tunnel Hollow. The Trail stretches 4,300 feet long from the intersection with the towpath and its width varies between 7 and 14 feet. Both the road and the trail have existed since at least 1836 when construction began on the nearby tunnel, but it has been graded and improved many times and it is unclear whether it retains historic integrity. Portions of the road are in poor condition due to erosion and the portion nearest the Hollow, which consists of two narrow and steep switchbacks, has been undercut. There is some evidence that, at one time, a dry laid stone retaining wall supported the downhill side of the road, which is now being undercut. Neither the Tunnel Hill Road nor the Tunnel Hill Trail are listed in the NRHP.

A dry laid stone wall was noted at a point approximately 2,700 feet downhill from the NPS gate at the intersection of Tunnel Hill Road and Tunnel Hill Trail. The 18 foot long wall is 4.5 feet from the edge of the road and was built as a retaining wall for the road. The road is 8.5 feet wide in this location and the land slopes steeply up north of the road and steeply down south of the road.

Two collapsed spring houses are located approximately 4,240 feet downhill from the NPS gated road entrance, between the last switchback on Tunnel Hill Road and the towpath. They are dry laid constructions of spoil from the tunnel excavation, and they are built into a large pile of spoils. They are approximately 15 feet apart and there is water flowing through each springhouse.

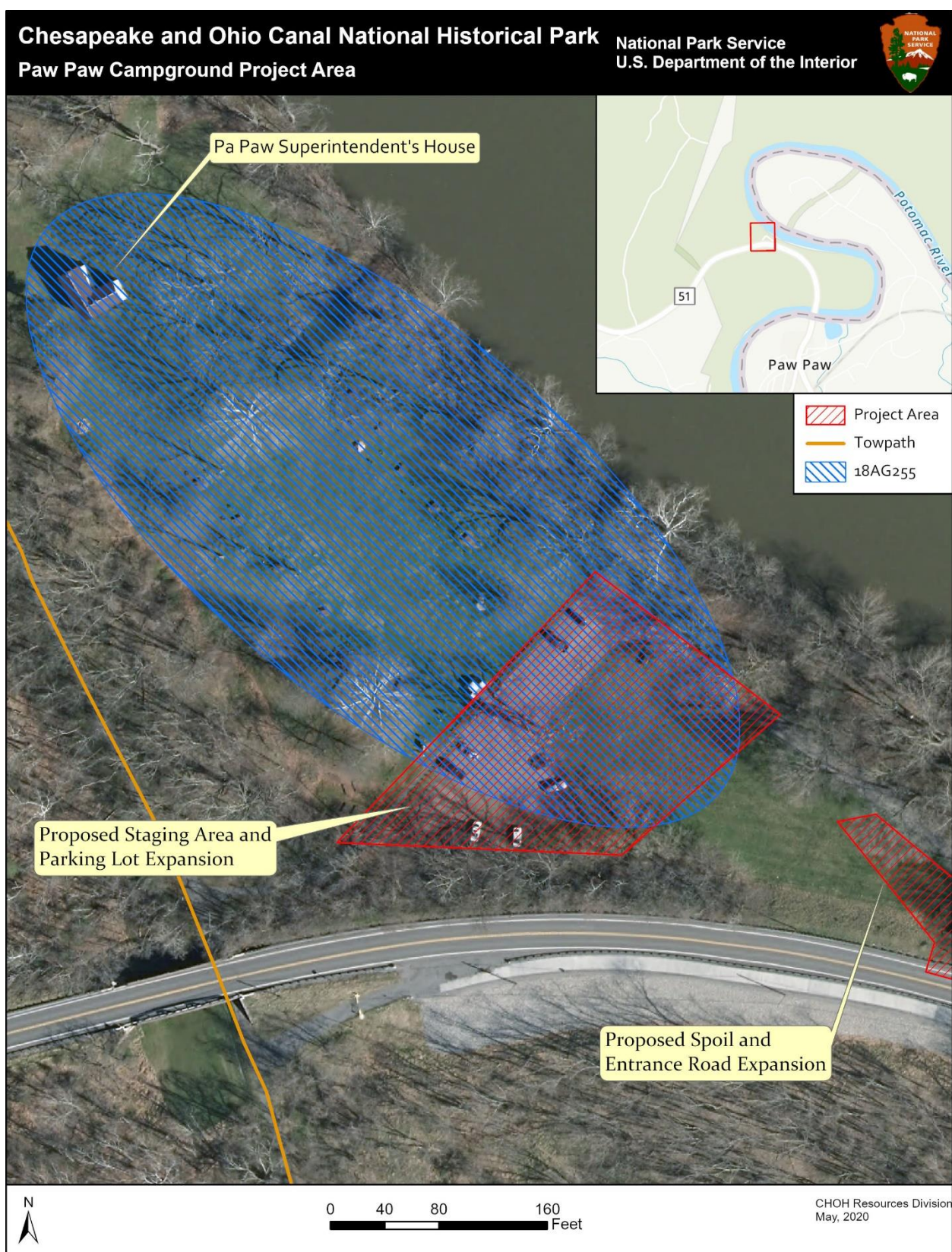


ARCHEOLOGY

Several archeological investigations have identified cultural material within the project area. In 1976, an archeological survey of the Tunnel Hollow was completed, which identified several features and noted that the entire area is a manmade feature and is a listed archeological site. Between 2008 and 2010, a multi-year archeological survey of the western end of the park was conducted by The Louis Berger Group Inc., which identified a site in the Paw Paw Campground.

The site that encompasses the Paw Paw Campground and surrounding features is the Superintendent's House Archeological Site and listed as 18AG255 (Figure 7). This site contains a prehistoric lithic scatter, debris from the construction of the Paw Paw Tunnel, and domestic debris associated with the Canal Superintendent's House which still stands on the site. The current Paw Paw Campground parking lot is located on top of the southern end of the site. During the 2020 investigation of this area, the site was shown to extend approximately 60 feet beyond the southern edge of the parking lot. The ground was heavily disturbed past this point, likely by the construction of State Route 51 in the 1930s.

The Paw Paw Tunnel Complex is listed as site 18AG221 and contains the canal, towpath, and locks, as well as the remains of several support structures, including lock houses, a carpenter's shop, and structures that were likely used to store lumber (Figure 8). The standing structures associated with the complex are discussed above in the Historic Structures section and many of the archeological resources identified in the Tunnel Hollow are outside of the project area. Within the project area are slight depressions at each lock which are the remains of the snubbing posts used to slow canal boats as they entered locks; these features were missed by the 1976 archeological survey but were noted by the 2020 survey. Additionally, on the river side of the towpath near Lock 64 2/3, there are two mounds of brick rubble which were originally identified in the 1976 archeological survey as Feature H and were relocated during the 2020 survey. This is likely the remains of a foundation or hearth associated with a log structure. Two structures are noted on the 1894 maps of Canal Company property on the river side of the towpath near Lock 66. Two elongated mounds were noted in this location as Feature C during the 1976 survey, but these mounds were not relocated during the 2020 survey.



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Figure 7: Paw Paw Campground and site 18AG255.

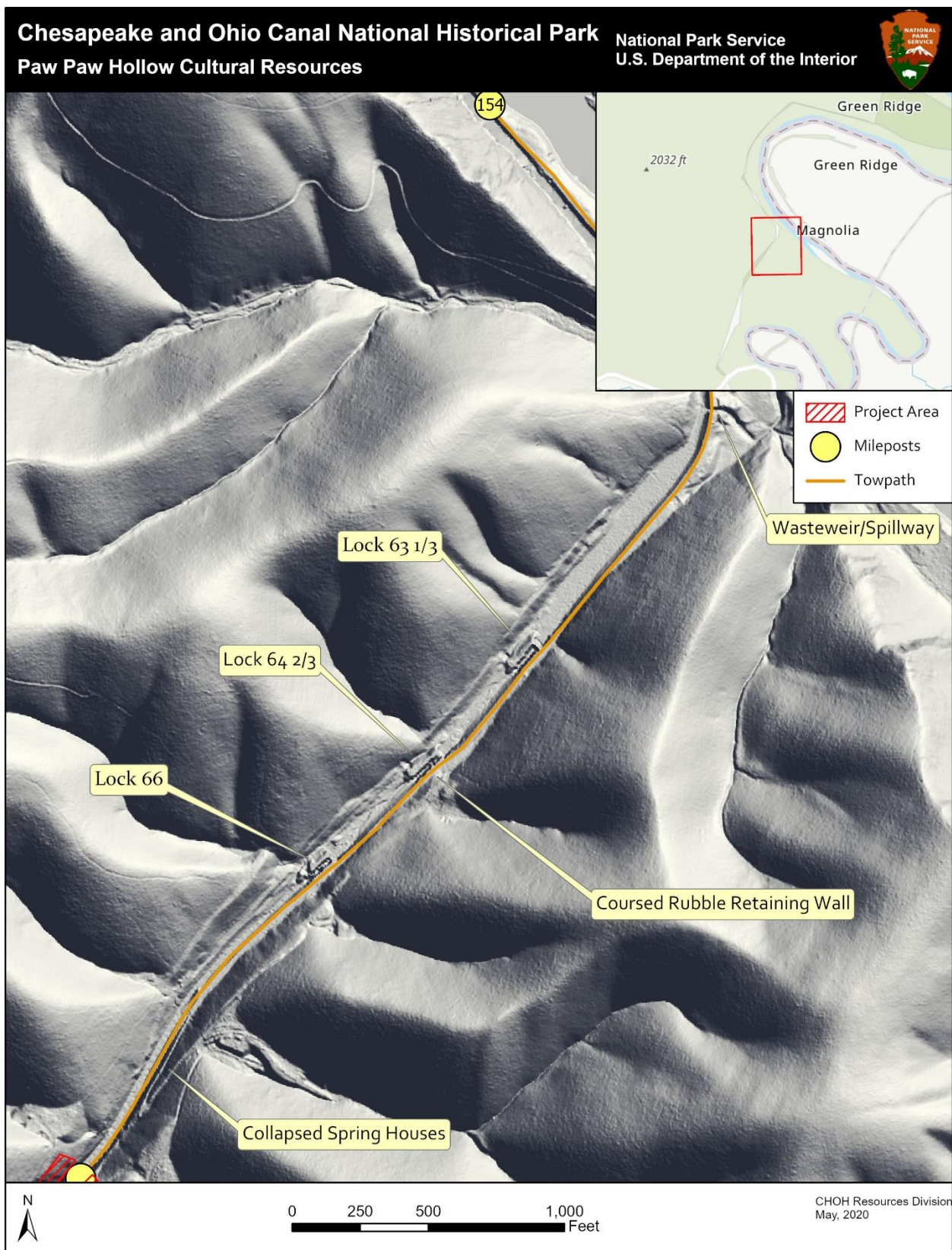
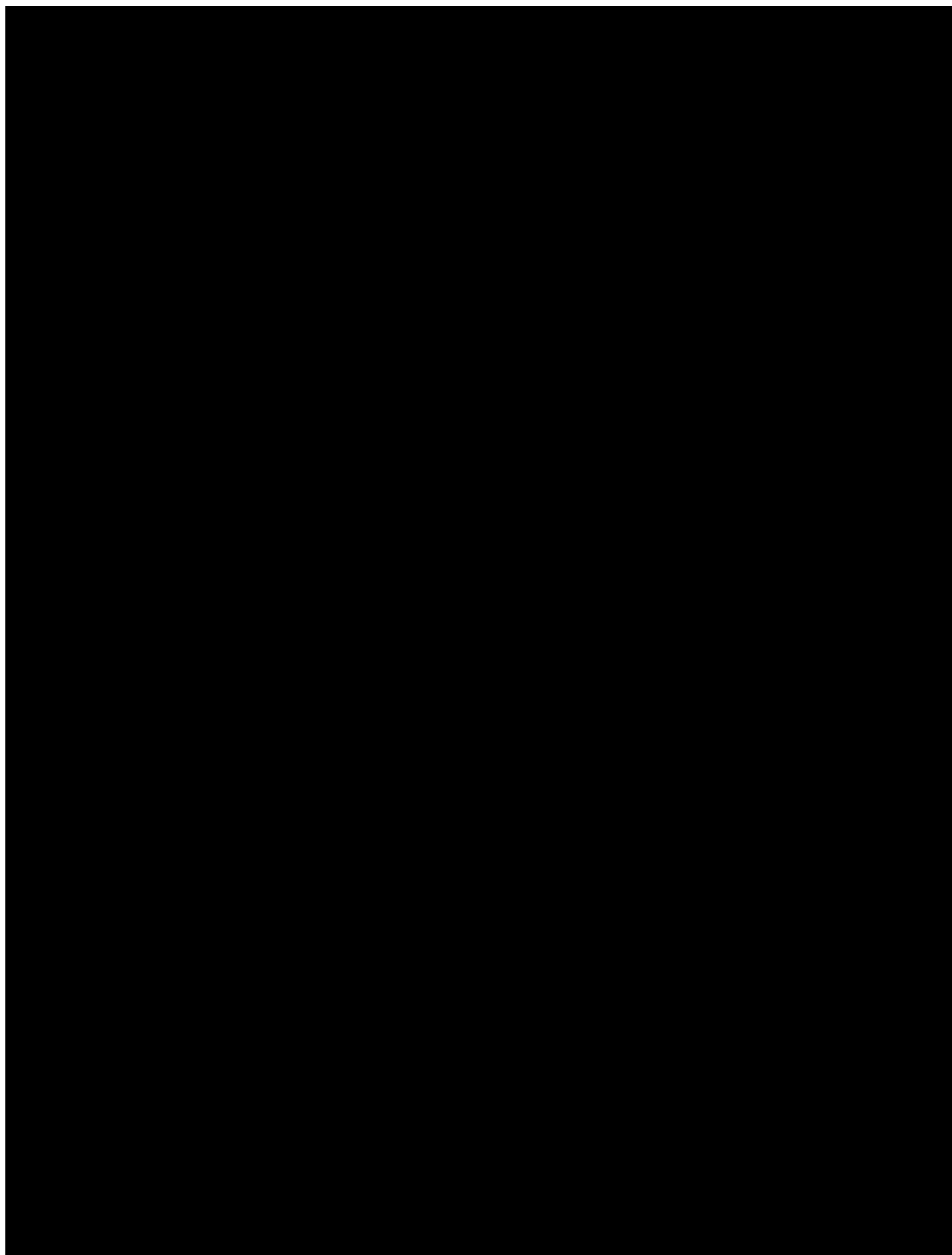


Figure 8: Paw Paw Tunnel Hollow cultural resources.



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Figure 9: [REDACTED]

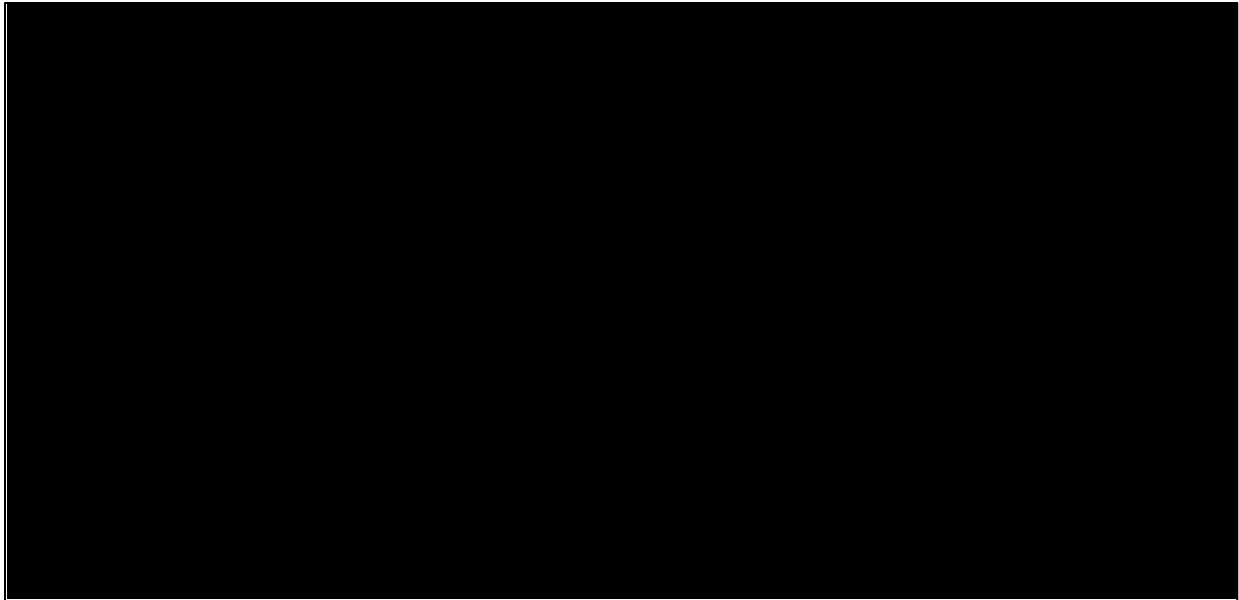


Figure 10:



The portions of Tunnel Hill Road and Tunnel Hill Trail within the project area both follow historic road traces and have been regraded and graveled several times. A 2020 pedestrian survey of the Tunnel Hill Trail located several historic features, including a dry laid stone retaining wall, historic spoil piles, and a historic switchback. The dry laid stone wall is located 2,700 feet downhill from the intersection of Tunnel Hill Road and Tunnel Hill Trail. It is 4.5 feet from the edge of the road and 18 feet long. Running parallel to the road, it acts as a retaining wall. From a point 2,730 feet downhill from the intersection to a point 3,300 feet from the intersection, the trail runs atop of historic spoil excavated from the Paw Paw Tunnel (Figure 11). The historic switchbacks are located between a point 3,580 feet downhill from the intersection and continue until Tunnel Hill Trail meets the towpath. The switchbacks are cut into rock and may have historically had dry laid stone retaining walls along the downhill sides. Along these switchbacks, the trail comes to its narrowest width of seven feet.



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Figure 11: Tunnel Hill Trail cultural resources.



CULTURAL LANDSCAPE

The cultural landscape in the project area has not been evaluated for National Register eligibility. However, the Paw Paw Tunnel and Tunnel Hollow offer intact historic features in a unique viewscape that has been a popular attraction since construction was completed.

Effects Assessment

HISTORIC STRUCTURES

Impacts of No Action Alternative

Historic structures within the APE would be unaffected. Regular maintenance would be performed on the boardwalk, but it would continue to decay as it is at the end of its structural life. The boardwalk would continue to be a safety hazard and would be vulnerable to future rockfalls and landslides. The boardwalk would continue to undergo regular maintenance and repair/rehabilitation of the boardwalk would be addressed in the CHOH 5 year plan and addressed in a future project.

Impacts of Action Alternative (NPS Preferred)

Under this Alternative, actions would be taken to avoid, minimize, and reduce impacts to historic structures within the APE. Heavy equipment would be transported into the project area by way of the Paw Paw Tunnel which may damage the structure with vibrations, impacts, or exhaust fumes. Large equipment would be transported into the project area, where it would remain until the project ends, at which point it would be removed again through the Tunnel. Vibration monitoring equipment would be installed to ensure equipment transport does not cause adverse effects to the Tunnel. The boardwalk would be replaced with in-kind materials and within the same footprint of the current boardwalk. The canal prism would be restored as rock debris is removed.

Option 1:

Smaller heavy equipment, including dump trucks, would drive through the Tunnel to reach the project site, but would exit the Tunnel Hollow via the towpath heading downstream when loaded with removed rock material. There are many historic structures along the route from the rock stabilization area to the proposed spoil area. This route has been used before during similar options in the 1970s and 1990s with no known impacts to the historic structures. However, the potential exists for structures adjacent to the towpath, including stone retaining walls, to be affected by vibrations from passing trucks. Vehicles would drive down the towpath, which could be affected from the transportation of heavy loads of rock material. Similarly, the towpath and vehicular traffic would cross over the wastew weir at mile marker 154.1 and Culvert 210. During an interdisciplinary 2020 NPS site evaluation, it was determined that there was enough room along the towpath to avoid physically impacting stone structures along the length of this route. All structures would be marked, and traffic would be monitored to avoid damage. Temporary stabilization of structures may be needed if additional impacts are anticipated by the contractor and approved by NPS.

Option 2:

Smaller heavy equipment, including dump trucks, would drive through the Tunnel to reach the project site; however, if this option is chosen, removed rock material would pass back through the Paw Paw Tunnel via heavy equipment, vehicles, or by other means. The use and transport of heavy equipment loaded with rock material would greatly increase the risk of damage to the Tunnel from vibrations, accidental impacts, and engine exhaust. This option would only be selected if a method of rock material transport could be presented that would avoid vibration impacts to the Tunnel. If such methods are introduced, this route of rock material removal would not cause any impacts to historic structures.



Option 3:

In this option, rock material would be removed via the Tunnel Hill Trail and Tunnel Hill Road. The collapsed spring houses along the Trail may be damaged by vibrations or impacts from passing vehicles. It may be necessary to modify the historic switchbacks of the Tunnel Hill Trail near the towpath, which would alter the historic alignment of the Trail. The dry laid stone retaining wall found along the Tunnel Hill Trail could be damaged by repeated heavy vehicle traffic.

Conclusion:

The proposed Action Alternative and associated Option 1 would result in no adverse effect on the historic structures of the C&O Canal National Historical Park. The proposed Action Alternative and associated Option 2 may result in an adverse effect on the Paw Paw Tunnel due to the poor condition of the structure, but would not affect other historic structures within the APE. Option 3 could adversely affect the Tunnel Hill Trail by shifting its alignment, if necessary to do so.

ARCHEOLOGY

Impacts of No Action Alternative

Archeological resources would remain unaffected.

Impacts of Action Alternative (NPS Preferred)

Under this Alternative, rock stabilization efforts are unlikely to damage archeological materials. The Tunnel Hollow is a historic feature and contains no prehistoric material. If significant resources are discovered during this project, an appropriate mitigation plan would be prepared and implemented by NPS in coordination with the Maryland Historical Trust.

Option 1:

It is unlikely that any archeological resources would be damaged by transporting the rockfall material along this route. [REDACTED]

[REDACTED] No archeological site impacts would occur.

Option 2:

Expansion and improvement of the Paw Paw Campground parking lot would cover a greater extent of the existing archeological site. However, in this area, the site consists of a thick lens of brick rubble that is unlikely to be affected by limited excavation, grading, and graveling.

Option 3:

The Tunnel Hill Trail sits atop of historic spoils piles from the construction of the Paw Paw Tunnel. This Option would re-gravel and regrade the Trail; however, no ground disturbance or excavation would occur.

Conclusion:

The proposed Action Alternative and associated Options would result in no adverse effect on the archeological resources of the C&O Canal National Historical Park.



CULTURAL LANDSCAPE

Impacts of No Action Alternative

The cultural landscapes of the Paw Paw Campground and the Tunnel Hollow would remain as they are. The cultural landscape of the Tunnel Hollow would be marred by existing pinned mesh, rock bolts, and shear blocks. Without efforts to stabilize the rock faces, future rockfall is more likely. This rockfall would take time to remove and would affect the canal complex. The Hollow may become inaccessible to visitors due to rockfall or unsafe conditions, in which case, they would not be able to experience the landscape.

Impacts of Action Alternative (NPS Preferred)

The rock scaling and reconstruction of the boardwalk would have only temporary impacts to this viewscape. The rock itself naturally fragments and falls as it weathers and rockfalls have been noted throughout history back to the excavation of the Tunnel Hollow. Previously installed and new rock bolts, shear blocks, and pinned mesh would remain visible within the cultural landscape. The rock pins and shear blocks protrude several inches from the rock face and are noticeable. The existing pinned draped mesh would be removed. Pinned mesh would be added as needed at various locations along the slope, but at only on the upper portions of the slope to reduce its impact on the cultural landscape.

The cultural landscape of the Paw Paw Campground would be affected by any expansion of the parking lot. However, the proposed area of expansion is between the existing parking lot, the entrance road, and State Route 51. State Route 51 dominates the landscape in this area. The cultural landscape of the Paw Paw Campground as viewed from the parking lot, facing away from Maryland 51 would remain unaffected.

Option 1:

The existing spoil piles from the 1970s and 1990s are visible from the towpath and the proposed spoil pile would also be visible. By placing it adjacent to the existing spoil, it is hoped that the impact on the landscape would be minimal. The repair of the causeway crossing the canal north of Culvert 210 would have little impact on the cultural landscape. The canal is littered with rubble debris from the original causeway, which has been damaged by repeated flooding. The realignment of Twigg Run with Gross Run through the historic drainage excavated for the task would improve the historic landscape. Currently, Twigg Run drains directly into the canal; it is not known when Twigg Run stopped flowing through the historic drainage.

Option 2:

Rockfall material spoiled along the Paw Paw Campground entrance road would affect the cultural landscape of the area. However, the entrance road and State Route 51 are artificially raised in this area and a widening of the exiting entrance road would have minimal impact on a landscape that is already dominated by State Route 51.

Option 3:

Widening and resurfacing Tunnel Hill Trail with crushed rockfall material would not affect the majority of the cultural landscape of the historic road. The road has been graded and graveled repeatedly. The cultural landscape around the switchbacks where Tunnel Hill Trail meets the towpath would be adversely affected by any alteration of the road, but the overall integrity of the landscape would remain intact.

Conclusion:

The proposed Action Alternative and associated Options would result in an adverse effect on the cultural landscape of the C&O Canal National Historical Park.



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524 **EFFECTS ASSESSMENT CONCLUSION**

525 The implementation of individual elements of the Action Alternative may have the potential to impact
526 historic structures and archeological resources. However, because each element of the project would be
527 implemented in strict accordance with the guidance set forth by the Secretary of the Interior's Standards
528 for the Treatment of Historic Properties, and in close consultation with the Maryland Historical Trust,
529 these potential impacts would be avoided or minimized.

530 The adverse impacts to the cultural landscape can be mitigated but not avoided. As a result, the National
531 Park Service has determined that the overall implementation of the Action Alternative of the project
532 "Improve Visitor Safety and Mitigate Rockfall Hazards in the Tunnel Hollow" would have an adverse
533 effect on the cultural landscape of the C&O Canal National Historical Park.



Avoidance, Minimization, and Mitigation

In order to avoid, minimize, and mitigate adverse effects on historic properties, several steps would be undertaken by NPS during implementation of the Action Alternative and associated Options.

Historic Structures Mitigations

- The contractor would be required to protect all historic structures in the project area. This would likely be accomplished by identifying historic structures, applying vibration monitors adjacent to vehicular paths, and maintaining low speeds while traveling along the towpath.
- High visibility material may be used to temporarily identify historic structures that are close to the proposed paths of travel and traffic delineators or boundary markers may be used to ensure vehicles do not stray from designated paths of travel.
- Gravel, geotextile, timber mats, or steel plates would be placed, as needed, over sensitive historic structures such as historic retaining walls, Culvert 210, and the wastewear to more evenly distribute the weight of passing vehicles. If necessary, temporary bridges would be constructed over the structures to avoid damage.
- Cribbing or additional stabilization could be placed in locks if it is determined that the weight of heavy equipment may affect the lock walls.
- Vibration monitors and structural deformation monitors would be placed in the Paw Paw Tunnel. If the passage of vehicles creates unacceptable vibrations levels or if the structural deformation monitors indicate strain or damage, additional timber mats or other structural supports would be installed before work could continue. Monitoring devices will be mounted on mortar joints, not on masonry.
- Unless a means of ingress and egress can be identified that does not cause excessive vibrations under Action Alternative Option 2, vehicular access to the Paw Paw Tunnel would be limited to smaller equipment and only when necessary to reach the project site.

Archeological Resources Mitigations

- Any ground disturbance related to the parking lot expansion in the Paw Paw campground would be limited to the top six inches of soil, leaving a buffer of six inches before archeological features would be encountered.
- Gravel and geotextile would be required in the staging area to distribute the weight of heavy equipment.

- [REDACTED]
- [REDACTED]
- [REDACTED]

Cultural Landscape Mitigations

- The exterior portions of rock bolts and pinned mesh would be colored to match the surrounding rock face, if possible.
- The ends of the rock drains will be cut flush with the rock surface and would be painted to match the surrounding rock face.
- The existing draped mesh would be removed. Pinned mesh would be added at various locations along the slope but at higher elevations that would be less impactful to the cultural landscape.



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- Contractor would be encouraged to develop designs to make shear blocks less apparent. Possible techniques may include coloring the concrete to match the surrounding rock face or shaping the concrete to appear more similar to the surrounding rock face.



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