

BADGER STATE TRAIL

STEWART TUNNEL ALTERNATIVES ANALYSIS



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I. Executive Summary

The Stewart Tunnel is located on the Badger State Trail, approximately 20 miles south Madison, just a few miles south of Belleville near Tunnel Road. Sections of loose and falling rocks from the ceiling and side walls inside the Stewart Tunnel caused the department to close the tunnel in 2019 for safety concerns. The tunnel remains closed today. Tunnel Road provides a temporary detour for users to go around the tunnel.

This Alternatives Analysis seeks to explore alternatives and provide a recommendation for reopening the Stewart Tunnel section of the Badger State Trail. In December 2021, engineering firm GEI Consultants provided a *Badger State Trail Stewart Tunnel Review of Alternatives* report for Stewart Tunnel that analyzed nine different alternatives from an engineering standpoint. The Bureau of Parks and Recreation used the GEI report as a starting point for analyzing a variety of considerations to formulate a recommendation.

Below are the alternatives that are included in this analysis.

1. Tunnel Repair Alternatives

- » Alternative 1 – Portal Doors - **Not a Stand-Alone Option**
- » Alternative 2 – Rock Netting with Portal Doors
- » Alternative 3 – Steel Framing/Scaffolding with Roof and Portal Doors
- » Alternative 4 – Corrugated Metal Pipe Tunnel Reline with Bat Entry
- » Alternative 5 – Cast-in-Place Concrete Tunnel Lining

2. Trail Reroute Alternatives

- » Alternative 6 – Reroute Trail Along Existing Roads
- » Alternative 7 – Reroute Trail Above Tunnel
- » Alternative 8 – Cut and Fill Reroute Trail Above Tunnel

3. Tunnel Removal Alternative

- » Alternative 9 – Tunnel Roof and Overburden Removal

4. Additional Alternatives (not included in the GEI report)

The Bureau of Parks and Recreation initiated a public comment period from April through June 17, 2022. Key stakeholders and the public were encouraged to submit comments using an online feedback form or in writing to the department. Additionally, DNR staff identified and contacted 16 stakeholders to submit comments indicating their preferred alternative. Staff also met with several stakeholders including the State Trails Council, Nonmotorized Recreation and Transportation Trails Council, Governor's Bike Council, Wisconsin Bicycle Federation, South Central Wisconsin Rail Transit Commission, Friends of Badger State Trail, Village of Belleville, Ice Age Trail Alliance, and Bike Fitchburg.

A total of 901 public comments were received, both through the online feedback form and in writing. The comments indicated a strong preference for the Tunnel Repair Alternatives compared to the Tunnel Reroute or Removal Alternatives. In order of priority, the respondents indicated that preserving tunnel access, safety, and historic preservation are the most important considerations for evaluating the alternatives.

This Alternatives Analysis provided a mechanism for the bureau to analyze a variety of considerations, including public and stakeholder input, to formulate a recommendation for reopening the Stewart Tunnel section of the Badger State Trail. Alternative 4 – Corrugated Metal Pipe Lining is recommended because it would provide a long-term solution for ensuring safer year-round access to the tunnel for recreational purposes while also preserving the bat hibernaculum. It is recommended that this alternative be funded in the 2023-2025 capital development budget.

II. Introduction

The Wisconsin Department of Natural Resources (Department) Division of Fish, Wildlife and Parks prioritizes the safety and security of its visitors and the public, especially through the maintenance of park and trail infrastructure. The Stewart Tunnel is located on the Badger State Trail, approximately 20 miles south of Madison, just a few miles south of Belleville near Tunnel Road. Sections of loose and falling rocks from the ceiling and side walls inside the Stewart Tunnel caused the department to close the tunnel in 2019 for safety concerns. The tunnel remains closed today. Tunnel Road provides a temporary detour for users to go around the tunnel. In order to reopen this segment of the Badger State Trail, a long-term solution is still needed to ensure a safe trail facility.

A. Purpose

The purpose of this report is to explore alternatives for reopening this segment of the Badger State Trail in the context of:

- Safety
- Recreation Use and User Experience
- Accessibility
- Construction Costs and Maintenance
- Real Estate Needs
- Historical and Archaeological Resources
- Endangered Plants and Animals
- Economic and Community Impact
- Future Rail Use
- Master Plan Compliance

B. Process

In December 2021, engineering firm GEI Consultants provided a *Badger State Trail Stewart Tunnel Review of Alternatives* report for Stewart Tunnel. The GEI report evaluated nine different alternatives from an engineering standpoint and provided an opinion of probable cost for each alternative (Appendix A). The full GEI report is linked to in Appendix B. Using the GEI report as a starting point, the Bureau of Parks and Recreation Management (Bureau), part of the Department's Division of Fish, Wildlife and Parks, analyzed a variety of considerations to formulate a recommendation.

III. Background

A. Railroad

Passenger trains ran daily on the old Illinois Central Railroad line through Green County up until the 1960s. Freight use continued into the 1980s.

According to the department's 2006 master plan for the Badger State Trail:

“The Illinois Central Gulf Railroad Company filed a petition for abandonment with the Interstate Commerce Commission (ICC) on November 5, 1976. The Department of Natural Resources inspected the Wisconsin segment of the rail corridor and completed a trail feasibility study in December 1976. In 1978 the South Central Wisconsin Rail Transit Commission (SCWRTC) was created when Dane and Green Counties entered into a contract to continue rail service in the branch running between Madison and Freeport, Illinois. The ICC approved the abandonment, and the Wisconsin Department of Transportation (WisDOT) purchased the corridor as a short line operation (Wisconsin and Calumet Railroad) that continued to provide rail service. Eventually the short line operation was terminated and the corridor was again inspected on August 15, 1991 by department staff for a possible conversion to trail use.”

It wasn't until February 1997 that the WisDOT and the SCWRTC began negotiations to convert the Monroe to Madison segment of the corridor to a recreational trail under the federal Rails to Trail Act. After conducting an extensive review of the past twenty year history of rail usage and a railroad shipper/business in the area, SCWRTC approved the conversion of the corridor."

According to Southwestern Wisconsin Regional Planning Commission's website, "Created under state law, rail transit commissions oversee preservation, operation, and improvement of freight rail lines."

With the rail corridor banked by SCWRTC and WisDOT, both entities signed an April 1, 2000 "Interim Trail Use/Rail Banking Agreement" with the Department for the purpose of "temporarily establishing a recreational trail to be used in the interim before the restoration and reconstruction of the rail line." Amended in 2005, this agreement remains in effect.

B. Stewart Tunnel

According to the department's website, Illinois Central Railroad Company crews began working on the tunnel on December 13, 1886. In spite of construction needing to be stopped for several days, "because the roof had become unsafe and needed support," the tunnel was completed in December 1887.

According to a 2018 report by UW-Platteville students:

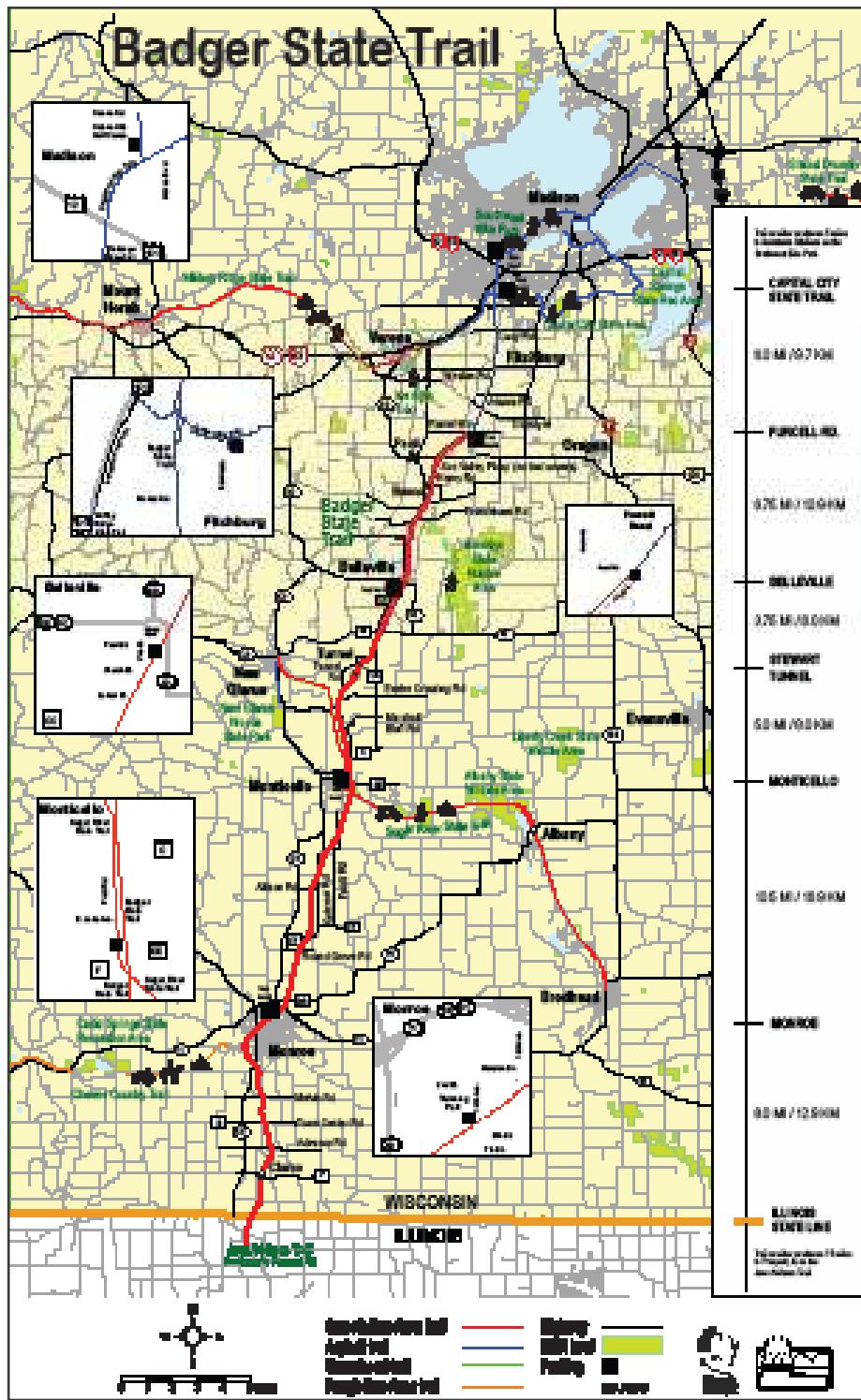
"Although the dates of the first repairs to the tunnel are unknown, it is apparent that the SCWRTC utilized brick installations to ensure the width of the tunnel remain large enough to allow train access. A total of four brick structures have been built inside the Stewart Tunnel. The structures were built with brick units removed to allow drainage of infiltrating water that would otherwise pool between the brick and bedrock. During the initial site visit, most of the brick structure drains did not show signs of drainage, meaning they may not be functioning properly. The next fix occurred in the 1980's when the SCWRTC built a cast-in-place concrete structure. The structure (STA 14+58 through STA 14+73) measures 15 feet in length and was only poured on the right side of the tunnel, likely in response to a collapse that occurred at that location."

After the WDNR obtained control of the tunnel, they installed two structural fixes. The first installation was a cast-in-place concrete and corrugated steel arch, completed in 2005. This structure was in good condition, however the drainage installed on the bottom of the structure was clogged and curved upwards, not allowing proper drainage of infiltrating water. The second installation was a rock net, which was installed in response to a ceiling collapse in 2017. The rock net was in good condition and appeared to be functioning properly. No rocks appeared to have dislodged or fallen in the area since the nets installation."

C. Badger State Trail

The Badger State Trail was established in 2000, after a feasibility study was completed and the department reached an agreement with WisDOT and the SCWRTC to convert the corridor from rail-to-trail use. In 2006 the master plan for the rail-bed was approved by the Natural Resources Board making it the Badger State Trail. The Badger State Trail is owned by the WisDOT, with oversight from SCWRTC, and developed and managed by the department under an agreement.

Located approximately 20 miles from the City of Madison, a community that boasts a large cycling population and trail network, the Badger State Trail is a popular destination for bicycling enthusiasts. The trail offers a rural experience as it traverses farmlands, woodlands, rolling topography, scenic meadows, remnant prairies, ravines, and glacial and unglaciated topography and also features historical points of interest including the Stewart Tunnel, the depot in the Village of Belleville and the Woolen Mill (built in 1888) in the Village of Monticello.



The Badger State Trail received approximately 190,000 visits in 2021. The trail offers bicycling, hiking, snowshoeing and cross-country skiing (un-groomed) opportunities. Snowmobiling is allowed on the trail from Purcell Road all the way south to the Illinois state line. Snowmobiles have a bypass that goes around the Stewart Tunnel on private land. Winter all-terrain vehicle (ATV) use is also allowed on the Badger State Trail with some restrictions, but only on the section from Monroe to Monticello.

Stewart Tunnel has been one of the Trail's major attractions. Visitation data indicates high trail use from Madison to Belleville. User numbers dramatically turn downward south of Monroe. During peak season, visitors often park along the shoulder of Tunnel Road and walk, or park in Belleville and bike, just to view and experience the tunnel.

IV. Considerations

An evaluation of alternatives for the Stewart Tunnel must take into account various considerations that are outlined below.

One consideration that was identified but not included in the analysis is *education and interpretation opportunities*. It was not analyzed because there are different and unique education and interpretation opportunities with every alternative.

A. Safety

The Wisconsin Department of Natural Resources, Division of Fish, Wildlife and Parks prioritizes the safety and security of its visitors and the public, especially through the maintenance of park infrastructure.

In early 2017, the Stewart Tunnel was closed to the public due to its crumbling ceiling. After some months of study, a May 18, 2017 article in the New Glarus Post Messenger Recorder reported, the fix was “to net the ceiling with a fence like material which is bolted to the ceiling. This will prevent rock from any additional failure in this area to be supported... This type of stabilization is used widely in the mining industry.” After a contractor completed the installation of netting to 30 feet of tunnel ceiling, the tunnel was re-opened to the public.

A May 22, 2019 article in the Milwaukee Journal Sentinel reported, “The Stewart Tunnel is officially open, but the Department is reporting there is standing water inside.”

Problems with the tunnel continued and in September 2019 the tunnel needed to be closed again after rocks were regularly found on the trail surface. These rocks were falling from the ceiling of the tunnel, a height of about 20 ft above the trail, and the falling rocks presented an unsafe condition for trail users. The tunnel has since remained closed.

Each of the alternatives outlined in this report, except Alternative 1, provide safe access through the tunnel or a safe alternative route.

B. Recreation Use and User Experience

According to a 2018 report by UW-Platteville students, “Rails to Trails” is a program to both convert unused railways into something useful to the public, typically trails, and to maintain the rights-of-way well enough to allow future railway conversion if necessary... Due to the low ceiling and narrow width of the Stewart Tunnel, it is no longer viable to be converted back to a railway in its present form. Therefore, the tunnel and path are maintained by the Wisconsin Department of Natural Resources (WDNR) for recreational use only.”

The tunnel is unique because it is built on a curve and visitors cannot see light at the other end of the tunnel when entering. Additionally, for some users, the rock formations and subterranean characteristics provide an experience that is thrilling, beautiful, or inspires curiosity. These aesthetic qualities of the tunnel may be difficult to quantify but are still important to consider as they provide a unique user experience.

During the department’s Southwest Savanna Regional Master Plan process, sixteen (16) public comments related to opening or preserving the tunnel were submitted. For these commenters, making repairs to the Stewart Tunnel and having the tunnel opened as soon as possible was stated as a priority, noting that the tunnel is an asset that enhances the user experience and attracts additional users. One other commenter expressed support for having a trail around the Stewart Tunnel. In general, public input supported the Draft Plan’s proposal to maintain existing uses of the trail. This includes support for continuing snowmobile use on the trail, and strong opposition to year-round ATV/UTV use on the trail.

C. Accessibility

The department recognizes a need to provide reasonable access to department lands by citizens representing the broadest cross section of society including those persons with disabilities. Accessibility can also be thought of as providing recreation opportunities for all different ages, abilities and skill or comfort levels. Currently, the Badger State Trail offers recreational opportunities for a wide range of users given its hard surface and flat grade. The Wisconsin State Trail system is an integral part of accessible recreation for people with disabilities and every effort should be made to maintain the accessibility of the trail. It is important to consider how each alternative could impact trail accessibility within this context.

D. Construction Costs and Maintenance

The GEI Consultants' December 2021 *Badger State Trail Stewart Tunnel Review of Alternatives* report provided an opinion of probable cost for each alternative that ranged from \$180,000 to \$18,230,000. To provide some context, the department's entire budget for state trails for the 2019-21 biennium budget was roughly \$8.5 million. Additionally, there is a significant need for trail surfacing and infrastructure across the system, for both linear and loop trails, that makes up approximately 30% of park backlog projects. The department understands the importance of balancing the needs across the system and having reasonable funding expectations as part of this analysis.

The GEI report considered maintenance costs from an engineering standpoint, which suggested that alternatives requiring frequent regular maintenance would be the costliest to maintain. Another way to evaluate maintenance costs is in terms of longevity and durability. Alternatives that have a high lifespan are considered to be more durable, resulting in less frequent maintenance costs.

One factor that the GEI report did not take into account was the potential for vandalism or graffiti which would increase maintenance costs. Historically, the Stewart Tunnel has been a target for graffiti. A significant amount of time and resources have gone into stopping and removing graffiti, yet it continues to be an ongoing issue. Preventative strategies to deter graffiti, vandalism, and other undesirable activities could be developed as necessary for the selected alternative.

E. Real Estate Needs

Some of the alternatives for the Stewart Tunnel may involve the acquisition of property from willing landowners near the Stewart Tunnel. Potential land acquisition costs were not included in the opinion of probable costs provided by GEI Consultants.

The Natural Resources Board approved the Southwest Savanna Regional Master Plan in December 2021 which includes the Badger State Trail. The plan enlarges the Badger State Trail project boundary around the Stewart Tunnel. The enlarged project boundary allows the department to work with willing landowners regarding their potential interest in selling or donating property.

The cost of acquiring any real estate is based on a willing seller and is generally determined by a certified appraisal determining fair market value. Funding for such acquisition(s) could potentially come from the Knowles-Nelson Stewardship Program, private donations, grants, or other funding. It must be noted that, since the project boundary around Stewart Tunnel was enlarged after May 2013, use of Knowles-Nelson Stewardship Program funding for land acquisition would require approvals that are currently difficult to obtain.

F. Historical and Archaeological Resources

The ¼ mile long tunnel Stewart Tunnel on the Badger State Trail is located in Exeter Township. The historic tunnel was built in 1887 as the final tunnel along the Illinois Central Railroad Line's route from Freeport, Illinois to Madison, Wisconsin. The tunnel is significant because of its importance in transportation history and for its method of construction. Its construction overcame the last major obstacle on the Illinois Central Railroad line's route.

As a historic site, the department consulted with the State Historic Preservation Office (SHPO) at the Wisconsin Historical Society pursuant to Wis. Stats. s. 44.40. SHPO as part of a preliminary review of the tunnel repairs that were proposed in the 2018 report by UW-Platteville students. SHPO concurred with the department that the addition of portal doors and rehabilitation work within the tunnel as proposed in the report were necessary for the continued safety and use of the trail and tunnel. Any scope changes would require additional review from DNR Historic Preservation.

An archaeological review was also completed as part of this preliminary review that did not reveal any documented archaeological sites. Any scope changes would also require additional archaeological review.

G. Endangered Plants and Animals

Stewart Tunnel is a significant hibernaculum for multiple state listed and federal listed bat species. Other endangered, threatened, or special concern species have also been documented either on the property or in the vicinity, including one species of animals and one species of plants.

Department biologists have been carrying out monitoring of bats, environment and rock-fall at Stewart Tunnel since at least September 2020. Site monitoring is on-going.

Closing the tunnel to human disturbance in recent years has likely made the tunnel a more suitable and desirable bat hibernaculum. Hibernating bats are sensitive to disturbance and the various alternatives proposed for the tunnel may result in varying closure dates when construction and human visitation to the tunnel will be limited. Hibernation sites with public access generally restrict access during the hibernation period from late fall through mid spring. These closure dates may need to be revisited on a regular schedule (e.g. every 3-5 years) due to anticipated changes in future bat presence (diversity) and potential changes to federal listing status of multiple bat species currently under consideration for federal Endangered Species Act (ESA) listing. Ultimately, U.S. Fish and Wildlife Service must be consulted on potential physical changes to the hibernaculum or potential disturbance to hibernating bats to ensure compliance with the ESA.

The fungus that causes White-nose Syndrome was detected in the tunnel in 2016 via department testing although visible signs of the fungus have not been observed on bats in Stewart Tunnel, likely due to the extreme cold at the site. The state invasive species rule (Wis. Admin. Code NR 40) may require that a biosecurity plan related to White-nose Syndrome be created for the site and would likely involve informational signage placed at tunnel entrances and trail access points.

Many factors impact bat hibernation, including temperature, airflow, and disturbance. If doors or other temperature buffering structures are added to the tunnel, the over-wintering bat population will likely increase. White-nose Syndrome fungal presence in the environment will also likely increase as tunnel temperatures and humidity increase. Increased fungal loads in the environment and on bats early in the hibernation season may also lead to increased mortality later in winter. Adding doors or other environmental buffering will make season close/open dates even more important because opening doors too early in spring may drive bats out too early when insect prey is minimal and nights remain cold.

H. Economic and Community Impact

Stewart Tunnel has been one of the Badger State Trail's major attractions and tourist draws for the Belleville area. It has been observed that during peak season, visitors often park along the shoulder of Tunnel Road and walk, or park in Belleville and bike from there, just to view and experience the tunnel. Additionally, visitation data has indicated high trail use from Madison to Belleville with user numbers dramatically turning downward south of Monroe. It is uncertain whether this increased use on the northern section of the trail is due solely to the tunnel. Another explanation could be its proximity to the Madison metropolitan area.

Numerous studies have shown that bicycling is a major economic driver. According to the WI Bicycle Federation, a recent economic impact study by the Outdoor Industry Association shows that bicycling contributes \$1.4 billion dollars to Wisconsin and provides more than 13,000 jobs.

While determining use numbers for state trails is not an exact science and it is not uncommon for use numbers to fluctuate from year to year, the following are use numbers for the Badger State Trail since 2014:

2021 – 190,053
2020 – 240,036
2019 – 226,175
2018 – 216,541
2017 – 220,229
2016 – 184,959
2015 – 181,591
2014 – 160,548

Visitation numbers, such as the above, can help gauge the potential economic impacts of Stewart Tunnel. Several studies have indicated that high trail use correlates with a high economic value. Trail users spend money at gas stations, restaurants, hotels/motels, and other local merchants during their visits, which helps sustain and grow nearby communities and their local economies. More data or an economic impact study would be necessary, though, to fully examine the potential economic and community impacts of the alternatives that are outlined in this analysis.

If nothing else, the process of closing the tunnel in 2019, fencing the portals in late 2020, and designating an on-road reroute/detour demonstrated there is a lot of community interest in the tunnel and partner support.

The GEI report considered the potential for permanent or temporary disruption to nearby stakeholders in their evaluation of the repair alternatives and is included as part of this analysis.

I. Future Rail Use

Under the "Interim Trail Use/Rail Banking Agreement" with the Department for the purpose of temporarily establishing a recreational trail to be used in the interim before the restoration and reconstruction of the rail line, "there is a possibility" that the Badger State Trail, along with the Stewart Tunnel, could revert back to rail use.

While the Stewart Tunnel in its present form is not viable for modern rail use, it is important to consider how each alternative could impact restoration or reconstruction of the tunnel as necessary for future rail use. Depending on the alternative selected, a variance from the WisDOT-SCWRTC agreement might be needed prior to implementation.

J. Master Plan Compliance

A master plan establishes the level and types of public uses and the authorized resource management and facility development that may take place on a DNR property. It acts as a blueprint for the property, providing for consistent, long-term management. Master plans are developed according to guidelines set forth in Chapter NR 44, Wis. Admin. Code.

The Natural Resources Board approved the Southwest Savanna Regional Master Plan, which includes the Badger State Trail, in December 2021. Each of the Stewart Tunnel alternatives as outlined in this report was evaluated in regard to whether they comply with the objectives for the trail as identified in this master plan.

The Southwest Savanna Regional Master Plan indicates that the entire Badger State Trail is managed as one Type 4 Recreational Management Area. The objective of a Type 4 Recreational Management Area is to provide areas offering opportunities for intensive recreational use activities and experiences.

The public use and recreation objectives for the trail as listed in the master plan include:

- Provide a high-quality rail-trail experience for off-road transportation and recreation
- Provide opportunities for scientific research, interpretation and education

The natural resource objectives for the trail as listed in the master plan include:

- Maintain the existing diversity of cover types for high-quality scenic settings for trail users, wildlife and ecological benefits
- Maintain populations of rare plants that occur within the trail corridor

Each of the alternatives outlined in this analysis are considered to be in compliance with the master plan. One of the alternatives, Alternative 6, is outside the scope of the master plan.

V. Stewart Tunnel Alternatives Analysis

GEI Consultants developed a report that analyzed nine different alternatives from an engineering and cost standpoint.

The alternatives considered in the GEI report included the following:

Alternative	Cost
1. Portal Doors (Not a stand-alone alternative)	\$140,000
2. Rock Netting	\$880,000
3. Steel Framing/Scaffolding with Roof	\$4,080,000
4. Corrugated Metal Pipe Tunnel Lining	\$3,480,000
5. Cast-in-Place Concrete Tunnel Lining	\$9,200,000
6. A. Reroute Trail Along Existing Roads (Tunnel Rd.)	\$1,340,000
B. Reroute Trail Along Existing Roads (CTH CC)	\$2,010,000
7. Reroute Trail above Tunnel	\$270,000
8. Cut and Full to Reroute Trail above Tunnel	\$740,000
9. Tunnel Roof and Overburden Removal	\$18,230,000

For the purpose of this Alternatives Analysis Report, the department grouped the different alternatives into four categories:

1. Tunnel Repair Alternatives (Alternatives 1 to 5)
2. Trail Reroute Alternatives (Alternatives 6 to 8)
3. Tunnel Removal Alternative (Alternative 9)
4. Additional Alternatives (Not included in the GEI report)

The Tunnel Repair Alternatives include Alternatives 1 to 5 that would reopen Stewart Tunnel for public trail use, while the Trail Reroute Alternatives (Alternatives 6 to 8) would establish a new trail route, either on or off-road, that would bypass Stewart Tunnel. The Tunnel Removal Alternative (Alternative 9) is unlike any of the others as it would completely remove the tunnel roof and soil above it, creating a trench that the trail would go through. Key considerations and evaluation measures are discussed below for Alternatives 1 to 9. Appendix A includes an analysis of the alternatives in table format.

VI. Tunnel Repair Alternatives

The five Tunnel Repair Alternatives as outlined below would all maintain public access through the tunnel either year-round or for part of the year. GEI developed opinions of probable costs for each alternative that include a contingency of 10% to cover uncertainty in quantities and unit costs, 10% for mobilization, for design and construction engineering, and 4% Department of Administration/Division of Facilities Development (DFD) administration fees. These alternatives require the removal of loose rock and removal and replacement of an existing bridge for construction access. These costs were also included in the opinions of probable costs. The opinions of probable cost are considered rough budgetary estimates based on conceptual designs.

The construction area for the Tunnel Repair Alternatives is largely limited to the inside of the tunnel. Because of this, these alternatives would not require additional land acquisition(s) nor would they likely impact any documented rare and endangered plants and animals found outside of or above the tunnel within the right-of-way.

A. Alternative 1 - Portal Doors (NOT A STAND-ALONE ALTERNATIVE)

Alternative 1 would include the installation of portal doors at the north and south entrances of Stewart Tunnel. The doors would be closed in the winter months to reduce the tunnel's exposure to freeze/thaw cycles that would help slow the rate of rock deterioration. According to the GEI report, potential openings in the doors could be designed to accommodate bat entry and exit of the tunnel. This is assumed for the purpose of this analysis.

The GEI report concluded that it's unlikely that Alternative 1, by itself, would resolve the issues completely. Therefore, this alternative is not a stand-alone option and has been combined with Alternatives 2 and 3 for the purpose of this analysis.

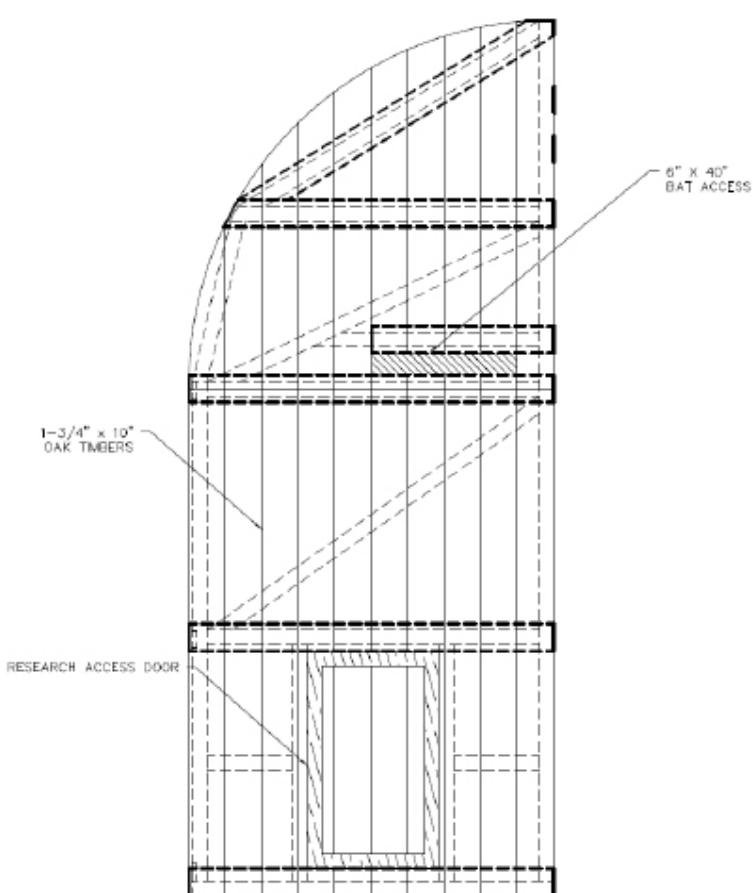


Figure 1: Sketch of potential door with bat entry



Figure 2: Elroy-Sparta Tunnel Entrance

B. Alternative 2 – Rock Netting with Portal Doors

Alternative 2 would include installing rock netting on the tunnel ceiling and upper parts of the walls to prevent loose rocks from falling in addition to installing portal doors to help slow the rate of rock deterioration. The netting would be similar to the repairs that were previously performed in a 30-foot section of the tunnel in 2017, however could additionally include netting on the walls to further reduce the risk of falling rocks.

Construction Costs and Maintenance

The GEI report included an opinion of probable cost of \$880,000 for the rock netting and \$140,000 for the tunnel doors, totaling \$1,020,000. This cost assumed that the rock netting would only be installed on the tunnel ceiling for a length of 770 feet. Alternative 2 is a relatively affordable option with costs anticipated to be less than \$4 million.

This alternative would require frequent regular maintenance to remove rock debris that's collected in the netting, which could result in high maintenance costs. Alternatives 2 and 3, compared to Alternatives 4 and 5, would have a shorter lifespan, less than 50 years, and be considered less durable from a maintenance standpoint. Graffiti or other types of vandalism may continue to be an issue and increase maintenance costs with Alternatives 2 – 5.



Figure 3: Existing rock netting installed in 2017

Recreation and Accessibility

Under this option, Stewart Tunnel would remain open and accessible to users during peak season, May to October, maintaining it as a tourist destination. However, Alternative 2 would require a detour around the tunnel when the doors are closed. Similar to the Elroy-Sparta Trail, the tunnel doors would likely be closed to the public annually from November 1 to April 30th. This time period could be longer to avoid the bat hibernation season (see section III.D. Endangered Plants and Animals above). Because of this, the existing trail grade, tunnel access, user experience and off-road transportation, and recreation opportunities as they exist today would only be maintained for a portion of the year when the portal doors are open. Alternatives 2 and 3 are less preferred than Alternatives 4 and 5 from a recreational standpoint.

Endangered Plants and Animals

The rock netting would severely restrict or limit access to the ceiling and other bat roosting surfaces. It is also possible that White-nose Syndrome fungal presence in the tunnel environment would increase as temperatures and humidity increase when the doors are closed (see section III.D. Endangered Plants and Animals above). Alternatives 2 and 5 are the least preferred among the Tunnel Repair Alternatives from an endangered resource protection standpoint.

Historical Impacts

This alternative preserves the original historic tunnel structure as it exists today. However, the rock netting could detract from the aesthetic qualities of the natural bedrock.

Future Rail Use

Compared to Alternatives 3, 4, and 5, Alternative 2 would have the least impact on future rail use, as it would not change the usable space of the bedrock tunnel as it exists today.

Nearby Stakeholder Impacts

Alternatives 2 and 3 would likely have less disruptions to nearby stakeholders during construction compared to Alternatives 4 and 5, since the projects would be smaller in scale.

C. Alternative 3 – Steel Framing/Scaffolding with Roof and Portal Doors

Alternative 3 would include installing a steel canopy or heavy-duty scaffolding within the tunnel and installing portal doors to help slow the rate of rock deterioration. The steel canopy would be sloped to deflect falling rock material to the sides of the tunnel. This alternative would also include installing rock netting along the walls to prevent debris from rolling into the traveled trail surface.

Construction Costs and Maintenance

The GEI report included an opinion of probable cost of \$4,080,000 for the steel framed roof and \$140,000 for the tunnel doors, totaling \$4,220,000. With costs exceeding just over \$4 million, Alternative 3 could be challenging from a funding perspective.

This Alternative would require regular maintenance to remove rock debris from the sides of the tunnel that collects in the netting or has fallen onto the trail surface. The steel structure could be designed to be dismantled if needed for maintenance purposes.

Alternatives 2 and 3, compared to Alternatives 4 and 5, would have a shorter lifespan, less than 50 years, and be considered less durable from a maintenance standpoint. Graffiti or other types of vandalism may continue to be an issue and increase maintenance costs with Alternatives 2 – 5.

Recreation and Accessibility

The recreation impacts for this alternative would be similar to Alternative 2 as it would also require a detour around the tunnel when the doors are closed. Because of this, the existing trail grade, tunnel access, user experience and off-road transportation, and recreation opportunities as they exist today would only be maintained for a portion of the year. Alternatives 2 and 3 are less preferred from a recreational standpoint than Alternatives 4 and 5.

Endangered Plants and Animals

Similar to Alternative 2, it is possible that White-nose Syndrome fungal presence in the tunnel environment would increase as temperatures and humidity increase when the doors are closed (see section III.D. Endangered Plants and Animals above). Alternative 3 would have less of an impact than Alternative 2 on the bat population because access to the ceiling and other bat roosting surfaces would be retained.

Historical Impacts

This alternative preserves the original historic tunnel structure as it exists today. The ceiling would not be visible, and the walls would be covered in rock netting, though, possibly making this alternative less attractive compared to Alternative 2 from an aesthetic standpoint.

Future Rail Use

Since, according to the GEI report, the steel structure "could be dismantled relatively easily," Alternative 3 would have less impact on future rail use than Alternatives 4 and 5.

Nearby Stakeholder Impacts

Alternatives 2 and 3 would likely have less disruptions to nearby stakeholders during construction compared to Alternatives 4 and 5, since the projects would be smaller in scale.

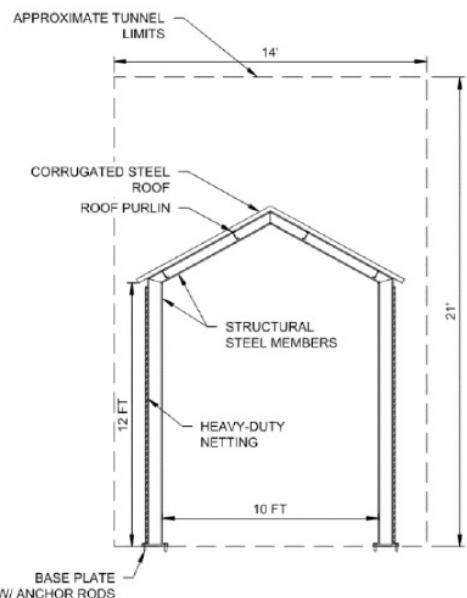


Figure 4: Proposed steel framing sketch

GEI Consultants Inc., Badger State Trail Stewart Tunnel Review of Alternatives, 2021

D. Alternative 4 – Corrugated Metal Pipe Tunnel Lining

Alternative 4 would include the installation of a large diameter corrugated metal arch through the tunnel, similar to the type of tunnel lining system that was constructed at the Poe Paddy Tunnel in Centre County, Pennsylvania. Space could be left between the backfill material and the top of the existing tunnel for maintaining bat habitat. According to the GEI report, the Poe Paddy Tunnel has worked well to protect trail users from falling rock while also maintaining bat habitat. GEI spoke to officials at the Poe Paddy Tunnel who reported that the repair is functioning as intended, the bat population has increased, and the public has been pleased with the repair. Alternatives 4 and 5 would completely cover up the bedrock tunnel, eliminating the need for the portal doors.

Construction Costs and Maintenance

The GEI report included an opinion of probable cost of \$3,480,000 for the corrugated metal pipe tunnel lining, making Alternative 4 more affordable than Alternatives 3 and 5 with costs anticipated to be less than \$4 million.

Compared to Alternatives 2 and 3, this option would have a longer lifespan, greater than 50 years, and be more durable and require less frequent maintenance. Graffiti or other types of vandalism may continue to be an issue and increase maintenance costs with Alternatives 2 – 5.

Recreation and Accessibility

The tunnel doors would not be necessary with this alternative, so the existing trail grade, tunnel access and off-road transportation and recreation opportunities as they exist today would be maintained year-round. Alternatives 4 and 5 are preferred from a recreational and accessibility standpoint.

Endangered Plants and Animals

Alternative 4 would preserve the bat habitat provided that space would be left at the top of the tunnel for maintaining bat hibernaculum. This option would also retain access to the tunnel ceiling and other surfaces within the space for roosting bats and provide year-round protection for the bat habitat as the space would be completely closed off to public use and separate from the trail.

Historical Impacts

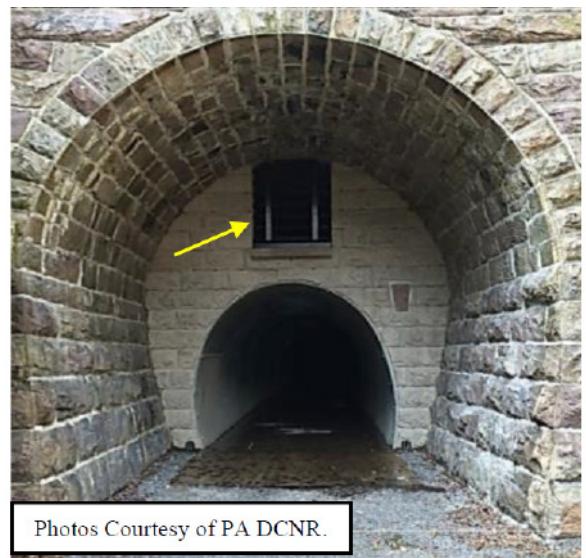
Amongst the Tunnel Repair Alternatives, Alternatives 4 and 5 would have the greatest negative impacts on the tunnel's historic and aesthetic qualities as they would completely cover up the bedrock tunnel.

Future Rail Use

Alternatives 4 and 5 would negatively impact future rail use of the tunnel because they would shrink the usable space of the bedrock tunnel.

Nearby Stakeholder Impacts

Compared to Alternatives 2 and 3, Alternatives 4 and 5 could have more disruptions to nearby stakeholders during construction as the projects are significantly larger in scale.



Photos Courtesy of PA DCNR.

Figure 5: Poe Paddy Tunnel with slotted door for bat entry
GEI Consultants Inc., Badger State Trail Stewart Tunnel Review of Alternatives, 2021

E. Alternative 5 - Cast-in-Place Concrete Tunnel Lining

Alternative 5 would include the construction of cast-in-place concrete walls to support a large-diameter corrugated metal ceiling arch within the tunnel. The space between the existing tunnel ceiling and corrugated pipe arch would be backfilled with concrete. It would be similar to repairs previously done at two locations within the tunnel in 2005. This alternative would also include the installation of drains and weep/drain holes to collect and direct any water that seeps through the bedrock. Alternatives 4 and 5 would completely cover up the bedrock tunnel, eliminating the need for the portal doors.

Construction Costs and Maintenance

The GEI report included an opinion of probable cost of \$9,200,000 for the cast-in-place concrete tunnel lining. This is the most costly tunnel repair option, exceeding well over \$4 million that could be extremely challenging from a funding standpoint.

Similar to Alternative 4, this option would have a longer lifespan greater than 50 years and be more durable and require less frequent maintenance compared to Alternatives 2 and 3. Graffiti or other types of vandalism may continue to be an issue and increase maintenance costs with Alternatives 2 – 5.

Recreation and Accessibility

Similar to Alternative 4, the tunnel doors would not be necessary with this alternative, so the existing trail grade, tunnel access and off-road transportation and recreation opportunities as they exist today would be maintained year-round. Alternatives 4 and 5 are preferred from a recreational standpoint.

Endangered Plants and Animals

With Alternative 5, there is high potential for the disturbance of hibernating bats because year-round access to the tunnel by the public would not protect bats from human disturbance during the hibernation period. In addition, although access to the ceiling and walls would be retained, the surfaces would need to be roughened or modified to provide adequate bat roosting surfaces. Alternatives 2 and 5 are the least preferred among the Tunnel Repair Alternatives from an endangered resource protection standpoint.

Historical Impacts

Alternatives 4 and 5 would have the greatest negative impacts on the historic and aesthetic qualities as they would completely cover up the bedrock tunnel.

Future Rail Use

Alternatives 4 and 5 would negatively impact future rail use of the tunnel because they would shrink the usable space of the bedrock tunnel.

Nearby Stakeholder Impacts

Compared to Alternatives 2 and 3, Alternatives 4 and 5 could have more disruptions to nearby stakeholders during construction as the projects are significantly larger in scale.



Figure 6: Existing cast-in-place tunnel repair constructed in 2005.

VII. Trail Reroute Alternatives

The three Tunnel Reroute Alternatives as outlined below would either reroute the trail along existing roads or above the tunnel. The Trail Reroute Alternatives, by themselves, do not address or resolve the issues of loose and falling rocks inside the tunnel. Similar to the Tunnel Repair Alternatives, GEI developed opinions of probable costs for each alternative that include a contingency of 10% to cover uncertainty in quantities and unit costs, 10% for mobilization, for design and construction engineering, and 4% DFD administration fees. The cost to replace an existing bridge for construction access was also included in the opinions of probable costs for Alternatives 7 and 8. Potential land acquisition costs for the Trail Reroute Alternatives were not included in the opinion of probable costs provided by GEI Consultants. The opinions of probable cost are considered rough budgetary estimates based on conceptual designs.

These alternatives would not maintain a trail through the tunnel or this unique user experience. Recognizing that the tunnel is a major attraction, each of these alternatives could also potentially provide limited public access for maintaining it as a historical feature and interpretive site. “Limited public access” could potentially include only the first 20 or so feet of the tunnel from each end and only during certain times of year. If one of the trail reroute alternatives is pursued, this concept would have to be further developed as part of the design and engineering phase. Although the tunnel would largely remain closed to the public, it could be preserved and managed for bat habitat with the Trail Reroute Alternatives.

A. Alternative 6 – Reroute Trail Along Existing Roads

Alternative 6 would include rerouting the trail along existing roads to bypass the tunnel, either 2.5 miles along Tunnel Road or 3.3 miles along CTH CC/Exeter Crossing Rd. This option would require widening the roadways to accommodate 5-foot-wide bicycle lanes in both direction. It would also require authorization by and coordination with the county or town as they are the owners and operators of these roadways.

The department doesn't have master planning authority over Alternative 6 since it does not own or operate the roadways. If it is determined to be viable and desirable to permanently close the tunnel under this alternative, the department would determine additional public process at that time.

Construction Costs and Maintenance

The GEI report included an opinion of probable cost of \$1,340,000 for the Tunnel Road reroute and \$2,010,000 for the CTH CC reroute. This alternative is a relatively low cost option, with anticipated costs being less than \$4 million.

Alternative 6 would provide a trail system with a long lifespan and require the least maintenance over the longest period of time. Additionally, there is less potential for graffiti or other forms of vandalism with this option compared to the Tunnel Repair Alternatives.

Real Estate Needs

Alternative 6 would likely require the acquisition of land or easements for widening the roadways.



Figure 7: Rerouted trail routes for Alternative 6

GEI Consultants Inc., Badger State Trail Stewart Tunnel Review of Alternatives, 2021

Recreation and Accessibility

Alternative 6 could negatively impact recreational uses as this section of the Badger State Trail would be on-road, which is less desirable from a recreational and accessibility standpoint. For example, families with children or persons with mobility impairments may not feel comfortable biking or hiking on or along the road. Additionally, this alternative would not maintain the flat trail grade as it exists today, providing even less recreational opportunities for a wide range of users. Safety may also not be improved with Alternative 6 since it puts bicyclists and pedestrians alongside motor vehicles traveling at high speeds. By putting users on-road, Alternative 6 would probably be the only alternative that may decrease the economic impact to levels below what they were before the tunnel was closed.

Endangered Plants and Animals

Alternative 6 would maintain the bat habitat. However, a minimally secured fenced-off tunnel as it exists today, would not adequately protect bats from human disturbance during hibernation.

If this option is pursued, impacts to other rare and endangered species would need to be further evaluated for the proposed roadway improvements.

Historical Impacts

Alternatives 6 and 7 would preserve the historic tunnel structure and aesthetics as it exists today, but the tunnel would remain closed to the public. As previously mentioned, it is possible that limited public access for maintaining the tunnel as a historical feature and interpretive site could be provided.

Since Alternative 6 would involve ground disturbance activities along the roadways, additional historical and archaeological reviews would likely be necessary.

Future Rail Use

Alternative 6 would have little impact on future rail use since it would not change the usable space of the bedrock tunnel as it exists today.

Nearby Stakeholder Impacts

This reroute option would have the least impact to nearby stakeholders as it would completely bypass the tunnel.

B. Alternative 7 – Reroute Trail Above Tunnel

Alternative 7 would involve rerouting the trail above the tunnel. Existing site grades near the tunnel portals and above the tunnel are up to 16% in some areas. With grades this steep, a trail would need to be paved to reduce erosion. The trail right-of-way may also need to be widened to reroute a trail above the tunnel. A trail re-route running parallel to and east of the tunnel as shown in the image to the right appears to be the best for utilizing the existing gradual slopes near the portal approaches. The tunnel would remain closed to the public under this alternative.

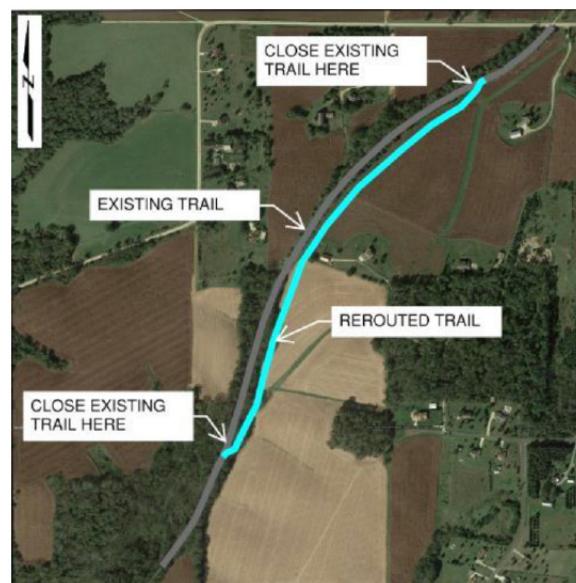


Figure 8: Proposed rerouted trail location

GEI Consultants Inc., Badger State Trail Stewart Tunnel Review of Alternatives, 2021

Construction Costs and Maintenance

The GEI report included an opinion of probable cost of \$270,000 for rerouting the trail above the tunnel. This alternative has the lowest anticipated costs, well under \$4 million.

Similar to Alternative 6, this option would provide a trail system with a long lifespan and require the least maintenance over the longest period of time. There is less potential for graffiti or other forms of vandalism with this option compared to the Tunnel Repair Alternatives.

Real Estate Needs

Alternative 7 would likely require the acquisition of land or easements for widening the trail right-of-way.

Recreation and Accessibility

Alternative 7 would allow off-road recreational use on a year-round basis to resume. However, the steep grades required for this alternative would eliminate or severely limit the accessibility of the trail for a wide range of users.

Alternatives 7 and 8 would provide some scenic views from above the tunnel that could be a point of interest for the trail and provide a different user experience.

Endangered Plants and Animals

Similar to Alternative 6, this option would maintain the bat habitat. However, a minimally secured fenced-off tunnel as it exists today would not adequately protect bats from human disturbance during hibernation.

If this option is pursued, impacts to other rare and endangered species would need to be further evaluated as there are several documented rare and endangered plants and animals found in the area (see section III.D. Endangered Plants and Animals above).

Historical Impacts

Alternatives 6 and 7 would preserve the historic tunnel structure and aesthetics as it exists today, but the tunnel would remain closed to the public. As previously mentioned, it is possible that limited public access for maintaining the tunnel as a historical feature and interpretive site could be provided.

Since Alternatives 6 – 8 would involve ground disturbance activities above the tunnel and outside of the trail right-of-way, additional historical and archaeological reviews may be necessary.

Future Rail Use

Alternative 7 would have little impact on future rail use since it would not change the usable space of the bedrock tunnel as it exists today.

Nearby Stakeholder Impacts

Alternatives 7 and 8 could have some disruptions during construction to nearby stakeholders. The widening of the right-of-way could also have permanent impacts to adjacent lands.

C. Alternative 8 – Cut and Fill to Reroute Trail Above Tunnel

Alternative 8 would be similar to Alternative 7 except that soil would be excavated from above the tunnel for constructing approach ramps near the existing tunnel portals. The GEI report selected a ramp surface grade of 10% to limit the horizontal extent of the ramp (extending approximately 600 feet from the south portal and 500 feet from the north portal). The ramps for this alternative are not intended to provide for an accessible trail entrance. Soil excavation from above the tunnel would reduce the steeper portions of the trail. The required excavation could have impacts on an existing woodland and open grown oak. Similar to Alternative 7, paving would be necessary to reduce erosion and the existing right-of-way may need to be expanded.

The tunnel would also remain closed to the public under this alternative. It is possible that the approach ramps could be designed to preserve and secure tunnel access for bats and allow limited public access for historical interpretation opportunities.

Construction Costs and Maintenance

The GEI report included an opinion of probable cost of \$740,000 for this alternative. This is a relatively low cost option, with anticipated costs being less than \$4 million.

Similar to Alternatives 6 and 7, this option would provide a trail system with a long lifespan and require the least maintenance over the longest period of time. This option has less potential for graffiti or other forms of vandalism compared to the Tunnel Repair Alternatives.

Real Estate Needs

This option would likely require the acquisition of land or easements for widening the trail right-of-way.

Recreation and Accessibility

Similar to Alternative 7, this option would allow off-road recreational use on a year-round basis to resume. Although the approach ramps would reduce the steeper portions of the trail, the grades would still eliminate or severely limit the accessibility of the trail for a wide range of users.

Alternatives 7 and 8 would provide some scenic views from above the tunnel that could be a point of interest for the trail and provide a different user experience.

Endangered Plants and Animals

Similar to Alternatives 6 and 7, this option would maintain the bat habitat, but a minimally secured fenced-off tunnel as it exists today would not adequately protect bats from human disturbance during hibernation.

If this option is pursued, impacts to other rare and endangered species would need to be further evaluated as there are several documented rare and endangered plants and animals found in the area (see section III.D. Endangered Plants and Animals above).



Figure 9: Plan view of proposed ramp at south portal

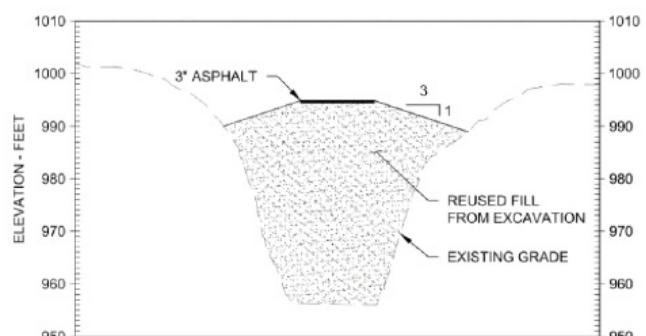


Figure 10: Section view of proposed ramp

Historical Impacts

Alternative 8 would change the appearance of the tunnel from the outside with the required soil excavation from above the tunnel and construction of ramps near the portal entrances. It is likely that this option could possibly still provide limited public access for maintaining the tunnel as a historical feature and interpretive site.

Since Alternatives 6 – 8 would involve ground disturbance activities above the tunnel and outside of the trail right-of-way, additional historical and archaeological reviews may be necessary.

Future Rail Use

The tunnel would remain under Alternative 8, however it is unclear how the ramps would impact tunnel access for future rail use. It may be possible that this option would have little impacts to future rail use, similar to Alternatives 6 and 7, but further review would be necessary.

Nearby Stakeholder Impacts

Alternatives 7 and 8 could have some disruptions during construction to nearby stakeholders. The widening of the right-of-way could also have permanent impacts to adjacent lands.



Figure 11: Large oak above the tunnel

VIII. Tunnel Removal Alternative

A. Alternative 9 – Tunnel Roof and Overburden Removal

Alternative 9 would include the excavation of soil and rock above the tunnel to create an open cut trench along the entire length of the tunnel. According to the GEI report, the open cuts could be up to a maximum of 300 feet wide at existing ground surface elevation above the tunnel to create safe and stable rock and soil side slopes. Rock slopes could be steepened if rock stabilization was performed. Blasting may be required for excavating through the rock and drilling exploratory soil borings may be necessary to determine the location of the soil to rock contact. The open excavations may require widening of the existing right-of-way and could impact adjacent lands. If it is determined to be viable and desirable to remove the tunnel under this alternative, the department would determine additional public process at that time.

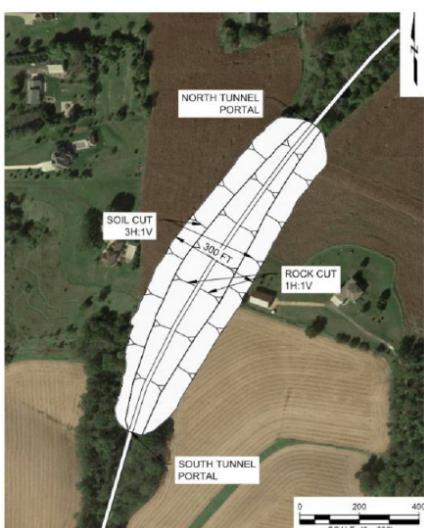


Figure 12: Approximate limits of excavation

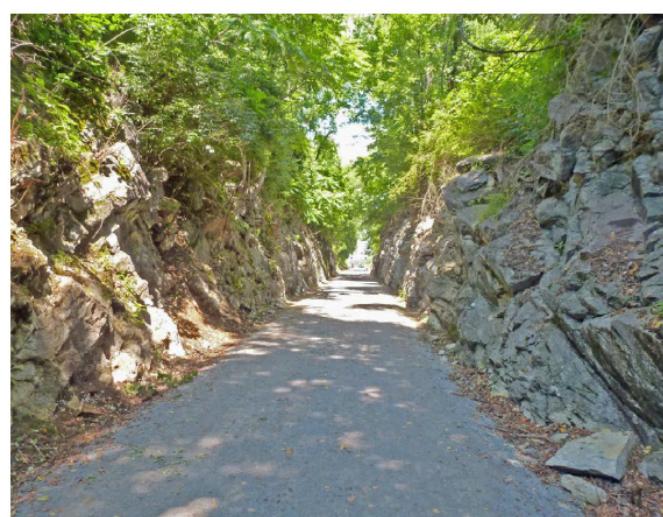


Figure 13: Approximate limits of excavation

Construction Costs and Maintenance

The GEI report included an opinion of probable cost of \$18,230,000 for the tunnel roof and overburden removal. This repair alternative is the costliest due to the volume of soil and rock that would need to be removed and stockpiled or reused on other projects. Given the extremely high anticipated costs, this alternative would be the most challenging from a funding standpoint.

Similar to Alternatives 6-8, this alternative would provide a long lifespan of the trail system and require less maintenance over a long period of time. With the rock walls created by the trench, graffiti or other types of vandalism may continue to be an issue with this alternative. Some regular maintenance could be required for addressing rocks that may fall from the sides of the trench.

Real Estate Needs

Alternative 9 would likely require the acquisition of land or easements for widening the trail right-of-way.

Recreation and Accessibility

This alternative maintains the existing trail grade, offering recreational opportunities for a wide range of users while also providing off-road transportation and recreation opportunities on a year-round basis. Alternative 9 would not maintain the unique user experience provided by the trail going through the tunnel and could be less of a tourist draw than a functioning tunnel.

Endangered Plants and Animals

This alternative is the least preferred from an endangered resource protection standpoint as it would completely eliminate the bat hibernaculum and potentially other rare or endangered plants and animals that might be there (see section III.D. Endangered Plants and Animals above).

Historical Impacts

Alternative 9 would completely eliminate the historical and aesthetic significance of the tunnel. Similar to Alternatives 6 – 8, this option would likely require additional historical and archaeological reviews.

Future Rail Use

This alternative would likely improve conditions for future rail use as there would no longer be any height or width constraints that would restrict future rail use.

Nearby Stakeholder Impacts

Amongst all of the alternatives, Alternative 9 would have the greatest impact to nearby stakeholders during construction, since the excavation through the rock may require blasting and it would require a significant amount of grading beyond the right-of-way to achieve the slopes required for the open excavations. The widening of the right-of-way could also have permanent impacts to adjacent lands.

IX. Additional Alternatives

A. Do Nothing Alternative

This alternative would keep the tunnel gated and closed with chain link fencing at each portal. Recreational use would continue to be rerouted around the tunnel on Tunnel Road. Human impacts on bats in the tunnel would be minimized but not eliminated.

B. Pedestrian-only Rerouted Trail Above the Tunnel Alternative

The GEI report did not take into consideration a pedestrian-only rerouted trail above the tunnel. A rerouted trail above the tunnel for pedestrian use only would require little to no engineering and be less costly, however, it would leave bicycle use to reroute around on existing roads. It is likely that a rerouted pedestrian-only trail above the tunnel could be established within the existing right-of-way, but more planning would be necessary to determine whether this would be feasible. This alternative could also be considered for providing a separated route for the Ice Age National Scenic Trail along this section of the Badger State Trail.



Figure 14: View from above the tunnel

C. Combined Alternatives

Some of the alternatives could be combined to create hybrid options. Alternative 1, the portal doors, is inherently a combined alternative, since the GEI report concluded that it is unlikely that Alternative 1, by itself, would resolve the issues. It would need to be combined with one or more other alternatives to provide a solution. For this reason, Alternative 1 was combined with Alternatives 2 and 3 as discussed in section V.A.

Alternative 1 could also be combined with Alternatives 6 – 8 to reduce the rate of rock deterioration as a way to stabilize the tunnel structure for potential future use and secure it for protecting bats from human disturbance during the hibernation period.

Alternatives 2 and 3 could also be combined with Alternatives 6 – 8 for providing a trail detour and reroute for when the portal doors are closed.

The Pedestrian-Only Rerouted Trail Above the Tunnel Alternative would also be considered a combined alternative since, by itself, it wouldn't provide for all of the recreational uses. This alternative could potentially be combined with Alternatives 2 and 3 for providing an off-road detour for pedestrian use only when the portal doors are closed. It could also be combined with Alternative 6, or a narrowed width Alternative 6, to create an off-road pedestrian use only rerouted above the tunnel and an on-road reroute for bicyclists.

X. Stakeholder Input Summary

The Bureau of Parks and Recreation initiated a public comment period from April through June 17, 2022. Key stakeholders and the public were encouraged to submit comments using an online feedback form or in writing to the department. Additionally, staff identified and contacted 16 stakeholders to encourage them to submit comments indicating their preferred alternative. Staff also met with several stakeholders including the State Trails Council, Nonmotorized Recreation and Transportation Trails Council, Governor's Bike Council, Wisconsin Bicycle Federation, South Central Wisconsin Rail Transit Commission, Friends of Badger State Trail, Village of Belleville, Ice Age Trail Alliance, and Bike Fitchburg.

A total of 901 public comments were received, both through the online feedback form and in writing. The comments indicated a strong preference for the Tunnel Repair Alternatives compared to the Tunnel Reroute or Removal Alternatives.

Of the 893 responses to the on-line feedback form, 84% (750 responses) selected one of the Tunnel Repair Alternatives (Alternatives 2 to 5) for the preferred Alternative. Thirty-two percent (282 respondents) chose Alternative 4, 25% (226 respondents) chose Alternative 2, 20% (176 respondents) chose Alternative 5 and 7% (66 respondents) chose Alternative 3. In contrast, only 4.7% (42 responses) selected one of the Tunnel Reroute Alternatives with a slight preference for Alternative 7. Lastly, only 0.45% (4 responses) selected the Tunnel Removal Alternative (Alternative 9).

In order of priority, the respondents indicated that preserving tunnel access, safety, and historic preservation are the most important considerations for evaluating the alternatives. The survey responses for questions 5 to 9 are included as Appendix C. Appendix D includes the 343 written comments that were submitted using the online feedback form.

The table below lists the preferred alternatives selected by primary stakeholder groups. Appendix E includes a full list of the stakeholders and other organizations that submitted comments and indicated their preferred alternative.

Primary Stakeholder	Preferred Alternative
Belleville Economic Development Committee	Alternative 4 – Corrugated Metal Pipe Lining
Belleville Village Board	Alternative 4 – Corrugated Metal Pipe Lining
Bike Fitchburg	Alternative 4 – Corrugated Metal Pipe Lining
Friends of Badger State Trail	Alternative 4 – Corrugated Metal Pipe Lining
Green County Tourism	Alternative 4 – Corrugated Metal Pipe Lining
Ice Age Trail Alliance	Alternative 4 – Corrugated Metal Pipe Lining
Nonmotorized Recreation and Transportation Trails Council*	Alternative 4 – Corrugated Metal Pipe Lining
Polk County Tourism	Alternative 3 – Steel Framing/Scaffolding with Roof and Portal Doors
South Central Wisconsin Rail Transit Commission	Alternative 2 – Rock Netting with Portal Doors
WI Bicycle Federation	Alternative 4 – Corrugated Metal Pipe Lining

*The Nonmotorized Recreation and Transportation Trails Council also supports an additional trail above the tunnel with Alternative 4 to provide a loop trail and different experience for users including those uncomfortable being inside the tunnel.

XI. Recommendation

Alternative 4 – Corrugated Metal Pipe Lining is recommended because it would provide a long-term solution for ensuring safer, year-round access to the tunnel for recreational purposes while also preserving the bat hibernaculum. Additionally, the anticipated construction costs are reasonable and this option would have a long lifespan, requiring little maintenance. Design adjustments may be necessary as the project enters the design and engineering phase to meet budget constraints, comply with historical, cultural, and endangered resources review requirements, or contend with unforeseen circumstances. Engineering assessments may also be conducted as part of the design process to explore the feasibility of exposing sections of the original tunnel done in conjunction with Alternative 4. This would allow users to experience the natural aesthetics of the original tunnel and create interpretive opportunities. For example, the corrugated metal pipe lining could possibly start further back, inside the tunnel portals, to leave the original tunnel exposed for viewing. The other Tunnel Repair Alternatives (Alternatives 2, 3 and 5) outlined in this report may be considered if Alternative 4 is not proven feasible.

It is recommended that Alternative 4 – Corrugated Metal Pipe Lining be funded in the 2023-2025 capital development budget. The next action steps for this project include:

- Internal and external communications regarding the path forward.
- Develop budget request to submit for the Department's 2023-2025 biennium budget.

XII. Conclusion

The Stewart Tunnel is one of the primary attractions along the Badger State Trail. Reopening this section of trail is a priority for the Bureau of Parks and Recreation. This Alternatives Analysis provided a mechanism for the bureau to analyze a variety of considerations, including public and stakeholder input, to formulate a recommendation for reopening the Stewart Tunnel section of the Badger State Trail. Alternative 4 – Corrugated Metal Pipe Lining is recommended because it would provide a long-term solution for ensuring safer year-round access to the tunnel for recreational purposes while also preserving the bat hibernaculum. It is recommended that this alternative be funded in the 2023-2025 capital development budget.

Appendices

[Appendix A - Key Considerations and Evaluation Measures](#)

[Appendix B - GEI Engineering Report](#)

[Appendix C - Survey Responses \(Questions 5 - 9\)](#)

[Appendix D - Survey Responses \(Question 10\)](#)

[Appendix E - Stakeholder Respondents](#)



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