United States Department of the Interior
National Park Service

SG-1306

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in National Register Bulletin, *How to Complete the National Register of Historic Places Registration Form.* If any item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions.

1. Name of Property

Historic name: Sixteen Tunnel

Other names/site number: Tunnel No. 16

Name of related multiple property listing: N/A

(Enter "N/A" if property is not part of a multiple property listing)

2. Location

Street & Number: N/A

City or town: Sunbright State: TN County: Morgan

Not For Publication: N/A Vicinity: X Zip: 37872

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended,

I hereby certify that this X nomination ___ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60.

In my opinion, the property X meets ___ does not meet the National Register Criteria. I recommend that this property be considered significant at the following level(s) of significance:

☐ national ☐ statewide ☒ local

Applicable National Register Criteria: ☐ A ☐ B ☒ C ☐ D

Claudia Tubbs 5/17/17

Signature of certifying official/Title: **Date**

Deputy State Historic Preservation Officer, Tennessee Historical Commission

State or Federal agency/bureau or Tribal Government

In my opinion, the property ___ meets ___ does not meet the National Register criteria.

Signature of Commenting Official: **Date**

Title: **State of Federal agency/bureau or Tribal Government**

Sixteen Tunnel — Morgan County, TN
Name of Property — County and State

4. National Park Service Certification

I hereby certify that this property is:

- ✓ entered in the National Register
- ___ determined eligible for the National Register
- ___ determined not eligible for the National Register
- ___ removed from the National Register
- ___ other (explain:) ___

Signature of the Keeper (For) — Date of Action: 7.10.2017

5. Classification

Ownership of Property
(Check as many boxes as apply.)

Private	X
Public – Local	
Public – State	
Public – Federal	

Category of Property
(Check only **one** box.)

Building(s)	
District	
Site	
Structure	X
Object	

Number of Resources within Property
(Do not include previously listed resources in the count)

Contributing	Noncontributing	
0	0	buildings
0	0	sites
1	0	structures
0	0	objects
1	0	Total

Number of contributing resources previously listed in the National Register 0

Sixteen Tunnel | Morgan County, TN
Name of Property | County and State

6. Function or Use

Historic Functions (Enter categories from instructions)	Current Functions (Enter categories from instructions)
TRANSPORTATION/rail-related	VACANT/NOT IN USE

7. Description

Architectural Classification
(Enter categories from instructions.)
Other: arched tunnel

Materials: (enter categories from instructions.)
Principal exterior materials of the property: STONE/Limestone; BRICK; CEMENT

Narrative Description

Sixteen Tunnel was constructed ca. 1879 in Morgan County (population 21,987 in 2010), Tennessee as part of the Cincinnati Southern Railway (U.S. Census Bureau 2017). The tunnel is located in the Sunbright vicinity within a heavily wooded area, approximately 0.20 miles east of Highway 27 and near Scott Branch. Situated within the Cumberland Plateau which is characterized by steep, rocky outcrops and bluffs, the tunnel cuts through a narrow ridge that ranges in elevation from 1,440 to 1,580 ft above sea level from its base to its peak. Mature trees and secondary growth grow atop the tunnel. The immediately surrounding area is comprised of dense woods also composed of mature trees and secondary growth.

Sixteen Tunnel is a 1,084-foot long arched tunnel with an opening at its northern and southern ends (CNOTP 1889:8). Initially, the structure was timber-lined, but was relined with brick and stone ca. 1885. Each tunnel opening measures fifteen feet five inches in width, and fourteen feet six inches in height at its center. Each opening is flanked on each side by a five-foot, one-inch-wide, stone masonry wing wall faced with coursed cut limestone that is partially coated with a one-half-inch-thick layer of concrete with weep-holes for water drainage. Surrounding the arched opening, typical stretcher stones measure two feet seven inches in length

by one foot two-and-one-half inches in height, while typical headers measure one foot six inches in width by one foot two-and-one-half inches in height, which indicates the implementation of Cincinnati Southern Railway's first class arch masonry standards (Bouscaren 1880:13-15). The masonry's horizontal joints (spaces between each stone unit) run the entire length of the tunnel face and into the interior, while the vertical joints are broken (or not aligned); immediately surrounding the arch, the vertical joints are stepped.

A rectangular stone bearing the inscription ‘No 16’ was once centrally located above the arch on the tunnel’s south face, but has fallen (or been removed) sometime since 2012 (*Figure 1*). The interior of the tunnel is lined with coursed cut limestone at its base, with a brick-lined ceiling coated with a half-inch-thick layer of hydraulic cement. According to Cincinnati Southern Railway's tunnel lining guidelines, bricks used to line the tunnel interior roof are molded to nine inches long, two-and-one-half inches thick, and four-and-one-half inches wide. The original railroad track is no longer extant and the tunnel floor is now composed of packed dirt and gravel. Vacant spaces between the masonry and surrounding natural rock were filled with dry packing, which consisted of durable stone, "broken to the required size to pack well and well rammed in" (Bouscaren 1880:13-15).

The only non-extant component once associated with the tunnel was the railroad track, which was removed sometime after 1955 and once extended from the north and south ends of the tunnel. Although the rail track is gone, the railroad bed and grade remain. Leading up to each end of the tunnel, the hillside has been cut away to create a corridor for the rail bed. This cut levels off with the natural terrain south of Sixteen Tunnel. Although the railroad track has been removed, the extant corridor demonstrates the original location of the railway as it approached and left the tunnel structure.

Sixteen Tunnel | Morgan County, TN
Name of Property | County and State

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

- [ ] A Property is associated with events that have made a significant contribution to the broad patterns of our history.
- [ ] B Property is associated with the lives of persons significant in our past.
- [X] C Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- [ ] D Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations N/A
(Mark "x" in all the boxes that apply.)
Property is:

- [ ] A Owned by a religious institution or used for religious purposes.
- [ ] B removed from its original location.
- [ ] C a birthplace or grave.
- [ ] D a cemetery.
- [ ] E a reconstructed building, object, or structure.
- [ ] F a commemorative property.
- [ ] G less than 50 years old or achieving significance within the past 50 years.

Areas of Significance
(Enter categories from instructions.)
ENGINEERING

Period of Significance
Ca. 1879-1888

Significant Dates
Ca. 1879; 1885

Significant Person
(Complete only if Criterion B is marked above.)
N/A

Cultural Affiliation
N/A

Architect/Builder
Cincinnati Southern Railway

Statement of Significance Summary Paragraph

Sixteen Tunnel meets National Register Criterion C for local significance in Engineering as a good example of a late-nineteenth-century railroad tunnel that has not been modified since ca. 1885 and reflects changing methods and technology used in drilling and lining railroad tunnel structures. The brick-and-stone-lined arched tunnel is representative of tunnel engineering methods used by the Cincinnati Southern Railway in the 1870s and 1880s throughout the Second District of their Queen and Crescent Route. The structure's Period of Significance begins with its construction ca. 1879 and terminates in 1888, upon the completion of its relining. Sixteen Tunnel remains unaltered since this time, and retains integrity of design, feeling, location, materials, setting, and workmanship.

Narrative Statement of Significance

Historical Background

Located in East Tennessee, three treaties with the Cherokee Nation secured settlement in the area that would eventually become Morgan County: the Treaty of 1794, the Third Tellico Treaty of 1805, and the Hiwassee Purchase of 1819. Between 1785 and 1790, settlement into the region was spurred by the State of North Carolina, which issued land grants to Revolutionary War veterans in exchange for their military service. Samuel and Martin Hall, two veterans who capitalized on these land grants, are attributed as being the first to settle the area in 1807. The Tennessee General Assembly created Morgan County in 1817 out of a portion of Roane County and the newly formed county was named in honor of Revolutionary War veteran General Daniel Morgan (Todd 1998:645).

Although Morgan County is renowned for its natural beauty, its geographical composition hindered the settlement and economic development of the county. During the early settlement period, many counties benefited from Tennessee’s two principal rivers, the Tennessee and Cumberland, which played vital roles in transporting people and goods. Unfortunately, Morgan County’s two main waterways (the Obed and Emory Rivers) were not suitable for river transport. Moreover, the county’s topography limited farming to the fertile mountain valleys, which amounted to less than half of the county’s available land. Accordingly, the county was slow to develop, which forced settlers to rely on subsistence farming and the region’s plentiful game (Todd 1998:645-646).

By the mid-nineteenth century, a trunk line railroad system was implemented in Tennessee that connected the major cities of Chattanooga, Knoxville, Memphis, and Nashville with broader regional markets in the South. These early rail lines included the Nashville and Chattanooga; Louisville and Nashville; and Memphis, Clarksville, and Louisville, amongst others. In East Tennessee, the first state-chartered railroads to be completed were the East Tennessee and Georgia and the East Tennessee and Virginia, which connected the region with markets in the North Atlantic. The completion of these major railroads allowed for the construction of smaller branch lines from the primary 'trunk' line into less-populated areas (Jones n.d.:5-15).

According to historian James Jones, "Tennessee's nineteenth- and twentieth-century railroad development experience was closely tied to the exploitation of mineral and lumber resources and passenger transportation" (1987:2). The discovery of coal deposits on the Cumberland Plateau offered the possibility to advance the economy of rural Morgan County. However, by 1860 only two mines were in operation, employing a total of

sixteen men (Todd 1998:645-646). Coal mines in Morgan County were largely handicapped by the county's lack of a railroad for the transport of coal to consumer markets.

After the Civil War, Morgan County languished economically; however, new opportunities arose with the construction of the Cincinnati Southern Railway in the late-nineteenth century. In the period after the Civil War, a national increase in steel production led to greater demand for coal and iron and stimulated the construction of additional rail lines throughout the region (Jones 1987:2). The Cincinnati Southern Railway was constructed and owned by the city of Cincinnati and leased long-term to the Cincinnati, New Orleans, and Texas Pacific Railroad (CNOTP). The 388-mile rail line stretched from Cincinnati to Chattanooga, passing through Morgan County (*Figure 2*) (Abandoned 2015). Cincinnati had begun plans to develop its own railroad in 1835 in order to establish a transportation network between the South and the Midwest and become economically competitive with the city of Louisville, Kentucky, which was the headquarters of the Louisville & Nashville Railroad (Abandoned 2015). However, financial troubles hampered the railway's development plans, and an 1851 amendment to the Ohio Constitution prevented cities from entering into partnerships with stock corporations. Additional efforts to raise $1 million in cash by private investors for the construction of a Cincinnati, Lexington, and East Tennessee railroad were halted due to the onset of the Civil War (Abandoned 2015).

During the Civil War, President Abraham Lincoln recommended the construction of a military railroad that would provide a Union supply line into the South, in an effort to establish a Midwest-South rail connection. Although initial surveys for the proposed railroad were undertaken, no further progress was made (Abandoned 2015). Barred from partnering with stock corporations, Cincinnati municipal leaders backed the construction and outright ownership of the railroad by the city itself. Proposed by Edward A. Ferguson in 1868, the resolution was adopted by the city council in May of 1869 (Abandoned 2015). A month later, Chattanooga was selected as the Cincinnati Southern Railway's terminus and a $10 million municipal bond was issued to fund the railroad's construction. Chattanooga was delighted with their selection as the line's terminal city, which was chosen because it already served as a major rail hub from which thousands of miles of existing railway branched (*The Chattanoogan* 2004). In a letter to the mayor of Cincinnati printed in national newspapers, Chattanooga mayor A.S. Sharpe exclaimed,

> "Chattanooga hails with joy the promise of her speedy union with the Queen City of the West. Sitting in her mountain home, where seven fertile valleys converge, and holding the key to the great system of Southern railroads, she will receive their wealth and pour it into the lap of her elder sister city. The action of Cincinnati today is the harbinger of relations which will bind the whole South to her in close ties of mutual friendship" (*The Pittsburgh Gazette* 1869).

The Tennessee Legislature granted the Cincinnati Southern Railway a charter on January 20, 1870 and the railway began the process of land acquisition shortly after (Freytag and Ott 1971:48). In December of 1873, five thousand dollars were awarded for the excavation of the rail line's first tunnel through King's Mountain, Kentucky (Abandoned 2015). Construction began immediately, but by May 1875 the initial municipal funds were depleted. The city of Cincinnati issued an additional $6 million bond in March 1876. By the following year, the railway was completed between Ludlow and Somerset, Kentucky and trains began running along

that northern segment. Funding ran out yet again, however, and another $2 million municipal bond was requested. Public opposition to the project grew as a result of the repeated delays and financial issues associated with the railway. City voters initially rejected the additional bond proposal, but a second vote was held and the measure passed with restrictions that no additional funds would be granted (Abandoned 2015). By 1877, construction in Tennessee was ready to begin.

Prior to the railway's installation, the immediate region surrounding Sixteen Tunnel was sparsely populated, and the original owner of the land immediately containing the structure is yet unidentified. A newspaper article from 1872 in the *Nashville Union and American* indicates that Morgan County residents "conditionally donated" 20,000 acres of land to the railway, likely seeing the huge economic gains to be had by granting the right-of-way. Thirty-two land transactions between the Cincinnati Southern Railway and local residents were recorded between September 1877 and March 1880; each tract of land was purchased by the railway for one dollar (Morgan County Register of Deeds n.d.). Lands surrounding Sixteen Tunnel were under the ownership of the Rugby Board of Aid to Land Ownership (BALO, later known as the Rugby Land Company) by the late 1870s (Morgan County Register of Deeds 1916:229). An agency created by the future founder of Rugby, Thomas Hughes, the BALO was attracted to the Cumberland Plateau by the new rail line, which provided supply and passenger access to the region (Alexander 2014:77). The BALO purchased approximately 350,000 acres (roughly 470 square miles) of land on the plateau (known as the Rugby Board of Aid Estate [BAE]), with the aim of attracting settlers from the northeastern United States and Europe to both the plateau region and to the colony of Rugby (*Figure 3)* (Hughes 1878). Available farmland on the BAE, intersected by ten miles of the Cincinnati Southern Railway, was marketed to potential buyers by the BALO as "well-watered and timbered, and have excellent market, shipping, and especially lumbering facilities" (*The Rugbeian* 1883). The BALO land was divided into 100-acre farms that fronted the railway and were all located within three miles of the rail depots at Sunbright and Glen Mary (*The Rugbeian* 1883). According to the BALO, buyers would enjoy health benefits such as freedom from malarial, pulmonary, and intestinal diseases; as well as abundant natural pastures, rich soil, and flowing mineral springs (*The Rugbeian* 1883).

Construction labor for the railway project was provided by area convicts, who were contracted to the Cincinnati Southern Railway through Cherry, O'Conner, and Company (COC). The COC was a private agency that held a Tennessee convict lease until the 1890s, and facilitated the employment of prisoners (at a profit) to various corporations. Prisoners, the majority of whom were black men, also worked in factories, on plantations, the Tennessee Central Railroad, and for the Tennessee Coal, Iron, and Railroad Company from the 1860s until the late 1920s. The state of Tennessee relinquished full control of the convict labor force to the leasing agencies, who were responsible for feeding and housing the prisoners (Bergeron et. al. 1999:200). Men worked sixteen-hour days, preparing the rail beds and laying track on the Cincinnati Southern Railway (Robinson 2007:184). During construction, inmates were housed in temporary stockades located along the rail route (*The Chattanoogan* 2004).

The 388-mile rail line was finally completed in December 1879, and the first freight train completed the Cincinnati-Chattanooga route in February of the following year (Abandoned 2015); the first passenger train followed a month later. On September 7, 1881, the Cincinnati Southern Railway was leased to the CNOTP

for a term of twenty-five years. With the addition of the Cincinnati Southern line, the CNOTP now had a direct route from Cincinnati to New Orleans, which became known as the "Queen and Crescent" route (Hall 1902:71).The new rail line entered Morgan County through Emory Gap and followed the Emory River towards Lancing. From there, it ran north to south through the central portion of the county. Shorter rail spurs transported lumber to the railway from Nemo and Pilot Mountain (Dickinson n.d.:46). The Cincinnati Southern Railway increased the economic success of the Cumberland Plateau region in the late-nineteenth and early-twentieth century, helping to spur the development of towns such as Lancing, Sunbright, and Oakdale, which prospered in conjunction with the flourishing logging industry (*Figure 4*). The railroads also led to the creation of resorts and spas, such as Deer Lodge and Franklin, which proved to be popular summer destinations for families throughout the Southeast (Todd 1998:645). Additional railroads that later intersected the county include the Louisville and Nashville Railway, Harriman and Northeastern Railway, Morgan and Fentress Railway, and the Emory River Lumber Company Railroad (Dickinson n.d.:84-85).

The community of Sunbright, located approximately 1.2 miles southwest of Sixteen Tunnel, became an important economic hub in Morgan County and was originally called Pine Top, named for the thick pine stands that blanketed the area (Morgan County Heritage Book Committee [MCHBC] 1999:24). Sunbright was later named Stapleton, in honor of the first Pine Top postmaster, Benjamin Staples. In 1879, the town's name was changed for a third time to Sunbright, following the construction of the Cincinnati Southern Railway. Reportedly, during the construction of the railway, a laborer stood on one of the town's hills and yelled "sunbright!" Stapleton's railroad depot was given this name, which the town took up for its own shortly after (*Figure 5*) (MCHBC 1999:24). With the installation of the railway, Sunbright thrived economically and in the late-nineteenth century was home to two hotels, a general store, post office, seminary school, boarding house, and Masonic Lodge by the turn of the century (*Figures 6-9*) (Dickinson n.d.; MCHBC 1999). The Southern Railway Company, which at the turn of the twentieth century had subsumed control of the CNOTP, established an engineer's office at Sunbright headed by C.A. Hayworth and C.O. Lowe (Earth and Stone Movers 1918:9).

The Cincinnati Southern Railway was divided into three districts; Sixteen Tunnel is located in the second district, which stretched from Danville, Kentucky to Oakdale, Tennessee. The district was given the nickname "The Rathole" due to its long series of hairpin curves, steep grades, and twenty-seven tunnels (Abandoned 2015). The Rathole included a tunnel roughly every ten miles, "so many that it is not considered worthwhile to turn out the lights in the passenger coaches" (Earth and Stone Movers 1918:7). Each tunnel was numbered sequentially from north to south and varied in length from 3,992 feet (Tunnel No. 2) to 189 feet (Tunnel No. 6) (Southern Railway 1963). The tunnel structures were typically fifteen feet in width and twenty feet in height. The rail ties that ran through the tunnel were originally constructed as five-foot, broad-gauge ties, but were converted to standard-gauge in 1886. In a massive undertaking, the company managed to convert the entire railroad in just thirteen hours (Abandoned 2015).

Those tunnels (including Sixteen Tunnel) not excavated through solid rock were originally lined with timber. The CNOTP lease required the relining of these tunnels with stone and brick, as the original timber lining began to decay within a few years. According to the railroad's annual report, Sixteen Tunnel was at least partially relined with brick and stone by 1885 (CNOTP 1886:8). During the relining process, company

regulations dictated the employment of the highest-quality burnt bricks, which were to be laid using the best available hydraulic cement mortar. The interior and exterior of the tunnel were coated in a one-half-inch-thick layer of hydraulic cement, leaving weep holes for water drainage. Only first- or second-class masonry was considered acceptable for stonework on Cincinnati Southern structures (Bouscaren 1880:13). According to Cincinnati Southern Railway's construction standards, first class masonry (and arch masonry for tunnels and arched bridges) employed the highest quality materials dressed to specific sizes. Second class masonry used slightly lesser quality stone and brick, of smaller size (Bouscaren 1880:13). By 1888, the arching of Sixteen Tunnel was completed, at a total cost of $46,127.22 (approximately $1.2 million in today's dollars) (CNOTP 1889:8). A total of sixteen tunnels across the district were relined by 1892 (Abandoned 2015).

Over time, the heavy usage of the railway created a need for regular upgrades and maintenance. At the turn of the century, four tunnels in the Second District that had yet to be relined were either simply removed and the line was rerouted, or the tunnel's roof was removed in a process known as 'daylighting' (*Figure 10*) (Abandoned 2015). The railway's success necessitated the installation of double tracks along the route. This work was conducted from 1919 to 1920 and led to the removal of a number of tunnels which were too narrow for the new equipment. Seven tunnels in the district were simply abandoned as the line was rerouted. Sixteen Tunnel continued to be used for southbound rail traffic only and an additional line was constructed to the east to accommodate northbound traffic, which is visible on the Sixteen Tunnel USGS location map (Abandoned 2015). Eleven miles of the track constructed in Morgan County was awarded to H.H. Thrasher, a contractor from Knoxville. Thrasher made his project headquarters at Sunbright and there operated five steam shovels. A portion of the work was subcontracted to the Costello Brothers of Indianapolis and it was this firm that handled the two miles of construction directly around Sunbright. Additional subcontractors on the project included John O'Hara, the Chickamauga Quarry Company, and Thomas Sheahan, who supplied necessary concrete work (Earth and Stone Movers 1918:9).

By 1925, approximately 1.7 billion ton-miles of revenue freight had been transported on the Cincinnati Southern line through Morgan County (Abandoned 2015). The Cincinnati Southern Railway brought in $1.1 million (approximately $15.3 million in today's dollars) in annual rent from the CNOTP for the city of Cincinnati, and the city remained the only municipality in the country to own a railroad into the early 1920s (*Toledo Blade* 1923). Freight traffic continued to increase along the railway through the mid-twentieth century, and by 1967, over 4.1 million ton-miles of revenue freight was shipped. During this same period, passenger traffic decreased, after peaking in 1925 with a maximum ridership of 134,000 passengers (Abandoned 2015). In the late 1940s, the newer northbound track at Sunbright was doubled, and the southbound track (including Sixteen Tunnel) was used only for 'passing siding,' a track specifically for slower traffic, allowing faster trains to pass (Abandoned 2015; Bridgehunter.com 2015). The tunnel was officially abandoned in 1955 after the installation of Centralized Traffic Control technology, which negated the need for a passing track (Abandoned 2015). In 1961, five other original tunnels in Morgan County were removed or enlarged, but Sixteen Tunnel remained untouched (Dickinson n.d.:112-113). In 1961, the Sunbright rail depot officially closed, and its rail agent was transferred. By 1969, passenger service through the county ended (Dickinson n.d.:112-113). The railway became part the Southern Railway Western Division in 1972, and was later bought by Norfolk Southern Corporation (Abandoned 2015).

The construction of the Cincinnati Southern Railway had a profound impact on East Tennessee, particularly on Morgan County. Area residents that had previously been isolated from the rest of the state due to the region's mountainous terrain found themselves with new travel opportunities and access to markets and goods from farther afield (Alexander 2014:76). Funded by municipal bonds and erected on lands donated by area residents, the railway was a large-scale public construction project that revolutionized the rural way of life in Morgan County. Of the initial twenty-seven tunnels constructed in the Second District, at least fourteen tunnel structures have been removed, daylighted, or enlarged over the course of the last ninety years. The remaining thirteen tunnels are extant, although no longer in use and in varying states of disrepair (Abandoned 2015; *Ties* 1963). As all Cincinnati Southern Railway tunnels were constructed and designed according to strict guidelines and standards, the tunnels exhibited similar designs in masonry, but varied in size, width, and arch angle, depending on each tunnel's particular site.

Engineering

The history of tunneling for infrastructure projects in the United States is inextricably linked to tunnel construction traditions and technology implemented throughout Europe. American engineers borrowed from European ideas and techniques of hand-drilling and excavation (Drinker 1893:19). In the period from 1791 to 1828, thirty-six railroad, canal, or navigation companies were incorporated in the United States, which drove the need for advanced methods in infrastructure technology. In the United States, tunnel engineering was first attempted in 1821 with the construction of a tunnel at Pennsylvania's Schuylkill Navigation Canal (NRHP 5/6/1988). Ten years later, the first railroad tunnel was drilled along Pennsylvania's Allegheny Portage Railroad (NRHP 10/15/1966). At that time, tunneling through a natural obstruction was considered to be a last-resort measure and more often railroad engineers chose to re-route (Bianculli 2003:14, 94). In the 1830s and 40s, railroad engineers consistently preferred to reroute or heavily grade a corridor, considering this work to be cheaper and quicker than drilling a tunnel. Early tunnels were often constructed using the "cut and cover" method (as opposed to drilling), whereby a cut was excavated from the ground surface and an arched tunnel was erected in the cut; the cut was back-filled with gravel, covering the tunnel structure, and the ground surface was replaced (Bianculli 2003:95). An example of this method was the Pennsylvania Railroad tunnel in Philadelphia. In early drilling methods, multiple shafts were bored at each end of the tunnel to mitigate anticipated alignment errors (Bianculli 2003:95).

By the mid-nineteenth century, more than fifty tunnels had been completed in the United States, of which twenty-nine were for railroad purposes. Between 1850 and 1880, there was a large increase in the number of railroad tunnels constructed throughout the country, largely due to advancements in explosives technology (such as the development of nitroglycerine and dynamite) and the invention of specialized machinery and tools like pneumatic rock drills, which allowed tunnels to become more economically practical (Bianculli 2003; Drinker 1893). Although more powerful explosives facilitated tunnel boring, they remained incredibly dangerous. Prior to the invention of the safety fuse, many accidents occurred during the process of blasting. While the implementation of safety fuses reduced the number of accidents, they were not completely eradicated (Bianculli 2003:97).

Henry S. Drinker became the best known nineteenth-century tunnel builder and wrote the definitive text on tunnel construction in 1893, entitled *Tunneling, Explosive Compounds, and Rock Drills*. Drinker worked as a mining engineer on the Easton and Amboy Railroad in New Jersey, where he utilized an Ingersoll pneumatic drill for the construction of the Musconetcong Tunnel. According to Drinker, pneumatic rock drills brought the field of tunneling into the modern era; the first machine-operated drill was patented by J.M. and John A. Singer in May 1839 and was first used in Illinois. The Singer drill was a drop-drill which could only be used for the excavation of vertical holes (Drinker 1893:189). Five years later, C. Brunton developed a drill-hammer that used compressed air to power the tool; additional technological advances in the mid- to late-nineteenth century included the patent of a steam forge-hammer, a revolving-cutter machine, diamond-borers, percussion rock drills, and full-area tunneling machines (Drinker 1893:191-197).

For excavation along the Cincinnati Southern Railway, laborers used both churn drills (operated by hand) and mechanized diamond drills (American Railway Engineering Association 1915:226). A churn drill was a large drilling machine mounted on four wheels that would chip away at rock in successive blows, thereby deepening the bore hole (Hudson Institute of Mineralogy 2017). According to Drinker, mechanized diamond drills were one of the more costly methods of drilling, but produced results that were "beautifully straight and smooth when compared with the results obtained by the usual process of hand-drilling" (1893:224). The drill was driven using two oscillating cylinders set at an angle, attached to an engine-turned drum. Two parallel legs and a moveable third leg support the apparatus. Explosive material was then loaded into the drilled shafts and detonated (Drinker 1893:225). All resulting debris was shoveled into an empty railcar and rolled out of the tunnel.

An 1875 progress report on the construction of the Cincinnati Southern Railway recommended that all tunnels were to be excavated to accommodate a single track. When tunneling through areas of looser rock or soil, it was necessary to support the roof of the tunnel structure, typically done through the method of timbering (Bianculli 2003:97). Temporary timber supports were used to initially line the tunnels, and were considered a cost-effective measure that could last for twenty to fifty years in dry conditions, until profits from the completed railroad allowed for the completion of masonry work (*Figures 11-12*) (Bianculli 2003:94). When the timber supports became wet, however, they decayed rapidly and only lasted approximately seven years. To allow for more localized supervision, construction of the railroad was divided into forty-mile segments, which were further subdivided into ten-mile components that were directly supervised by a Resident Engineer (Hall 1902:53). It was up to the Resident Engineer to determine whether vertical shafts would be sunk into each hilltop to assist excavation and to account for all costs, including the materials and labor necessary for ventilation, water removal, and any hoisting or pumping machinery (Lovett 1875:18). The engineer's duties also included supervision of the selection of materials for the tunnel lining (brick, stone, or timber) and installation thereof. Following the completion of the lining, both the tunnel interior and faces were to be treated with a one-half-inch-thick hydraulic cement coating (Bouscaren 1880:13).

When relining the tunnels, the Cincinnati Southern Railway recommended the use of "first class arch masonry," which served as the railway's strictest standard for tunnel and arched bridge construction. As stipulated in these guidelines, courses of stone were to measure between ten and thirty inches in thickness,

tapering from the base to the top of the structure (Bouscaren 1880:13). Stone courses were to be laid continuously and on their natural surface. Joints (the spaces surrounding each stone) were to be "well broken" vertically, with no two vertical joints to be directly in line with one another. Horizontal joints were continuous from the tunnel faces through the interior. Prior to installation, each stone unit was to be dressed (i.e. hand cut) as necessary to create a rectangular shape. Each joint was to be no more than one-half inch thick, and the entire wall was to be laid flush using cement mortar; any spaces between the facing and the surrounding natural rock were to be filled with cement-laid small stones and spalls (stone fragments) (Bouscaren 1880; Building Stone Institute 2016). Ring stones directly surrounding the opening were to have joints of three-eighths-inch thickness, and were to be cut and dressed to shape at the engineer's discretion (Bouscaren 1880:13-15). Bricks used to line the tunnel interior roof were to be well-tempered, of the highest quality, and molded to dimensions of nine inches long, two-and-one-half inches thick, and four-and-one-half inches wide; moreover, no cracked or improperly-fired bricks were allowed to be used. Any vacancies behind the walls or above the arch were to be filled with either dry packing or concrete, as directed by the engineer (Bouscaren 1880:13-15). These stringent standards ensured the stability and longevity of the tunnel structures and were closely followed by contractors and engineers, who were held personally responsible by the railway for all accidents or structural failures (Boucaron 1880:17). Although vandalism and disrepair as a result of neglect have resulted in the loss of some stone masonry work, the tunnel remains largely intact, and serves as a testament to the Cincinnati Southern Railway's high engineering standards and use of high-quality materials.

As previously stated, the Cincinnati Southern Railway was a massive interstate railroad project that involved the construction of twenty-seven tunnels within "The Rathole," which contains the nominated property and was particularly well-known for its steep grades and winding curves. In addition to tunnels, the Cincinnati Southern railway's original construction included 105 bridges and viaducts of varying sizes. From its initial conception, the Cincinnati Southern Railway was designed to be a 'first class' railroad, and its series of tunnels were seen as a marvel of engineering in the Southeast. While other railroads constructed in the late-nineteenth century emphasized light equipment with heavy grades and sharp curves in order to keep costs at a minimum, the Cincinnati Southern focused on the use of quality, long-lasting materials and the construction of tunnels, to create a straighter rail line that would require less habitual maintenance (Hall 1902:52-55). Sixteen Tunnel is one of only thirteen remaining tunnels constructed by the Cincinnati Southern Railway and is a good, extant example of a brick-and-stone-lined tunnel that represents late-nineteenth-century tunneling technology. Constructed using a combination of hand-operated churn drills and steam-powered diamond drills, Sixteen Tunnel is a physical manifestation of the transitional period in the history of tunnel excavation, from the widespread use of hand-drilling techniques to mechanized drills. The advent of mechanized drilling was a watershed event in American tunnel construction, the cusp of which is represented by Sixteen Tunnel.

While the original structure was a timber-lined tunnel later relined and faced with brick, stone, and hydraulic cement, these alterations have achieved their own historical significance. Moreover, the alterations reflect the strict design and engineering standards maintained by the Cincinnati Southern Railway in the late nineteenth century. Despite the loss of some ca. 1885 stone masonry on the north and south tunnel faces and the removal of the original railroad track, this has not altered the tunnel's original appearance nor diminished its

historical significance. As such, the tunnel continues to retain a high level of integrity of design, materials, and workmanship. In addition, a high level of integrity of location and setting is maintained, as the tunnel has not been moved from its original location and the setting of the original railway corridor has been maintained. The immediate surrounding area continues to feature dense woods that are untouched by commercial, industrial, or residential development.

9. Major Bibliographic References

Abandoned
2015 Cincinnati Southern Railway. Electronic document, http://abandonedonline.net/locations/railroads/cincinnati-southern-railway/, accessed January 5, 2015.

Alexander, Brenda L.
2014 *Planting a "Community of Gentlemen and Ladies" on the Cumberland Plateau: Thomas Hughes and the East Tennessee Rugby*. Doctoral dissertation submitted to the Department of History, University of Tennessee, Knoxville.

American Railway Engineering Association
1915 *Bulletin of the American Railway Engineering Association.* Volume 17, No. 178. Electronic document, https://books.google.com/books?id=mYRVAAAAYAAJ&dq=Queen+and+Crescent+rail+drill&source=gbs_navlinks_s, accessed October 5, 2016.

Bergeron, Paul H., Stephen V. Ash, and Jeanette Keith
1999 *Tennesseans and Their History*. University of Tennessee Press, Knoxville, Tennessee.

Bianculli, Anthony J.
2003 *Trains and Technology: The American Railroad in the Nineteenth Century. Volume IV, Bridges and Tunnels, Signals*. University of Delaware Press, Newark, Delaware.

Bridgehunter.com
2015 CNTP-Tunnel 16. Electronic document, http://bridgehunter.com/tn/morgan/bh54670/, accessed October 5, 2016.

Bouscaren, G.
1880 *Report on the Progress of Work and Cost of Completing and Maintaining the Cincinnati Southern Railway*. Wilstach, Baldwin, and Company Printers, Cincinnati.

Building Stone Institute
2016 Glossary of Terms. Electronic document, http://www.buildingstoneinstitute.org/technical-stone-information/rock-knowledge/glossary-of-terms/, accessed November 14, 2016.

The Chattanoogan [Chattanooga, Tennessee]
2004 Remembering the Cincinnati Southern Railroad. 11 March.

Cincinnati, New Orleans and Texas Pacific Railway Company [CNOTP]
1886 *Report And Statement Of Accounts Of The Cincinnati, New Orleans, and Texas Pacific Railway Company For The Year Ending December 31, 1885*. WM. A. Webb & Sons, Printers, Cincinnati, Ohio.

1889 *Seventh Annual Report of the Cincinnati, New Orleans, and Texas Pacific Railway Company And Statement of Accounts For The Year Ending December 31, 1888*. The Webb Stationery and Printing Company, Cincinnati, Ohio.

Dickinson, W. Calvin
n.d. *Morgan County*. Memphis State University Press, Memphis, Tennessee.

Drinker, Henry S.
1893 *Tunneling, Explosive Compounds, and Rock Drills.* John Wiley and Sons, New York.

Earth and Stone Movers
1918 "Some Problems in Railroad Construction". In *The Earth Mover*. Volume 5. March 1918. No. 1. Earth Mover Publishing Company, Aurora, Illinois.

Freytag, Ethel and Glena K. Ott
1971 *A History of Morgan County Tennessee*. Specialty Printing Company, Knoxville, Tennessee.

Hall, Charles G. (editor)
1902 *The Cincinnati Southern Railway A History*. McDonald Printing Company, Cincinnati.

Hudson Institute of Mineralogy
2017 Mindat Glossary. Electronic document, https://www.mindat.org/glossary.php, accessed April 12, 2017.

Hughes, Thomas
1878 *Extracts From Report Of The Board Of Aid To Land Ownership*. On file at the Tennessee State Library and Archives, Nashville.

JREB.org
2015 Abandoned Rathole Tunnels. Electronic document, http://www.jreb.org/ns/index.php?topic=91.100, accessed November 14, 2016.

Jones, James B.
n.d. *Early Railroad Development In Tennessee 1820s-1865. Study Unit No. 4.* Manuscript on file at the Tennessee Historical Commission, Nashville.

1987 *Railroad Development In Tennessee, 1865-1920. Study Unit No. 5*. Manuscript on file at the Tennessee Historical Commission, Nashville.

Lovett, Thomas D.
1875 *Report on the Progress of Work, Cost of Construction, Etc., of the Cincinnati Southern Railway*. Wrightson and Company, Cincinnati.

Mendenhall, Edward
1879 *Map of the Cincinnati Southern Railway and Connections*. Cincinnati Southern Railway, Cincinnati.

Morgan County Heritage Book Committee [MCHBC]
1999 *The Heritage of Morgan County, Tennessee 1817-1999*. Walsworth Publishing Company, Marceline, Missouri.

Morgan County Pictorial Historic Committee
1976 *Pictorial History of Morgan County, Tennessee*. Morgan County Pictorial History Committee, Wartburg, Tennessee.

Morgan County Register of Deeds
n.d. *Deed Index Volume A-B*. January 1818-November 1888. Roll 17. Microfilm on file at the Tennessee State Library and Archives, Nashville.

1916 Rugby Land Company to A.M. Litton et ux. Deed Book D3, pp. 229-230.

Nashville Union and American [Nashville, Tennessee]
1872 Tennessee News. 26 September.

The Pittsburgh Gazette [Pittsburgh, Pennsylvania]
1869 Southern Railroad Project- Report of City Council Committee- Chattanooga Selected as the Terminus. 5 June.

The Rugbeian [Rugby, Tennessee]
1883 Cheap Homes on the Board of Aid Estate, on the Cumberland Plateau. 10 February.

Southern Railway
1963 "The New CNO&TP opened up... straightened out...with NO LIMITS on Service..." In *Ties*. August. Electronic document, http://southern.railfan.net/ties/1963/63-8/limits.html, accessed October 5, 2016.

Ties
1963 90 Years to "Daylight". Electronic document, http://southern.railfan.net/ties/1963/63-8/daylight.html, accessed January 31, 2017.

Todd, Donald
1998 "Morgan County" in *The Tennessee Encyclopedia of History & Culture*, edited by Carroll Van West, pp 645-646. Rutledge Hill Press, Nashville.

The Toledo Blade [Toledo, Ohio]
1923 Cincinnati Only Municipality in Country That Owns a Railroad. 28 June.

U.S. Census Bureau
1872 *Statistics of Population*. Government Printing Office, Washington, D.C.

2017 Quick Facts: Morgan County, Tennessee. Electronic document, https://www.census.gov/quickfacts/table/PST045215/47129,00, accessed March 20, 2017.

Previous documentation on file (NPS):		**Primary location of additional data:**	
	preliminary determination of individual listing (36 CFR 67 has been requested)	X	State Historic Preservation Office
	previously listed in the National Register		Other State agency
	previously determined eligible by the National Register		Federal agency
	designated a National Historic Landmark		Local government
	recorded by Historic American Buildings Survey #		University
	recorded by Historic American Engineering Record #		Other
	recorded by Historic American Landscape Survey #	Name of repository:	
Historic Resources Survey Number (if assigned):			

10. Geographical Data

Acreage of Property 0.92 **USGS Quadrangle** Rugby (128-A SW)

Latitude/Longitude Coordinates

A. Latitude: 36.262252 Longitude: -84.660209

B. Latitude: 36.262219 Longitude: -84.660083

C. Latitude: 36.259519 Longitude: -84.661152

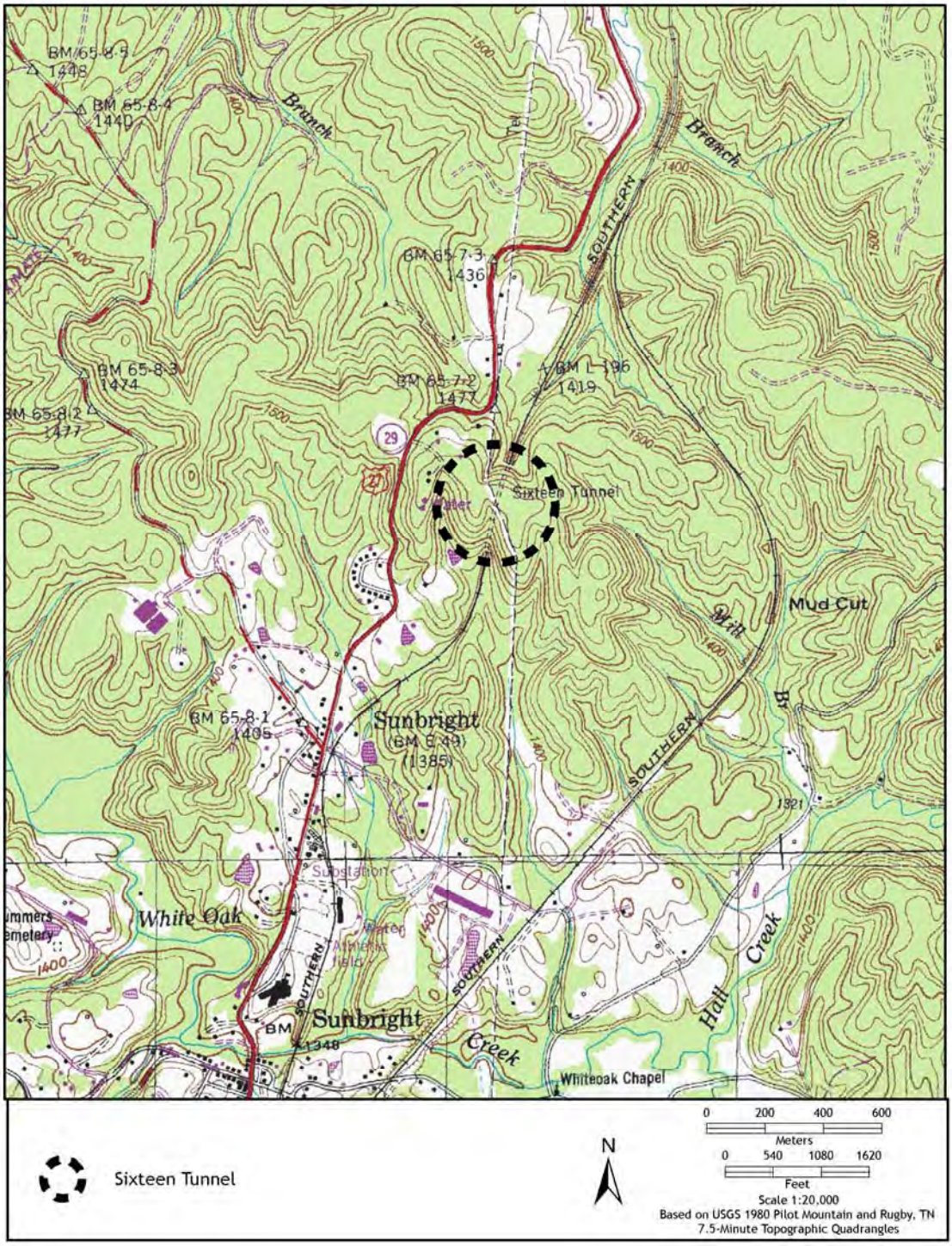
D. Latitude: 36.259486 Longitude: -84.661004

Verbal Boundary Description

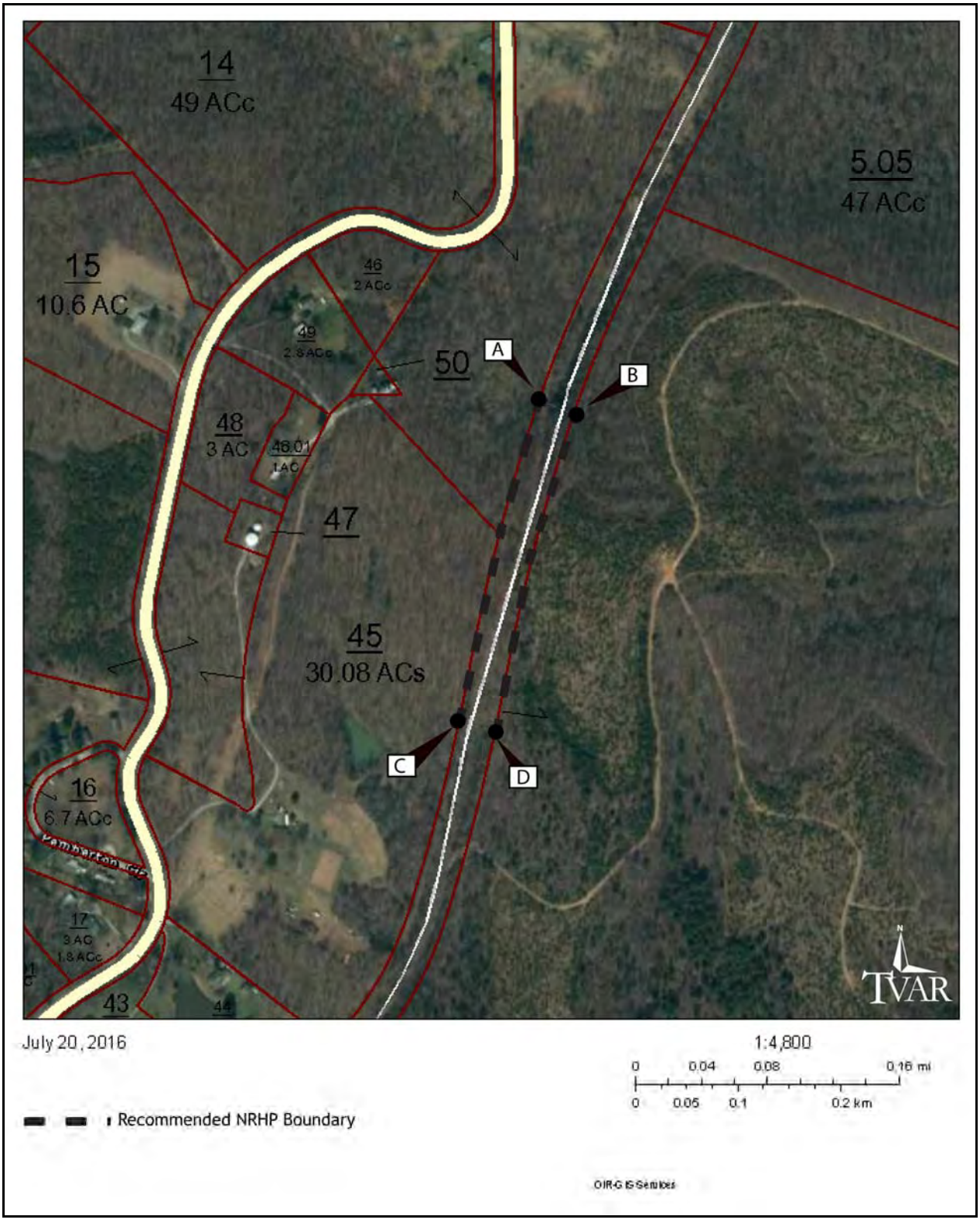
The boundary of the Sixteen Tunnel is shown on the accompanying map entitled "Sixteen Tunnel Location Map" which is based on the 1980 USGS Pilot Mountain and Rugby, Tennessee 7.5-minute topographic quadrangles. The National Register boundary for the Sixteen Tunnel includes the immediate tunnel footprint, which encompasses 0.92 acres and contains one contributing resource, the tunnel itself. The recommended NRHP boundary is a segment of the abandoned railroad right-of-way currently owned by Norfolk Southern Corporation.

Boundary Justification

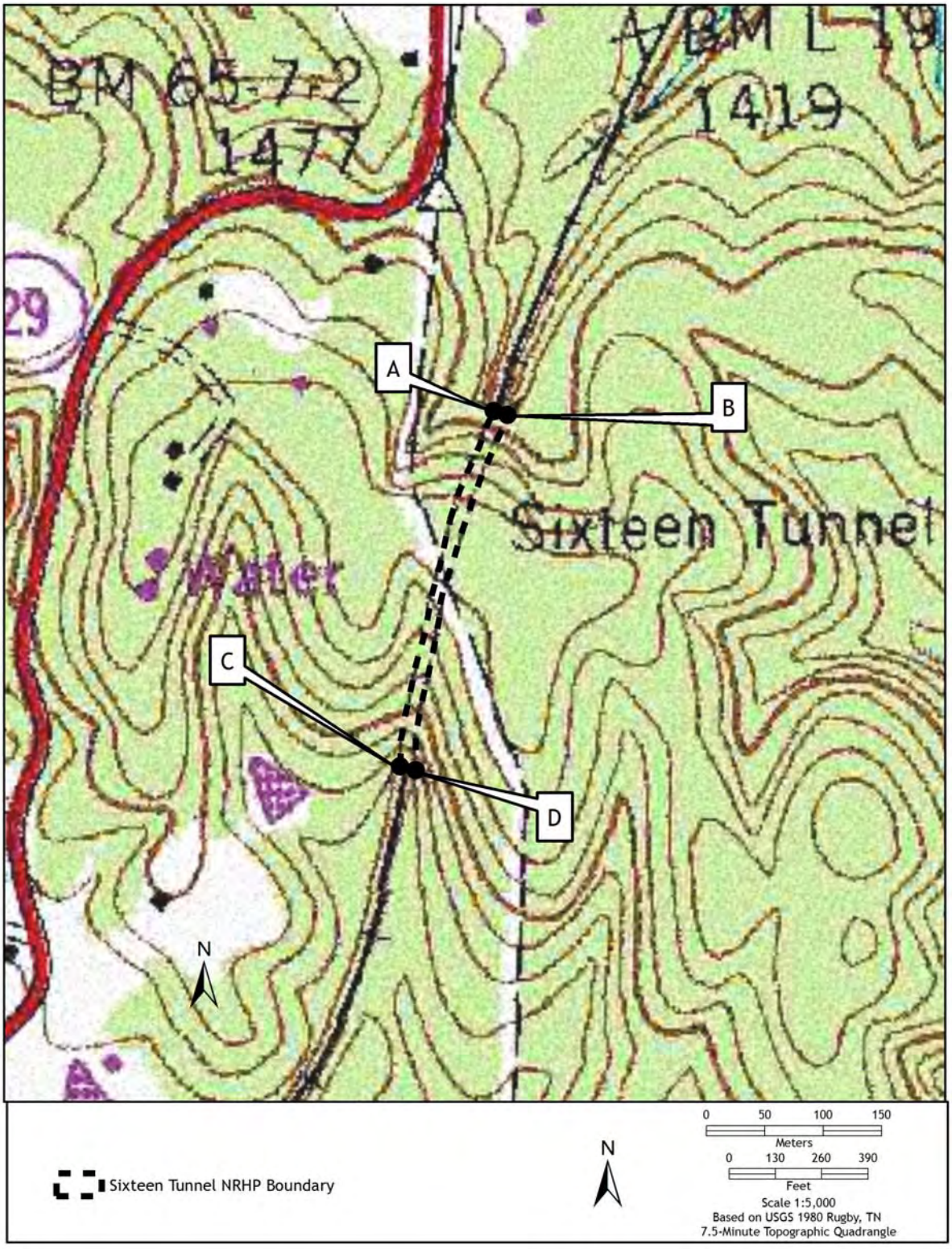
The NRHP nomination boundary solely includes the tunnel structure due to the absence of extant, additional buildings or structures historically associated with the Sixteen Tunnel. While the tunnel is flanked and topped by dense woods, the recommended boundary excludes the lands above and surrounding the tunnel. In addition, although the original railroad grade and bed extend beyond the tunnel, only those portions of the grade and bed that fall within the tunnel are included in the recommended boundary.



USGS Topographical Map (1980 Pilot Mountain and Rugby), showing location of Sixteen Tunnel.



Parcel tax map with Sixteen Tunnel NRHP Boundary.



USGS topographical map (1980 Rugby) with Sixteen Tunnel NRHP boundary.

Sixteen Tunnel | Morgan County, TN
Name of Property | County and State

11. Form Prepared By

Name	Meghan Weaver, Preservation Planner and Ted Karpynec, Sr. Preservation Planner				
Organization	Tennessee Valley Archaeological Research				
Street & Number	4219 Hillsboro Pike, Suite 201	Date	March 31, 2017		
City or Town	Nashville	Telephone	615-760-5693		
E-mail	mweaver@tvaresearch.com; tkarpynec@tvaresearch.com	State	TN	Zip Code	37215

Additional Documentation

Submit the following items with the completed form:

- **Maps:** A **USGS map** or equivalent (7.5 or 15 minute series) indicating the property's location.
- **Sketch map** for historic districts and properties having large acreage or numerous resources. Key all photographs to map.
- **Photographs (**refer to Tennessee Historical Commission National Register *Photo Policy* for submittal of digital images and prints**)**
- **Additional items:** (additional supporting documentation including historic photographs, historic maps, etc. should be included on a Continuation Sheet following the photographic log and sketch maps)

Photo Log

Name of Property: Sixteen Tunnel
City or Vicinity: Sunbright vicinity
County: Morgan State: TN
Photographer: Meghan Weaver
Date Photographed: Unless noted otherwise, all photos taken January 2016

Description of Photograph(s) and number, include description of view indicating direction of camera:

1 of 9. Sixteen Tunnel; view to north.

2 of 9. Sixteen Tunnel southern face; view to north.

3 of 9. Sixteen Tunnel northern face; view to south. Photo taken November 2016.

4 of 9. Sixteen Tunnel interior from the southern entrance; view to north. Photo taken November 2016.

5 of 9. Sixteen Tunnel interior from the northern entrance; view to south.

6 of 9. Detail of brick and stone interior lining with hydraulic cement coating on southern face. Photo taken November 2016.

7 of 9. Detail of missing stone masonry from the northern face, exposing a section view of the brick lining and hydraulic cement coating. Photo taken November 2016.

8 of 9. View to south from the Sixteen Tunnel southern entrance featuring the former railroad bed.

9 of 9. View to north from the Sixteen Tunnel northern entrance featuring the former railroad bed.

Site Plan w/Photo Key

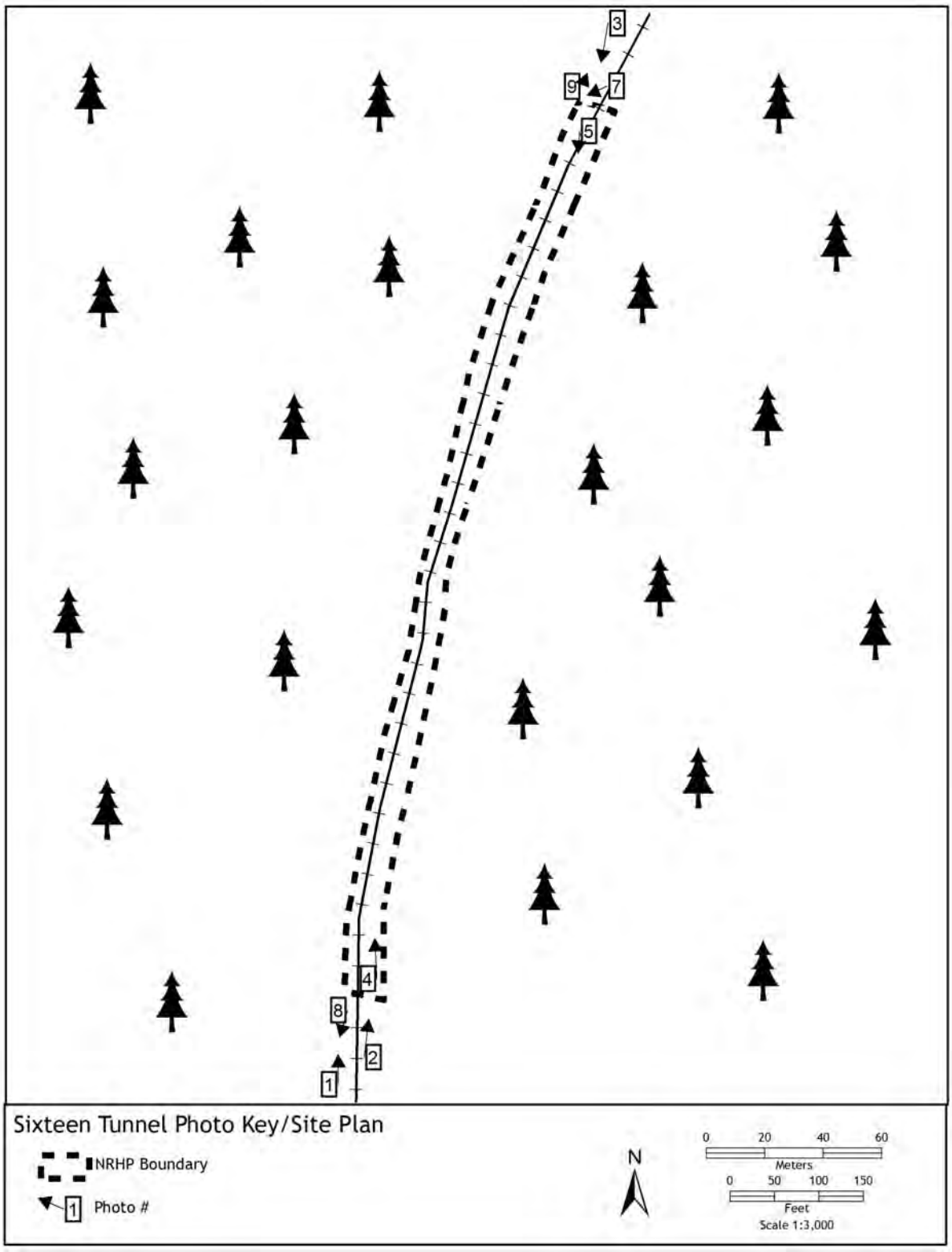


Figure 1. 2012 image showing a stone (not extant) reading "No 16," formerly located above the arched entrance on Sixteen Tunnel's southern face (Bridgehunter.com 2015).

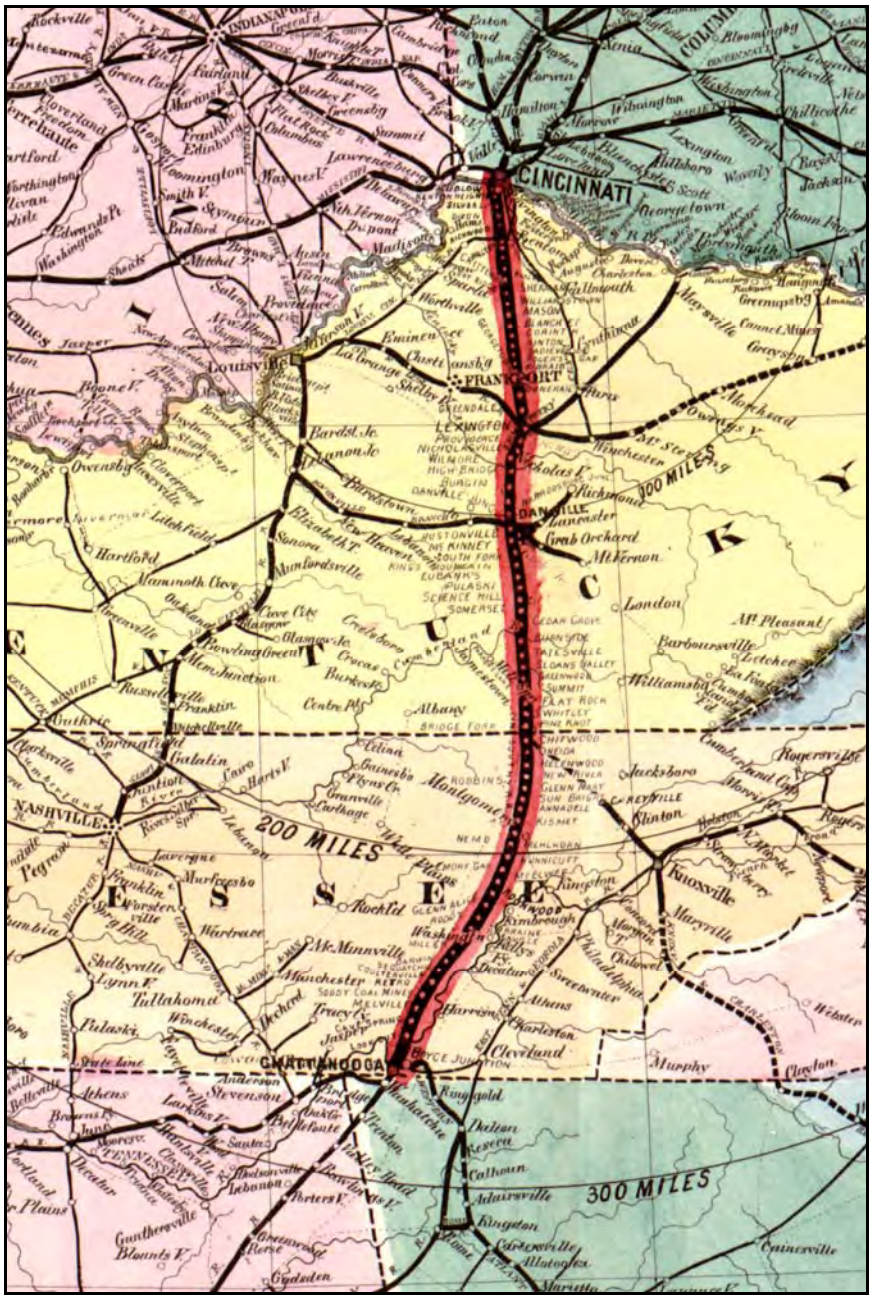


Figure 2. Map illustrating the Cincinnati Southern Railway route, ca. 1879 (Mendenhall).

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Sixteen Tunnel
Name of Property
Morgan County, Tennessee
County and State
N/A
Name of multiple listing (if applicable)

Section number figures Page 28

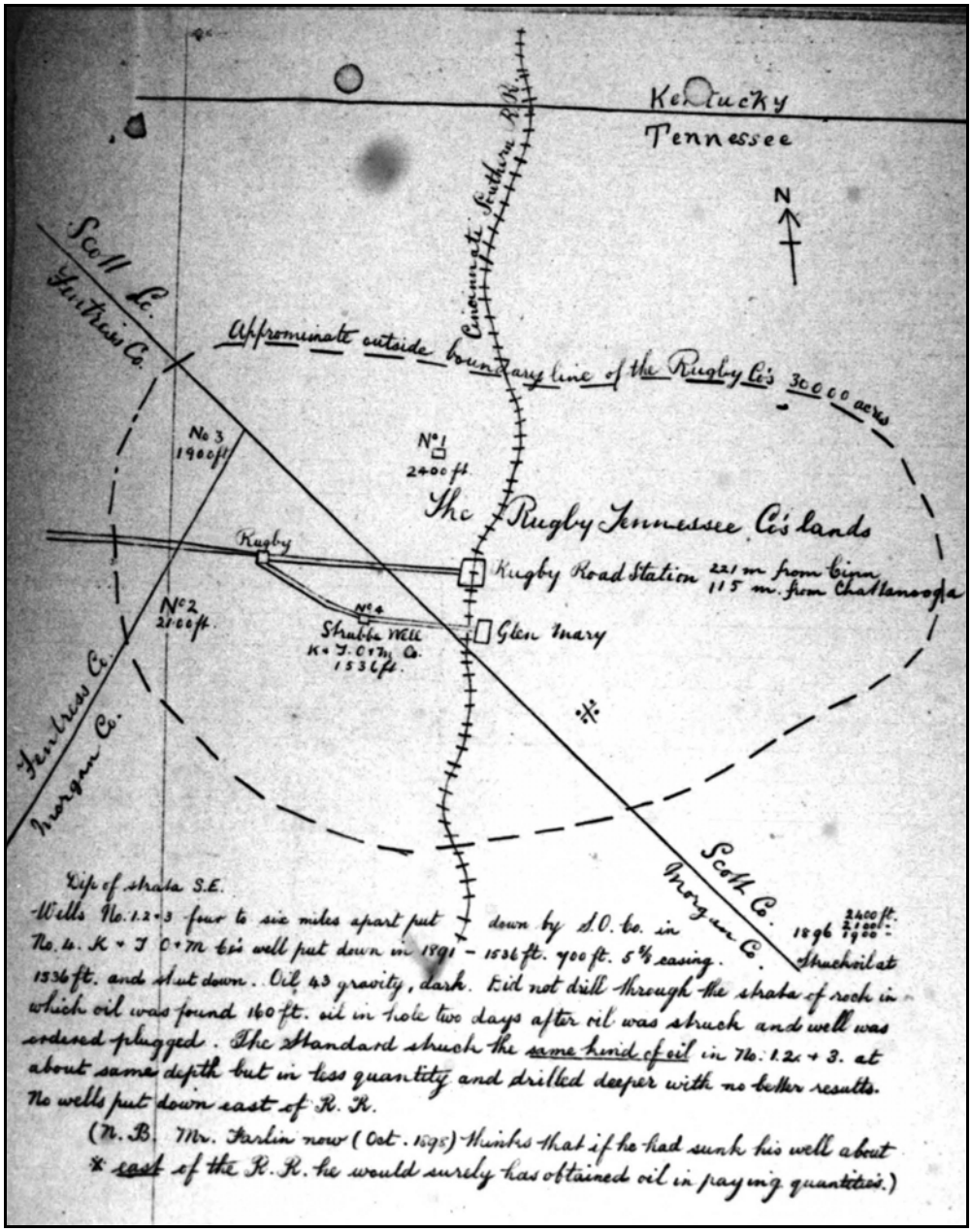


Figure 3. Ca. 1898 sketch map illustrating the Rugby Board of Aid to Land Ownership's land holdings in Fentress, Morgan, and Scott Counties. On file at the Tennessee State Library and Archives (TSLA).

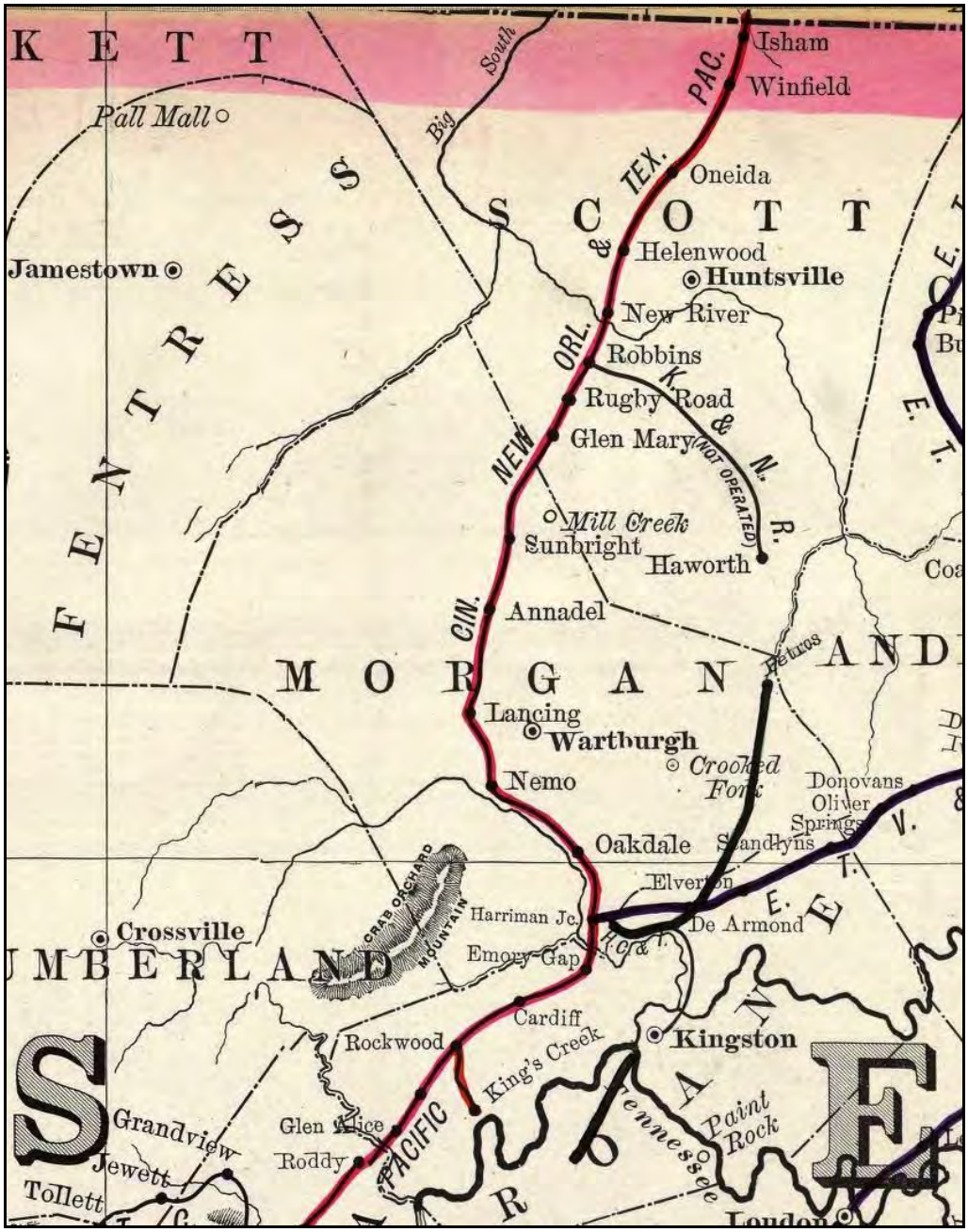


Figure 4. Map dated 1891 illustrating late-nineteenth century communities in Morgan County.

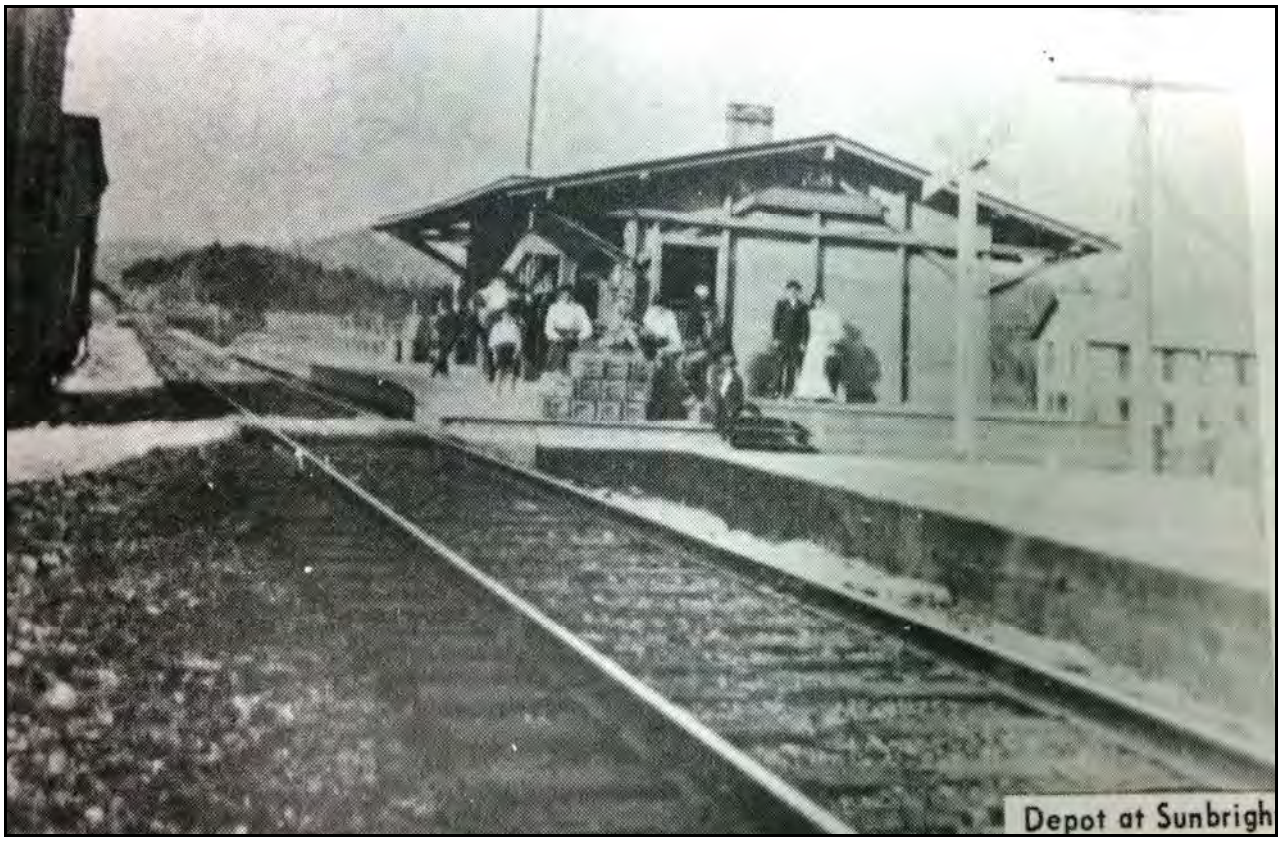


Figure 5. Undated image of the Sunbright depot (Morgan County Pictorial History Committee 1976).

Figure 6. Undated image of Sunbright (Morgan County Pictorial History Committee 1976).

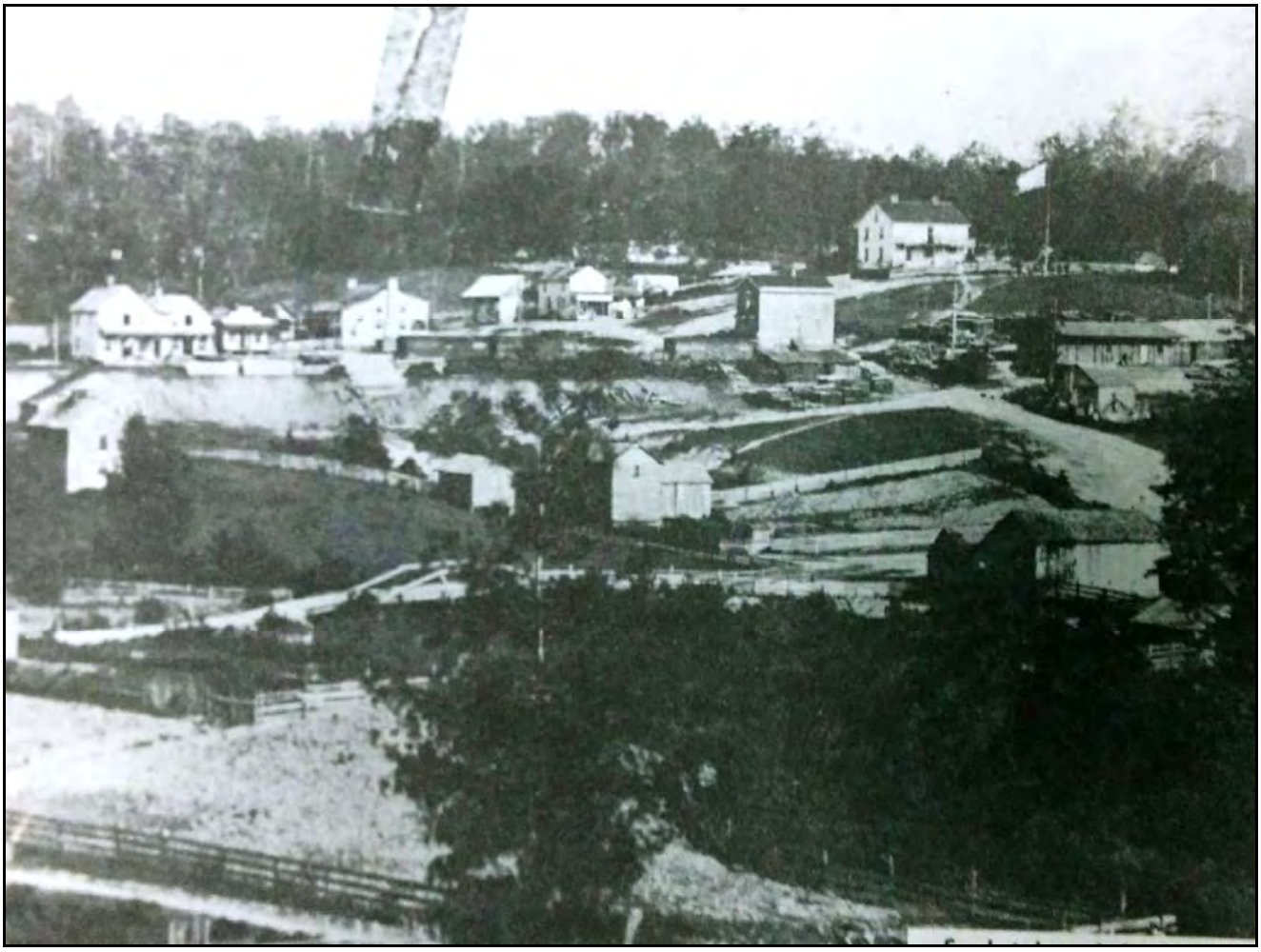


Figure 7. July 4, 1888 image of Sunbright (Morgan County Pictorial History Committee 1976).

Figure 8. Image of Cincinnati Southern Railway at Sunbright, c. 1918 (Morgan County Pictorial History Committee 1976).

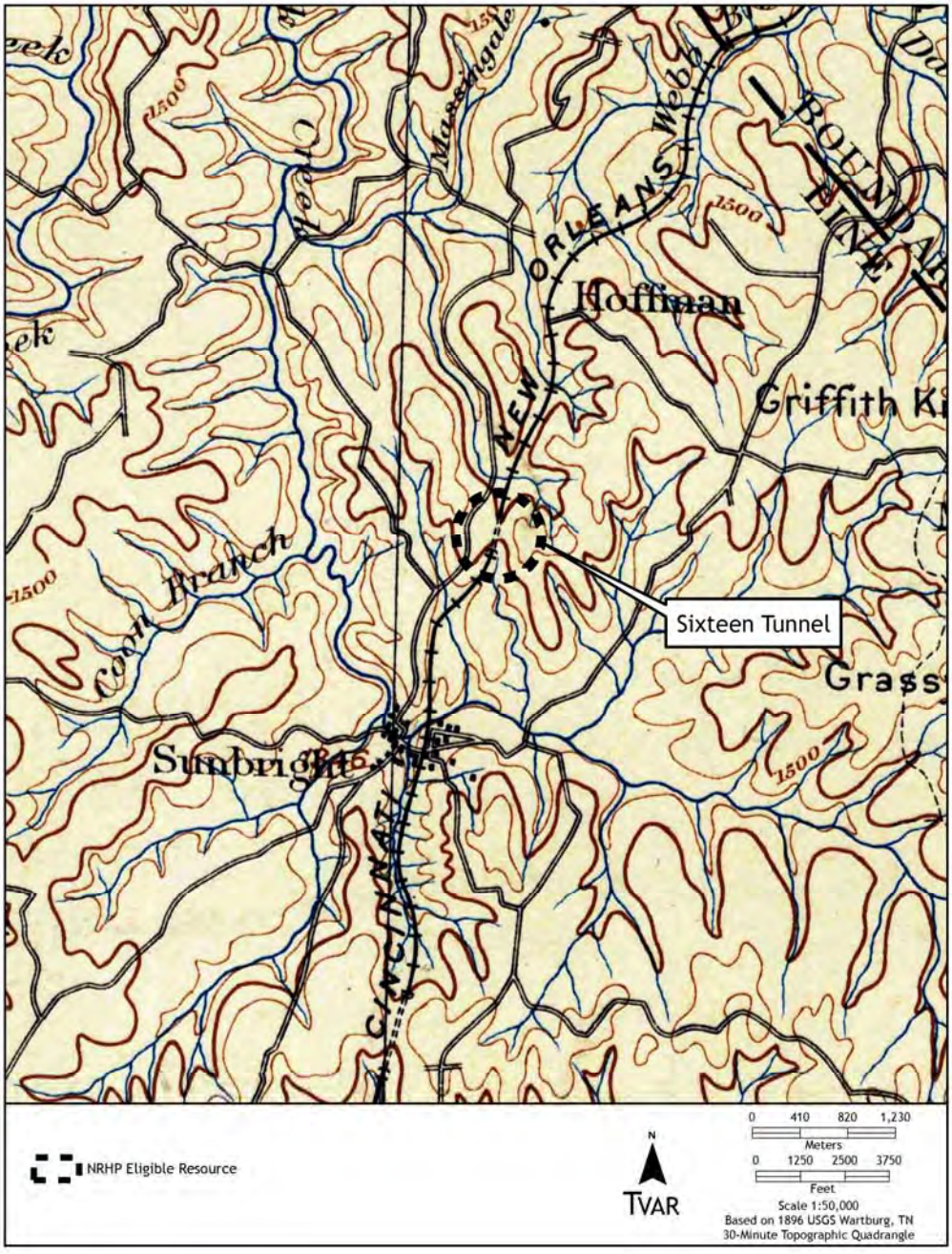


Figure 9. Excerpt of the 1896 USGS Wartburg, Tennessee topographic quadrangle showing Sixteen Tunnel.

Figure 10. Ca. 2011 image showing the daylighted Tunnel No. 10 (JREB.org 2015).

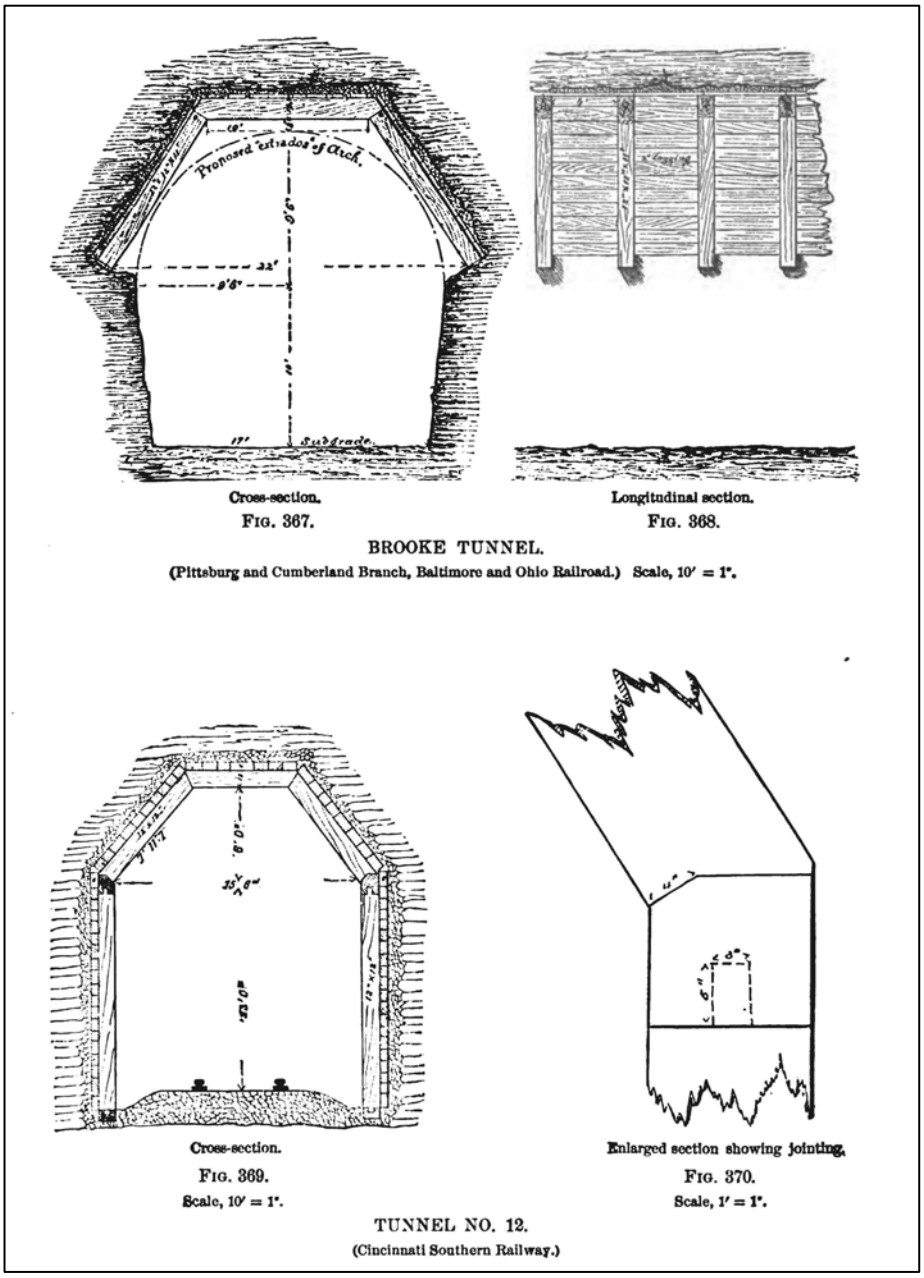


Figure 11. Section drawings illustrating timber lining techniques used in railroad tunnel construction; note an example of Cincinnati Southern Railway Tunnel No. 12 (Drinker 1893:568).

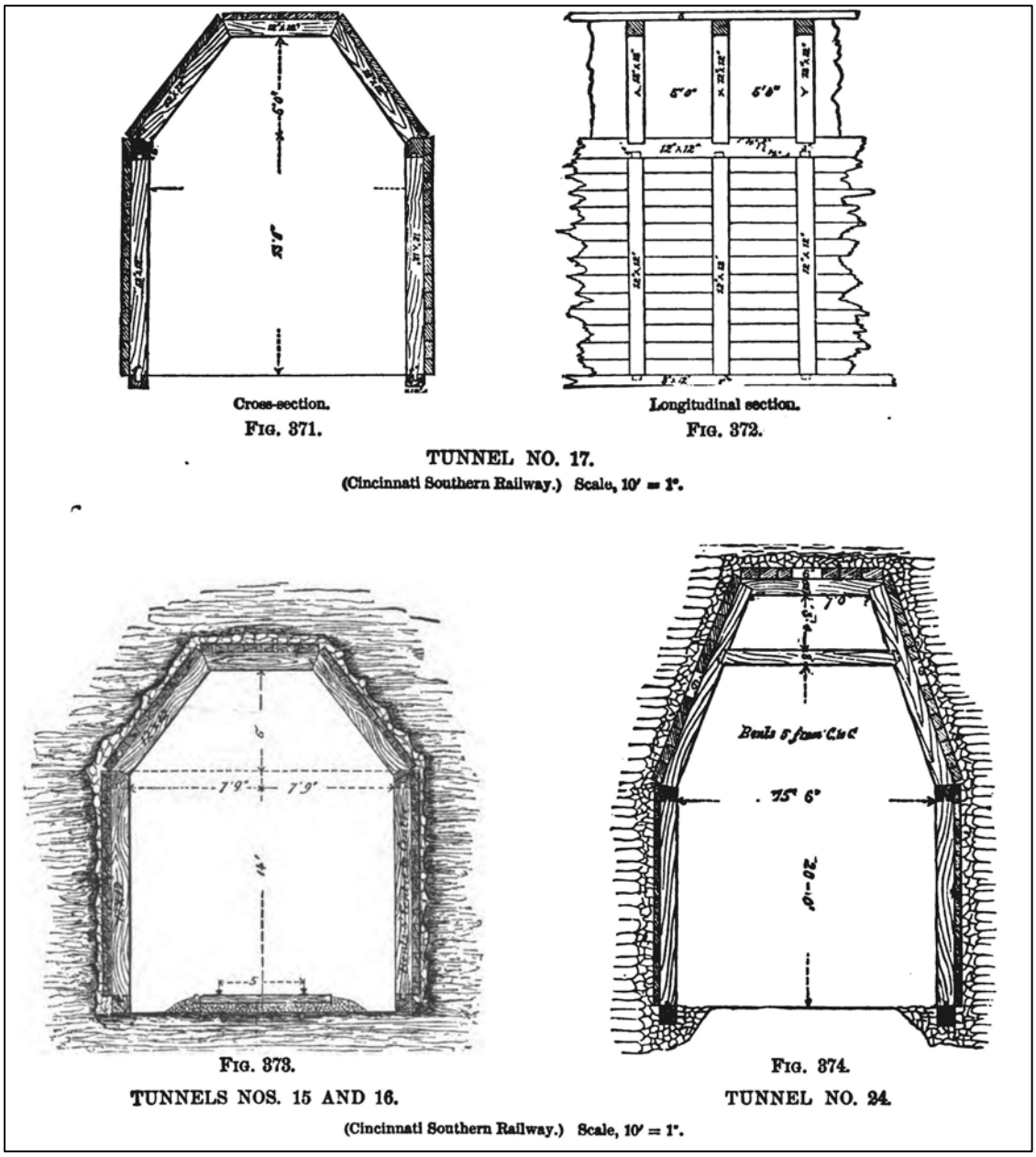


Figure 12. Section drawings of selected Cincinnati Southern Railway tunnels; note Sixteen Tunnel on bottom left (Drinker 1893:569).

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
EVALUATION/RETURN SHEET

Requested Action: Nomination

Property Name: Sixteen Tunnel

Multiple Name:

State & County: TENNESSEE, Morgan

Date Received:	Date of Pending List:	Date of 16th Day:	Date of 45th Day:	Date of Weekly List:
5/26/2017	6/28/2017	7/13/2017	7/10/2017	

Reference number: SG100001306

Nominator: State

Reason For Review:

__X__ Accept _____ Return _____ Reject **7/10/2017** Date

Abstract/Summary Comments: Well-designed tunnel which served as an engineering solution ot the hills and mountains of eastern TN

Recommendation/ Criteria: Accept / C

Reviewer Jim Gabbert Discipline Historian

Telephone (202)354-2275 Date

DOCUMENTATION: see attached comments : No see attached SLR : No

If a nomination is returned to the nomination authority, the nomination is no longer under consideration by the National Park Service.

TENNESSEE HISTORICAL COMMISSION
STATE HISTORIC PRESERVATION OFFICE
2941 LEBANON PIKE
NASHVILLE, TENNESSEE 37243-0442
OFFICE: (615) 532-1550
E-mail: Claudette.Stager@tn.gov
(615) 770-1089

May 17, 2017

J. Paul Loether
Deputy Keeper and Chief
National Register and National Historic Landmark Programs
National Register of Historic Places
1849 C St. NW
Washington, D.C. 20240

Dear Mr. Loether:

Enclosed please find the documentation to nominate the *Sixteen Tunnel* to the National Register of Historic Places. The enclosed disks contain the true and correct copy of the nomination for the listing of the *Sixteen Tunnel* to the National Register of Historic Places.

If you have any questions or if more information is needed, contact Caroline Eller at (615) 770-1086 or Caroline.Eller@tn.gov.

Sincerely,

Claudette Stager
Deputy State Historic Preservation Officer

CS:ce

Enclosures (3)