

FORT BELVOIR RAILROAD BRIDGE
Spanning US Route 1
Accotink
Fairfax County
Virginia

HAER VA-141
HAER VA-141

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED COPIES OF MEASURED DRAWINGS

FIELD RECORDS

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001

HISTORIC AMERICAN ENGINEERING RECORD

FORT BELVOIR RAILROAD BRIDGE

(Facility No. 1433)

HAER No. VA-141

LOCATION: Spanning U.S. 1, Accotink, Fairfax County, Virginia

DATE OF CONSTRUCTION: 1928, 1935

STRUCTURAL TYPE: Concrete arch and plate girder

DESIGNER/BUILDER: U.S. Army Quartermaster Corps, Virginia Bridge and Iron Company

PRESENT OWNER: U.S. Army

PREVIOUS OWNER: U.S. Army

PRESENT USE: None

SIGNIFICANCE: The Fort Belvoir Railroad Bridge (Facility No. 1433) (Virginia Department of Historic Resources [DHR] No. 02 9-5424) was constructed to support the Fort Belvoir Military Railroad. The current structure replaces an earlier crossing, Trestle 5, which was completed in 1918. By the mid-1920s, replacement of the trestle became necessary due to deterioration. The current bridge was completed in 1928, with modifications undertaken in 1935. The bridge is associated with the Fort Belvoir Military Railroad, which was constructed to support World War I mobilization efforts. The Fort Belvoir Military Railroad was used to transport personnel, equipment, and supplies. In 2007, the Virginia State Historic Preservation Office (SHPO) concurred with Fort Belvoir's recommendation that the bridge was eligible for inclusion in the National Register of Historic Places as a Multiple Property Listing. The Virginia SHPO subsequently concurred with the Federal Highway Administration that the bridge was eligible as a contributing resource to the Fort Belvoir Military Railroad pursuant to Section 106 consultation on the Route 1 improvements project.

AUTHORS: Kirsten Peeler, Senior Project Manager
Kathryn M. Kuranda, Senior Vice President, Architectural and Historical Services
R. Christopher Goodwin & Associates, Inc.

PROJECT INFORMATION: Documentation of the Fort Belvoir Railroad Bridge (Facility No. 1433) was undertaken in partial fulfillment of the stipulations contained in a Programmatic Agreement executed in November 2012 among the Department of Transportation Federal Highway Administration; United States Army Garrison, Fort Belvoir; County of Fairfax, Virginia;

Commonwealth of Virginia Virginia Department of Transportation; Department of Defense Office of Economic Adjustment; Catawba Indian Nation; National Trust for Historic Preservation; Advisory Council on Historic Preservation; and Virginia State Historic Preservation Officer. The Historic American Engineering Record (HAER) is administered by the Historic American Buildings Survey/Historic American Engineering Record, a division of the National Park Service, U.S. Department of the Interior.

I. Introduction

The Fort Belvoir Military Railroad was constructed to support World War I mobilization efforts and was begun in January 1918. Construction work was completed by military engineers augmented by civilian employees. The approximately 4.51-mile railroad originally included six wood trestles; culverts also were constructed. The Fort Belvoir Military Railroad extended from the Quartermaster Corps warehouses located on the South Post to the north, terminating at Accotink Station (now Newington). The railroad ultimately linked the post to Alexandria and Washington, D.C, facilitating the movement of goods to the installation and troop movement between the installation and metropolitan centers.

Two of the original six wood trestles on the military railroad were replaced by reinforced-concrete bridges during the late 1920s. Facility No. 1433, which spans U.S. Route 1 and links the North Post to the South Post, was one of the replacement structures. The remaining original trestles were demolished and the ravines or crossings were infilled.

II. Geographical Information and Resource Description

The Fort Belvoir Railroad Bridge (Facility No. 1433) is part of the interior military railroad at Fort Belvoir and spans U.S. Route 1, which divides the North and South posts at the U.S. Army Garrison Fort Belvoir. The military installation is located on the southern tip of the Belvoir Peninsula in Fairfax County, Virginia. The 8,600-acre installation is located approximately 10 miles south of Alexandria, Virginia, and 20 miles south of Washington, D.C.¹ The alignment of U.S. Route 1 predates the establishment of the installation.

The Fort Belvoir Railroad Bridge is a reinforced-concrete and metal bridge whose current design represents a series of modifications from 1928 through 1935. Reinforced-concrete arches (two bays on the north elevation and three on the south) provide the approach to the single-span, deck plate girder that crosses over U.S. Route 1. The mowed rail corridor is flanked by woods; vegetation, consisting of vines, shrubs, and saplings, grows adjacent to and atop the abutments. A manufacturer's badge reading "BUILT

¹ Fort Belvoir Directorate of Public Works, *Fort Belvoir. Host to History. Second Edition* (U.S. Army Garrison Fort Belvoir, Virginia: Fort Belvoir Directorate of Public Works, 2010), 28.

AT VIRGINIA BRIDGE & IRON CO. ROANOKE, VA. 1935” is located on the northwest approach span.

The north abutment measures 38’ 9 ½” in length, the south abutment measures 55’-10” in length, and the metal girder measures 100’ -1 ¾” in length for a total span of 194’-9 ¼”. The bridge measures an average of 25’ in height, with the north abutment having a height of 24’ and the south abutment having a height of 25’-4”. Reinforced-concrete, free-standing, double-faced arches, resting on poured-concrete footers form the bridge abutments to create a structure similar to a viaduct. The rebar consists of “square-deformed bars” measuring 1”, ½”, and ¼”. Each arch has a radius of 6’-6” with a distance of 13’ between piers. The arches are connected by interior, horizontal concrete bracing. A poured-concrete retaining wall obscures the northeast elevation of the north abutment. The minimal ornamentation is limited to the simple cornice, which is carried from the abutment through the girder.

Rocker bearings pinned to masonry posts terminating in modest capitals attach to the plate girder. The rocker bearings allow for the girder to move by absorbing load stresses. The bearings on the south approach are different from those located on the north approach. The bearings at the north approach are fixed in the assembly, while those on the south approach allow for lateral movement. The tracks approaching the bridge no longer are extant; however, the rails, ties, and guard timbers remain on the plate girder. Boards were placed perpendicular to the ties on the girder deck. Riveted metal trusses support the underside of the girder, which is comprised of riveted panels, or web. Metal pipes attached to the plate girder carry utilities.

A review of archival photographs, visual observation, and verification of field measurements suggests that one arch from each the north and south abutments was removed when the existing plate girder was installed in 1935. The installation of the new plate girder resulted in the reduction of the south abutment to three arches and the north abutment to two arches. In 1973, the guard timbers, decking, and bridge ties were replaced with new materials.²

III. Summary History of Fort Belvoir

Fort Belvoir (formerly Fort Humphreys and Camp Humphreys) was established during the United States mobilization for World War I to provide training facilities for the Corps of Engineers. Originally named Camp A. A. Humphreys after Andrew A. Humphreys, a Civil War commander and former Chief of Engineers, the camp was one of several established to train soldiers in the technical branches. As the United States prepared to enter World War I, the Army increased military engineer training activities. Existing training facilities at the Engineer School at Washington Barracks (now Fort McNair) in Washington, D.C., were insufficient and additional training sites were required. The installation was known as Camp Humphreys between 1915 and 1922, after which time, the post became Fort Humphreys.

² Fort Belvoir Directorate of Facilities Engineering. Drawings from the drawings vault (U.S. Army Garrison Fort Belvoir, Virginia: Directorate of Public Works, var.).

Military officials looked south to Virginia and selected a rural location south of Alexandria and 20 miles south of Washington, D.C. The Virginia site, Camp Humphreys, fulfilled a number of selection criteria. The location afforded sufficient land for engineers to engage in land and water-based training opportunities. Camp Humphreys ultimately proved an ideal location for the practical training of military engineers in the construction of floating bridges; the felling of trees for construction projects; and the construction of bridges before heading to the front in France.³ Army officials intended the new site also to serve as the new home of the Engineer School.

Existing transportation networks influenced site selection. The Richmond, Alexandria, and Washington Road (U.S. Route 1) provided access to Washington, D.C. and important shipping ports. (Several names for U.S. Route 1 appear in the archival record, including the Richmond, Alexandria, Washington Road, the Richmond-Washington Road, the Washington-Richmond Road, the Fort Humphreys Washington Road, and the Robert E. Lee Highway. Unless specified otherwise, the Richmond, Alexandria, Washington Road will be used throughout this report.) Access to an existing rail line in the vicinity also was a crucial factor in final site selection. The Richmond, Fredericksburg, & Potomac (RF&P) Railroad maintained a station at nearby Accotink. The Washington-Virginia Electric Railway Terminal at Mount Vernon also served the region. An established rail line facilitated efficient and rapid movement of troops and materials during an era when travel by automobile was unreliable and highway networks rudimentary. Final authorization for the establishment of the new military installation, Camp A. A. Humphreys, came on 18 December 1917 when Secretary of War Newton D. Baker authorized \$3,300,000 for the construction of a 16,000-man cantonment.⁴ By late April 1918, 200 officers and 6,200 soldiers were stationed at Camp Humphreys.⁵

World War I mobilization efforts resulted in large-scale construction projects at Camp Humphreys. Facilities were needed to house the large number of troops stationed at Camp Humphreys for engineer training before deployment in Europe. Barracks, training facilities, and administrative buildings were constructed, often of temporary materials. Construction activities, which began in January 1918, also included the construction of a standard gauge (i.e., 4' 8 1/2") railroad spur connecting the installation to the existing RF&P Railroad and a 2' narrow gauge internal railroad.⁶ Warehouses were constructed to store

³ U.S. House of Representatives, *Camp A. A. Humphreys, VA. Construction of Officers' Quarters. Hearings before the Committee on Military Affairs. 66th Congress, First Session, July 15* (Washington, DC.: Government Printing Office, 1919), 6.

⁴ Kirsten Peeler and Melissa Crosby, "Fort Belvoir Historic District National Register of Historic Places Nomination Form." (U.S. Army Garrison Fort Belvoir, Directorate of Public Works, VA, 2010), 53.

⁵ "Fort Humphreys, Virginia," (U.S. Army Garrison Fort Belvoir, Directorate of Public Works, VA, ca. 1930), 17. Available from the Cultural Resources Manager / Post Historian.

⁶ Fort Belvoir Directorate of Public Works, *Fort Belvoir. Host to History*, 13-14.

supplies. The previously unpaved Richmond, Alexandria, and Washington Road was surfaced in concrete and a plank road was built to connect the installation to the newly paved highway.⁷

At the conclusion of World War I, many Army posts established to support the war effort were declared excess property and subsequently closed. Camp Humphreys avoided closure due to the efforts of its former commandant, Colonel Richard Park; the former Constructing Quartermaster, Major Harold Kebbon; and Chief of Engineers Major General William Black. General Black sought to designate Camp Humphreys as the permanent home for the Engineer School. He enlisted the assistance of Colonel Park and Major Kebbon to achieve that goal. Ignoring Congressional directives to reduce military spending, camp officials continued construction activities during the immediate postwar years. Construction continued through 1919 in order to support the establishment of the new home for the Engineer School at Camp Humphreys.⁸

The War Department made the installation a permanent Army facility in 1922 with the official transfer of the Engineer School to the northern Virginia location. Designation as a permanent installation enabled permanent construction, i.e., the use of masonry materials, to proceed. When the facility became a permanent post, the installation's name changed to Fort Humphreys to reflect its new status. The installation was known as Fort Humphreys between 1922 and 1935, after which time the facility acquired its current name: Fort Belvoir.

Additional construction funding for Fort Humphreys became available in 1926 when the Federal government sold excess military properties under a plan advocated by Secretary of War, John W. Weeks. The money generated from the sales was used to establish a specific funding pool, the Military Post Construction Fund, to support construction at select military installations. Fort Humphreys received funds from the program. A comprehensive design approach was developed for the new construction campaign, with the Colonial Revival style selected for all new buildings. During this construction period, the South Post attained its current design. Throughout the 1930s, Fort Belvoir continued to receive funding to construct barracks, senior officer housing, and non-commissioned officer family housing, in addition to administrative, educational, and recreational facilities.⁹ The installation also underwent another name change during this period when General Order Number 1 was issued, renaming the installation Fort Belvoir on 14 February 1935.¹⁰ Archeological investigations completed at the installation during the early 1930s identified the location of William Fairfax's plantation. William Fairfax, a member of a prominent Virginia family, owned the land on which the military would construct an Army post. His home, Belvoir

⁷ Ibid., 14.

⁸ Peeler and Crosby, "Fort Belvoir Historic District," 54.

⁹ Ibid., 55.

¹⁰ Ibid., 54.

Manor, was constructed in 1741.¹¹ The post's new name was selected to recall the property's association with the Fairfax family and the plantation that once occupied it.

Construction activities at Fort Belvoir again intensified in preparation for World War II. Wood-frame temporary and semi-permanent buildings were constructed to support the mobilization effort. Barracks, mess halls, warehouses, and officers' quarters were built to accommodate 22,794 enlisted men and 1,548 officers.¹² Once again, upon the conclusion of the war, many of the buildings constructed for the war effort were demolished.

Some military missions at Fort Belvoir were eliminated during the years immediately following the conclusion of World War II. However, the post gained additional missions during the Cold War period as the Federal government responded to the threat of communism. A major change occurred at Fort Belvoir when the Engineer School relocated to Fort Leonard Wood, Missouri, in 1988. Fort Belvoir's mission expanded during the late twentieth century when it became host to tenants, including, the Fort Belvoir Community Hospital, the Defense Systems Management College, and the Defense Mapping School.¹³

IV. Overview History of Army Construction Policies during the Interwar Period

The military was downsized following the end of World War I as the Federal government prepared to return to a smaller peace-time military. At the direction of the Federal government, temporary military installations established to support the war effort were slated to close and all construction projects were suspended. Many of the training camps, comprising wood-frame temporary construction, were demolished.

Limited funding was available for the military installations that were not closed. Top military officials advocated austerity in construction expenditures. In August 1921, Secretary Weeks mandated a \$500 cap on expenses for "any building or military posts or grounds" without his prior approval.¹⁴ Later that month he issued additional guidance regarding new construction and maintenance and repair activities. This policy, which remained in effect for six years, directed:

No permanent construction will be undertaken where permanent construction can be postponed and only such repairs and temporary construction necessary will be considered.¹⁵

¹¹ Fort Belvoir Directorate of Public Works, *Fort Belvoir. Host to History*, 8.

¹² Peeler and Crosby, "Fort Belvoir Historic District," 55, 56.

¹³ *Ibid.*, 57.

¹⁴ Lenore Fine and Jesse A. Remington, *United States Army in World War II. The Technical Services. The Corps of Engineers: Construction in the United States* (Washington, DC: Center of Military History, 1989), 44.

¹⁵ *Ibid.*

In compliance with official Army policy, between 1921 and 1926, Congress appropriated limited funds for military construction projects, with the majority of the money directed at a few major projects at select installations.¹⁶ Funds were appropriated for the construction and repair of hospitals, and limited funding was appropriated for maintenance and utilities. During this same period, Secretary Weeks developed plans to remove selected military facilities from the Federal inventory.

Congress eventually supported more robust funding levels for construction activities in 1926, when the Quartermaster General received authority to expend \$7 million on permanent construction during that year.¹⁷ Congress ultimately appropriated \$8 million for new construction in 1926 and \$14 million for maintenance, repairs, and utilities for barracks and quarters.¹⁸ Replacement of wood Trestle 5 spanning U.S. Route 1 with a permanent railroad bridge (Facility No. 1433) was completed during this period of fiscal austerity.

V. Railroad and Bridge Construction during the Early Twentieth Century

The railroad network provided the primary means of transportation for the country at large during the early twentieth century. Access to this transportation network through the RF&P Railroad was critical to the success of Camp Humphreys as a World War I mobilization facility. Construction of the Fort Belvoir Military Railroad proceeded concurrently with the construction of Camp Humphreys' buildings and infrastructure. The requirements, materials, and operational deadlines imposed for the military railroad were similar to conditions that engineers might encounter in the field and the construction of the Fort Belvoir Military Railroad presented ideal training opportunities.

Wood trestles commonly were constructed by military and private-sector engineers to span crossings. Indeed, the construction of wood trestle bridges by railroad companies was common during the nineteenth and early twentieth centuries. Because railroads required minimal changes in grade with maximum inclines ranging from two to four per cent, structures such as bridges and trestles often were necessary in order to minimize extreme changes in grade.¹⁹

By the mid twentieth century, approximately 1,800 miles of wood trestles were in use in the country's railways.²⁰ Private-sector engineers noted the many disadvantages of wood construction, even though its use in bridge and trestle construction was widespread. The disadvantages of wood included its lack of

¹⁶ Ibid.

¹⁷ Ibid., 47.

¹⁸ Ibid.

¹⁹ Alaska Railroad Corporation, "Timber Trestle Bridges in Alaska Railroad History," n.d.,10.

²⁰ Ibid.,11.

durability in comparison to steel or masonry, its ability to span shorter lengths in comparison to steel, and the fact that it is less fire resistant than other materials.²¹

The typical service life of an untreated wood trestle was 20 to 30 years; frequent replacement of wood members was common due to failure.²² Indeed, an ongoing program of selected repair and replacement of deteriorated elements was preferred “until such time as the general condition of the structure requires entire renewal.”²³ Failure and repeated repairs often resulted in complete replacement of the trestle with other types of bridges or the spans were filled entirely.²⁴ Wood as a material used in bridge construction remained popular, despite its shortcomings. The major advantages of wood construction were its cost and availability.²⁵

Design of Military Railroads and Bridges

The Quartermaster Corps had a long history of developing standardized plans for both temporary and permanent Army construction. Beginning with the mid nineteenth century, the Corps developed plans to guide all types of construction, including “headquarters buildings, barracks, electrical vaults, prisoner of war camps, railroad trestles and munitions storage.”²⁶ The purpose of the plans was to assure uniformity in building type throughout the Army, regardless of location, and to promote economy and efficiency in construction.

The Army relied on standardized plans during periods of national emergencies, when rapid and efficient construction was required. During World War I and World War II mobilization efforts, a series of standardized plans for permanent and temporary construction were prepared. Construction guidance for World War I mobilization activities was presented in the *Manual of the Construction Division of the Army. Section C. Engineer Division 1918*. The manual, revised in 1919, was prepared by the Construction Division of the Army, and was “intended for use in connection with emergency work only.”²⁷ The manual was developed “for the purpose of making generally available the fundamental principles and standards which have been adopted for emergency construction.”²⁸ The standards and drawings presented in the manual were “influenced by the emergency conditions requiring speed, economy of construction, and the

²¹ George A. Hool, William Spaulding Kinne, Roy Richard Zipprodt, Datzell Melvin Griffith, *Steel and Timber Structures* (New York: McGraw-Hill Book Company, Inc., 1942), 372.

²² Alaska Railroad Corporation, “Timber Trestle Bridges,” 11.

²³ American Railway Engineering Association, *Manual of the American Railway Engineering Association* (Chicago: American Railway Engineering Association, 1921), 295.

²⁴ Alaska Railroad Corporation, “Timber Trestle Bridges,” 11.

²⁵ Hool, et al., *Steel and Timber Structures*, 372.

²⁶ U.S. Army Corps of Engineers, “Context Study of the United States Quartermaster General Standardized Plans 1866-1942,” 1997, 6.

²⁷ War Department, *Manual of the Construction Division of the Army. Section C. Engineer Division 1918. Revised June 1, 1919* (Washington, DC: Consolidated Supply co., Printers, 1919), n.p.

²⁸ *Ibid.*, 1.

conservation of certain materials.”²⁹ Constructing officers were encouraged to consult and use the standards and drawings presented in the manual before preparing new drawings.³⁰

The 1918 manual included guidance on all aspects of camp construction. Drawings for the layout of cantonment grounds, the design and construction of warehouses and port terminals, and materials specifications were provided. In addition, the manual provided drawings for the layout and design of railroad terminals and cantonment warehousing areas. General guidance on culverts, track laying, ballast, ties, and rails, among other railroad-related features, were included, and the efficacy of wood-trestle construction was recognized. Indeed, the manual’s discussion on crossings is brief, stating, “Wherever the railroad crosses a road or highway, a suitable crossing, similar to type shown on general plan, should be constructed.”³¹ A wood trestle was the only type of crossing presented (Figure 1).

An engineer’s field manual titled, *Professional Papers of the Corps of Engineers of the United States. Engineer Field Manual*, also provided guidance on a variety of topics related to railroad construction, including survey and reconnaissance and the construction of railroads, roads, and bridges while in the field. Published in 1918, much of the bridge discussion presented in the field manual centered on the construction of wood trestles, although other types of bridges were examined, including Howe and Pratt trusses and suspension bridges. A limited discussion on railway bridges also was included.

The engineer’s field manual provided more detailed, technical advice on the construction of rail-related resources than the document prepared by the Construction Division. Guidance in the 1918 field manual stipulated the “**kind of bridge** to be built depends upon the *load*, the nature of the *obstacle* and the *materials* available” (emphasis in the original).³² The manual offered calculations for determining load; identified constants of strength and weight for a variety of species of wood; discussed the types of fastenings that should be used; and offered suggestions for the design of military bridges. The 1918 field guide suggested avoiding constructing on an incline; rather, the approaches to the bridge at each end “should be straight and nearly level for a distance equal to at least twice the maximum train length.”³³ Despite the wealth of guidance provided on the construction of military bridges in general, little technical expertise is presented on the construction of railway bridges. Discussion is limited to the placement of stringers, ties, and guardrails, and the recommended clear width (i.e., 14’) between trusses for the construction of a standard-gauge, single-track railroad.³⁴

²⁹ Ibid.

³⁰ Ibid.

³¹ Ibid., 28.

³² War Department, *Professional Papers of the Corps of Engineers of the United States. Engineer Field Manual* (Washington, DC: Government Printing Office, 1918), 147.

³³ Ibid., 242.

³⁴ Ibid.

Private-Sector Railway Bridge Construction

The military's guidance on bridge construction echoes similar contemporary advice from the private sector. The *Manual of the American Railway Engineering Association. Definitions, Specifications and Principles of Practice for Railway Engineering* published by the American Railway Engineering Association (AREA) defined a railway trestle and discussed the advantages and disadvantages for its use. Specifications on appropriate trees for use in the construction of a trestle – a structure of upright members that support horizontal members used to support loads applied to the horizontal members – were provided.³⁵ Wood trestles, which can encompass a frame trestle in which the upright members or supports are made of framed timbers, or a pile trestle, which the upright members are constructed of piles, were used to span gullies, valleys, and bodies of water. Wood was an abundant material that was less expensive than steel or masonry and did not require the same level of skill as the construction of a masonry structure.

In contrast to the manuals prepared by the Army, the civilian, private-sector manuals also presented options other than trestles for spanning medium-length spans. Those options included both through and deck plate girder bridges. The Army's 1918 *Engineer's Field Manual* was intended primarily for Army engineers working in the field, especially those in forward areas that required rapid, usually temporary, construction. Accordingly, the Army field manual emphasized bridges that could be built using basic tools and local raw materials such as wood. The *Engineer's Field Manual* included minimal details that applied to through truss bridges, but the 1921 AREA manual included details about all types of bridges in common use at the time. It is likely the Army and its contractors relied on the AREA manual or similar manuals when designing permanent bridges at Army installations in the United States to insure that the bridges met industry standards. For deck plate girder spans between 30' to 75', the AREA manual specified that the two plate girders of single-track deck-type bridges were to be spaced 6' -6" apart.³⁶ For similar bridges with spans of 75' or greater, the plate girders were to be arranged as follows:

The width center to center of girders or trusses shall be not less than one-fifteenth of the effective span, and not less than is necessary to prevent overturning under the assumed lateral loading. Panel lengths shall not exceed 1 ½ times the width c. to c. of trusses or girders³⁷ ...but not less than 7' -6" between centers.³⁸

³⁵ American Railway Engineering Association, *Manual of the American Railway*, 281, 283.

³⁶ *Ibid.*, 757.

³⁷ *Ibid.*, 744.

³⁸ *Ibid.*, 757.

The parts of the girder included: flange sections, web plates, flange rivets, flange splices, web splices, and end stiffeners.³⁹ No such discussion occurred in military manuals.

In addition to guidance on bridge and trestle construction, the 1921 manual provided insights on other rail-related construction, including general specifications and accepted industry standards on the production of the steel for rails and concrete for masonry bridges. The manual also specified material tests to verify performance for select materials. According to the manual, almost every part of the railroad should be marked. This included dating nails used in the ties and branding the ties and the rails. Specifications for how and where the dates should be placed were provided.⁴⁰ For rails, the date of manufacture, and, in some cases, the manufacturer's name, was to be identified.⁴¹

Military Cooperation with Private-Sector Railroads during National Emergencies

Military railroads, that is, railroads owned and/or operated by the military, emerged as key components to World War I and World War II mobilization efforts. The military relied on the cooperation of the private-sector rail industry to assist with troop movement and supply shipments. Railroads were crucial to both war efforts, particularly during an age when road transportation was difficult and unreliable.

The War Department planned to coordinate with the American Railway Association for assistance during World War I.⁴² In his remarks before Congress, Maj. Gen. James B. Aleshire, Quartermaster General, did not specify the type of assistance the American Railway Association would provide. During the same hearings, Army personnel presented their current capabilities for moving troops and equipment throughout the country. These capabilities are identified in Table 1.

Moving large numbers of troops and equipment had the potential to become logistically challenging. The railroads would be responsible for moving not just troops, but also supplies and industrial material, i.e., raw materials and manufactured products.⁴³ Military use of the railroads would be competing with the private sector.⁴⁴ However, priority for moving supplies and troops would be given to those trains with the most important cargo.⁴⁵ The movement of supplies and troops would be divided into different trains, with each train carrying between 10 and 30 days' supplies for the troops being transported by that particular

³⁹ Ibid., 758.

⁴⁰ Ibid., 105, 121.

⁴¹ Ibid., 121.

⁴² U.S. House of Representatives, *To Increase the Efficiency of the Military Establishment of the United States. Hearings before the Committee on Military Affairs. House of Representatives. Sixty-fourth Congress. First Session on the Bill to Increase the Efficiency of the Military. January 6 to February 11, 1916 (In two volumes) Vol. 1* (Washington, DC: Government Printing Office, 1916), 281.

⁴³ Ibid., 283.

⁴⁴ Ibid.

⁴⁵ Ibid.

train.⁴⁶ The President of the United States was authorized under Section 6 of the Act to Regulate Commerce, as amended, to demand that troop transportation and material of war be given preference and precedence during times of war or threatened war.⁴⁷ The rail carriers “shall adopt every means within their control to facilitate and expedite the military traffic.”⁴⁸ While legislation directed the rail industry to facilitate and expedite military traffic, in practice, rail companies were unable to comply. Regulatory, financial, and labor conditions made compliance difficult. These conditions led to severe back-ups of all freight.⁴⁹

By late 1917, the U.S. railway system was overburdened with the movement of military freight and troops. On December 26, 1917, President Woodrow Wilson nationalized the U.S. railroads and the United States Railroad Administration (USRA) took administrative control of the railroads. Train schedules were streamlined and new railroad engines and cars were standardized.⁵⁰ Between May 1917 and November 11, 1918, over 8.7 million military personnel were transported via railroads. This included transportation to mobilization and training centers and to ports of embarkation for service overseas. Troop movements peaked in July 1918, when over 1.1 million military personnel were transported.⁵¹ Following the end of the war, the railroads were returned to their owners in March 1920.⁵²

The Railroad Industry after World War I

The Great Depression of the 1930s also affected the railroad industry. By 1933, revenues had declined by 50 percent from 1928. By 1937, 30 percent of all rail miles were in receivership.⁵³ During the build up to World War II, the U.S. military again looked to the railroads to transport personnel and materials. Railroads provided access to new military bases, defense plants, and coastal ports. Between 1940 and 1943, freight tonnage carried by railroads doubled while passenger numbers tripled. The railroad owners cooperated closely with the Federal government during the war to avoid a repeat of losing administrative control as had happened during World War I.⁵⁴

⁴⁶ Ibid.

⁴⁷ Ibid., 285.

⁴⁸ Ibid., 284.

⁴⁹ J. Lawrence Lee, e-mail message to Kirsten Peeler, April 17, 2014.

⁵⁰ “U.S. government takes over control of nation’s railroads,” The History Channel, <http://www.history.com/this-day-in-history/us-government-takes-over-control-of-nations-railroads>.

⁵¹ W.F. Riter, “Rail Transportation: An Historical Military Study,” The Quartermaster Review, March-April 1927, <http://www.qmfound.com/rail.htm>.

⁵² “U.S. government takes over control of nation’s railroads,” The History Channel.

⁵³ American Association of Railroads, “A Short history of U.S. Freight Railroads.” (Washington, DC: American Association of Railroads, 2013), 2.

⁵⁴ Carl J. Schneider and Dorothy Schneider, *World War II* (New York, NY: Infobase Publishing, 2003), 49.

During the early Cold War period, military planners assumed the railroads would continue to provide service in support of military actions as they did during World War I and, more recently, World War II.⁵⁵ By the 1960s, however, military officials recognized that the level of service provided by the railroads would be reduced. Significant improvements in transportation occurred since World War I. Increased competition from other types of transportation, i.e., trucks via highway and air transportation, meant the Federal government would not have to depend on the railroads as heavily during previous large-scale mobilization efforts.⁵⁶

Changes in the transportation and shipping industries adversely affected the railroads. By the mid twentieth century, the railroads were less competitive because the railroad companies had more expenses than their rival forms of transportation. Shipping companies, by truck, air, or water, could take advantage of publicly funded and maintained rights-of-way. By contrast, the railroad companies were responsible for maintaining their rail corridors.⁵⁷ Technical changes that included the use of heavier rail, which facilitated the use of heavier and faster trains, and the increased use of electrical signaling devices increased single-track capacity by 75 to 80 per cent during the postwar period.⁵⁸ Revolutions in how freight was shipped also occurred during the period. The late 1950s saw the introduction of trailer-on-flat car, or “piggyback” whereby rail line transportation was combined with trucks used at pickup and delivery points.⁵⁹ These changes in the railroad industry occurred during a period of reduced passenger ridership and a period of increased labor costs. As a railroad industry expert who spoke at a conference of private- and public-sector professionals cautioned, if another mobilization was required, as was the case during World War II, the rail industry would be insufficiently prepared to provide service.⁶⁰ According to this official, the rail industry had advance notice to prepare for World War II, and “substantial reserve of railroad capacity in equipment as well as in basic facilities.”⁶¹ Unlike during World War II, according to this official, the railroads, in the postwar era of the late 1950s, no longer had a “similar reserve of equipment capability.”⁶² Because the railroad industry in general was operating “for so long at the margins of financial stringency [it] is not in a position to provide any substantial reserve of capability to meet a sudden emergency.”⁶³

Army Warehousing and Storage Capabilities Supporting Military Railroads

⁵⁵ Burton N. Behling, “Railroads – Their Development, Problems, and Prospects,” in *U.S. Transportation Resources, Performance and Problems. A Collection of Papers Prepared for the Transportation Research Conference Convened by the National Academy of Sciences at Woods Hole, Massachusetts. August, 1960* (Washington, DC: National Academy of Sciences-National Research Council, 1961), 203.

⁵⁶ *Ibid.*

⁵⁷ *Ibid.*, 204.

⁵⁸ *Ibid.*, 198.

⁵⁹ *Ibid.*, 198-199.

⁶⁰ *Ibid.*, 202.

⁶¹ *Ibid.*

⁶² *Ibid.*

⁶³ *Ibid.*

During both world wars, the Quartermaster Corps relied on a system of depots to distribute goods and supplies. Troops were moved to and from the front lines through the War Department's ports of embarkation.⁶⁴ At the onset of World War I, the storage facilities at the Quartermaster Corps depots could not accommodate the large quantity of supplies needed to support the mobilization effort.⁶⁵ Additional storage buildings and warehouses were constructed to store necessary supplies. The depot system, which had been reorganized into geographic zones, supplied all camps and posts within a certain geographic area.⁶⁶ At the training camp level, numerous warehouses were constructed to store the vast quantities of supplies. These warehouses were built with railroad sidings to facilitate supply shipments. Long, rectangular, wood-frame, single-story buildings with loading platforms were constructed.

During World War II, each technical branch maintained its own distribution systems as well as general depots.⁶⁷ The Quartermaster Corps began planning for the storage of supplies and materials and logistics in the event of another large-scale military action during the late 1930s. Although the Quartermaster Corps began plans to enlarge its existing 12 depots, these efforts were not realized until after the protective mobilization efforts were implemented in 1940.⁶⁸ The Quartermaster Corps continued to expand its supply and warehousing facilities through May 1943 when the Army Service Forces halted all depot construction, except for extraordinary circumstances⁶⁹

VI. Summary History of the Construction of the Fort Belvoir Military Railroad

Access to existing railroads played a determining factor in site selection for Camp Humphreys as a training facility for organizing and training engineer replacement troops during World War I.⁷⁰ Construction of spurs from the steam railway operated by the RF&P Railroad at Accotink and the Washington-Virginia Railway interurban terminal at Mount Vernon provided the training camp with access to Washington, D.C.⁷¹ Eventually, two railroads were constructed at Fort Belvoir: a narrow gauge used primarily to distribute materials within the installation arriving by boats travelling along the Potomac River and a standard gauge, i.e., the Fort Belvoir Military Railroad, that linked the installation to

⁶⁴ Deborah C. Whelan, Leo Hirrel, William T. Dod, J. Hampton Tucker, and Katherine Grandine, "Historic Context for Department of Defense World War II Permanent Construction. Final Report," (Frederick, MD: R. Christopher Goodwin & Associates, Inc. 1997), 92.

⁶⁵ Katherine Grandine and Deborah Cannan, "Support and Utility Structures and Facilities (1917-1946). Overview, Inventory, and Treatment Plan. Final Report," (Frederick, MD: R. Christopher Goodwin & Associates, Inc., 1995), 51.

⁶⁶ Grandine and Cannan, "Support and Utility Structures," 51.

⁶⁷ Whelan et al., "Historic Context for Department of Defense," 92.

⁶⁸ Ibid., 96.

⁶⁹ Ibid.

⁷⁰ Major Walter A. Gray, "History of Railroads at Fort Belvoir, Virginia," (U.S. Army Garrison Fort Belvoir, Directorate of Public Works, VA, 1949), 1. Available from the Cultural Resources Manager / Post Historian.

⁷¹ Ibid.

the national railway system. The Army's transportation personnel operated the rail lines that connected the Army posts to the civilian railroads.⁷²

Construction of the Narrow-Gauge Railroad

A twenty-mile long narrow gauge railroad was constructed at Fort Belvoir in 1917 to support the movement of supplies and workers as overall construction activities intensified to accommodate the large number of troops arriving at the post for training. Due to the poor conditions of the Alexandria Road, installation officials decided that goods and materials should be transported along the Potomac River by barge. An incline was constructed from the dock to help facilitate the transportation of supplies arriving by barge. Ultimately, construction of the narrow gauge railroad facilitated the construction of Camp Humphreys.

The Camp Commander requested 100 railroad cars from the Director General of Military Railways. Nearly all the cars were provided, including ten drop end gondola cars, fourteen gas locomotives, and at least three Baldwin gasoline locomotives.⁷³ Arrival of the material, which included 60 centimeter rail, ties, frogs, and switches, began in February 1917.⁷⁴ The tracks were distributed throughout the installation, with the spurs leading to storage areas placed along loading docks.⁷⁵ Construction and operation of the narrow gauge railroad was undertaken by the Second Battalion of the First Replacement Regiment of Engineers. Some of the cars the Camp Commander requested were shipped elsewhere by late 1918. One gasoline locomotive and six cars were shipped to Fort Benjamin Harrison, Indiana, in September 1918, and one gasoline locomotive and ten cars were shipped in October 1918.⁷⁶ By 1921, the Army operated 17 locomotives and 84 cars on the narrow gauge railroad.⁷⁷

After the railroad was completed, it proved cost effective. Deliveries averaged 100,000 feet per day at an average cost of 50 cents per 1,000 feet. Railroad usage proved an economical method of transportation when compared to maximum delivery rate of "89,000 feet a day at a cost of \$20.00 per 1,000 feet by motor truck and teams in use by the Construction Quartermaster."⁷⁸ The narrow gauge railroad served the various camp units, transporting commissary supplies, bedding, and refuse.⁷⁹ Engineers operated the

⁷² U.S. House of Representatives, *Army Appropriation Bill, 1922. Hearing before Subcommittee of House Committee on Appropriations* 66th Congress, (Washington, DC: Government Printing Office, 1921), 661.

⁷³ Colonel Richard , "Camp Humphreys 1918 Park Report," (U.S. Army Garrison Fort Belvoir, Directorate of Public Works, VA, 1918), 66. Available from the Cultural Resources Manager / Post Historian; H.V. Pittman, "History of the Industrial Railway and of the Light Railway School," Appendix XXIII (n), 1918, 2, 4 in Park "Camp Humphreys 1918 Park Report".

⁷⁴ Park, "Camp Humphreys 1918 Park Report," 66.

⁷⁵ Ibid.

⁷⁶ Pittman, "History of the Industrial Railway," 5A.

⁷⁷ U.S. House of Representatives, *Army Appropriation Bill, 1922*, 662.

⁷⁸ Pittman, "History of the Industrial Railway," 3.

⁷⁹ Ibid., 4.

railroad and were assigned duty with the track work and locomotives; however, the Engineering Schools eventually assumed operation of the narrow gauge railroad system.⁸⁰

The following equipment was on hand in November 1918:

- 12, 50 H.P. gasoline locomotives 60 CM
- 3, 17-½ ton Baldwin 2-4-2 saddle tank locomotives 60 CM
- 84, 10-ton combination cars, 22'x6'3", 60 CM
- 4, 1-½ yard dump cars 60 CM
- 2 Kalamazoo 60 CM inspection cars
- 2 Fairbanks – Morse 60 CM inspection cars
- 20 miles, approximately, 60 CM track with necessary steel, ties, switches, frogs and appurtenances.⁸¹

Construction of the narrow gauge railroad also afforded a potential learning opportunity for engineers. Camp Belvoir's commanding officer considered maintaining the narrow gauge railroad as a school of instruction for light railway troops serving in France.⁸² Installation officials anticipated maintaining operation of the narrow gauge railroad after the camp was completed. The narrow gauge railroad would become a tool for eliminating automotive and animal transportation within the installation.⁸³ Ultimately, construction and operation of the narrow gauge railroad proved highly successful in terms of training engineer troops and in supporting the overall construction activities at the installation. The skills engineers received while constructing the narrow gauge railroad at Camp Humphreys later were used in France. After completion, installation officials opined that continued use of and training on the narrow gauge railroad, a railroad that most likely would be used during wartime, would be beneficial, particularly since American troops took over operation of the narrow gauge railways from the British in France.⁸⁴

The railroad had several practical wartime applications. The narrow-gauge railroad was easy to construct and later dismantle, if necessary. The tracks, which could be carried by two soldiers, were 5-meters long and weighed one hundred kilograms.⁸⁵ The pieces then could be snapped together.⁸⁶ In addition to its ease of construction, the narrow gauge railroad could handle more easily tight curves and steep grades than the standard gauge railroad.⁸⁷ Both steam and gas locomotives ran on the narrow gauge railroad.⁸⁸ These

⁸⁰ Ibid., 5.

⁸¹ Ibid., 11.

⁸² Ibid., 2.

⁸³ Ibid.

⁸⁴ Ibid., 7.

⁸⁵ David Vergun, "Forgotten tiny trains carried WWI vets to Victory," 2010, n.p.

⁸⁶ William Kelly, "Is the Use of Narrow-Gauge Railways Profitable in War," *The Military Engineer. Journal of the Society of American Military Engineers*; Volume XII, Numbers 61 to 66; January-December 1920, 415.

<http://google.com/books?id=-NKAQAIAAJ>; Vergun, "Forgotten tiny trains carried WWI vets to Victory," n.p.

⁸⁷ Kelly, "Is the Use of Narrow," 415; Vergun, "History of the Industrial Railway," n.p.

qualities made the narrow gauge railroad ideal for use in wartime France. Despite the wishes of installation officials to maintain the narrow gauge railroad for training opportunities after the war, the archival record suggests the narrow gauge railroad service at Camp Humphreys was discontinued by the early 1920s.⁸⁹

Construction of the Standard-Gauge Railroad

Land acquisition, survey, and construction of the Fort Belvoir Military Railroad were completed rapidly. The route for the railroad was finalized on 26 January 1918. A land acquisition plan was implemented in January 1918 and was completed by May 1918 for the approximately 100-foot wide right-of-way needed for the construction of the military railroad.⁹⁰ Survey work also began in January 1918 and was completed by May 1918. The government acquired the land for the railroad following negotiations with private property owners. Condemnation proceedings for the railroad right-of-way began in February 1918. Eventually, the Federal government was able to reach agreements with all but one of the affected property owners. The Acting Secretary of War approved the purchase of land for the railroad right-of-way for a cost of \$10,227 on 22 November 1918.⁹¹ Archival research suggests the government was in negotiations with the property owners regarding compensation. These negotiations were not finalized until after the railroad was completed and the war ended.⁹²

Construction of the standard-gauge railroad originally was under the auspices of the Construction Quartermaster, who had arranged the steam shovels, wagons, and scraper outfits and was drafting the construction contract.⁹³ On 14 January 1918, the Construction Quartermaster was informed that the Engineer troops would handle all aspects of railroad construction, including the survey.⁹⁴ Consequently, all arrangements with the construction contractor were cancelled.⁹⁵ Military engineers, aided by civilian engineers, completed the survey work for the siting, profiles, and alignment of the military railroad.⁹⁶

The Construction Division received orders in January 1918 to acquire stringer material, decking, and guard rails for 2,000 linear feet of trestle.⁹⁷ The camp commander concurrently ordered ties and Russian

⁸⁸ Vergun, "Forgotten tiny trains carried WWI vets to Victory," n.p.

⁸⁹ Vergun, "Forgotten tiny trains carried WWI vets to Victory," n.p.

⁹⁰ Gray, "History of Railroads," 1.

⁹¹ U.S. House of Representatives, *Annual Reports – Quartermaster General (Director of Purchase and Storage), Chief of Chemical Warfare Service, Director of Tank Corps, Chief of Construction Division, Chief of Coast Artillery, Chief of Real Estate Service for the Fiscal Year Ended June 30, 1919* 66th Congress, (Washington, DC: Government Printing Office, 1920), 706.

⁹² *Ibid.*, 704-708.

⁹³ Park, "Camp Humphreys 1918 Park Report," 82.

⁹⁴ *Ibid.*

⁹⁵ *Ibid.*

⁹⁶ Gray, "History of Railroads," 2-3.

⁹⁷ Park, "Camp Humphreys 1918 Park Report," 82.

rail through the Director General of Military Railways.⁹⁸ Russian rail, which was made by the Cambria Steel Company from specifications provided by the Russian government, also were ordered through the Director General of Military Railroads.⁹⁹ The rail ultimately proved less than ideal for American military use. The Russian rail was “not adapted for heavy motive power or equipment such as in use in standard gauge railroads in this country.”¹⁰⁰ Duplicate materials were ordered from both the Director General of Military Railways and the Construction Quartermaster to ensure that sufficient materials were available to complete construction. The supplies ordered from the Construction Quartermaster arrived before those provided by the Director General of Military Railways.¹⁰¹

Engineer troops, representing the numerous engineering trade schools, completed most of the work associated with railroad construction. The 304th Engineers started the work on the railroad. The 45th Engineers later replaced the 304th Engineers after the latter were deployed elsewhere.¹⁰² Initial work consisted of preparing the camp and obtaining the necessary tools and equipment to start construction.¹⁰³ Grading of the roadbed to the unloading siding at Accotink Village was completed by 18 March 1918.¹⁰⁴ Civilians were used to assist with grading for the railroad. However, the contractor responsible for completing the grading experienced severe labor shortage, and, in early May, military officials decided to replace all remaining civilian employees with soldiers.¹⁰⁵ This action enabled the completion of all remaining grading to proceed at reduced costs.¹⁰⁶ Troops completed the ballasting and track laying, and they also maintained and operated the railroad.¹⁰⁷ Additionally, troops were responsible for constructing trestles and culverts.

Construction of the railroad proceeded under the supervision of Major Churchill of the 304th Engineers.¹⁰⁸ The Second Battalion of the 304th Engineers began construction from Accotink station and another group of engineers started work on the railroad from Camp Humphreys.¹⁰⁹ All work, including the construction located outside the military boundaries, fell under the control of the engineers. The 45th Engineers were responsible for work completed outside the installation boundaries, whereas replacement troops completed work on government property.¹¹⁰ By late July, the railroad was completed to the

⁹⁸ Ibid., 82,83.

⁹⁹ Ibid., 11.

¹⁰⁰ Ibid.

¹⁰¹ Ibid., 83.

¹⁰² Ibid., 2.

¹⁰³ Gray, “History of Railroads,” 4.

¹⁰⁴ Ibid.

¹⁰⁵ Park, “Camp Humphreys 1918 Park Report,” 2.

¹⁰⁶ Ibid.

¹⁰⁷ “Fort Humphreys, Virginia,” 19.

¹⁰⁸ U.S. Army Corps of Engineers 304th, *The Official History of the Three Hundred and Fourth Engineer Regiment. Seventy-Ninth Division, U.S.A.* (The Regiment. Under Supervision of its Commanding Officer, 1920), 33.

¹⁰⁹ Ibid., 30.

¹¹⁰ Park, “Camp Humphreys 1918 Park Report,” 3.

Quartermaster's warehouses.¹¹¹ When completed, the railroad extended from 23rd Street north to Accotink Station for a distance of approximately 4.51 miles.¹¹²

Troops constructing the railroad were housed in temporary camps located at Camp Accotink, near Accotink Station, and others in the vicinity of the Belvoir cantonment.¹¹³ Engineer troops stationed at Camp Humphreys also participated in camp construction projects, in addition to railroad construction, prior to their deployment to France.

The undulating terrain, with its numerous ravines, required the construction of six trestles. Because the military training camp extended north and south of the existing Richmond, Alexandria, and Washington Road (U.S. Route 1), construction of a trestle over the road was necessary in order for supplies arriving at Accotink Station to the north to reach the Quartermaster warehouses at the southern end of the camp. Work on one trestle often was started by one regiment and completed by another. Construction on trestles 1, 2, and 3 was started by the 304th Engineers in February 1918; Trestle 4 was started by the 45th Regiment of Engineers in May 1918; and trestles 5 and 6 were started in March 1918 by the 102nd Regiment of Engineers.¹¹⁴ Ultimately, engineers from the various engineer training schools completed trestles 5 and 6.¹¹⁵

The design and construction of the trestles required skilled calculations by trained engineers. As recounted in the *Official History of the Three Hundred and Fourth Engineer Regiment, Seventy-Ninth Division, U.S.A.*, the

largest of these [trestles] demanded nice calculation. This was designed by Capt. St. John, and was some 600 ft. long. It was on a 6^o curve and a 1.5% grade, and its two easement curves required especially accurate workmanship. The timbers for this bridge were measured, cut and placed by our men—some of the timbers were even hewn down and hauled from where they grew. Toward the end of the work, when extra speed was called for, a series of electric lights was installed around the trestle, and work was continued both day and night.¹¹⁶

The Second Battalion of the 304th Engineers left Virginia on 14 April 1918.¹¹⁷ The deployment of trained troops impacted construction and the Army relied on untrained troops to complete the work. The battalion constructing the railroad spur from Accotink to Camp Humphreys, for example, comprised immigrants from Philadelphia who had been drafted into the Army and who had limited engineering and railroad

¹¹¹ Ibid.

¹¹² Ray Gallagher, "Fort Belvoir Railroad is 65 Years Old," *Castle*, September 10, 1982.

¹¹³ "Fort Humphreys, Virginia," 17.

¹¹⁴ Park, "Camp Humphreys 1918 Park Report," 5.

¹¹⁵ Ibid., 3.

¹¹⁶ U.S. Army Corps of Engineers 304th, *The Official History*, 30.

¹¹⁷ Ibid., 33.

construction experience.¹¹⁸ Despite the challenging terrain and work conditions and a lack of experienced troops, the railhead ultimately reached the Camp Humphreys railroad terminal on 20 July 1918.¹¹⁹ After construction, the railway operated ten passenger trains carrying troops daily and handled 35 loads in and out.¹²⁰

Archival research suggests the early steam power locomotives consisted of both Army-owned and those leased from the RF&P Railroad. The motive power changed through the life of the railroad, but only partial records of acquisitions and retirements are now available, making a complete locomotive roster impossible to generate. The original requisition of motive power included: one U.S.E.D. steam locomotive No. 1 of the switch engine, 2-6-0 Mogul type; two RF&P Railroad locomotives of the 4-6-0 ten-wheeler type; and two 125-horsepower standard gauge gasoline locomotives. The request for the two gasoline locomotives allowed for the release of the 4-6-0 locomotive for a 2-6-0 type. Locomotive No. 1 purportedly was built and served on the Panama Canal and in an industrial capacity in the United States before it was acquired by the Director General Military Railways. U.S.E.D. locomotive No. 7 also served in the Panama Canal and in an industrial capacity in the United States before it was purchased by the military. Both locomotives No. 1 and No. 7 likely were converted from 5' to standard gauge. Neither locomotive could meet the military demand; road engines of the 4-6-0 type leased from the RF&P Railroad supplemented the military locomotives. The Federal government also obtained two standard gauge, Vulcan 4-wheel, 125-horsepower gasoline locomotives; however, they proved problematic for heavy use because they required significant maintenance. Each steam locomotive worked three shifts. At the time the military railroad was completed, rolling stock was not included in its inventory. However, by 1921, the Army operated two locomotives and 26 cars on the standard gauge railroad.¹²¹

In 1943, at least one Baldwin locomotive was in use at the installation.¹²² Locomotives built in 1958 replaced the earlier locomotives.¹²³ General Electric 80-ton units predominated, with at least eight of them serving the installation at different times. A few Electro-Motive SW-8 locomotives were also used. These diesels were obtained from a government facility in Utah, and were periodically exchanged for rebuilt locomotives.¹²⁴

The railroad did not originally own any rolling stock, but a few cars were acquired over the years for local use. Loaded cars delivered by the RF&P were owned by various railroads. After World War II, military

¹¹⁸ Park, "Camp Humphreys 1918 Park Report," 82, 84.

¹¹⁹ *Ibid.*, 110.

¹²⁰ *Ibid.*, 19.

¹²¹ U.S. House of Representatives, *Army Appropriation Bill*, 662.

¹²² Gray, "History of Railroads," 6-7, 13; Allan A. Davidson, "I've Been Workin' on the Railroad," *Belvoir Castle*, July 16, 1943, 5; Lee, e-mail message to Kirsten Peeler, April 26, 2014.

¹²³ Mary Hudson, "On Track: Post Train System. Trains Move Materials and Mobilize Belvoir," *Castle*, March 8, 1985.

¹²⁴ Lee, e-mail message to Kirsten Peeler, April 26, 2014.

vehicles typically were moved using government-owned flat cars, although railroad-owned cars supplemented Army-owned cars when needed.¹²⁵

The Fort Belvoir Military Railroad continued to function after World War I through the 1990s. Up through the early 1950s, the railroad transported personnel, equipment, and material. After the outbreak of the Korean Conflict, the railroad primarily was used to carry goods, coal specifically, to other military installations in the region.¹²⁶ The railroad also, on occasion, transported heavy equipment that could not be transported on the highway via tractor trailer. This heavy equipment included military vehicles such as trucks and tanks, as well as bridge components.¹²⁷

During the 1990s, the Fort Belvoir Directorate of Logistics operated and maintained the railroad, which was used to transport coal for the General Services Administration during the summer months.¹²⁸ Continued use of the military railroad came under review during the late 1990s. Post officials explored the effectiveness of continued railroad use. Maintenance costs relative to usage precipitated the preparation of a study to examine continued use of the railroad.¹²⁹ Options under consideration included extending passenger service from the installation to the Franconia-Springfield transportation center.¹³⁰ Also under consideration was abandonment of the rail line south of U.S. Route 1, which would eliminate the need for the bridge crossing U.S. Route 1. In 1990, estimated costs for replacing the military railroad bridge over U.S. Route 1 was a minimum of \$500,000.¹³¹ Military officials ultimately decided to terminate railroad service. The last locomotive departed Fort Belvoir in September 1993.¹³²

History of the Construction of Trestle 5 (Facility No. 1433) (DHR No. 029-5424)

Trestle 5 was one of six wood trestles completed by July 1918.¹³³ The design of the current structure (Facility No. 1433) is the result of a series of alterations undertaken to address a variety of needs, including material failure and road widening. The bridge incorporates modifications made in response to changing needs with earlier alterations and existing site conditions dictating design solutions. The current bridge characterizes a pragmatic and expedient approach to bridge modification rather than a holistic, uniform design process. The subsequent result is a hybrid-design bridge that incorporates both reinforced-

¹²⁵ Ibid.

¹²⁶ Meg Greene Malvaisi, "Draft Fort Belvoir Military Railroad National Register of Historic Places Multiple Property Documentation Form," (Fairfax, VA: Paciulli, Simmons & Associates, 2012), 15. Available from the Cultural Resources Manager / Post Historian.

¹²⁷ Ibid.

¹²⁸ Woolpert, "Real Property Master Plan. Fort Belvoir Long Range Component – 1993," 1993, 2-10, 2-11.

¹²⁹ Deborah Fields, "Post's Railroad Status under Review," *Castle*, February 23, 1990.

¹³⁰ Ibid.

¹³¹ Ibid.

¹³² Maury S. Cralle to Mr. Daniel Seymour, 31 July 1995, U.S. Army Garrison Fort Belvoir; Post Historian, VA.

¹³³ Park, 3.

concrete arch and plate girder construction. The construction sequence for Trestle 5 (Facility No. 1433) briefly is summarized below:

- Trestle 5 completed in 1918;
- Metal girder added to Trestle 5 (date unknown);
- Trestle 5 replaced by concrete arch bridge (Facility No. 1433) in 1928. Metal girder remained in place; and,
- Two bridge arches removed and current metal girder installed in 1935.

The original Trestle 5 extended 400' and had a maximum height of 60'; the distance between bents was 15'.¹³⁴ Trestle 5 was a multi-story structure completed of white oak hewn and cut at the trestle site or transported from other parts of the camp (Figure 2).¹³⁵ Work on the trestle was completed simultaneously from the north and south approaches; steam hoisting engines raised "the members from the ground to story after story, thus permitting all dowel [sic] pins to be placed entirely through the cap and entirely into both the batter and plumb post sufficiently to give excellent bonding."¹³⁶

By the late 1920s, it became apparent that replacement of trestles 2, 5, and 6 were necessary because they "were of war time construction made of green timbers, all of which was [sic] badly deteriorated and unsafe."¹³⁷ In 1927, drawings prepared by the Quartermaster Corps depict a reinforced-concrete bridge with four arches, measuring 13' across, on the south approach and three arches, also measuring 13', on the north.

Replacement of the wood trestle with a reinforced-concrete arch bridge offered a potential costs savings. Among the primary advantages of concrete construction were its durability and relatively low maintenance costs.¹³⁸ Use of concrete as a construction material for arch bridges was well established. First used in the United States in 1889 at the Golden Gate Park in San Francisco, California, reinforced-concrete arch bridges gained in popularity throughout the late nineteenth century and into the early twentieth century.¹³⁹ Although less common than truss, beam, and slab bridges, concrete arch bridges in Virginia were not uncommon.¹⁴⁰ Reinforced-concrete arch bridges appeared in Virginia by 1904.¹⁴¹

¹³⁴ E.M. deBerri. Construction Progress. Camp Humphreys, VA. P.N. 9982. Record Group-111-SC. Records of the Office of the Chief Signal Officer. Prints. Military History, 1860 – 1938. 9862 to 9999. Box 70. (College Park, Maryland: National Archives and Records Administration, 1918.)

¹³⁵ Ibid.

¹³⁶ Park, "Camp Humphreys 1918 Park Report," 7.

¹³⁷ U.S. Quartermaster General. Completion Report. Fort Belvoir, Virginia. Vol. 2. Record Group 77 Office of the Chief of Engineers. Construction Completion Reports 1917-1943. Box 30 Camp Beauregard – Vol. 5 through Fort Belvoir Vol. 2 (College Park, Maryland: National Archives and Records Administration, 1928), 2.

¹³⁸ Ann B. Miller, Kenneth M. Clark, and Matthew C. Grimes, "Final Report. A survey of Masonry and Concrete Arch Bridges in Virginia," 2000, 16.

¹³⁹ Ibid.

¹⁴⁰ Ibid., 24.

Concrete arch bridges often incorporated decorative railings or parapets, a feature absent in concrete arch railroad bridges.

The Quartermaster Corps jointly supervised the construction of a portion of U.S. Route 1, referred to as the Alexandria-Humphreys Road in contemporary accounts, under the Office of Public Roads and the Construction Division. The eight and a-half-mile road cost \$346,542.79.¹⁴² The Motor Transport Corps supplied road materials for four miles of the road; the remainder was provided by private contractor.¹⁴³ Archival research suggests U.S. Route 1 south of the Fort Belvoir main entrance may not have been paved. Newspaper accounts from the 1920s describe major improvements along the entire length of the road leading from Richmond to Washington, D.C. (U.S. Route 1). The Richmond-Washington Highway, as the road was named in contemporary newspaper articles, was scheduled to open in spring 1927, after years of delay.¹⁴⁴ It is possible that the plate girder bridge referenced in the 1927 drawings was installed as part of the road improvement project.

The plans prepared for Facility No. 1433 are similar, in terms of the use of concrete, to those prepared for the replacement of Trestle 4 with a new bridge (Facility No. 2298) over Beulah Road, but the dimensions of each are site-specific. The drawings for Facility No. 2298 incorporate some similarities in terms of design (i.e., arches) but otherwise it does not appear as if they were designed as part of an attempt to create a uniformed look or design aesthetic for the installation's railroad crossings.

A girder connects the north and south approaches; the design of the girder is not depicted on the 1927 drawings. A new poured-concrete culvert to be located under the south span also is depicted on the drawings. The 1927 drawings indicate that concrete posts located at the north and south ends of the girder and the girder itself were present at the time the drawings were prepared in 1927. The drawings suggest that the wood trestle would remain in place during the construction of the replacement bridge. Significant fill would be required to accommodate major changes in grade (Figure 3). A photograph taken shortly after construction depicts the completed bridge (Figure 4).

The title block on the plans developed by the Quartermaster General does not suggest the design was based on standardized plans. Indeed, it appears that the drawing is unique and the new bridge design was adapted to incorporate the existing metal girder. Archival research did not identify photographs of masonry repair, or records or drawings that illustrate changes to the wood trestle over time. Field photographs taken during and shortly after construction of Trestle 5 do not depict the use of concrete. In addition, contemporary accounts do not reference the use of concrete in the construction of any of the wood trestles. The presence of the plate girder at the time the trestle was replaced suggests that repairs had occurred between the time the trestle was constructed in 1918 and replaced in 1928.

¹⁴¹ Ibid., 22-23.

¹⁴² U.S. House of Representatives, *Annual Reports*, 281.

¹⁴³ Ibid.

¹⁴⁴ "Invite Nations to Celebration," *Richmond-Times Dispatch*. March 31, 1927. www.genealogy.com.

Five of the original wood-frame trestles were replaced in 1928 under two separate contracts. The Quartermaster General's construction completion reports for filling the trestles summarize project details. The replacement of trestles 2, 5, and 6 were completed under contract W 406 - qm -2 by L. Morgan Johnston of Alexandria, Virginia, and trestles 3 and 4 were completed under contract No. W 406 - qm 55 by Jarboe & Houghton, Mechanicsville, Maryland, for a cost of \$37, 218.60.¹⁴⁵ These two construction projects resulted in the removal of all six wood trestles. The crossings were infilled with new culverts or bridges (Facility No. 1433 and Facility No. 2298) were constructed.

The Quartermaster supervised construction with the assistance of one Assistant Quartermaster and one inspector.¹⁴⁶ Public law 630 authorized the construction project. The work was awarded to L. Morgan Johnston for \$51,281.46. The total cost of the work was \$50,168.43 with \$1,831.57 retained for other repairs to the track.¹⁴⁷ The replacement of Trestle 5 with Facility No. 1433 was completed in February 1928.

L. Morgan Johnston was a developer and rental property owner. As a general contractor, he completed projects for the public sector. Some of his contracts included roadwork for the Department of the Navy and roadwork for local and state governments. As a developer and owner, he developed 30 hollow-tile, single-family dwellings in the Rucker-Johnston subdivision of Alexandria's Rosemont neighborhood between 1919 and 1920.¹⁴⁸ He also acquired the Hermitage apartment building on Vermont Avenue in Washington, D.C.¹⁴⁹

L. M. Johnston constructed culverts on Evarts Street in Washington, D.C.¹⁵⁰ The 1919 Annual Report of the Quartermaster General identified all contractors and subcontractors contracted for projects under the supervision of the construction division of the Army.¹⁵¹ L. M. Johnston was awarded a contract for road repair at Fort Myer, Virginia.¹⁵² The U.S. Department of the Navy entered into a contract with L. Morgan

¹⁴⁵ U.S. Quartermaster General. Completion Report, 53.

¹⁴⁶ *Ibid.*, 2.

¹⁴⁷ *Ibid.*

¹⁴⁸ Shirley Maxwell and James C. Massey, "Rosemont Historic District National Register of Historic Places Nomination Form, 1991, Section 8, p. 51; "Beautiful Homes Now Nearing Completion at North Rosemont, Alexandria, Va.," *The Washington Post*, September 26, 1915, 15, www.ancestry.com; "North Rosemont, Alexandria, Va.," *The Washington Post*, advertisement, April 25, 1920, 5, www.ancestry.com.

¹⁴⁹ "Hotel and Three Apartments Sold," *The Washington Post*, Third part, June 26, 1921. www.ancestry.com.

¹⁵⁰ "District of Columbia," *Engineering and Contracting*, No. 1, July 5, 1916, 46. http://google.com/books?id=O-MfAQAAAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false.

¹⁵¹ U.S. House of Representatives, *Annual Reports*, 389.

¹⁵² *Ibid.*, 374.

Johnston to construct roads at the Navy Mine Depot, Yorktown, Virginia, in 1927.¹⁵³ In legal documents filed by the Department of the Navy, L. Morgan Johnston was adjudged bankrupt in March 1928.¹⁵⁴

The 1920 census records Lewis M. Johnston, aged 40, living on Columbia Pike in the Jefferson District of Alexandria, with his wife Daisy (age 39), his sons Sidney B. (age 17) and Lewis M. Johnston, Jr. (age 10) and his daughter Dorothy (age 15).¹⁵⁵ His occupation was identified as general contractor. The 1930 census records identify L. Morgan Johnston living on Columbia Pike in Jefferson District with his wife Daisy, his sons Sidney and L. Morgan Johnston, Jr., his daughter Dorothy, and his son-in-law James H. McCallister. His occupation was identified as general contractor.¹⁵⁶ Census records suggest Lewis Morgan Johnston died by 1940. His wife Daisy, his daughter Dorothy, and his son-in-law James McCallister were recorded on North Chesterbrook Road in Arlington, Virginia.¹⁵⁷

Visual observation and archival research suggest the metal plate girder currently spanning U.S. Route 1 is not the same feature depicted on the 1927 drawing and the 1928 picture of the bridge. The manufacturer's badge located on the northwest approach indicates the existing girder was installed in 1935 by the Virginia Bridge and Iron Company. One arch from each the north and south abutments was removed to accommodate the longer girder. The real property card for Facility No. 1433 indicates that the length of the girder in 1941 / 1942 was 100', the same distance as the extant girder.¹⁵⁸

The Virginia Bridge and Iron Company was established in 1888 as the American Bridge Works.¹⁵⁹ After undergoing reorganization, the company was renamed the Virginia Bridge and Iron Company in 1895.¹⁶⁰ The Roanoke, Virginia-based company expanded and by the early twentieth century, it maintained an annual capacity of 12,000 tons of manufactured products, making the company's capacity the largest of any bridge manufacturer in the South.¹⁶¹ The company continued to expand throughout the early twentieth century, eventually expanding operations to Charlotte, North Carolina; Atlanta, Georgia; Memphis, Tennessee; New York, New York; and Los Angeles, California. The company produced steel railcars and tanks, steel power houses, and steel stadiums in addition to bridge components.¹⁶²

¹⁵³ J.R. McCarl, *Decision of the Comptroller General of the United States. Volume 8, July 1, 1828 to June 30, 1929*, (Washington, DC: Government Printing Office, 1929), 59.

¹⁵⁴ *Ibid.*, 63.

¹⁵⁵ U.S. Census, 1920. www.ancestry.com.

¹⁵⁶ U.S. Census, 1930. www.ancestry.com.

¹⁵⁷ U.S. Census, 1940. www.ancestry.com.

¹⁵⁸ Fort Belvoir Directorate of Public Works, Real Property Card, (U.S. Army Garrison Fort Belvoir, VA: Cultural Resources Manager, Directorate of Public Works, n.d.).

¹⁵⁹ Martha Carver, "Tennessee's Survey Report for Historic Highway Bridges." 2008, 215.

¹⁶⁰ *Ibid.*

¹⁶¹ *Ibid.*

¹⁶² *Ibid.*, 216.

By the early 1930s, the company was the third largest steel fabricating company in the country.¹⁶³ A subsidiary of the U.S. Steel Corporation, the Tennessee Coal, Iron and Railroad Company of Birmingham, Alabama, acquired the Virginia Bridge and Iron Company in 1936.¹⁶⁴ After its acquisition by the Tennessee Coal, Iron and Railroad Company, the company's Roanoke operations were renamed the Virginia Bridge Company and survived through the Great Depression. The renamed Virginia Bridge Company manufactured products for the war effort including ships and landing barges, dry docks, and portable military bridges.¹⁶⁵ The company later was acquired by the American Steel Company and continued to produce steel for a variety of building projects.¹⁶⁶ Labor disputes contributed to the company's closing during the mid-twentieth century.¹⁶⁷

VII. Project Background

Documentation of the Fort Belvoir Railroad Bridge (Facility No. 1433) (DHR No. 029-5424) to HAER standards was undertaken in partial fulfillment of the stipulations contained in the Programmatic Agreement executed in November 2012 among the Department of Transportation Federal Highway Administration; United States Army Garrison, Fort Belvoir; County of Fairfax, Virginia; Commonwealth of Virginia Virginia Department of Transportation; Department of Defense Office of Economic Adjustment; Catawba Indian Nation; National Trust for Historic Preservation; Advisory Council on Historic Preservation; and Virginia State Historic Preservation Officer to mitigate effects to historic properties associated with the U.S. Route 1 improvement project. The agreement was executed pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended. The Fort Belvoir Railroad Bridge will be removed as part of the U.S. Route 1 improvement project. In 2007, the Virginia SHPO concurred with Fort Belvoir's recommendation that the bridge was eligible for inclusion in the National Register of Historic Places as a Multiple Property Listing. The Virginia SHPO subsequently concurred with the Federal Highway Administration that the bridge was eligible as a contributing resource to the Fort Belvoir Military Railroad pursuant to Section 106 consultation on the Route 1 improvements project.¹⁶⁸

¹⁶³ Ibid.

¹⁶⁴ Ibid, 217.

¹⁶⁵ Ibid.

¹⁶⁶ Ibid.

¹⁶⁷ Ibid.

¹⁶⁸ Christopher Daniel, e-mail message to Jack Van Dop, November 26, 2013; Marc Holma to Jack Van Dop, 3 February 2014, Commonwealth of Virginia, Department of Historic Resources, Richmond.

Railroad equipment required to move various organizations of the Army at war strength.

	Personnel.					Railroad equipment required.							
	Officers.	Men.	Animals.	Vehicles.	Guns complete.	Fullman.	Coaches.	Baggage.	Box.	Stock.	Flat or gondola.	Total cars.	Trackage (feet).
Infantry regiment.....	55	1,890	177	22	....	5	43	5	15	9	8	85	5,150
Cavalry regiment.....	54	1,284	1,436	26	....	8	28	6	25	72	9	150	7,850
Artillery regiment, light.....	45	1,170	1,157	32	24	9	23	9	25	58	46	170	8,675
Artillery regiment, horse.....	45	1,173	1,571	35	24	10	24	10	25	78	47	194	9,830
Artillery regiment, mountain....	45	1,150	1,229	....	24	7	23	7	30	61	....	124	6,405
Engineers, pioneer, battalion....	16	502	165	12	....	2	12	2	10	8	4	38	2,110
Signal Corps, field battalion.....	9	171	206	15	....	2	4	2	5	10	5	28	1,460
Infantry division, comprising 3 brigades Infantry, 1 regiment Cavalry, 1 brigade Light Artil- lery, 1 pioneer engineer, 1 field battalion Signal Corps, and necessary wagon trains.....	736	22,285	7,660	775	48	46	487	45	245	383	301	1,507	82,265
Cavalry division, comprising 3 brigades Cavalry, 1 regiment Horse Artillery, 1 Pioneer en- gineer, 1 Signal Corps battal- ion, and necessary wagon trains.	458	10,259	12,231	414	24	63	218	63	210	611	137	1,302	77,190

To move a field army would require 2,115 passenger cars, 385 baggage cars, 1,055 box cars, 1,899 stock cars, and 775 flat cars; total 6,229 cars; which would make about 366 trains, and require this number of locomotives.

Table 1. Railroad Equipment Required to Move Various Organizations of the Army at War Strength
(Source: U.S. House of Representatives 1916:282).

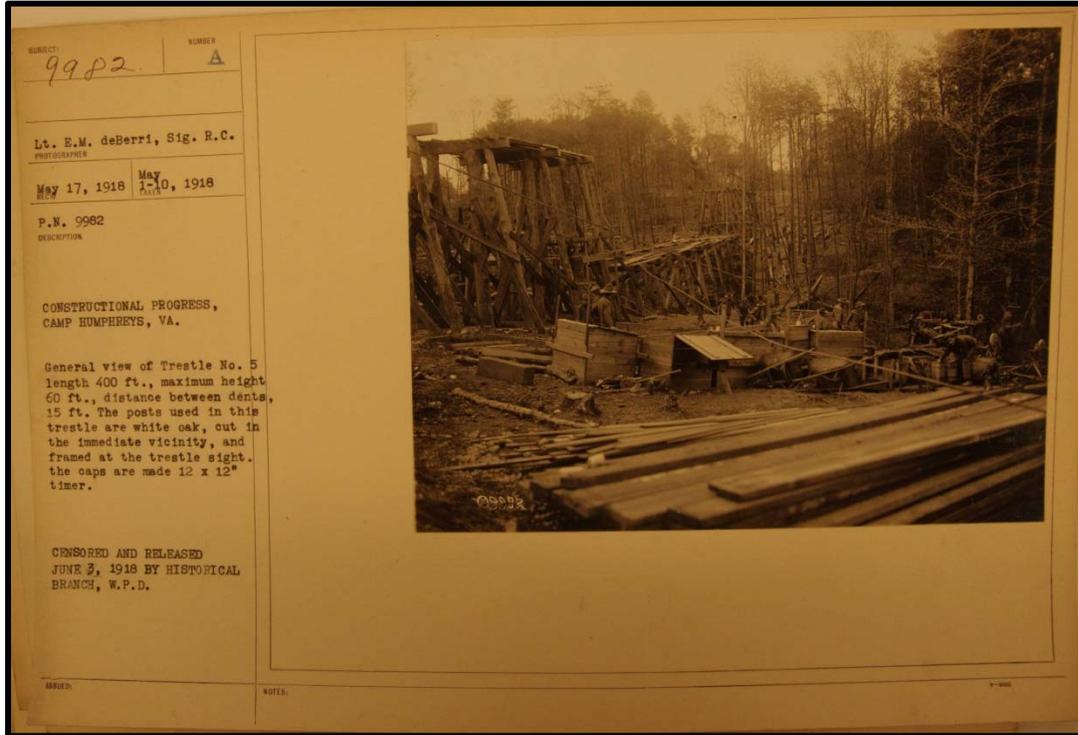


Figure 2. Construction of Trestle 5
(Source: deBerri, 1918).

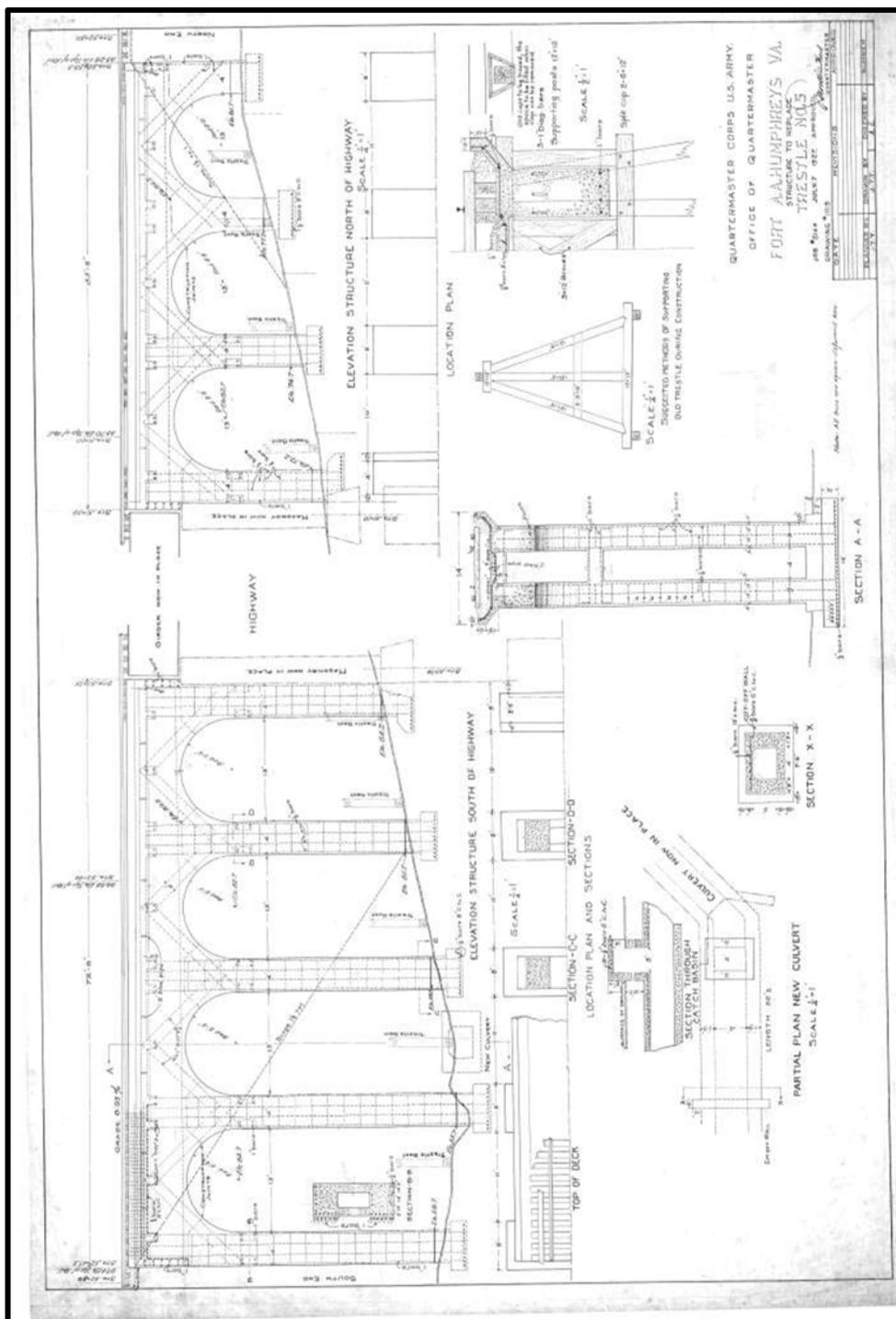


Figure 3. Facility 1433, Drawings Prepared by the Quartermaster General (Source: Fort Belvoir Directorate of Facilities Engineering).



Figure 4. Photograph of Facility No. 1433 Shortly after Construction
(Source: U.S. Quartermaster General Construction Completion Report, 1928).

Bibliography

- Alaska Railroad Corporation. "Timber Trestle Bridges in Alaska Railroad History," Electronic document, n.d.
<http://alaskarailroad.com/Portals/6/pdf/projects/Timber%20bridge%20history%20booklet.pdf>.
- American Association of Railroads, "A Short history of U.S. Freight Railroads," Washington, DC: American Association of Railroads, 2013.
<https://www.aar.org/keyissues/Documents/Background-Papers/a%20short%20history%20of%20us%20freight.pdf>.
- American Railway Engineering Association, *Manual of the American Railway Engineering Association. Definitions, Specifications and Principles of Practice for Railway Engineering*. Chicago: American Railway Engineering Association, 1921.
http://google.com/books?id=NfKvSmUJ5MQC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false.
- Behling, Burton N. "Railroads – Their Development, Problems, and Prospects," in *U.S. Transportation. Resources, Performance and Problems. A Collection of Papers Prepared for the Transportation Research Conference Convened by the National Academy of Sciences at Woods Hole, Massachusetts. August, 1960*. Publication 841-S. Washington, DC: National Academy of Sciences-National Research Council, 1961.
<http://books.google.com/books?id=xy8rAAAAAYAAJ&pg=RA1-PA203&dq=mobilization+railroads+united+states+world+war+II&hl=en&sa=X&ei=zdlCUvzVC7LG4APTqYG4Dw&ved=0CDUQ6AEwADgK#v=onepage&q=mobilization%20railroads%20united%20states%20world%20war%20II&f=false>.
- Carver, Martha. "Tennessee's Survey Report for Historic Highway Bridges," Electronic document, 2008.
<http://www.tdot.state.tn.us/environment/historic/bridgebook.htm>.
- Fine, Lenore and Jesse A. Remington, *United States Army in World War II. The Technical Services. The Corps of Engineers: Construction in the United States*. Washington, DC: Center of Military History, 1989.
- Fort Belvoir. Host to History. Second Edition*. U.S. Army Garrison Fort Belvoir: Fort Belvoir, VA, 2010.
- "Fort Humphreys, Virginia" (U.S. Army Garrison Fort Belvoir, Directorate of Public Works, VA. ca. 1930).
- Gray, Walter A., Major. "History of Railroads at Fort Belvoir, Virginia" Unpublished manuscript, 1949 U.S. Army Garrison Fort Belvoir, VA.
- Grandine, Katherine and Deborah Cannan. "Support and Utility Structures and Facilities (1917 – 1946). Overview, Inventory, and Treatment Plan. Final Report." Frederick, MD: R. Christopher Goodwin & Associates, Inc., 1995.

Hool, George A., William Spaulding Kinne, Roy Richard Zipprodt, and Datzell Melvin Griffith. *Steel and Timber Structures*. New York: McGraw-Hill Book Company, Inc., 1942.

Maxwell, Shirley and James C. Massey. "Rosemont Historic District National Register of Historic Places Nomination Form." Electronic document, 1991.
http://www.dhr.virginia.gov/registers/Cities/Alexandria/100-0137_Rosemont_HD_1992_Final_Nomination.pdf.

Miller, Ann B., Kenneth M. Clark, and Matthew C. Grimes. "Final Report. A Survey of Masonry and Concrete Arch Bridges in Virginia." Electronic document, 2000.
http://www.virginiadot.org/vtrc/main/online_reports/pdf/00-r11.pdf.

McCarl, J.R. *Decision of the Comptroller General of the United States. Volume 8, July 1, 1928 to June 30, 1929*. Washington, DC: Government Printing Office, 1929.
http://google.com/books?id=ayMWAQAAMAAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false.

Park, Richard, Colonel. "Camp Humphreys 1918 Park Report." Unpublished manuscript, 1918. U.S. Army Garrison Fort Belvoir, VA.

Peeler, Kirsten and Melissa Crosby. "Fort Belvoir Historic District National Register of Historic Places Nomination Form." Frederick, MD: R. Christopher Goodwin & Associates, Inc., 2010.

Pittman, H.V. "History of the Industrial Railway and of the Light Railway School," Appendix XXIII (n), in "Camp Humphreys 1918 Park Report". Unpublished manuscript, 1918. U.S. Army Garrison Fort Belvoir, VA.

Schneider, Carl J. and Dorothy Schneider. *World War II*. New York, NY: Infobase Publishing, 2003.

U.S. Army Corps of Engineers. "Context Study of the United States Quartermaster General Standardized Plans 1866 – 1942." Unpublished manuscript, 1997.

U.S. Army Corps of Engineers. 304th. *The Official History of the Three Hundred and Fourth Engineer Regiment. Seventy-Ninth Division, U.S.A.* The Regiment. Under supervision of its Commanding Officer, 1920.
http://google.com/books?id=icIMAAAAYAAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false.

U.S. Army Garrison Fort Belvoir. Drawings. Directorate of Facilities Engineering, Fort Belvoir, VA.
---. Papers. Directorate of Public Works, Fort Belvoir, VA.
---. Papers. Post Historian, Fort Belvoir, VA.

U.S. Census, 1920. www.ancestry.com.
---. 1930. www.ancestry.com.
---. 1940. www.ancestry.com.

“U.S. government takes over control of nation’s railroads.” The History Channel, 2014, <http://www.history.com/this-day-in-history/us-government-takes-over-control-of-nations-railroads>.

U.S. House of Representatives. *To Increase the Efficiency of the Military Establishment of the United States. Hearings before the Committee on Military Affairs. House of Representatives. Sixty-fourth Congress. First Session on the Bill to Increase the Efficiency of the Military. January 6 to February 11, 1916 (in two volumes). Vol. 1.* Washington, DC: Government Printing Office, 1916. http://google.com/books?id=fxM9AAAAAYAAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false.

----. *Camp A. A. Humphreys, VA. Construction of Officers’ Quarters. Hearings before the Committee on Military Affairs.* 66th Congress, First Session, July 15. Washington, DC: Government Printing Office, 1919. http://google.com/books?id=Z0yoQCq0gSwC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false.

----. *Annual Reports – Quartermaster General (Director of Purchase and Storage), Chief of Chemical Warfare Service, Director of Tank Corps, Chief of Construction Division, Chief of Coast Artillery, Chief of Real Estate Service for the Fiscal Year Ended June 30, 1919.* 66th Congress, 2d Session. House Documents, Vol. 17. Washington, DC: Government Printing Office, 1920. http://google.com/books?id=xq4qAAAAAYAAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false.

----. *Army Appropriation Bill, 1922. Hearing before Subcommittee of House Committee on Appropriations.* 66th Congress, 3rd Session. Washington, DC: Government Printing Office, 1921. <http://books.google.com/books?id=JL3bJFKMvrkC&printsec>.

Vergun, David. “Forgotten tiny trains carried WW I vets to victory.” Electronic document, 2010. <http://www.army.mil/article/47644/forgotten-tiny-trains-carried-wwi-vets-to-victory/>

War Department. *Professional Papers of the Corps of Engineers of the United States. Engineer Field Manual.* Document No. 355. Volume 29. Office of the Chief of Engineers. Washington, DC: Government Printing Office, 1918. <http://google.com/books?id=GLUmaqAAIAAJ>.

----. *Manual of the Construction Division of the Army. Section C. Engineer Division 1918. Revised June 1, 1919.* Washington, D.C.: Consolidated Supply Co., Printers, 1919. http://google.com/books?id=7X0DAAAAYAAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false.

Whelan, Deborah C.; Leo Hirrel; William T. Dod; J. Hampton Tucker; and Katherine Grandine. “Historic Context for Department of Defense World War II Permanent Construction. Final Report.” Frederick, MD: R. Christopher Goodwin & Associates, Inc., 1997.

Woolpert. “Real Property Master Plan. Fort Belvoir. Long-Range Component – 1993.” Unpublished manuscript, 1993.