

Cultural Resources



Discovering New Jersey's Transportation Past

A Publication of the New Jersey Department of Transportation

Digest

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April 2016

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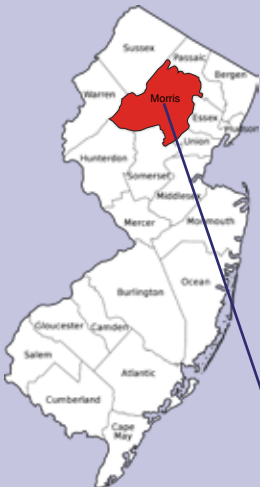
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Dover Township
Morris County

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Historic Bridges of the Delaware Lackawanna & Western Railroad



Delaware River Viaduct, Knowlton Township, Warren County, NJ and Upper Mount Bethel Township, Northampton County, PA, built 1908-11 [Source: Joseph Elliott 1999].

INTRODUCTION

This publication was produced to provide the general public with an overview of the significant and architecturally distinctive bridges of the Delaware, Lackawanna & Western (DL&W) Railroad. It was completed in accordance with a stipulation of the Memorandum of Agreement dated November 19, 2007 between the Federal Highway Administration and the New Jersey Historic Preservation Office (NJHPO) for the replacement of the Prospect Street Bridge (STR. #1464-157) over New Jersey Transit (NJ Transit)–Morristown Line, Dover, Morris County, New Jersey. In large part, the information within was drawn from data assembled in connection with a Preservation Plan developed for the NJ Transit–Morristown Line and from Historic American Engineering

Recordation documentation prepared for the railroad's numerous historic bridges.

This overview focuses on the historic structures located along the DL&W's Main Line and the DL&W's New Jersey Cutoff. Where multiple examples of a bridge type exist, such as concrete arch or through girder, the narrative highlights one unique or representative example of that type. All bridges that have been determined to be individually eligible for the National Register of Historic Places by the NJHPO are identified on the accompanying figure on page 18 and in the table on page 19. With the exception of the Hope Road bridge in Warren County, all of the significant bridges are still intact.

**All photographs by Glenn R. Modica, 2015, unless otherwise noted.*

OVERVIEW HISTORY

The Old Main Delaware, Lackawanna & Western Railroad Historic District (DL&W) extends across the state from Hoboken Terminal on the Hudson River to Knowlton Township on the Delaware River. The DL&W was formed in 1853 for the express purpose of transporting anthracite coal from northeastern Pennsylvania coal fields to east coast markets. The DL&W over time acquired an amalgamation of smaller railroads in Pennsylvania, New Jersey and New York. By the 1880s, the DL&W reached its peak mileage and extended from Hoboken to Buffalo by way of Pennsylvania with branch lines in each of the three states.

In New Jersey, the Main Line of the DL&W was formed from two earlier railroad lines: the Warren Railroad and the Morris & Essex Railroad. The Warren Railroad, incorporated in 1851, completed an 18.27-mile line that began near the village of Delaware on the Delaware River and ran to a connection with the Central Railroad of New Jersey near Hampton, Hunterdon County. The DL&W leased the Warren Railroad in 1857.

The Morris & Essex Railroad, formed in 1835, completed a line of rail between Morristown and Newark three years later. By 1865 the Morris & Essex connected Hoboken on the Hudson River with Phillipsburg on the Delaware River. The DL&W leased the Morris & Essex in 1868, becoming the DL&W's Morris & Essex Division. During the early twentieth century, the Morris & Essex Division evolved into an important commuter railway, bringing thousands of passengers into New York City each day.

In 1899 William Haynes Truesdale became president of the DL&W. During Truesdale's presidency (1899-1925) the DL&W embarked on an ambitious program to modernize and improve the company's infrastructure and equipment called the "Era of Great Accomplishments." In urban areas where the railroad crossed city streets, Truesdale and his Chief Engineer, George J. Ray, implemented grade-crossing elimination projects that either raised the railroad above grade or depressed the tracks below grade. Eliminating grade crossings reduced the danger of accidents and increased traveling speeds. Over the course of two decades, the DL&W completed grade crossing elimination projects in Harrison, Newark and Summit (1905), Morristown (1912), Chatham (1915), South Orange and Madison (1916), Orange (1918), and East Orange (1923).



William Haynes Truesdale (1851-1935) oversaw a period of unprecedented expansion and bridge construction during his presidency from 1899 to 1925 [Source: Taber III 1980].

In the process, the DL&W replaced many of its bridges with heavier and stronger structures to carry more freight and more passengers. The material of choice was concrete. The DL&W pioneered the use of reinforced concrete bridges, achieving exceptional success and creating handsome structures with the material, most notably in the New Jersey Cutoff (1908-11).

The DL&W's 40-mile corridor between Port Morris, New Jersey, and the Delaware River included numerous curves, some of them very sharp for a railroad, as well as steep grades that made it expensive to haul coal. A cutoff route was planned to shorten the trip by 12 miles and speed the delivery of anthracite coal to eastern markets. Construction of the DL&W's New Jersey Cutoff began in summer of 1908 and was completed in December of 1911 at a cost of \$11 million. The completely grade-separated 28-mile line included 73 bridges and culverts, all built of reinforced concrete. The railroad moved more than 14 million cubic yards of earth and gravel to build tunnels, construct cuts and fills and create a relatively flat crossing through the hills and valleys of northwestern New Jersey.

In 1960 the declining DL&W merged with the Erie Railroad to form the Erie Lackawanna Railroad. In 1976, the Erie Lackawanna was taken over by Conrail. Conrail ran trains over the New Jersey Cutoff until 1979 and later abandoned the line and removed the tracks. Passenger operations were transferred to NJ Transit. The Morris &

Essex Division between Dover and Hackettstown became part of NJ Transit's Morristown Line and Montclair-Boonton Lines. Norfolk Southern, which acquired Conrail in 1997, presently operates the remaining portion of the Morris & Essex line to Phillipsburg as part of its freight-carrying Washington Secondary.

In 1996, the New Jersey State Historic Preservation Officer determined that the Old Main DL&W Railroad Historic District was eligible for the National Register for its historical and engineering significance. The boundaries of the linear historic district extend from its eastern terminus at Hoboken Terminal in Jersey City to Washington Borough, Warren County, where it departs the historic route of the Morris & Essex Railroad to follow the historic route of the Warren Railroad through Buttzville, Manunka Chunk, and Delaware to the Delaware River.

BRIDGE TYPES

Stone Arch Bridges

The construction of stone arch bridges has evolved over thousands of years to produce a harmonious symmetry in design. In the United States, the first widespread use of stone arch bridges occurred in the mid-nineteenth century along the nation's eastern railroads. Unlike their predecessor – the timber bridge – stone arch bridges provided stability and durability, qualities most important for railroads as they progressively carried heavier loads. Stone arch bridges prevailed in railroad construction until the Industrial Revolution of the late nineteenth century which introduced new, alternative materials of steel and concrete.

The three stone arch bridges along the DL&W Main Line are the oldest structures remaining on the line. The oldest example, built in 1870, carries the railroad over Den

Brook at the northern edge of Estling Lake. During the 1920s, when the DL&W added additional tracks to its line, the Den Brook bridge was extended to the south with a concrete structure. The Parkway Arches in East Orange is a three-span stone arch bridge built 1890 that incorporates a tier of concrete arches added above in 1923. The only unaltered stone arch bridge is a relatively late example that was built in 1889 across the Passaic River between Union County and Morris County.

Truss Bridges

The development and refinement of steel manufacturing in the late nineteenth century brought about transition from stone arch bridge construction to steel truss and steel plate girder bridges. Simple wooden truss bridges, such as king post or queen post, dates back to the sixteenth century. The triangular units that comprise a truss bridge act in tension or compression to resist stresses caused by a railroad (or vehicle) crossing the bridge. Early metal truss bridges were built of cast iron or wrought iron and had pinned connections, where large metal pins inserted through holes in the truss members held them together. Steel, due to its greater strength, surpassed iron in popularity by the 1890s. Riveted connections, more practical and affordable than pinned connections, also become the preferred means of bridge construction.

The DL&W, and its predecessor the Morris & Essex Railroad, built many truss bridges along the Main Line during the late nineteenth century. The DL&W's widespread rebuilding campaign initiated by President William H. Truesdale at the dawn of the twentieth century brought down many pre-existing truss bridges. Today, a set of truss bridges survive at the western portal of the Bergen Tunnel in Jersey City historically known as the West End Through Truss Bridges (1908). Noteworthy is a short truss bridge in Warren County carrying a farm lane

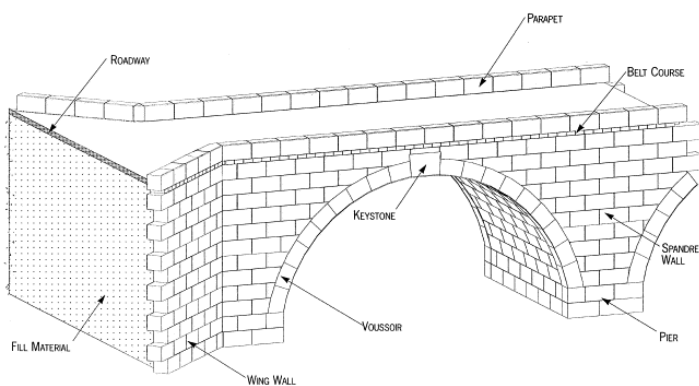
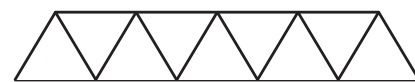
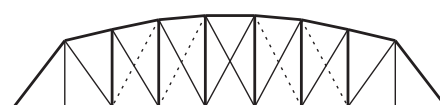


Diagram of a typical stone arch bridge [Source: "Bridges Notes," www.beatrizkolster3124.pbworks.com].



WARREN TRUSS



PARKER TRUSS

Two truss types found on the DL&W Main Line [Source: Historic Bridge Foundation].

over the railroad that the DL&W moved to this location in 1914. The five-span Delaware River Truss (1904) located along the line of the old Warren Railroad survived largely because the DL&W shifted freight operations away from the line after the completion of the New Jersey Cutoff in 1911.

Plate Girder Bridges

Railroads began building plate girder bridges rather than trusses starting in the late nineteenth century. By the early twentieth century plate girder bridges had become widespread along American railroads. Plate girders were more rigid than trusses and more economical to construct for spans less than 100 feet. Plate girder bridges could be preassembled in the shop, transported to the bridge site, and then hoisted into place without disrupting railroad operations. Plate girder bridges were commonly used for grade crossing elimination projects, and they were used extensively throughout the DL&W's Newark Grade Crossing Elimination project.

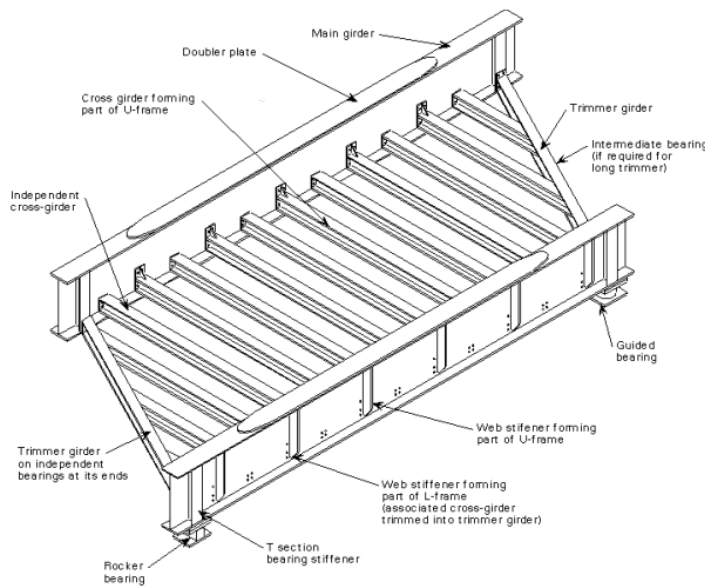
Built-up girders were composed of rivet-connected plates for the web and angles for the flanges to form an I-beam. The most common girder bridge type on the DL&W is the through girder where railroad passes between a pair of girders. Deck girder bridges, where the railroad passes at the top of the girders, were used where vertical clearance was not an issue. A 1991 survey of bridges along the NJ Transit's Morristown Line identified 49 through plate girder bridges and 16 deck plate girders. Three of the

through girders – one in Jersey City and two in Newark – are individually significant, while one decker girder bridge in Newark is significant.

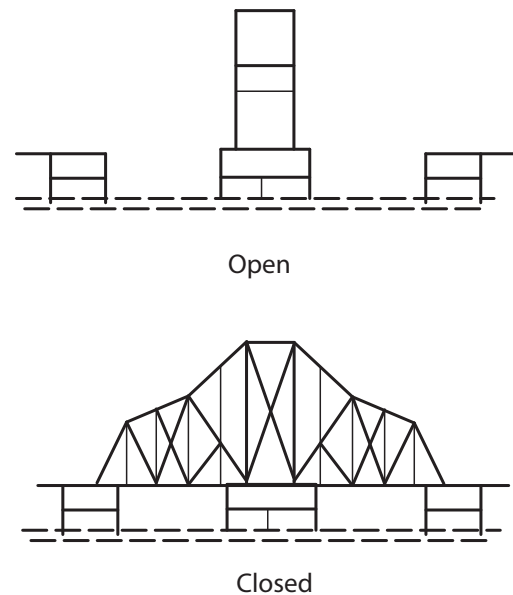
Movable Bridges

Movable bridges can be classified into three types: swing, bascule and vertical lift. Until the close of the nineteenth century, swing-span bridges, where the movable swing span revolves horizontally around a central pivot, dominated movable bridge construction where long channels needed to be crossed. Advantages of a swing span included unlimited vertical clearance and two channels to allow for the passage of two ships. Its mid-channel pier and long operating time combined with the increasing size of ships, ultimately led the swing span to be deemed a hindrance to navigation. The lone swing span bridge on the DL&W, erected in 1903, crosses the Passaic River between Kearny and Newark.

Improvements in counterbalancing the weight of the span and refinements in electric motors led to the development of the vertical lift. In a vertical lift bridge, the lift span is flanked by tower spans that are topped with steel wheels (sheaves) around which steel cables pass. Counterweights are attached at one end to the cables near the top of both tower spans and at the other end to the lift span. To raise the lift span, electric motors turn reduction gears connected to drums that pull the operating cables connected to the lift span and towers. Guided by rollers at each corner, the lift span remains horizontal as it is raised

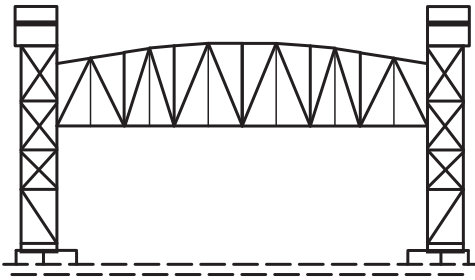


The DL&W extensively used steel plate girder bridges during its Newark Grade Crossing Elimination project [Source: www.steelconstruction.info].

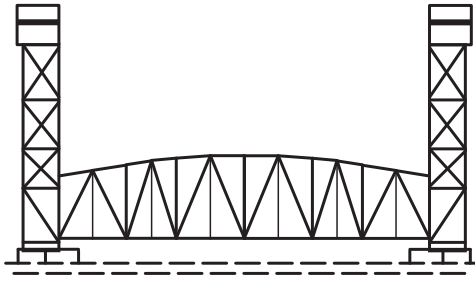


DOUBLE OPEN SWING BRIDGE

Diagram of a typical double open swing bridge found along the DL&W Main Line [Source: www.pgiseafarers.org].



Open



Closed

VERTICAL LIFT SPAN BRIDGE

Diagram of a typical vertical lift span bridge found along the DL&W Main Line [Source: www.pgiseafarers.org].

upward allowing river traffic to pass below. The vertical lift had many advantages over bascule or swing spans, especially when making long crossings: they operated faster, had no central pier to block the navigation channel or divert currents, and could be partially opened for small vessels. The first vertical lift bridges in America were built in 1872 over New York State's canal system, but the modern vertical lift bridge was largely an invention of John Alexander Low Waddell, the foremost vertical lift bridge engineer of the early twentieth century. For the DL&W, Waddell designed the Lower Hack bridge (1928), a vertical lift bridge that carries the DL&W line over the Hackensack River.

Concrete Bridges

Railroads began using concrete during the middle of the 19th century. At first concrete was employed as an inexpensive substitute for stone, used for abutments and retaining walls that were subject only to compressive forces. The tensile strength of concrete was greatly increased with the addition of steel reinforcement, either rods or mesh.

The DL&W pioneered the art of building with concrete, not only for bridges, but also for stations, tunnels and viaducts. As noted in *The Lackawanna Railroad in Northwest New Jersey*: "Reinforced concrete had been used by other railroads, but never before on such a scale,

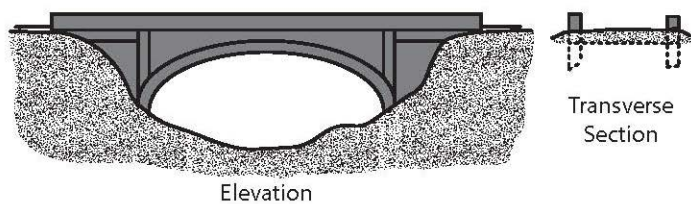
and the Lackawanna went on to become famous for its use of concrete in everything from stations to fence posts." The railroad's extensive and creative use of concrete displayed the aesthetic qualities of the material and enhanced the beauty of the railroad.

The DL&W built its first concrete bridge and first concrete railroad station in Bridgeville, White Township, Warren County in 1903. For the Newark Grade Crossing Elimination project (1903-05), the DL&W built primarily steel girder bridges but extensively used concrete for bridge abutments and retaining walls. The most artistic expression and extensive use of concrete culminated with the DL&W's construction of the New Jersey Cutoff.

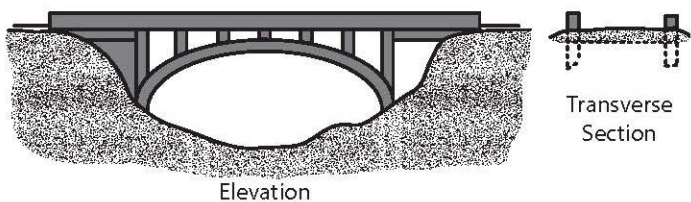
Abraham Burton Cohen, Engineer of Concrete Design for the DL&W, was influential in developing innovations in concrete bridge design. Cohen rose to Chief Engineer of the DL&W's Bridge Division in 1910. Cohen was primarily responsible for the concrete work in South Orange Village Township. Cohen left the DL&W in 1920 to go into private practice where he continued to evolve reinforced concrete. He designed the graceful and ornamental open spandrel arch bridge at Journal Square in Jersey City (1926). In 1927, the American Concrete institute awarded Cohen a gold medal for his solutions to bridge problems "with economy as well as architectural merit."



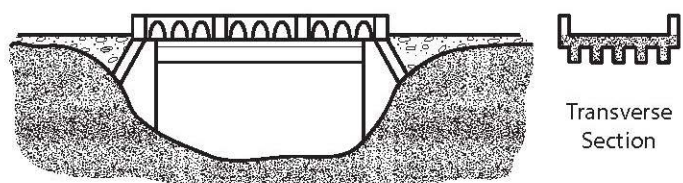
Abraham Burton Cohen (1882-1956), Engineer of Concrete Design for the DL&W from 1907 to 1920, pioneered the use of concrete in bridge construction, most prominently in the New Jersey Cutoff [Source: www.snipview.com].



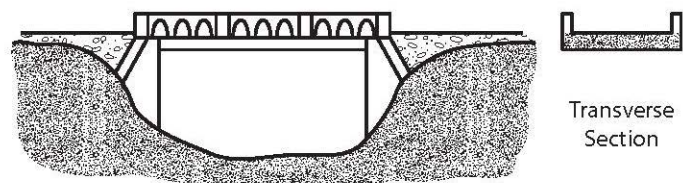
CLOSED SPANDREL ARCH



OPEN SPANDREL ARCH



CONCRETE GIRDER T-BEAM



CONCRETE SLAB

The DL&W pioneered concrete bridge construction and constructed various types of concrete structures throughout the line.

Meyer Hirschthal succeeded Cohen as the DL&W's Engineer for Concrete Design in 1920 and worked for the railroad company into the 1930s. Hirschthal's best known work are his concrete structures in East Orange, including the East Orange Station Viaduct, Parkway Arches and North Maple Avenue Footbridge.

Deck Arch Bridges

The earliest deck arch concrete bridges built by the DL&W was the concrete arch, which were reinforced with steel girders shaped to the arch. The DL&W built reinforced concrete deck arch bridges where vehicular bridges were needed to cross the rail line. The reinforced concrete deck was capable of relatively long spans while also providing

aesthetically graceful forms. For the New Jersey Cutoff, the DL&W built at least 11 concrete deck arch bridges to carry a roadway over the railroad. Along the Main Line, 12 bridges, equally divided among undergrade (rail over road) and overgrade (road over rail) bridges, have been identified. Eight of these concrete arches were considered individually significant, although one bridge – carrying Hope Road over the DL&W New Jersey Cutoff – has been replaced. Except for variations in local conditions, such as roadway alignment or foundation material, all of the deck arch bridges are single-span structures of similar design that were built between 1907 and 1917.

T-Beam Bridges

Beginning in 1913, Abraham Burton Cohen and the DL&W built precast concrete T-beams bridges specifically for vehicular crossings over the railroad. A T-beam is a reinforced concrete steel beam with a "T" shaped cross section. The longitudinal beam below and deck section above are integrally connected. The length of four previously surveyed T-beam bridges ranged from 34 to 42 feet, a distance longer than conventional reinforced concrete bridges could span at the time. T-beams were also more economical to construct than a concrete slab of equal length. Each T-beam weighed about 14 tons, still light enough to be easily transported and to support light highway traffic. Other railroads did not adopt precast T-beam bridges until the 1920s, and after World War II precast concrete beam spans became one of the most prevalent bridge types for vehicular use.

Six precast T-beam bridges are known to have been built by the DL&W. Four were still extant by 1994 when they were identified as part of the New Jersey Historic Bridge Survey. Two still stand as of the date of this publication. Since all of the identified T-beam bridges were constructed between 1913 and 1916 – after the completion of DL&W New Jersey Cutoff in 1911 – these bridges demonstrate both the railroad's and Abraham Burton Cohen's continued experimentation and successful application of reinforced concrete for bridges.

Open Spandrel Arch

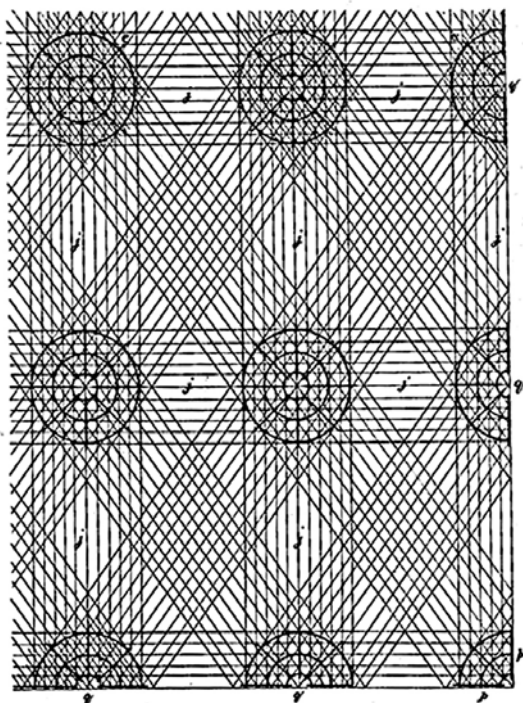
The development of reinforced concrete technology came to a graceful yet powerful culmination in the open-spandrel arch bridge. The limitation of reinforced concrete bridges to relatively short, single-spans changed when the dead load carried by the bridge (the weight of the bridge) was reduced with the introduction of open spandrel arches. These lighter more massive structures were capable of spanning longer distances and had more aesthetic capabilities. The open spandrel arch efficiently

combined the compressive ability of concrete with the tensile capacity of steel reinforcing. The type can have a continuous arch ring across the width of the bridge or individual ribs, which results in further economy of material. The DL&W completed the first examples of the bridge type in New Jersey when the Paulins Kill Viaduct and Delaware River Viaduct opened in 1911 as part of the New Jersey Cutoff.

Slab Bridges

Simply supported precast concrete slab bridges were constructed primarily after 1910, mostly by railroad companies, and initially for clear spans of up to 20 feet. A slab bridge has no support below the deck and is simply a fixed horizontal concrete member that spans two points. Since they can only span short distances, slab bridges can be used in a series with vertical piers to allow a longer length. The four-way flat slab system, first developed by Claude A.P. Turner in Minnesota in 1909, delivered a more economical and stronger method of slab construction. First used in building construction and adapted to railroad use, the four-way flat slab system is recognizable for its distinctive flared, or “mushroom,” columns that support the concrete slab with reinforcing bars laid in four directions: laterally, longitudinally and twice diagonally.

Precast concrete bridges were not only inexpensive to build but they were quick to install. They could be lowered in place all at once thereby causing little disruption to



Plan view of Claude A.P. Turner's patent for a 4-way system of slab reinforcement [Source: U.S. Patent Office].

railroad traffic and avoiding the need to build a temporary structure. The concrete slab represents the most common bridge type along the DL&W's main line. Sixteen concrete slabs have been determined to be individually eligible for the National Register. Most were used in the grade crossing elimination projects in Orange and East Orange. The DL&W's South Orange Station Viaduct (1915) was an early and successful example of the four-way flat slab type of construction. At 1,065 feet long, the Brick Church Station Viaduct (1923) held the distinction as the longest viaduct of its type in the country.

Steel Rigid Frame

The steel rigid frame bridge, where the top member and the verticals are integral, remains one of the most efficient uses of both steel and concrete, but it requires expensive and restrictive form work to erect. The bridge type is capable of spanning greater lengths than a concrete slab bridge. The telltale detail that usually distinguishes a rigid frame span from a slab is the arch soffit of the rigid frame that provides strength at the knees. The bridge type was developed in Europe during the last part of the nineteenth century, but it was not built in the United States until the 1920s. Its pre-World War II use in New Jersey is extremely limited and only one example is known to have been built by the DL&W: High Street bridge in Summit, Union County (1937).

DL&W MAIN LINE BRIDGES

DL&W over Grove Street, Jersey City, Hudson County (1896/1930)

This single-span through girder bridge carries seven tracks of NJ Transit's Morristown Line over Grove Street. Original stone abutments built in 1896 carry the four northern girder spans with open decks built by the Passaic Rolling Mill. Concrete abutments built in 1930 carry an additional three through girder spans with ballasted decks built by the American Bridge Company. The predecessor bridge at this site was a truss bridge completed in 1877 in conjunction with the Bergen Tunnel, a 4,278-foot long, 27-foot wide and 29-foot high two-track tunnel cut through trap rock that greatly sped freight deliveries.

The Grove Street bridge is the only surviving through girder on the line that predates 1899, the year William H. Truesdale became president of the DL&W and embarked on extensive infrastructure improvements and bridge rebuilding. East of the Grove Street bridge, through plate girders carry the railroad over Marin Boulevard (formerly Henderson Street) then into Hoboken Terminal, the DL&W's eastern terminus. West of Grove Street, through

plate girder bridges carry the line over Jersey Avenue (originally an extension of Hoboken Avenue) then over NJ Transit's Hudson Bergen Light Rail (originally New Jersey Junction Railroad) before entering the eastern portal of the Bergen Tunnel.



DL&W over Grove Street, Jersey City, Hudson County (1896/1930).

West End Through Truss Bridges, Jersey City, Hudson County (1908)

After emerging from the western portal of the original Bergen Tunnel, the DL&W spanned the former Erie Railroad by a pair of riveted Baltimore single-span truss bridges on concrete abutments. The trusses, each carrying two tracks, were built to replace two single-track plate girder bridges at this location because the Erie Railroad below the bridge had expanded to six tracks, longer than a plate girder could provide. The bridges are notable for their shallow deck, a feature likely implemented to provide



West End Through Trusses, Jersey City, Hudson County, 1908 [Source: Philip A. Hayden 2008].

as much vertical clearance as possible. The bridges were fully assembled by the American Bridge Company, transported to the site, and lowered into position so that railroad service would not be interrupted. After the completion in 1911 of the second Bergen Tunnel to the north, the bridges carried only westbound traffic.

Lower Hack Bridge, Jersey City and Kearny Town, Hudson County (1928)

The 1,309-foot long DL&W bridge over the Hackensack River, known as the Lower Hack, includes a technologically significant riveted Parker truss vertical lift span, 200 feet long and weighing 1,100 tons. The lift span is flanked by two Pratt truss tower spans with front vertical columns and rear inclined columns, each 153 feet tall. The east approach includes a deck plate steel girder span, while the west approach includes two deck plate steel girder spans and an 11-span reinforced concrete slab, the Kearny Viaduct. Power for lifting the bridge is supplied from electric motors in the two-story operator's house on the east tower span. The span can be lifted to its maximum height of 135 feet in about 90 seconds.

In 1924 the War Department ordered the DL&W to replace its existing swing span bridge over the Hackensack River, built 1902, in order to improve navigation. The DL&W began construction of its new vertical lift bridge in March 1927, and the bridge was put in operation on Sunday, October 21, 1928 at a cost of more than \$3 million. The bridge was designed by John Alexander Low Waddell, the foremost vertical lift bridge engineer of the early twentieth century. Meyer Hirschthal, the Lackawanna's concrete engineer, designed the concrete approaches, and the American Bridge Company fabricated all the steelwork.

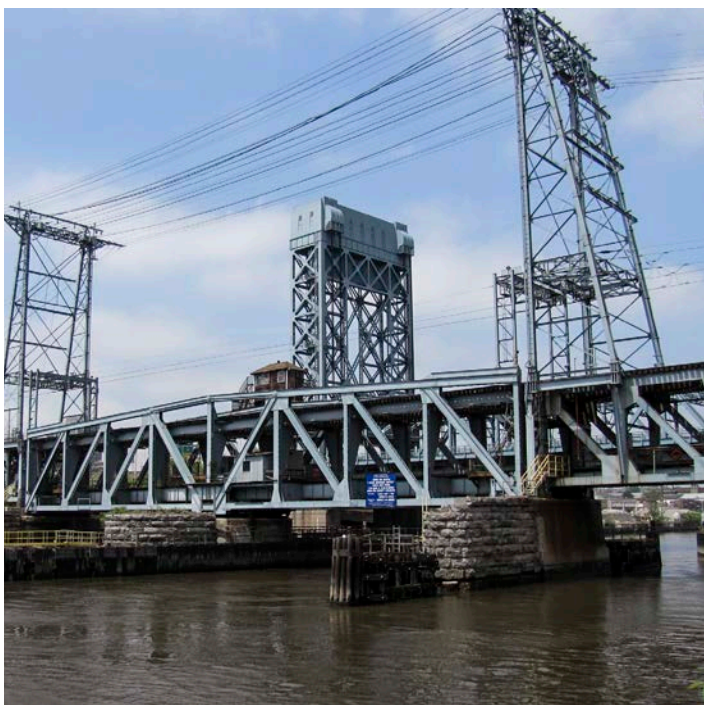


Lower Hack Bridge, Jersey City and Kearny Town, Hudson County, 1928 [Source: Joseph Elliott 2005].

The bridge is individually significant as an intact and operable example of a vertical lift bridge designed by Waddell. The Lower Hack Bridge is also one of four bridges that comprise the Hackensack River Vertical Lift Bridges Historic District.

Newark Drawbridge, Harrison and Newark, Essex County (1901/1903)

Commonly called the Newark Drawbridge, this bridge carries the DL&W over the Passaic River. This bridge opened in 1903 and incorporates a center-bearing swing-span which was completed two years earlier. The swing span, completed in 1901 and placed into service on the DL&W's main line, was designed with a lower and upper deck in anticipation of the Newark grade crossing elimination project and a realignment of the bridge. Since the existing piers were higher than the new piers only the lower deck initially carried trains. After the DL&W elevated its line and built a new bridge 35 feet north of the old bridge, the swing span was floated into place on the new, low-level piers. Building the bridge attracted national attention for the innovative methods used for its construction and installation. The two tracks on the upper deck served the main line while freight trains used the single track on the lower deck to reach the Broad Street freight yard in Newark. The bridge is 15 feet above mean high water and has a 77-foot lateral clearance. The freight track on the lower level has been removed.



Newark Drawbridge over the Passaic River, Harrison and Newark, Essex County (1901/1903).

DL&W over Broad Street, City of Newark, Essex County (1903)

The Broad Street Bridge is a three-span, steel through girder structure supported on four steel bents with lattice bracing and stone abutments. Along with the bridges over University Avenue and Dr. Martin Luther King Boulevard (formerly High Street) to the west, the Broad Street Bridge was built as part of the Newark Grade Crossing Elimination project, completed in 1905. Nearby elements associated with the Broad Street bridge and the Newark Grade Crossing Elimination project include a 750-foot long concrete viaduct that forms the western approach of the Newark Drawbridge and the restored Broad Street Station (1903). Most of plate girder bridges built as part of the Newark Grade Crossing Elimination project were unadorned utilitarian structures. But the contract between the city and the railroad specified decorative treatments at Broad Street, Newark's main commercial thoroughfare. Stone abutments were used rather than the prevailing concrete. The outside faces of the through girders were embellished with ornamental rosettes and brackets pierced with rosettes.



DL&W over Broad Street, City of Newark, Essex County (1903).

North Maple Avenue Footbridge, East Orange City, Essex County (1923)

One of two National Register-eligible footbridges (the other is in James Park in Summit), the North Maple Avenue Footbridge is a precast concrete slab 20 feet wide that crosses three railroad tracks. The footbridge features an original two-part staircase with decorative handrails at the north. The relocation of Main Street (now Dr. M.L.K., Jr. Boulevard) as part of construction of Interstate 280 required replacement of the south stairway. The North Maple Avenue Footbridge is the first precast footbridge built by the DL&W. The footbridge is nearly identical to the one several blocks to the east at 14th Street, completed in 1924. The North Maple Avenue Footbridge as well as

the Parkway Arches and East Orange Viaduct were all built by the DL&W as part of the East Orange Grade Crossing Elimination project.



North Maple Avenue Footbridge, East Orange City, Essex County (1923).

Parkway Arch, East Orange City, Essex County (1890/1923)

The Parkway Arch bridge that carries NJ Transit over the Garden State Parkway is a three-span stone arch bridge built in 1890. It incorporates a tier of concrete arches that were added in 1923. This unaltered stone arch bridge is a relatively late example of this bridge type which was built in 1890. The multi-span arch forms a continuous arcade of semicircular Roman arches. The stone arch bridge is significant as the only surviving multi-span stone arch bridge on the DL&W's Main Line, while the concrete arch is significant for its unique railroad use of relatively new concrete technology to augment an existing stone structure.



Parkway Arch, East Orange City, Essex County (1923).

East Orange Station Viaduct, East Orange City, Essex County (1923)

When completed in 1923, the 864-foot long East Orange Station Viaduct carried three railroad tracks over North Munn Avenue, North Arlington Avenue and Main Street. Construction of the viaduct allowed the DL&W to expand from two to three tracks without needing to acquire additional land. The viaduct incorporates the East Orange Station, parking areas, stairways and station facilities. Similar to the South Orange Station Viaduct (1916) and the Brick Church Station Viaduct (1923), the East Orange Station Viaduct was built using a four-way reinforced concrete slab structure. The station was built on reinforced concrete “mushroom” columns with drop panels. Fascia columns with arched panels form the long south and north elevations. On top of the columns was poured a deck 75 feet wide; railroad tracks and platforms were built on top of the deck. Underneath the deck was room for parking and additional station facilities. The East Orange Station Viaduct is individually significant for its innovative use of concrete and is also a contributing resource to the State and National Register-listed East Orange Station.

The East Orange Grade Separation Project was the last completed by the DL&W. In 1913, the DL&W approached East Orange officials with a proposal to eliminate grade crossings within the city that included a standard 10% contribution from the municipality to fund construction. The City of East Orange's long history of hostility to the railroad delayed the project until 1921, when the City of East Orange was directed by a court order to allow the project to move forward.



East Orange Station Viaduct, East Orange City, Essex County (1923).

DL&W over Central Avenue, Orange City, Essex County (1916)

The Orange Grade Crossing Elimination Project was one of the largest completed by the DL&W. The project involved the removal of 26 grade crossings, realigning the track to remove a sharp curve, adding a third track, and improving passenger and freight facilities. The concrete slab bridge predominated in Orange, and the Central Avenue bridge is an exemplary example of its type.

The Central Avenue bridge is a four-span, four-way reinforced concrete slab bridge with a solid concrete parapet. The middle section of the slab is supported by a row of mushroom columns with drop panels. Additional columns are recessed into the abutments. The slab is supported on the north and south by rectangular piers backed with half columns and connected with segmental arched panels. The bridge is unique among the concrete bridges built as part of the Orange Grade Crossing Elimination Project in that it is the only bridge that uses the four-way reinforcing technique. At the national level, the Central Avenue Bridge represents one of the few examples of four-way reinforcing applied to a bridge rather than a viaduct.

represent a variation of the acclaimed Melan concrete reinforcing system of the early twentieth century. The bridge is an integral part of Mountain Station, a brick station also completed in 1917. The unreinforced concrete abutments which form part of the station's retaining wall and covered staircases on either side of the bridge, also with an open parapet, convey passengers to the eastbound and westbound tracks. Despite the extent of the DL&W's grade crossing elimination projects, this is the only location between Harrison and Maplewood where the track elevation did not need to be changed.



Montrose Avenue over DL&W, South Orange Village Township, Essex County (1917).



DL&W over Central Avenue, Orange City, Essex County (1916).

Montrose Avenue over DL&W, South Orange Village Township, Essex County (1917)

Located at Mountain Station, the Montrose Avenue bridge is a single-span, reinforced concrete elliptical arch with open parapet that carries Montrose Avenue over three railroad tracks. The bridge is reinforced with 15 girders embedded in the concrete of the arch. These girders, fabricated by the American Bridge Company, were shaped to the profile of the curve in the arch and

South Orange Station Viaduct, South Orange Village Township, Essex County (1916)

Construction of the South Orange Grade Separation Project (1914-16) involved unique solutions to complicated engineering problems. The DL&W wanted to expand its line from two tracks to three. To do so in densely built-up South Orange would have required costly land acquisition. Instead, the DL&W devised a solution of building a series of concrete viaducts, making it unnecessary to acquire additional land.

The 427-foot long South Orange Station viaduct extends from South Orange Avenue to Third Street. The elevated tracks are carried on the reinforced concrete viaduct supported by a series of mushroom columns. The two-story station, platform and canopy, and an island platform with two shelter buildings and a stair pavilion are fully integrated into the viaduct structure. The main waiting room is built into the base of the track elevation and the piers are of exposed flat slab concrete design. Ornamental tiles are inlaid over each column to enhance the exterior.



1916 photograph of the South Orange Station Viaduct, South Orange Village Township, Essex County [Source: Taber III 1980].

The South Orange Station and associated viaduct were the first in a series of DL&W stations built as part of grade separation projects that led the way for similar stations in the City of East Orange (East Orange Station and Brick Church Station) and Buffalo, New York. The viaduct at the South Orange Station is noteworthy as one of the first reinforced concrete flat slab railroad viaducts built

east of the Mississippi River. The South Orange Station's Renaissance Revival and Prairie styles design is the work of Frank J. Nies, architect for the DL&W.

High Street over DL&W, Summit City, Union County (1937)

This is a late and unusual example of a steel rigid frame bridge built by the DL&W. The railroad completed the Summit grade separation more than three decades earlier (1905) and built at least seven steel girder bridges as part of the project. The construction of a bridge at this location likely stemmed from the need to link new residential development to the south with the business district to the north. The steel rigid frame was made possible by electric arch welding that permitted individual bridge elements, like posts and beams, to be integrated into a continuous unit. Riveted connected steel frames are visible under the deck, where seven exposed beams enter the concrete abutments. The abutments encase the rolled section columns of the steel frame. The bridge is significant as a distinguished and uncommon example of a pre-World War II steel frame bridge. Only one other example has been identified in the state from before World War II (Interstate 495 Lincoln Tunnel approach, commonly known as the Helix), also built in 1937.



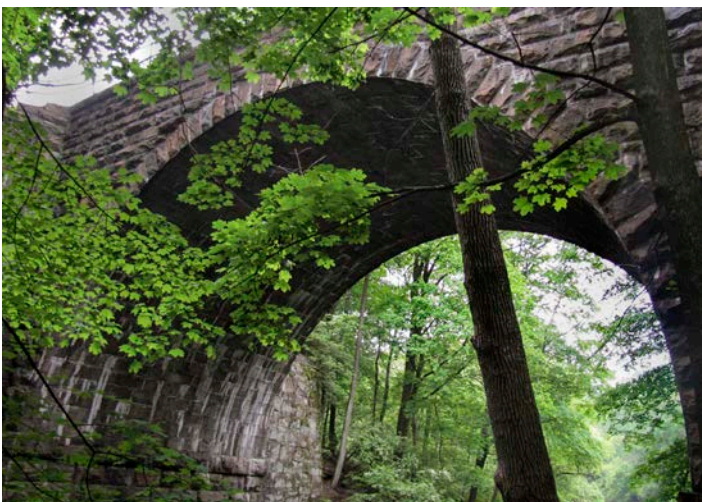
South Orange Station Viaduct, South Orange Village Township, Essex County (1916).



High Street over DL&W, Summit City, Union County (1937).

DL&W over Passaic River, Summit City, Union County and Chatham Township, Morris County (1889)

This single-span stone arch, 60 feet long and 33 feet wide, carries two railroad tracks over the Passaic River in Stanley Park, part of the Union County park system. The bridge was erected under the administration of Samuel Sloan and its solid yet conservative design is typical of the Sloan era (1867-1899). The bridge is a late example of its type yet possesses engineering significance for its stone arch technology and historical significance as one of the few surviving bridges that predate the massive reconstruction campaign carried out under President William H. Truesdale. Of the three stone arch bridges remaining on the DL&W Main Line, the Passaic River bridge is the only unaltered example.

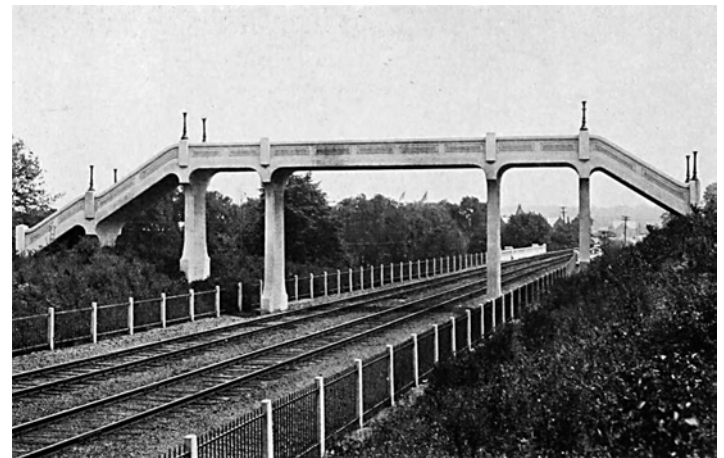


DL&W over Passaic River, Summit City, Union County and Chatham Township, Morris County (1889).

Ridgedale Avenue Footbridge, Madison Borough, Morris County (1916)

Built as part of the Madison grade separation project (1914-16), this 10-foot wide, three-span reinforced concrete slab bridge carries pedestrians over two active railroad

tracks that bisect James Park, located at the western end of downtown Madison. The four slender rectangular piers are beveled on the sides to appear less bulky. A single staircase leads down to the Madison Avenue side of the park, while a longer staircase with a landing leads down to the Park Avenue side. Both the bridge and stairs have paneled concrete parapets. Original lighting atop the stairs has been removed. The Ridgedale Avenue Footbridge is one of two footbridges on the DL&W Main Line, the other is North Maple Avenue in East Orange, both of which are individually eligible for the National Register.



1929 photograph of the Ridgedale Avenue Footbridge, Madison Borough, Morris County [Source: Whitney 1929: 309].



Ridgedale Avenue Footbridge, Madison Borough, Morris County (1916).

DL&W over Den Brook, Denville Township, Morris County (1870/1928)

Built in 1870, this is the oldest surviving bridge on the DL&W's Main Line. The single-span bridge consists of an original northern section that is a spandrel-filled, stone arch with dressed voussoirs. Inscribed in the keystone of the arch is "BUILT BY MS. COLEMAN 1870." An

increase during the 1920s of freight traffic, especially coal, required the addition of two tracks to the line. The bridge was widened to the south in 1928 with the addition of a reinforced concrete slab on concrete abutments and wingwalls. A semi-circular stone dam south of the bridge, possibly built during the 1890s, impounds Den Brook to create Estling Lake.



Original north face of the DL&W Bridge over Den Brook, Denville Township, Morris County (1870/1928).

Landing Road (CR 631) over DL&W and former Morris Canal, Roxbury Township, Morris County (1907)

The west span of this two-span, reinforced concrete deck arch bridge carries a two-lane road over NJ Transit's Morristown Line while the east span crosses the abandoned right-of-way of the Morris Canal. The bridge originally carried a trolley line of the Morris County Traction Company until 1928. Vacationers to Lake Hopatcong, a bustling destination during the early part of the twentieth century, arrived at the stone Landing (Lake Hopatcong) railroad station (completed 1912 and designed by Frank J. Nies) south of the bridge. Concrete stairs led from the station to the platforms below. After the State of New Jersey formally abandoned the Morris Canal in 1922, the canal at this location was filled in and became a parking lot. The concrete stairs were removed, and the railroad station has not served passengers for many years but may be adaptively reused.

In addition to its significant historical associations with the Morris Canal and the Landing railroad station, the Landing Road bridge is technologically significant in its own right. The Landing Road bridge is the earliest earth-filled concrete deck arch in Morris County and the only two-span example of its type in the county. According

to the 2011 Preservation Plan for the railroad corridor, the bridge was constructed by Morris County. The use of concrete and the form of the bridge suggests some involvement from the DL&W, as the bridge is one of the earliest examples of a reinforced concrete deck arch bridge in New Jersey, predating the DL&W New Jersey Cutoff (1908-11). The DL&W New Jersey Cutoff connects with the Main Line about 1,400 feet west of the bridge.



Landing Road (CR 631) over DL&W and Morris Canal in Roxbury Township, Morris County. The filled in and paved Morris Canal is in the foreground.



Circa 1910 postcard of Landing Road bridge showing active Morris Canal at right [Source: www.landingnewjersey.com].

Farm Lane over DL&W (MP 58.61), Mansfield Township, Warren County (1913)

This two-span, precast concrete slab bridge carries a private farm lane between agricultural fields over a single active railroad track. The bridge deck is composed of three concrete box beams in each span that are framed by cast-in-place curbs and metal pipe railings. The substructure consists of ashlar abutments of an earlier span. A central pier is composed of two precast concrete columns set on a cast-in-place plinth; a precast cap is between the columns

and the deck slab. This slab bridge illustrates the DL&W's leadership in working with reinforced concrete and is possibly the oldest known example of a precast concrete slab bridge in New Jersey.



Farm Lane over DL&W (MP 58.61), Mansfield Township, Warren County (1913).

Farm Lane over DL&W (MP 62.39), Mansfield Township, Warren County (1900/1914)

This is the only existing vehicular truss bridge over the DL&W Main Line. Even though the DL&W did not build it, the bridge still reflects the railroad's innovative use of concrete. Originally built around 1900 over a highway crossing near Clark's Summit, Pennsylvania, this single-span pony truss bridge was moved to this location to replace an earlier farm bridge that crossed the railroad. Stone abutments from the previous bridge were sufficiently taken down to provide concrete bridge seats.



Farm Lane over DL&W (MP 62.39), Mansfield Township, Warren County (1900/1914).

The 13-foot wide bridge is a four-panel, riveted Warren truss. What makes the bridge significant is its flooring system. The bottom chord and lower panel points, as well as the floor beams and stringers were encased in concrete. This strengthening allowed for the installation of the concrete deck poured directly on top of that. No other truss bridge with a concrete encased flooring system has been identified in the state.



Farm Lane over DL&W (MP 62.39), Mansfield Township, Warren County (1900/1914).

Brickyard Road over DL&W, Mansfield Township, Warren County (1913)

This narrow, 12-foot wide bridge carries a winding road over an active single track within a two-track right of way. The single-span, precast concrete bridge consists of three precast T-beams that form the bridge deck. The T-beams are set between self-supporting precast concrete truss-like balustrades. The bridge rests on rubble-coursed ashlar abutments from a previous bridge; a concrete seat is on



Detail of truss-like balustrades built of precast concrete on the Brickyard Road Bridge, Mansfield Township, Warren County (1913).

top of the stone abutments. The Brick Yard Road bridge is significant for its early and innovative use of precast concrete and as one of two remaining T-beam bridges built by the DL&W. The other remaining bridge carries a private farm lane over the railroad.



Brickyard Road over DL&W, Mansfield Township, Warren County (1913).

DL&W over NJ Route 57, Washington Borough, Warren County (1907)

This is actually two structures in one. The large, single-span elliptical deck arch bridge with concrete wingwalls carries an abandoned rail line over NJ Route 57 (originally Washington Street). In the northeast quadrant of the bridge a double concrete box culvert carries NJ Route 57 over Pohatcong Creek. The NJ Route 57 bridge is a significant precursor to the reinforced bridges built as part of the DL&W New Jersey Cutoff. This bridge, and the Delaware River Truss below, are the only two bridges in this survey on the route originally laid out by the Warren Railroad.



DL&W over NJ Route 57, Washington Borough, Warren County (1907).

Delaware River Truss, Delaware, Knowlton Township, Warren County, NJ and Upper Mount Bethel Township, Northampton County, PA (1904)

The Delaware River Truss is a five-span double Warren steel through truss supported by concrete abutments and four concrete piers. It is the fourth bridge at this crossing. The first structure, a wooden bridge built in 1855, was replaced in 1877 by an iron truss, which was later replaced in 1890. The heavier loads of locomotives and freight required the DL&W to upgrade its Delaware River crossing and build a new structure to the north in 1904. The railroad sold the previous truss bridge to Henry V.B. Darlington, a local Episcopal minister, for \$5,000. Darlington removed the tracks, converted the bridge to vehicular use, and collected toll revenue. No tracks remain on the Delaware River Truss or from the bridge to Washington – the historic route of the Warren Railroad. The Delaware River Truss has not been evaluated for the National Register. Still, the bridge is significant as an intact example of a Warren truss and for its historical association with an important river crossing for the DL&W.



Delaware River Truss, Delaware, Knowlton Township, Warren County, NJ and Upper Mount Bethel Township, Northampton County, PA (1904).

DL&W NEW JERSEY CUTOFF BRIDGES

Stanhope-Sparta Road (CR 605) over DL&W New Jersey Cutoff, Byram and Hopatcong Townships, Sussex County (1911)

This single-span, elliptical deck arch bridge once carried one lane of traffic over the abandoned New Jersey Cutoff. The bridge has open balustrades with a substructure that consists of scored concrete abutments and open concrete balustrades. The date of construction is inscribed just above the center of the arch. The Stanhope-Sparta Road bridge is significant as one of the original reinforced

concrete bridges built as part of the Cutoff. In 2008, the New Jersey Department of Transportation completed a wider bridge on a new alignment. The new Stanhope-Sparta Road bridge was also designed as a concrete arch with faux window balustrade railings to blend in with the old bridge. The original bridge remains but no longer carries vehicular traffic.



Stanhope-Sparta Road (CR 605) over DL&W New Jersey Cutoff, Byram and Hopatcong Townships, Sussex County (1911).

Hope Road (CR 521) over DL&W New Jersey Cutoff, Blairstown Township, Warren County (1910)

The one-lane Hope Road bridge was a single-span reinforced concrete elliptical deck arch. The arch rested on high concrete skewbacks founded on rock – the DL&W cut through rock at this location. The bridge had diamond pierced balustrades with a concrete rail above the pierced panels. A concrete rail spanned the posts above the panels. The bridge was significant for its use of reinforced concrete and for its association with the DL&W New Jersey Cutoff. In 2006 the Hope Road bridge



The replacement Hope Road Bridge over DL&W New Jersey Cutoff, constructed 2006.

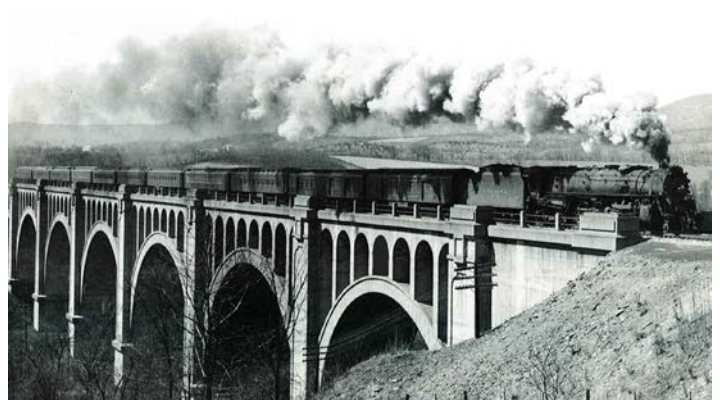
was replaced with two structures: one carrying two lanes of northbound traffic and a parallel bridge carrying two southbound lanes. The design of the new bridges are evocative of the historic Hope Road bridge.

Paulins Kill Viaduct, Knowlton Township, Warren County (1911)

The Paulins Kill Viaduct (also known as the Hainesburg Viaduct) is an impressive 1,100-foot, seven-span structure with open spandrel arches. Each span varies in length from 100 to 120 feet. At each end of the viaduct are smaller, 69-foot long concrete slab abutments. The viaduct is notable for its internal chambers that allowed engineers to inspect its structural integrity. The viaduct spans the Paulins Kill River, the New York, Susquehanna & Western Railroad and the Pequest Valley. Though several hundred feet shorter than the Delaware River Viaduct, the Paulins Kill Viaduct is more monumental as it soars 115 feet above the valley floor. The viaduct was briefly the largest in the world until the DL&W completed the Tunkhannock Viaduct in Nicholson, Pennsylvania in 1915. The Paulins Kill Viaduct is an intact and outstanding example of the DL&W's innovative use of concrete.



Paulins Kill Viaduct, Knowlton Township, Warren County (1911).



Undated photograph of the Paulins Kill Viaduct, Knowlton Township, Warren County [Source: Lowenthal and Greenberg, Jr. 1987].

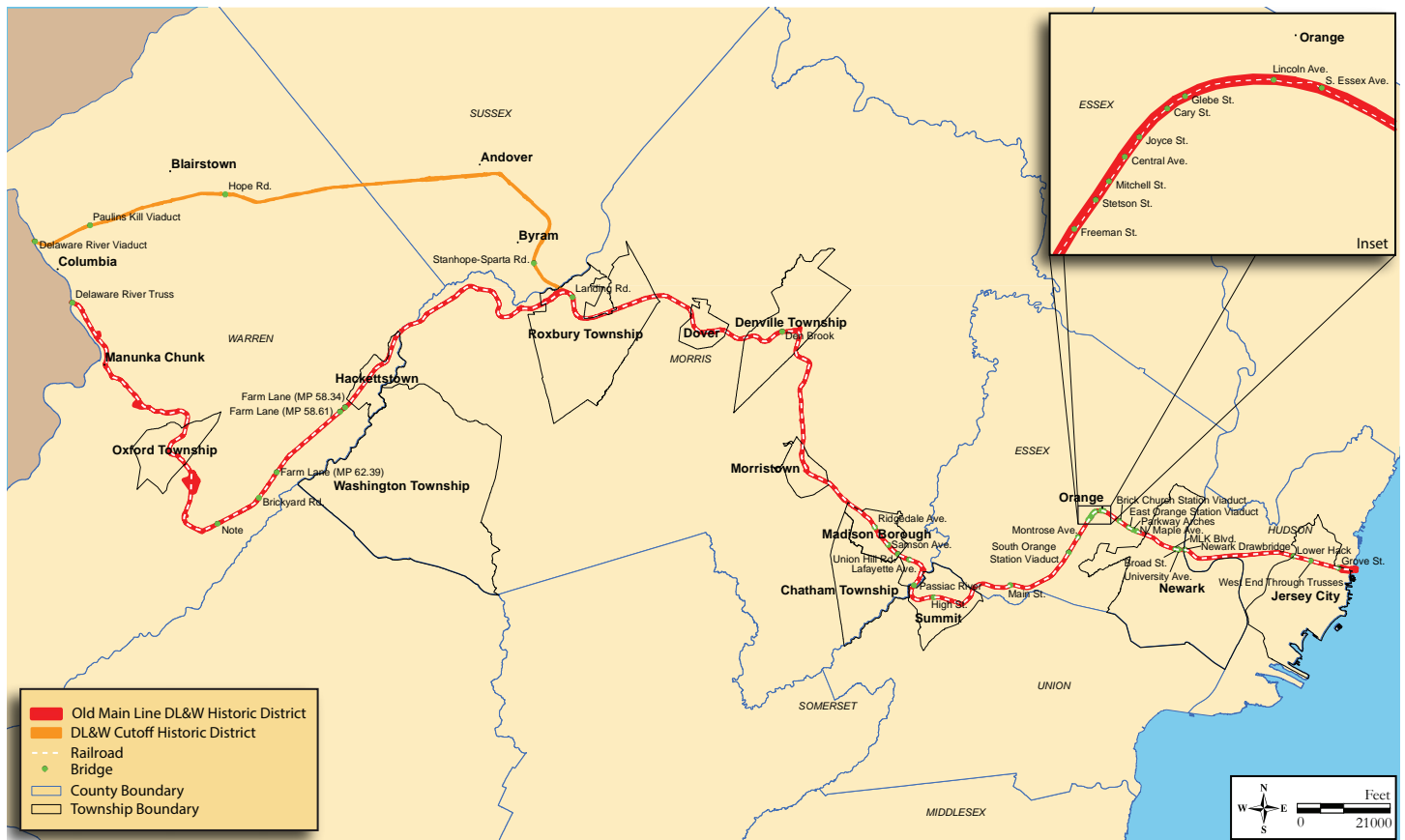
Delaware River Viaduct, Knowlton Township, Warren County, NJ and Upper Mount Bethel Township, Northampton County, PA (1911)

The Delaware River Viaduct is a nine-span open spandrel arch bridge approximately 1,450 feet in length. Similar in design to the Paulins Kill Viaduct, the viaduct crosses Interstate 80 in New Jersey, the Delaware River, and curves to the north to connect with the DL&W Main Line at Slateford Junction. The seven eastern spans are elliptical arches and the two western spans are deck arches. The restrained design of the viaduct reflects the simplicity of the light-colored reinforced concrete. The bridge piers project to accommodate safety niches and are enhanced by vertical panels. A projecting molding along the outside of each arch emphasizes the structural form. The 40-foot wide bridge carried two tracks 65 feet above the Delaware River but the tracks have been removed. Construction of the viaduct required sinking the piers 62 feet to rest on bedrock and the use of 51,376 cubic yards of concrete. The viaduct took nearly three years to complete (August 1908-December 1911). The Delaware River Viaduct possesses individual significance as an important engineering achievement representing the DL&W's innovative use of concrete. The viaduct also possesses



2000 photograph of the Delaware River Viaduct, Knowlton Township, Warren County, NJ and Upper Mount Bethel Township, Northampton County, PA (1911) [Source: Library of Congress, HABS/HAER/HALS Collection].

individual significance for its historical association with the New Jersey Cutoff.



This map illustrates the locations of the bridges located along the DL&W's Main Line and the DL&W's New Jersey Cutoff which have been determined to be individually eligible for the National Register of Historic Places by the NJHPO. The figure also shows the location and extent of the DL&W's Main Line and New Jersey Cutoff within New Jersey, both recognized today by the NJHPO as historic districts. The table on page 19 provides a list of these historic bridges. With the exception of the Hope Road bridge in Warren County, all of the significant bridges are still intact. The shaded rows represent those bridges discussed in this publication.

DL&W MAIN LINE BRIDGES & DL&W CUTOFF BRIDGES

Feature Carried	Feature Crossed	Common Name (if applicable)	Milepoint	Municipality	County	Construction Date	Bridge Type
DL&W	Grove Street	N/A	0.66	Jersey City	Hudson	1896/1930	Through Girder
DL&W	Conrail	West End Through Trusses	1.89	Jersey City	Hudson	1908	Truss
DL&W	Hackensack River	Lower Hack	2.64	Jersey City & Kearny	Hudson	1928	Vertical Lift
DL&W	Passaic River	Newark Drawbridge	7.48	Newark	Essex	1901/1903	Swing Span
DL&W	Broad Street	N/A	7.72	Newark	Essex	1903	Through Girder
DL&W	University Avenue	N/A	7.74	Newark	Essex	1903	Deck Girder
DL&W	MLK Boulevard	N/A	7.89	Newark	Essex	1903	Through Girder
North Maple Avenue	DL&W	N/A	9.72	East Orange	Essex	1923	Concrete Slab
DL&W	Oraton Parkway	Parkway Arches	9.88	East Orange	Essex	1890/1923	Stone Arch/ Concrete Arch
DL&W	Multiple Streets	East Orange Viaduct	10.05	East Orange	Essex	1923	Concrete Slab
DL&W	Multiple Streets	Brick Church Station Viaduct	10.6	East Orange	Essex	1923	Concrete Slab
DL&W	South Essex Avenue	N/A	11.38	Orange	Essex	1917	Concrete Slab
DL&W	Lincoln Avenue	N/A	11.51	Orange	Essex	1917	Concrete Slab
DL&W	Glebe Street	N/A	11.75	Orange	Essex	1917	Concrete Slab
DL&W	Cary Street	N/A	11.81	Orange	Essex	1916	Concrete Slab
DL&W	Joyce Street	N/A	11.92	Orange	Essex	1916	Concrete Slab
DL&W	Central Avenue	N/A	11.98	Orange	Essex	1916	Concrete Slab
DL&W	Mitchell Avenue	N/A	12.07	Orange	Essex	1917	Concrete Slab
DL&W	Stetson Avenue	N/A	12.13	Orange	Essex	1917	Concrete Slab
DL&W	Freeman Street	N/A	12.23	Orange	Essex	1917	Concrete Slab
Montrose Avenue	DL&W	N/A	13.08	South Orange Village	Essex	1917	Concrete Slab
DL&W	Multiple Streets	South Orange Station Viaduct	13.82	South Orange Village	Essex	1916	Concrete Slab
DL&W	Main Street	N/A	17.01	Millburn	Essex	1922	Concrete Slab
High Street	DL&W	N/A	20.88	Summit	Union	1937	Steel Rigid Frame
DL&W	Passaic River	N/A	22.31	Summit & Chatham	Union & Morris	1889	Stone Arch
DL&W	Lafayette Avenue	N/A	23.85	Chatham	Morris	1914	Concrete Arch
Union Hill Road	DL&W	N/A	24.39	Madison	Morris	1914	Concrete Arch
Samson Avenue	DL&W	N/A	24.96	Madison	Morris	1915	Concrete Arch
Ridgedale Avenue	DL&W	Ridgedale Avenue Footbridge	25.9	Madison	Morris	1916	Concrete Slab
DL&W	Den Brook	N/A	34.58	Denville	Morris	1870/1928	Stone Arch/ Concrete Extensions
Landing Road	DL&W	N/A	44.53	Roxbury	Morris	1907	Concrete Arch
Farm Lane	DL&W	N/A	58.34	Mansfield	Warren	1913	Concrete T-Beam
Farm Lane	DL&W	N/A	58.61	Mansfield	Warren	1913	Concrete Slab
Farm Lane	DL&W	N/A	62.39	Mansfield	Warren	1900/1914	Truss
Brickyard Road	DL&W	N/A	63.71	Mansfield	Warren	1913	Concrete T-Beam
DL&W	NJ Route 57	N/A	66.84	Washington Borough	Warren	1907	Concrete Arch
DL&W	Delaware River	Delaware River Truss	80.53	Delaware	Warren	1904	Truss
Stanhope-Sparta Road	DL&W Cutoff	N/A	47.88	Byram & Hopatcong	Sussex	1911	Concrete Arch
<i>Hope Road*</i>	<i>DL&W Cutoff</i>	<i>N/A</i>	<i>64.63</i>	<i>Blairstown</i>	<i>Warren</i>	<i>1910</i>	Concrete Arch
DL&W Cutoff	Station Road/Paulins Kill	Paulins Kill Viaduct	70.63	Knowlton	Warren	1911	Open Spandrel Arch
DL&W Cutoff	I80/Delaware River/PA Route 611	Delaware River Viaduct	73.17	Knowlton	Warren	1911	Open Spandrel Arch

Bridge included in publication *Demolished

Project: Replacement of Prospect Street Bridge over NJ Transit Morristown Line
Location: Town of Dover, Morris County
Date: 2005
Consultant: RGA, Inc., 259 Prospect Plains Road, Building D, Cranbury, NJ 08512

For More Information...

A.G. Lichtenstein & Associates, Inc. New Jersey Historic Bridge Survey, 1994. On file, New Jersey Historic Preservation Office, Trenton, NJ.

DeLeuw, Cather and Company. NJ Transit Historic Railroad Bridge Survey. Newark, NJ: DeLeuw, Cather and Company, 1991. On file, New Jersey Historic Preservation Office, Trenton, NJ.

Lowenthal, Larry and William T. Greenberg. The Lackawanna Railroad in Northwest New Jersey. Morristown, NJ: Tri-State Railway Historical Society, 1987.

Porter, Richard. A Survey of the Delaware, Lackawanna and Western Railroad in Western New Jersey. Prepared by The RBA Group for the New Jersey Department of Transportation. On file, NJDOT, Trenton, NJ.

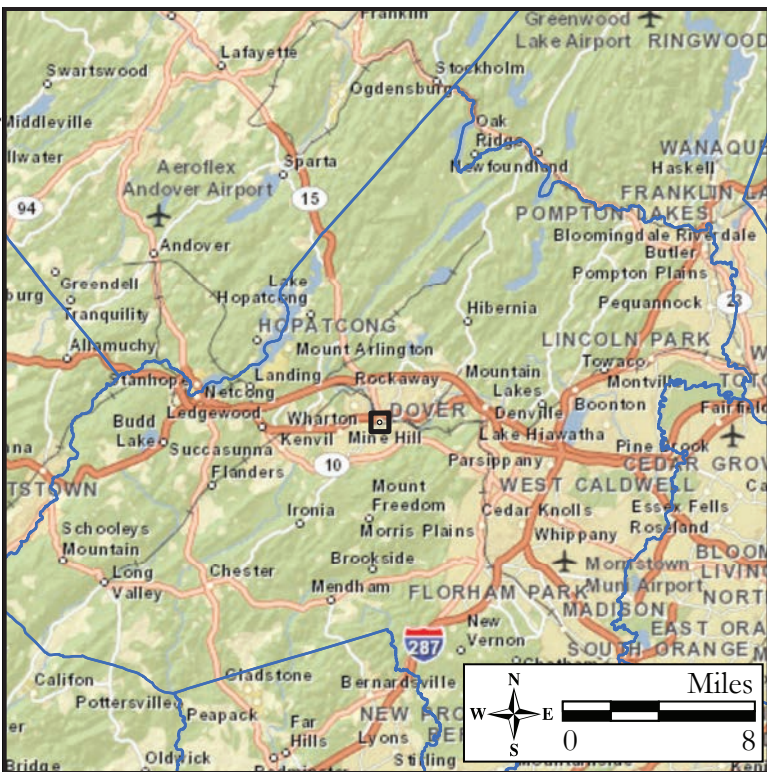
The RBA Group and Farewell Mills Gatsch Architects. Delaware, Lackawanna and Western Railroad Preservation Plan. Prepared for the New Jersey Department of Transportation, 2011. On file, NJDOT, Trenton, NJ.

Taber, Thomas Townsend. The Delaware, Lackawanna & Western Railroad, the Route of Phoebe Snow, in the twentieth century, 1899-1960. Muncy, PA: T.T. Taber III, 1980.

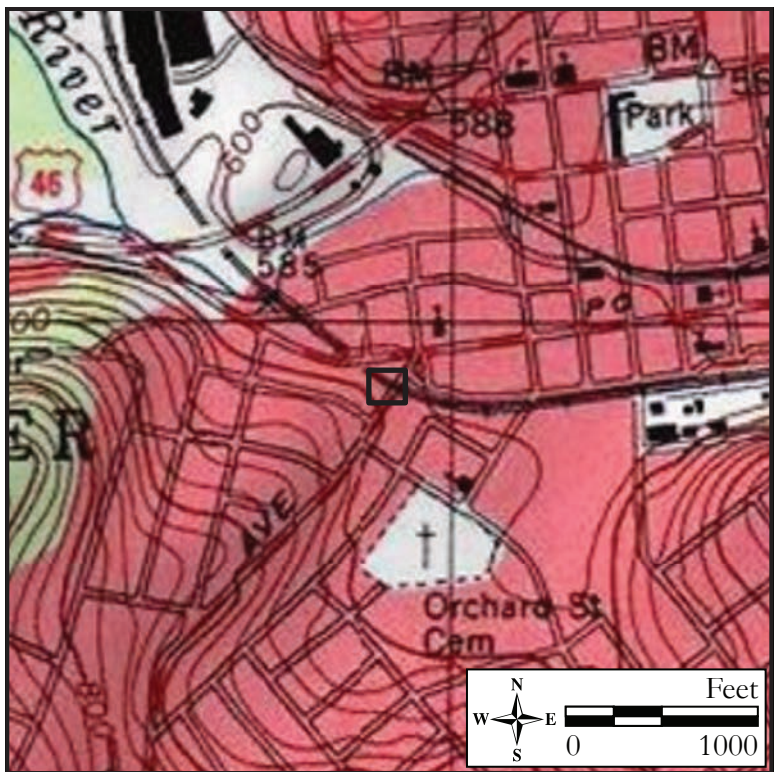
Taber, Thomas Townsend. The Delaware, Lackawanna & Western Railroad in the Nineteenth Century, 1828-1899. Scranton, PA: Steamtown Volunteer Association, 2000 (originally published 1977).

Additional information on transportation projects and historic preservation is available from the Division of Environmental Resources, New Jersey Department of Transportation (<http://www.nj.gov/transportation/works/environment/>), the Federal Highway Administration (<https://www.environment.fhwa.dot.gov/histpres/index.asp>), the New Jersey Historic Preservation Office (<http://www.nj.gov/dep/hpo/2protection/njrreview.htm>), and the Advisory Council on Historic Preservation (<http://www.achp.gov/work106.html>).

World Street Map, ESRI 2013



Project vicinity map.



Area of detail.

United States Geological Survey 7.5' Quadrangle