NEW HAMPSHIRE HISTORIC PROPERTY DOCUMENTATION

FAIRMOUNT STREET BRIDGE
OVER FORMER BOSTON & MAINE RAILROAD

NH State No. 714

LOCATION: Fairmount Street spanning former Boston & Maine Railroad right-of-way, Nashua, Hillsborough County, New Hampshire.
USGS Nashua North NH Quadrangle UTM Coordinates: 19.297335.4737908

BUILDER: Boston & Maine Railroad (B&M)

ENGINEERS: Benjamin W. Guppy, Engineer of Structures, Boston & Main Railroad.

DATE: 1934-1935

OWNER: New Hampshire Department of Transportation

PRESENT USE: Highway bridge

SIGNIFICANCE: The Fairmount Street Bridge is a five-span timber framed trestle highway bridge built by the B&M, Worcester, Nashua & Portsmouth Division in 1934-1935 to span their tracks in Nashua. It is considered a "rare survivor of a once common and important type…reflecting B&M policy and bridge management during the B&M's period of significance."[1] The B&M Worcester, Nashua & Portsmouth Division headquarters was located in Nashua and employed over 500 city residents, a significant force in the social and financial health of the city. The Fairmount Street Bridge is related to the development of the dwellings in the Fairmount Heights neighborhood and is a significant part of the broad settlement pattern in this suburban area of Nashua.

PROJECT INFORMATION: Fairmount Street Bridge was documented in accordance with the standards of the New Hampshire Historic Property Documentation Program in the spring of 2013 by Historic Documentation Company Inc. (HDC), Portsmouth, RI, for the City of Nashua, NH. The report was written and compiled by Richard M. Casella, Engineering Historian, HDC. Rob Tucher Photographic Documentation conducted and processed the large-format film photography in accordance with HABS/HAER standards. This documentation was undertaken to mitigate the removal and relocation of the bridge as part of the Broad Street Parkway construction project.

[1] NH Division of Historical Resources Determination of Eligibility Form No. NAS0199, Fairmount Street Bridge, Nashua, NH.

DESCRIPTION

Fairmount Street Bridge is a five-span, frame trestle highway bridge carrying Fairmount Street over the tracks of the former Boston and Maine Railroad, in Nashua New Hampshire (Figures 1 & 2). The bridge is oriented approximately east-west. The area along the approaches is settled with late 19th and 20th century residences. The northwest quadrant is a wooded lot; the other three abutting lots in each quadrant are occupied by residences dating from the 20th century according to the tax rolls.

The bridge is 101.0 feet long overall, 31.1 feet wide with a clear height over the railroad tracks of approximately 21 feet. The spans measure, from west to east to center of bearings, 16'-4", 20'-2", 27'-0", 19'-8" and 16'-4". The bridge deck is carried on four timber-framed bents on stone footings and on stone abutments. Bridge inspection drawings prepared in 1979 by Sverdrup & Parcel Engineers for the New Hampshire Department of Transportation (NHDOT) were obtained and are presented below in Figures 3-7.

There are two inside bents flanking the railroad bed that carry the primary center span. There are two outside bents located halfway up the embankment between the inside bents and the abutments (referred to as center bents and end bents, respectively, on the inspection drawings). The inside bents are identical to each other and consists of eleven timber columns 7-1/2"x9-1/2" in section, 17'-5" tall with 9-1/2"x9-1/2" cap and sill beams. Six of the columns are original to the 1934 construction, as shown in the accompanying figures; five additional columns were added between the original columns at some time after 1979. The original column spacing of 6'-2" was halved to 3'-1". An additional sill beam was added on top of the old sill under the new columns. The columns are joined with four 2-3/4x8" diagonal timber braces and 1" diameter thru-bolts. The new columns were fit in place between the bracing and bolted in place. The bent sills rest on six granite block piers, each block measuring roughly 24" high by 30" square. The piers are aligned with the original columns, and in turn rest on partly exposed granite footings of which two courses of the cut stone is visible. Mortar is visible in most of the joints.

The outside bents are also identical to each other, and are simply shorter versions of the center bents, measuring 7'-4" tall. All material and construction is the same as the inside bents, including the five new columns added between the six original columns. The granite piers and footings are of the same design as well, the only difference being the split granite footing walls that extend out of the ground about 5 feet. The footings are constructed with large blocks, some rectangular in shape and in excess of 24" square in section and 60" long, while others are equally large but irregular in shape. The coursing also varies from regular to irregular.

The west abutment is constructed of coursed, split-face granite blocks laid in mortar. The face of the abutment is approximately 80" in height. On top of the granite abutment is a 6"x12" timber sill with modern pressure treated 2"-thick blocking under it bearing on the rock, a later addition. The abutment is of the U-type, with short wings extending back perpendicular from the abutment. The wing on the north side is continued as a retaining wall that runs about 80 feet west along the north side of Fairmont Street. The wing on the south side meets a granite retaining wall, about 16 feet long, that parallels the railroad tracks. A timber retaining wall continues another 12' beyond the end of the stone wall. Both walls support the yard of the residence at 28

Fairmount Street. The east abutment is of the same construction as the west but only about 60" in height. There are no additional stone retaining walls, just short sections of timber retaining wall extending about 15' from the wing walls.

The deck framing consists of twenty-four timber stringers spaced approximately 12" on centers. The 1979 inspection drawings show twelve stringer; the extra stringers were inserted during the rehabilitation of the bridge after that time. The wood road deck consists of 4"x8" planks is laid flat and perpendicular to the stringers. A wood sidewalk, 4'-6" wide and 6" above the road deck runs along the north side of the bridge. The road and sidewalk decking were evidently replaced during the post-1979 rehabilitation. Standard W-section steel guardrail runs along each side of the bridge supported on wood posts bolted to the outside stringers. Chain-link fence, 5-foot-high, is attached to the outside of the guardrail.

Since no original drawings of the bridge were located, the engineer of the bridge could not be positively determined. When the bridge was constructed in 1934 to 1935, Benjamin W. Guppy served as Engineer of Structures for the Boston & Main Railroad. Guppy assumed the position in 1909 and was still working in that capacity in 1941 when he designed the Piscataquog River Trestle, a.k.a. Kelly's Falls Bridge, in Manchester, New Hampshire.[2] Guppy would have undoubtedly had final responsibility for the Fairmount Bridge design, and as he did for the Kelly's Fall Bridge, probably personally did the design work.

HISTORICAL BACKGROUND

The 1953 Boston and Maine Railroad Engineering Department Main Track Structures List for New Hampshire lists the Fairmount Street Bridge as Bridge Number 1.43 on the Hillsboro Branch, a framed trestle built in 1934-1935. Original B&M plans for the bridge were not located. The Hillsboro Branch was formerly known as Keene Branch of the Worcester, Nashua & Portland Division.

With the establishment of large water-powered manufacturing industries in Lowell and Nashua about 1824 the need arose for a transportation system to move goods with greater capacity than what horse teams and canals could provide. The railroad, developed in England and established in the US by 1830, was demonstrating seemingly unlimited potential to move vast quantities of cargo and people over great distances at unprecedented speed. Farmers opposed the railroads fearing the loss of market for hay and grain as horse teams were made obsolete. But the more powerful manufacturing interests prevailed and state legislatures proceeded with granting charters to railroad corporations by the dozens.

The building of the 26-mile Boston & Lowell Railroad, chartered June 30, 1830 and opened five years later on June 26, 1835, laid the groundwork for the extension of the first rail line into New Hampshire. Three days before the opening of the Boston & Lowell, the Nashua & Lowell Railroad was chartered by the New Hampshire legislature to build from Nashua to the

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[2] See NHDHR Individual Inventory Form MAN0487, B&MRR Goffstown Branch Bridge No. 1.89 over Piscataquog River, a.k.a. Kelly's Falls Bridge. On file at NHDHR, Concord.

Massachusetts line. In April the following year, mostly the same men incorporated the Lowell and Nashua Railroad to build and join with their New Hampshire road. Construction began in 1837 and in 1838 the two corporations were united under the New Hampshire corporate name. In August 1839 the Directors of the Nashua and Lowell Railroad Corporation delivered their first report to the stockholders, noting the opening of the line:

> The dividend which has just been declared has afforded you the most gratifying and tangible evidence that your rail-road is at length in operation. The passenger cars commenced running on the 8th of October last [1838], and freight cars on the 23rd of November last, to a temporary depot, about three-fourths of a mile from the village. The bridge across the Nashua now being finished, and the permanent depot completed, the cars commenced running to the village on the 23rd of December. Up to December 15th the moving power was furnished by the Boston & Lowell R. R. Corporation, under a contract by which we were to receive therefore one half of the proceeds. We now do our own business, having *three* locomotive engines, three large passenger cars, capable of carrying 60 passengers each, and 24 freight cars.[3]

With increasing business and the opening of the Concord Railroad to Nashua in 1842 the line flourished and in 1845 added a second track. Meanwhile the Wilton Railroad was incorporated in 1844 to build a line 16 miles in length between Nashua and Wilton. The projected route of the Wilton line is shown on 1847 map prepared by the company (Figure 8). The company encountered financial hardship during construction of the line and it was only through an operating agreement with the Nashua & Lowell Railroad that further backing was obtained and the line completed. When it opened to Amherst in 1848 the Nashua & Lowell was paid $24 a day to operate it. The line was completed to Wilton in December, 1851. In 1853, never having operated independently, the Wilton Railroad was leased in its entirety to the Nashua & Lowell Railroad.

In 1857 a joint operating agreement was made between the Nashua & Lowell Railroad and the Boston and Lowell Railroad that included the Wilton Railroad, among other branch lines. In 1866, the Peterborough Railroad was chartered to continue the Wilton line to Greenfield and Peterborough which was completed in 1874. The line was continued to Hillsborough with a branch to Keene in the 1880s. The Wilton line and other lines built into Nashua are shown on Figures 9-10.

After the operating lease with Nashua & Lowell Railroad expired in 1878 the Wilton Railroad went through a series of leasing and operating agreements culminating with the lease of the line to the Boston and Maine Railroad in 1890.[4] In 1901 the Nashua Daily Telegraph reported that the Worcester, Nashua and Portsmouth Division of the B&M, headquartered in Nashua, employed 528 residents of the city. The wages paid totaled $1,028 per day, equaling an average weekly salary of $11.68 for a six day work week. With a "grand yearly total of wages paid of more than $300,000, it can be readily seen from these figures the benefits that Nashua derives

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[3] Nashua and Lowell Railroad Corporation. *Report of the Directors of the Nashua and Lowell Railroad Corporation Made to the Stockholders, August, 1839.* Nashua: Printed by P. Morrill, 1839.
[4] See "Fairmount Street Bridge," NHDHR Inventory Form NAS0199 for additional information on the leasing of the Wilton Railroad at this time.

from the Boston & Maine are large and substantial and go a great ways toward increasing the wealth of the town as well as helping the trades interests of the city."[5]

The B&M operated the line continuously after that until becoming part of Guilford Transportation Industries in 1983 which changed its name to Pan Am Railways in 2006. "The section of track between Nashua and Wilton is currently owned by Pan Am, but the section from Wilton through Bennington is now owned by the New Hampshire Department of Transportation (NHDOT), as is the Fairmount Street Bridge." [6]

History of the Fairmount Street Bridge and Area [7]

In Nashua, the railroad ran from the depot in the center of town, turning northwest and roughly paralleling Amherst Street on its journey to one of its early stops in Amherst. In the mid-19th century, the neighborhoods along Amherst Street were just beginning to expand to the northwest from the center of town. This was part of the general growth of Nashua due to the prosperity of the Nashua Manufacturing Company and Jackson Mills textile mills, which attracted other industry to the city. From after the Civil War through the end of World War I, the area saw the construction of free-standing wood-frame houses built for artisans, merchants and industrialists. The 1858 map of the City of Nashua (Figure 9) shows a few dwellings had been built along Amherst Street in the area of Vernon Street and Circle Street, the north leg of which later became Fairmount Street. Before there were people living near the bridge, there would have been little demand for crossings over the right-of-way to and from Fairmount Heights. According to the NHDHR Inventory form, the original Fairmount Street Bridge was therefore most likely constructed in the late 1860s.[8] The 1883 G. H. Bailey & Co. Bird's Eye View of Nashua (Figure 11) shows the growing residential area along Amherst Street connected to Fairmount Heights, a plateau above the north bank of the Nashua River, by two railroad trestles over the B&M's Nashua-Wilton line. The bridge furthest to the northwest is the predecessor to the current Baldwin Street Bridge, the other is the predecessor to the current Fairmount Street Bridge. By 1892, as depicted on the D.H. Hurd map of that year (Figure 12) Fairmount Street and the other residential streets close to the bridge were just beginning to become populated.

During the early 20th century the B&M strengthened or replaced most bridges along their main lines and many on their secondary lines as well to carry heavier locomotives. Beginning in 1914 the Boston and Maine, along with all railroads in the United States, conducted a complete inventory and survey of its physical plant as required by the Interstate Commerce Commission. The purpose of the survey was to determine an accurate valuation of the railroad's capital facilities in order to enable the Commission to set rates so that railroads could earn a reasonable rate of return on their capital assets. In 1919 the Baldwin Street Bridge trestle, located several hundred feet north of the Fairmont Street Bridge was rebuilt reusing the granite abutments and footing from the preceding 19th century bridge. It is evident that the granite substructures of the Fairmount Street Bridge predate the 1934 reconstruction, but their exact age could not be

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5 Nashua Daily Telegraph. "Big Staff of Employees on B&M Divisions." Nashua Daily Telegraph, April 22, 1901.
6 "West Bridge Street Bridge," NHDHR Inventory Form NAS0209.
7 This section is taken from "Fairmount Street Bridge," NHDHR Inventory Form NAS0199.

determined. As noted, the bridge was rehabilitated at some time after the 1979 NHDOT inspection.

History & Technology of the Wood Trestle Bridge

Bridge engineer J.A.L. Waddell defines a trestle as "a bridge structure composed of bents or towers and supporting stringers or girders forming the floor system."[9] He further defines three subtypes: a *framed trestle* is one having framed bents, a *pile trestle* has pile bents, and a *knee-braced trestle* is one having knee braces. Trestles may be primarily of wood, concrete or steel construction, or a combination of materials. Wood trestles that carry highways over railroads, railroads over highways, or in some cases span streams where rock or firm foundation material is near the surface, are typically framed trestles with the vertical bent members consisting of sawn timbers resting on stone or concrete footings (Figure 13). Wood trestles crossing water bodies or wetlands are typically pile trestles with the vertical bent members consisting of log pilings driven to refusal or nearly so (Figure 14). The knee-braced trestle utilizes diagonal braces extending from the vertical bent members to the stringers or girders to effectively shorten their span length. An example of the less common knee-braced trestle is the former Tilton & Franklin (Boston & Maine) Railroad trestle spanning the Winnepesaukee River in Franklin NH (Figure 15).

Trestle bridges are one of the oldest bridge forms constructed by man, a multi-span version of the simple wood girder or stringer span. They were common during the American Colonial period when they were built with hand tools – an axe, adze, hammer, chisel, pry bar and cant-hook sufficed – and consisted of logs laid across a stream resting on simple stone footings or abutments of timber or stone. The logs were typically flattened on top and at their bearings, with smaller logs of uniform size laid atop crossways to form a solid deck. Flat planks were laid longitudinally down the center to provide a smooth roadway. Simple short spans were repeated as needed to cross wide streams with the ends resting on rock-filled timber cribs, wood piling or timber-framed bents, or stone piers.[10]

Due to the limited strength of solid wood beams, stringer spans have seldom exceeded 30 feet for highway loading and half that for railroad loading. Little if any mathematical engineering went into the design of single span timber stringer highway bridges prior to the 19th century. Timber bridge builders were carpenters who sized timbers on the basis of judgment or assessment of previous failures and simply increased the size and number of stringers as the span and anticipated loads increased. According to bridge engineer Charles C. Schneider:

> The earlier wooded and iron bridges were built very much in the same manner as the ancient Roman bridges, in accordance with empirical rules, by practical men who had no accurate knowledge of the strains produced on the various members of the structure by the exterior forces, but who were men of unusual constructive ability and sound

[9] Waddell, 1916, volume 2, Glossary.

[10] See Llewellyn N. Edwards. "The Evolution of Early American Bridges." *Transactions of the Newcomen Society*, 13 (1932):95-116, and also his later work, *A Record of History and Evolution of Early American Bridges* (Orono, ME: University of Maine Press, 1959) for a discussion of the earliest wooden stringer bridges built in the Colonies. A pen and ink drawing of a 19th century log stringer "horse bridge" in New Hampshire, drawn by Edwards, appears in *American Wooden Bridges* [ASCE Historical Publication No. 4] New York: ASCE, 1976, on page 147.

> judgment, who had to depend upon their own resources and natural instinct, experimenting with models and profiting by previous failures. Practice always preceded the science, thus the structural systems were invented before their theory was developed.[11]

During the 19th century as timber bridges were called upon for railroad loading, the necessary sizes of the beams for a given span were established. The development of the field of materials testing in the latter part of the 19th century led to specifications for timber construction based on the physical properties of various types of wood. Tables were published in the engineering literature listing the strength of the various species and the recommended dimensions of timbers for varying spans.[12] By the end of the century a substantial body of information on the physical properties of various species of wood had accumulated, a large portion of which was attributable to the work of Filbert Roth at the Forestry Division of the Department of Agriculture. Beginning in 1889, Roth began a series of investigations into many aspects of the nation's forests and the properties of wood that became generally known as the US Timber Investigations.[13] In 1898, J.B. Johnson, the renown Dean of Engineering at the University of Wisconsin published his seminal treatise on *The Materials of Construction* which presented a compilation of much of the Forest Service's work.[14] Johnson's book became a standard text and reference for student and professional engineer alike.

Southern species of pine, in particular southern yellow pine, were found to possess structural attributes that made it the wood of choice for long, large-dimension beams. In the northeast the availability of native structural timber was on the wane and pressure-treated Southern yellow pine of superior quality could be had at a competitive cost. Even though the pressurized treatment of wood with creosote was shown to extend the service life of wood by decades, the cost of treatment and transportation, combined with increasing cost of timber and its perception as "non-permanent construction" still made wood an unpopular choice for short spans compared to concrete.

In a discussion of wood pile trestles in 1908, Ketchum said, "Timber highway bridges were formerly quite generally used, and are still in use for temporary structures and in localities where

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[11] Charles C. Schneider. "The Evolution and Practice of American Bridge Building." *Transactions of the American Society of Civil Engineers* 54 (June, 1905):217.

[12] Dozens of articles on the subject can be found in the literature from 1885 to 1900; a few of the more important articles include: Carl S. Fogh. "Diagram for Proportioning Wooden Beams." *Engineering News* 32 (September 26, 1894):244; J. M. Michaelson. "A Simple Diagram, Giving, By Inspection, the Dimension of Wooden Beams for a Given Span and Load," *Transactions of the American Society Civil Engineers* 25 (August 1891):231; Onward Bates. "Pine Stringers and Floor Beams for Bridges," *Transactions of the American Society Civil Engineers* 23 (November 1890):261. Handbooks such as the *Civil Engineer's Pocket-Book*, first published by John C. Trautwine in 1876 gave formulas for calculating timber beam strength and tables of the relative strength of various wood types.

[13] Filbert Roth. *Timber: An elementary discussion of the characteristics and properties of wood.* [US Department of Forestry Bulletin No. 10]. (Washington, DC: US Government Printing Office, 1895). Filbert Roth. *Timber Physics. Resume of investigations carried on in the US Division of Forestry, 1889-1898.* (Washington, DC: US Government Printing Office, 1899).

[14] John Butler Johnson. *The Materials of Construction*, New York: John Wiley and Sons, 1898. Johnson conducted many materials tests himself in the University's laboratory. His other widely used textbook was Theory and Practice in *Designing Modern Framed Structures* first published in 1893.

transportation is difficult and suitable timber is available."[15] In 1916, Waddell stated that the use of timber in bridge construction was gradually being reduced for "three good reasons: first, its perishability; second, its increasing scarceness; and, third, its consequently augmented price. It is still employed largely for trestles, both railway and highway and will continue to be so used until the price of timber becomes prohibitory, the day for which is not far distant. It is employed largely for piling, but even there it is being gradually replaced by reinforced concrete." [16] In 1924, Phil Franklin, structural engineer with the McClintock-Marshall Company (primarily a builder of steel bridges) opened his discussion of timber bridges in *Steel and Timber Structures* with the following: "The only excuse for a timber bridge is that it is cheaper than some other form of construction."[17] He further noted that "until very recently highway loadings were not studied with any seriousness" and that "the heavy motor truck of today is as heavy as the railway engine of the early days … [and] it is this greatly increased weight that calls for far more careful consideration of the details of the wooden highway bridge than was customary a few years ago." [18]

Advances in heavy timber connectors, such as ring-type shear connectors, are seldom used in one or two story pile-trestle construction since the loads on the cross-bracing - the only members subject to significant bolt shear on the bridge - are generally within the limits of standard thru-bolt connections. Small town highway bridges continued to be erected by local carpenters without plans, and it was only when state highway engineers entered the business in the early 20th century that modern engineering practice was engaged.

For highway and railroad engineers located in areas with an abundant supply of high quality structural timber, timber bridges found renewed popularity during the Depression years as a more economical alternative to steel and concrete. The low cost of wood trestles made them the practical choice for railroad overpass bridges during the widespread grade-crossing elimination projects undertaken during the late 1920s and 1930s.

During World War II the shortage of war critical materials such as steel and concrete led to a resurgence in the use of timber trestles bridges which could built with largely unskilled labor from standardized plans found in engineering textbooks and wartime construction manuals such as the War Department's *Technical Manual TM5-286: Semi-permanent Highway and Railway Trestle Bridges.* Engineered wood beams and structural members, including bolt-laminated, glue-laminated, composite wood-concrete and wood-steel, were all developed during World War II to reduce the use of war-critical materials.

From about the 1960s on, research has continued in the use of glue-laminated wood beams for bridge construction, including prestressing and improved preservative treatment methods.[19] During the 1980s there was a resurgence of interest in the advantages of wood bridges and

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15 Milo S. Ketchum, *The Design of Highway Bridges of Steel, Timber and Concrete.* (New York: McGraw-Hill Book Co., 1908):389.
16 J.A.L. Waddell, *Bridge Engineering* (New York: John Wiley and Sons 1916), p. 52.
17 Phil A. Franklin, "Timber bridges and Trestles," in *Steel and Timber Structures*, George A. Hool and W.S. Kinne, Editors (New York: John Wiley and Sons, 1924):372.
18 Ibid.
19 Richard M. Gutkowski and Thomas G. Williamson. "Timber Bridges: State-of-the-Art." *Journal of Structural Engineering* 109 (September, 1983):2177-2178.

numerous technical papers were published on the subject.[20] With over 70,000 wood bridges in the United States in 1990, there was interest in improved methods of inspection maintenance and renewal as well.[21] Today, most modern bridge engineering texts include sections on the design of wood bridges.[22]

Boston and Maine Wood Trestle Bridges [23]

When the early railroad construction was at its peak in the 19th century, the timber trestle was a common bridge form because of the availability of timber at or near the construction site. Timber trestles that have survived have generally been rebuilt several times since their original construction (Wallace and Mausolf, 2001: 116). Mostly due to financial constraints, wood railroad bridges dominated on the Boston and Maine lines long past the time they were being abandoned in other parts of the country. By 1910 national practice favored iron or steel bridge construction while, by contrast, the Boston and Maine often replaced wood structures in kind well into the 1940s.[24]

Wood trestles remained popular with the B&M Corporation because of the availability of creosote wood preserving treatments. In early 1923, the B&M awarded the contract to build and operate a wood treatment plant on property it owned in Nashua to the Pittsburgh Wood Preserving Company. Later that year, the Pittsburgh Wood Preserving Company assigned the 10-year lease to the New England Wood Preserving Company, which had been created by the Pittsburgh Wood Preserving Company to operate the Nashua plant. The lease with B&M was reassigned several times to various companies who subsequently came to own the assets of the treatment plant, until both the lease and the plant came to Koppers Company in 1940. The lumber was treated by being loaded into treatment tanks where creosote or other preserving agent was forced into the wood at high temperatures of 190 degrees and under a pressure of 160 to 190 psi. The plant closed in the 1980s.[25]

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[20] See "Timber Bridges: State-of-the-Art." cited above for a bibliography of papers on the subject. Also see John R. Verna, et.al. "Timber Bridges: Benefits and Costs." *Journal of Structural Engineering* 110 (July, 1984):1563-1570.

[21] Frank Muchmore. "Techniques to Bring New Life to Timber Bridges." *Journal of Structural Engineering* 110 (August, 1984):1832-1846; Michael A. Ritter. *Timber Bridges: Design, Construction, Inspection, and Maintenance.* Washington, DC: U.S. Dept. of Agriculture, Forest Service, Engineering Staff, 1990.
Michael A. Ritter, "Timber Bridges – Design, Construction, Inspection and Maintenance," United States Department of Agriculture, Forest Service, EM 7800-8. Washington, DC, 1990

[22] See Richard M. Barker and Jay A. Puckett. *Design of Highway Bridges*. New York: John Wiley & Sons, Inc., 1998.

[23] This section is taken from excerpted "West Bridge Street Bridge," NHDHR Inventory Form NAS0209

[24] Wallace and Mausolf, 2001, p. 99.

[25] Nashua City Station Railroad History, Koppers Company, Inc.

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FIGURE 1: Location Map USGS Nashua North, NH 7.5 min. quadrangle, 1985.

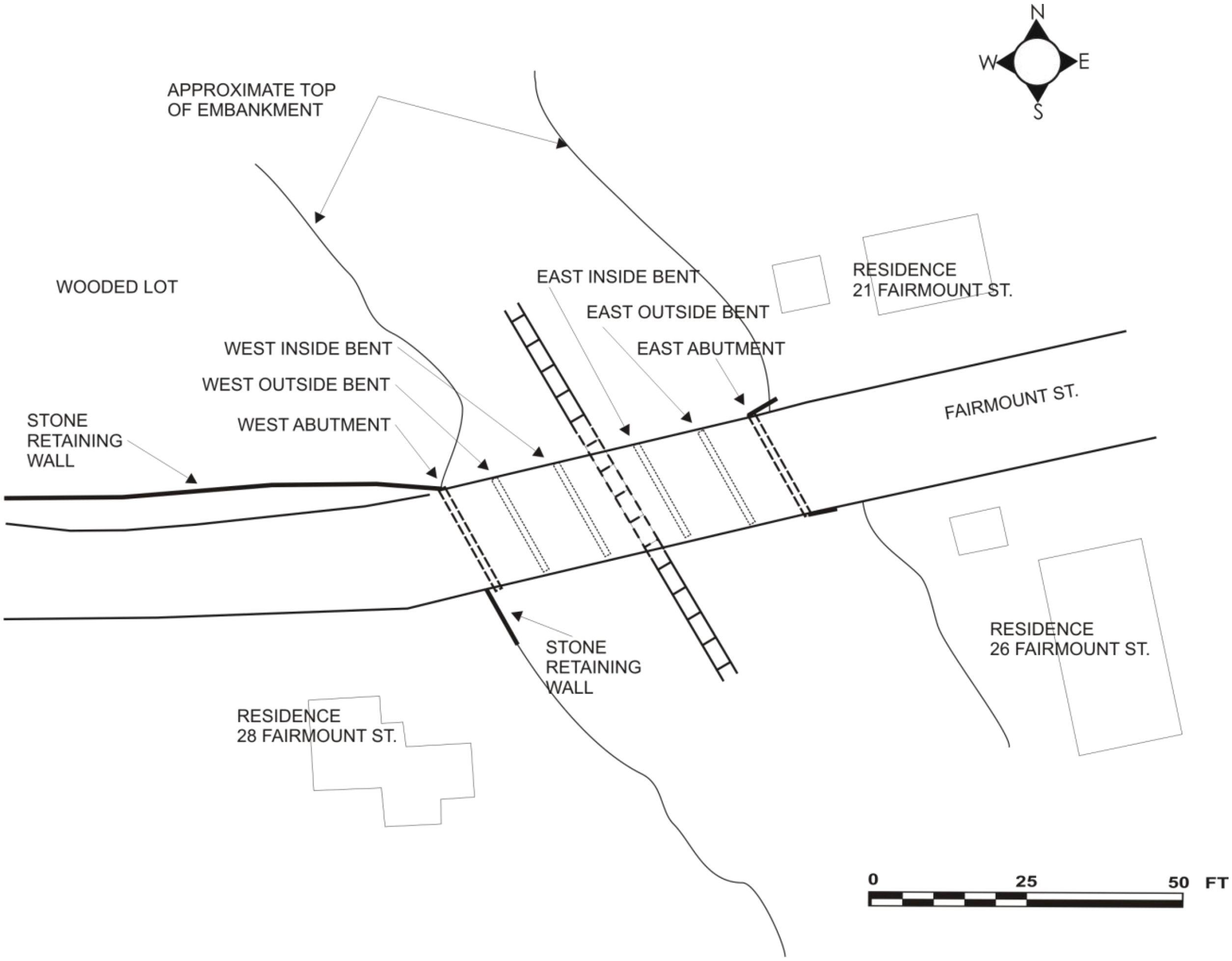


FIGURE 2: Site Sketch.

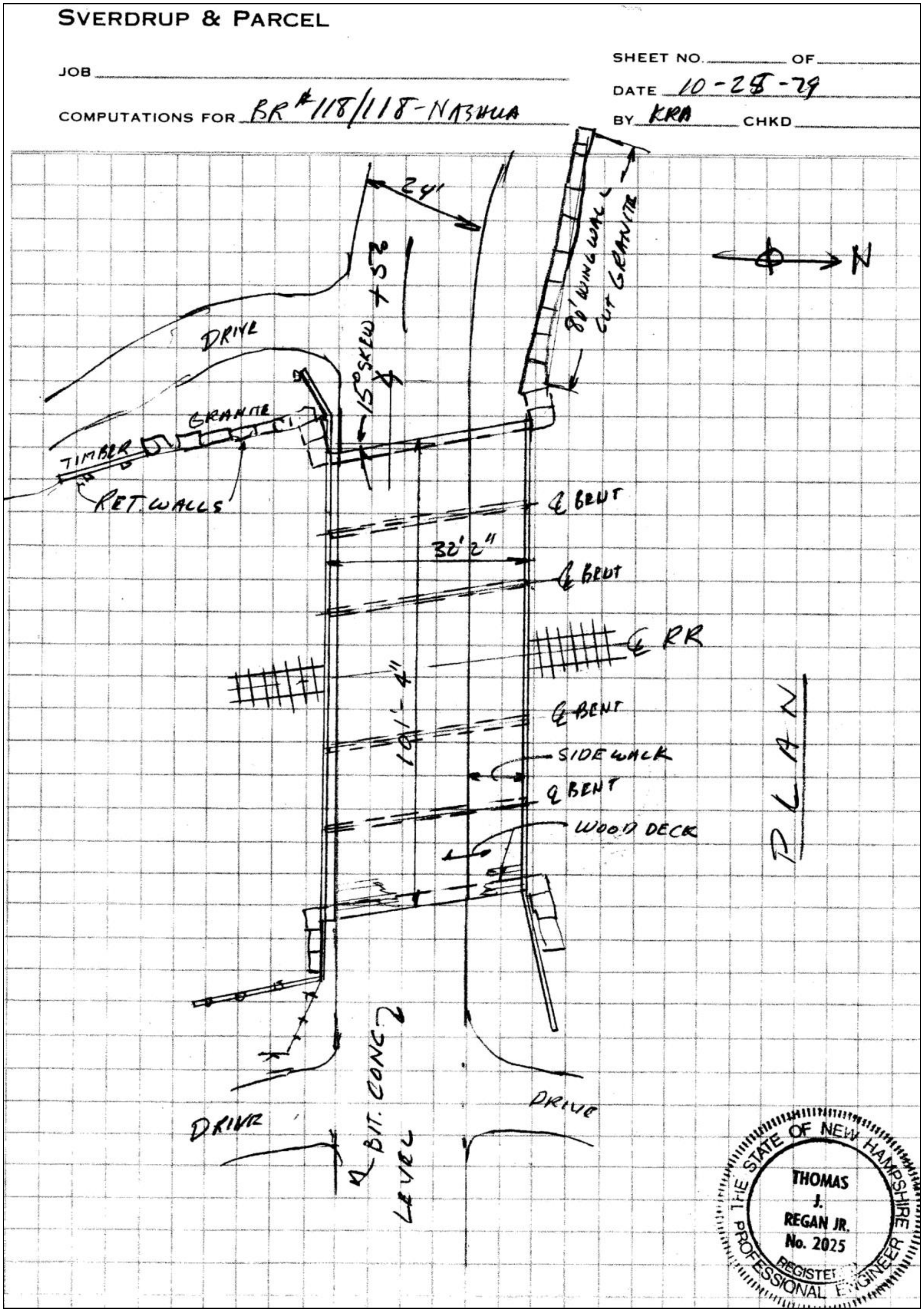


FIGURE 3: Fairmount St. Bridge Engineering Inspection Sketch by Thomas Regan, Jr. CE, Sverdrup & Parcel Engineers, October 1979 (NHDOT Bridge Inspection File).

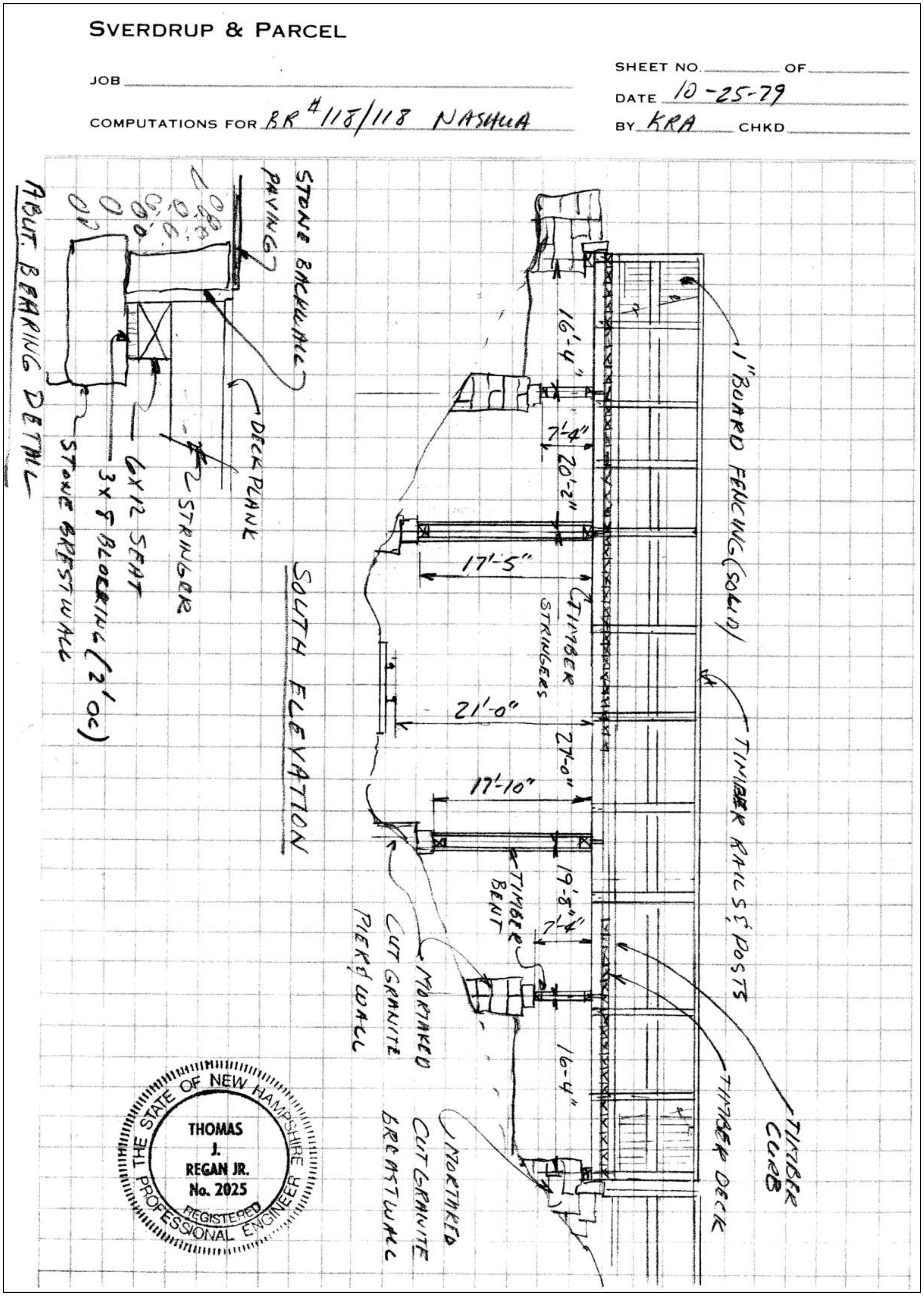


FIGURE 4: Fairmount St. Bridge Engineering Inspection Sketch by Thomas Regan, Jr. CE, Sverdrup & Parcel Engineers, October 1979 (NHDOT Bridge Inspection File).

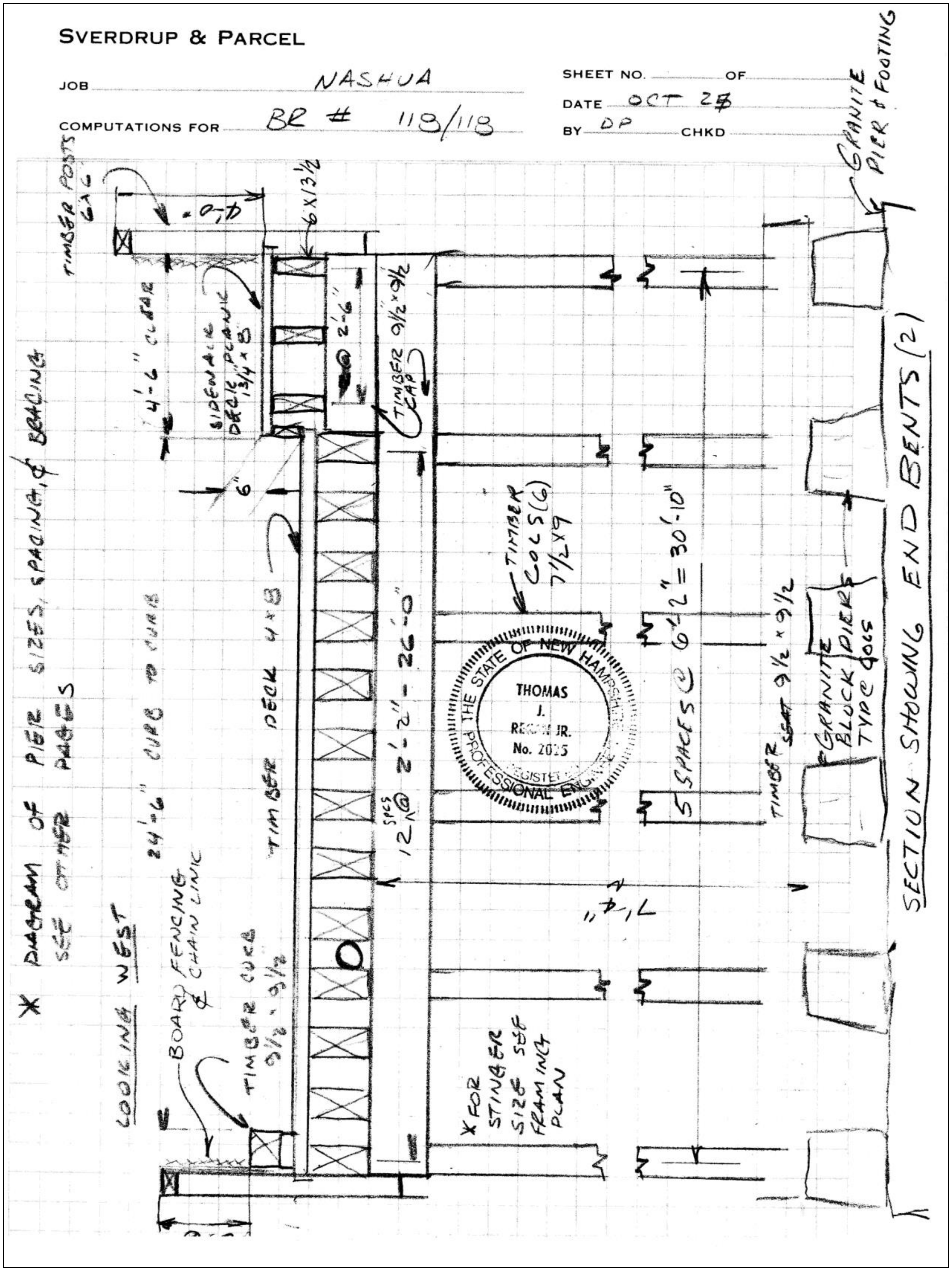


FIGURE 5: Fairmount St. Bridge Engineering Inspection Sketch by Thomas Regan, Jr. CE, Sverdrup & Parcel Engineers, October 1979 (NHDOT Bridge Inspection File).

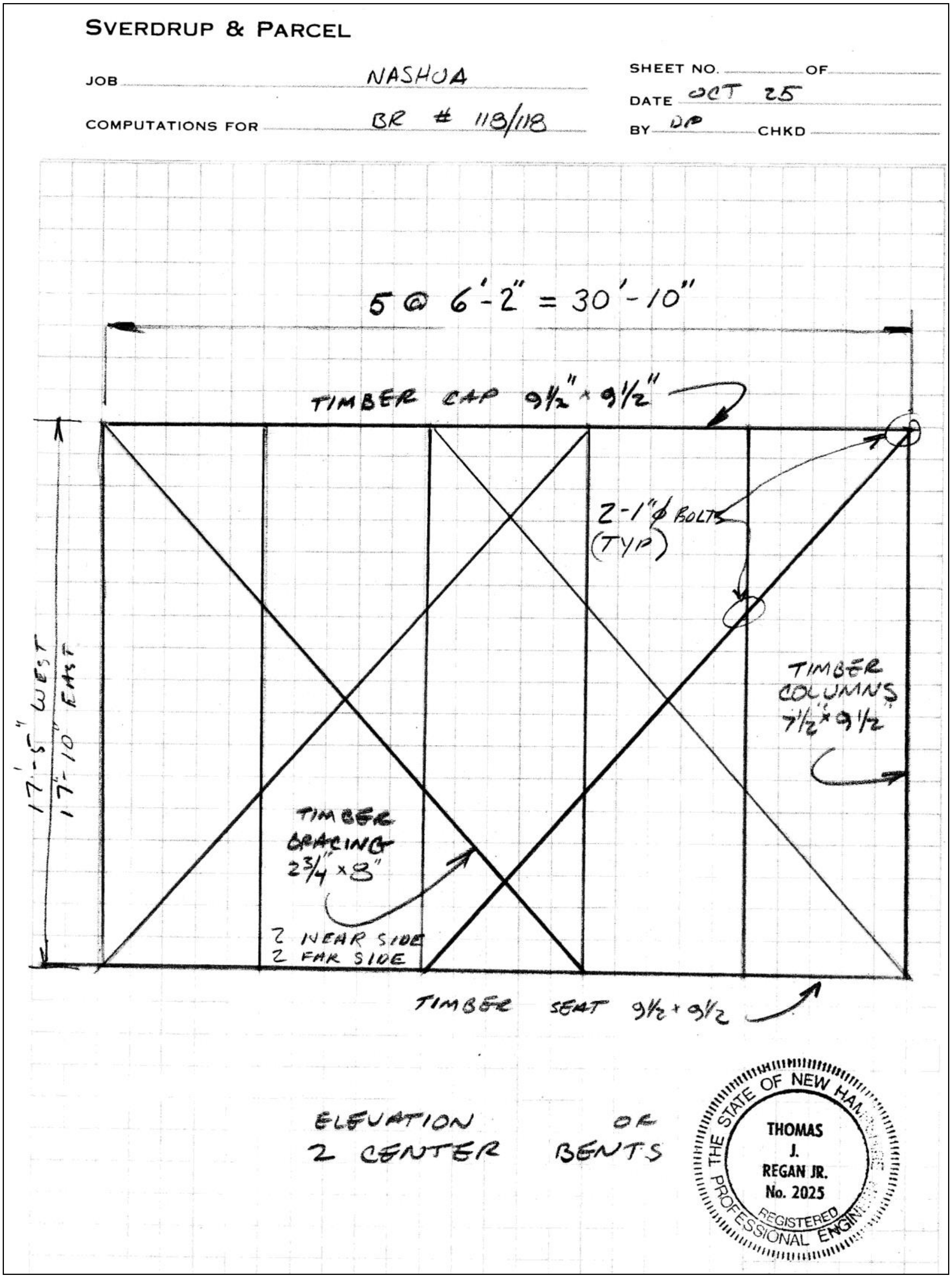


FIGURE 6: Fairmount St. Bridge Engineering Inspection Sketch by Thomas Regan, Jr. CE, Sverdrup & Parcel Engineers, October 1979 (NHDOT Bridge Inspection File).

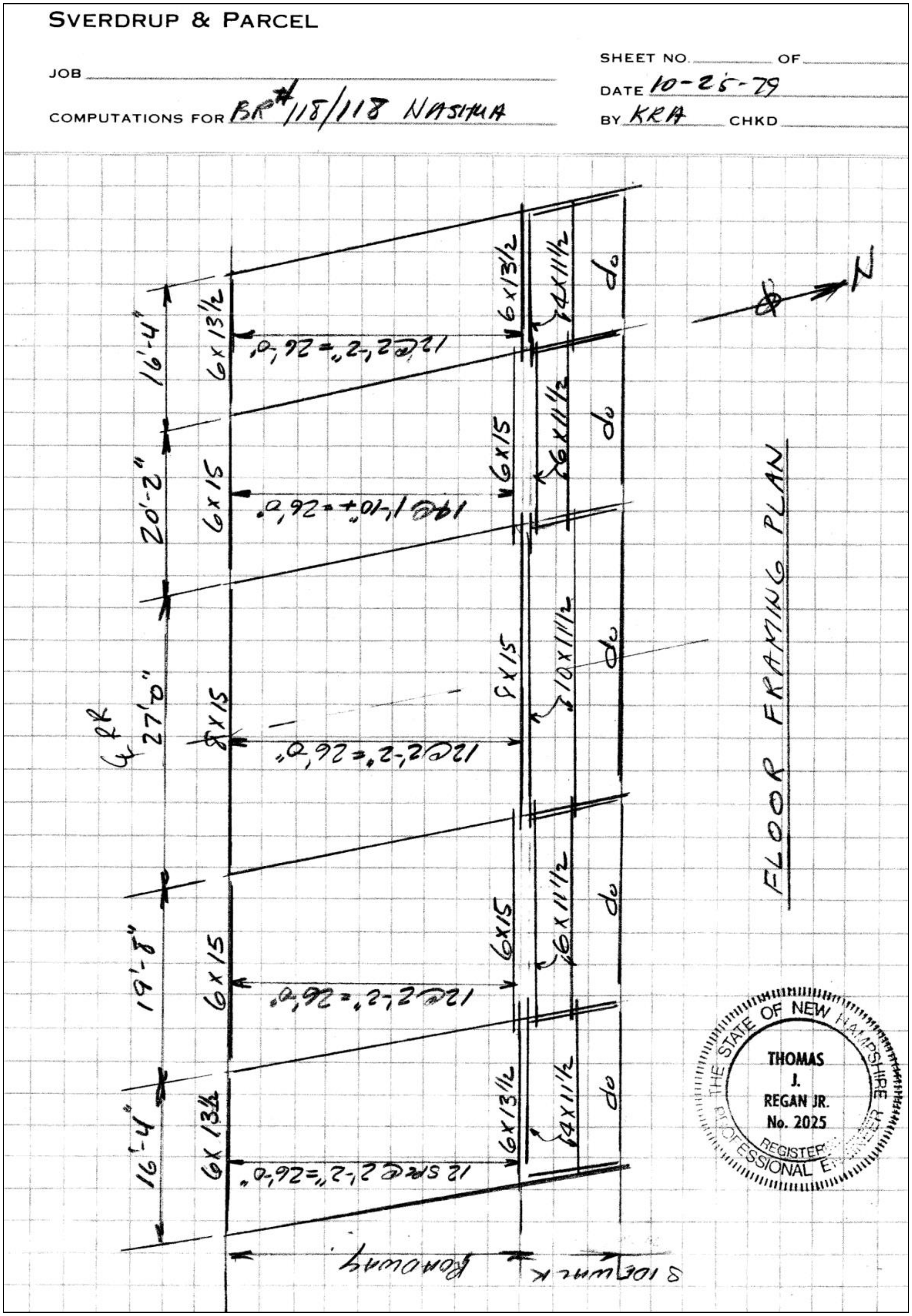


FIGURE 7: Fairmount St. Bridge Engineering Inspection Sketch by Thomas Regan, Jr. CE, Sverdrup & Parcel Engineers, October 1979 (NHDOT Bridge Inspection File).

FIGURE 8: Railroad Map, 1847, showing projected route of Wilton Railroad and its junction with the Nashua & Lowell RR and Concord Railroad in Nashua (Wilton Railroad, 1847).

FIGURE 9: 1858 Walling Map showing development of Nashua, location of Wilton Railroad and Worcester & Nashua Railroad (Walling, H.F., 1858).

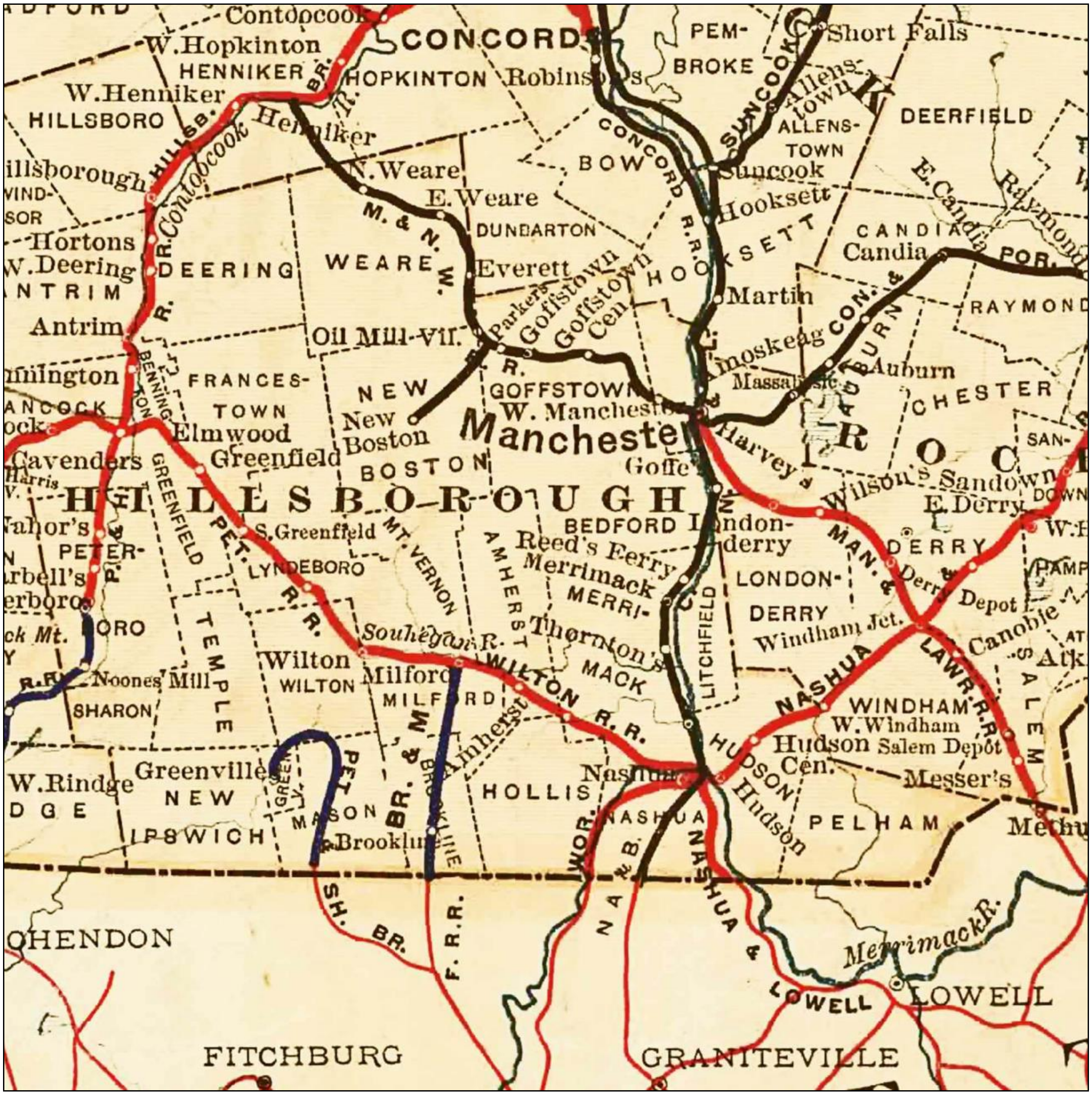


FIGURE 10: Railroad Map of New Hampshire, 1894 (New Hampshire Railroad Commissioners, 1894).

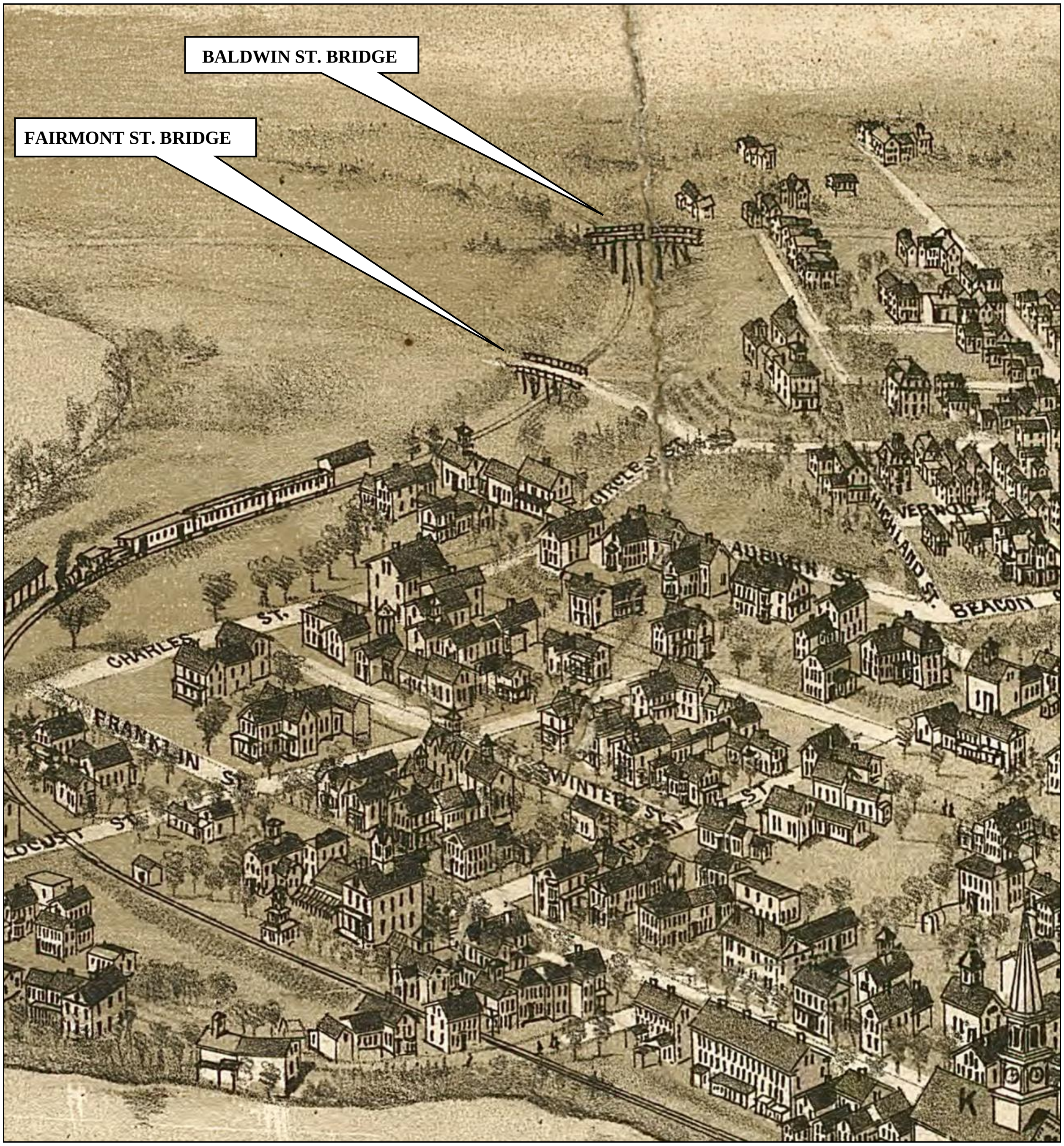


FIGURE 11: 1883 Birdseye view map of Nashua, depicting Baldwin Street and Fairmount Street trestle bridges over the Wilton Railroad (Bailey, O.H., 1883).

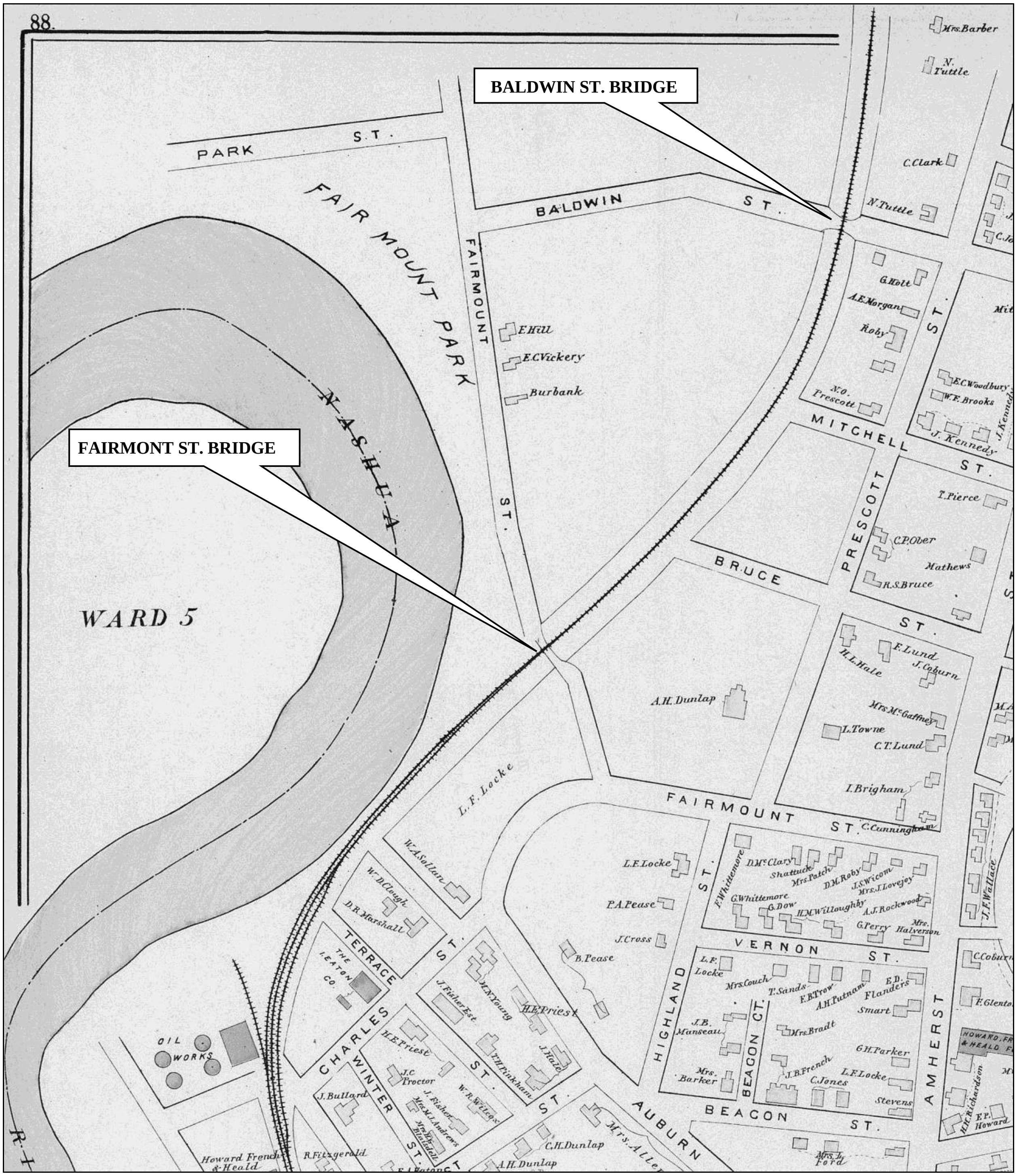


FIGURE 12: 1892 map of Nashua, depicting Baldwin Street and Fairmount Street trestle bridges over the Boston & Maine Railroad (Hurd, 1892).

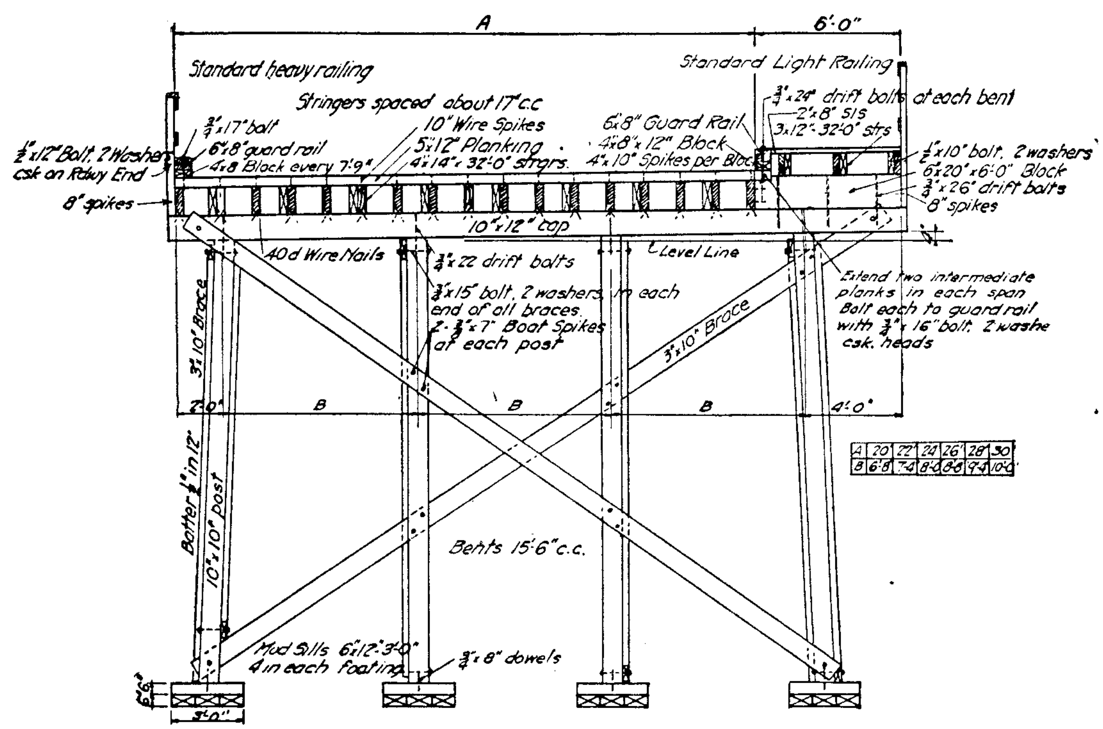


Fig. 31.—Typical section of roadway timber trestle, City of Seattle.

FIGURE 13: Typical framed bent trestle for highway loading (Hool & Kinne, 1924, p. 402).

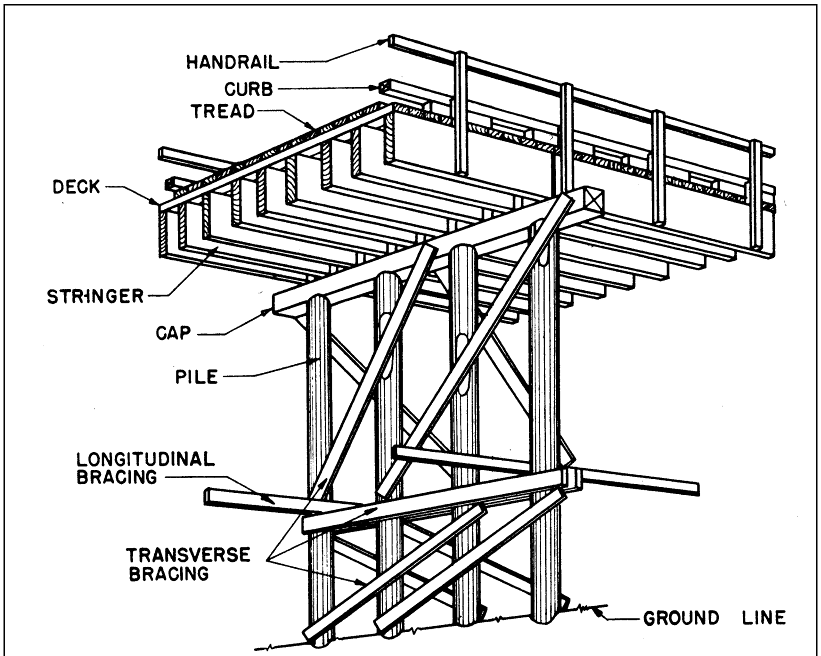


FIGURE 14: Typical pile bent trestle for highway loading (War Department, 1945, p. 2).

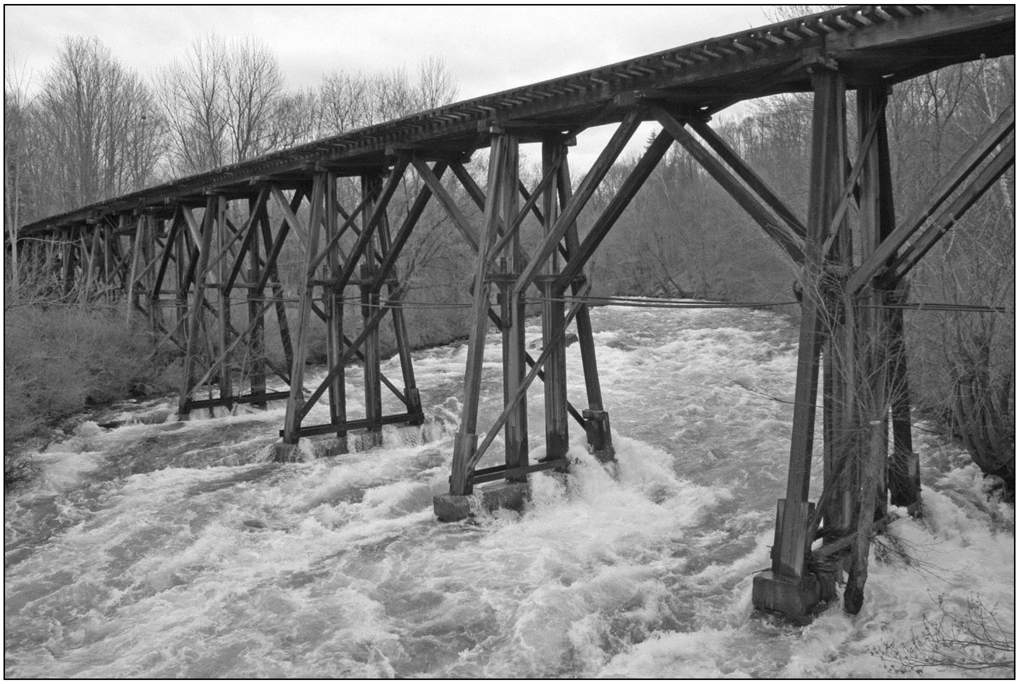
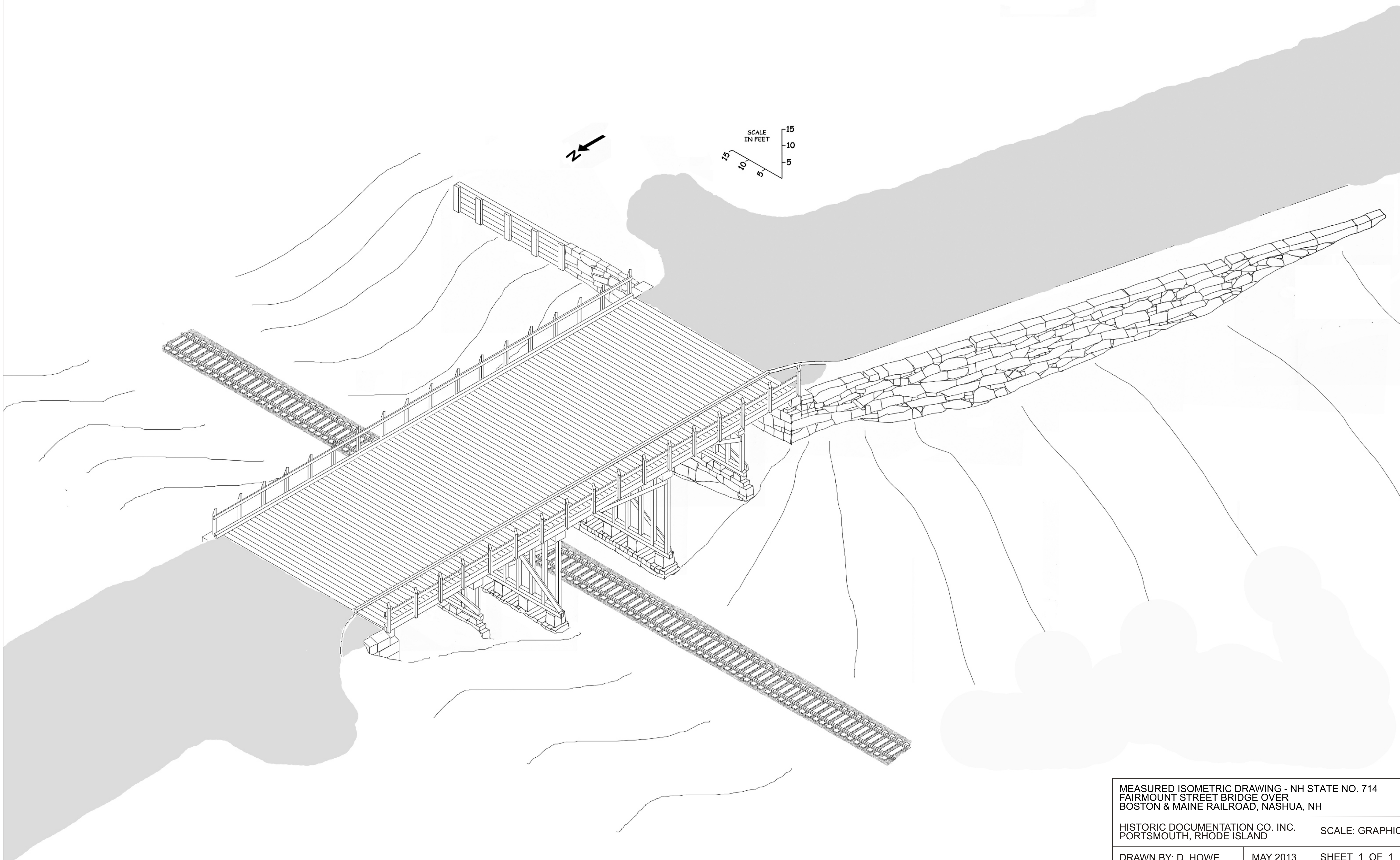


FIGURE 15: B&MRR Knee-braced railroad trestle over Winnipesaukee River, Franklin NH.



MEASURED ISOMETRIC DRAWING - NH STATE NO. 714
FAIRMOUNT STREET BRIDGE OVER
BOSTON & MAINE RAILROAD, NASHUA, NH

HISTORIC DOCUMENTATION CO. INC. PORTSMOUTH, RHODE ISLAND	SCALE: GRAPHIC

DRAWN BY: D. HOWE	MAY 2013	SHEET 1 OF 1

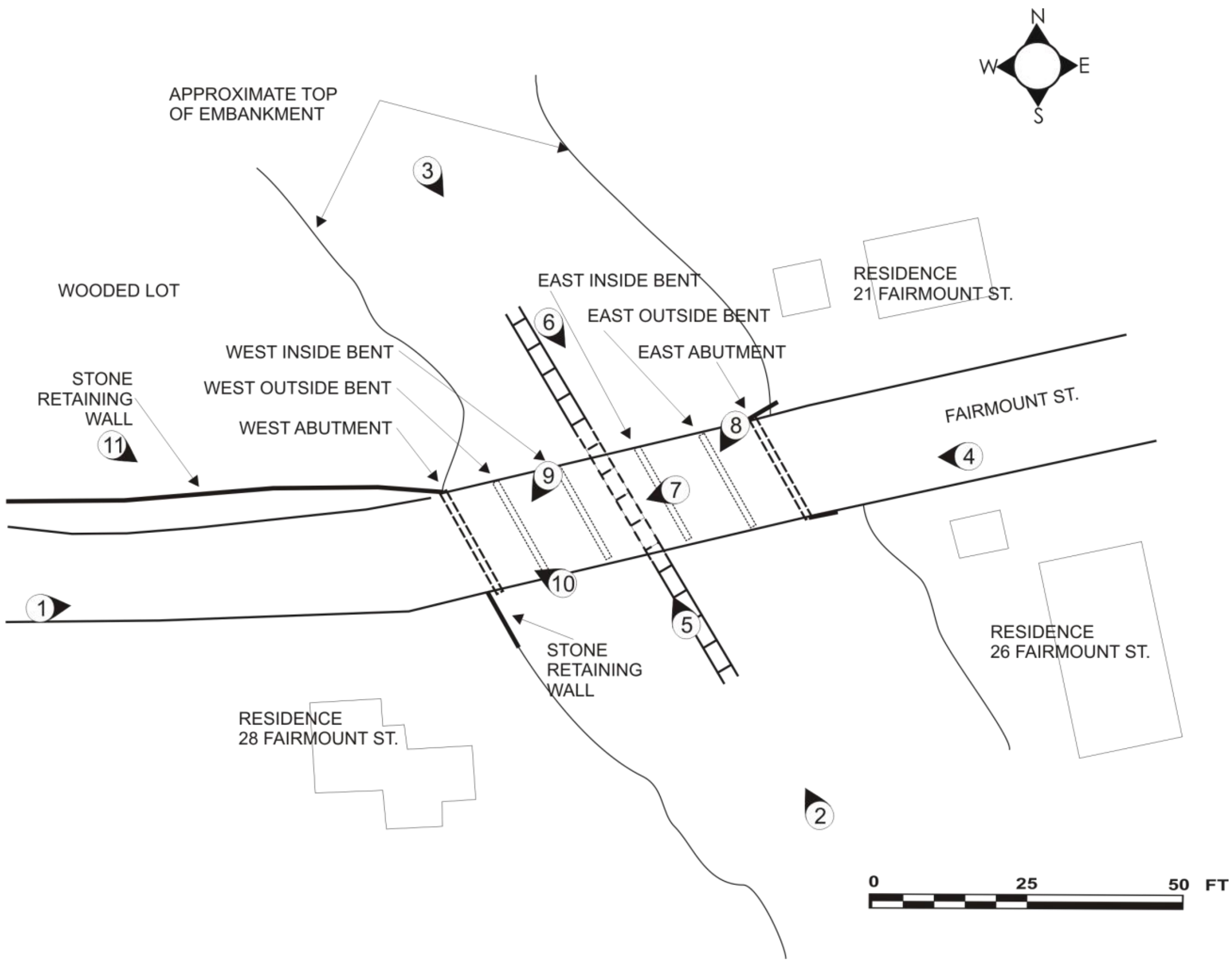
INDEX TO PHOTOGRAPHS

FAIRMOUNT STREET BRIDGE OVER FORMER BOSTON & MAINE RAILROAD
Nashua,
Hillsborough County,
New Hampshire.

New Hampshire State No. 714
Photographer: Rob Tucher
April 2013

NH-714-1	West approach to bridge in context from Fairmount Street. Looking east.
NH-714-2	South elevation and context from railroad tracks. Looking north.
NH-714-3	North elevation and context from railroad tracks. Looking south.
NH-714-4	Deck view. Looking west.
NH-714-5	South elevation. Looking north.
NH-714-6	North elevation. Looking south.
NH-714-7	West inside bent and granite footing, side facing tracks. Looking west.
NH-714-8	East outside bent and granite footing, side facing east abutment. Looking southwest.
NH-714-9	West outside bent and granite footing, side facing tracks. Looking southwest.
NH-714-10	West abutment. Looking northwest.
NH-714-11	Retaining wall along Fairmount Street, west approach, north side. Looking southeast.

BALDWIN STREET BRIDGE
NH State No. 714
Key to Photographs



NH-714-1: West approach to bridge in context from Fairmount Street. Looking east.

NH-714-2: South elevation and context from railroad tracks. Looking north.

NH-714-3: North elevation and context from railroad tracks. Looking south.

NH-714-4: Deck view. Looking west.

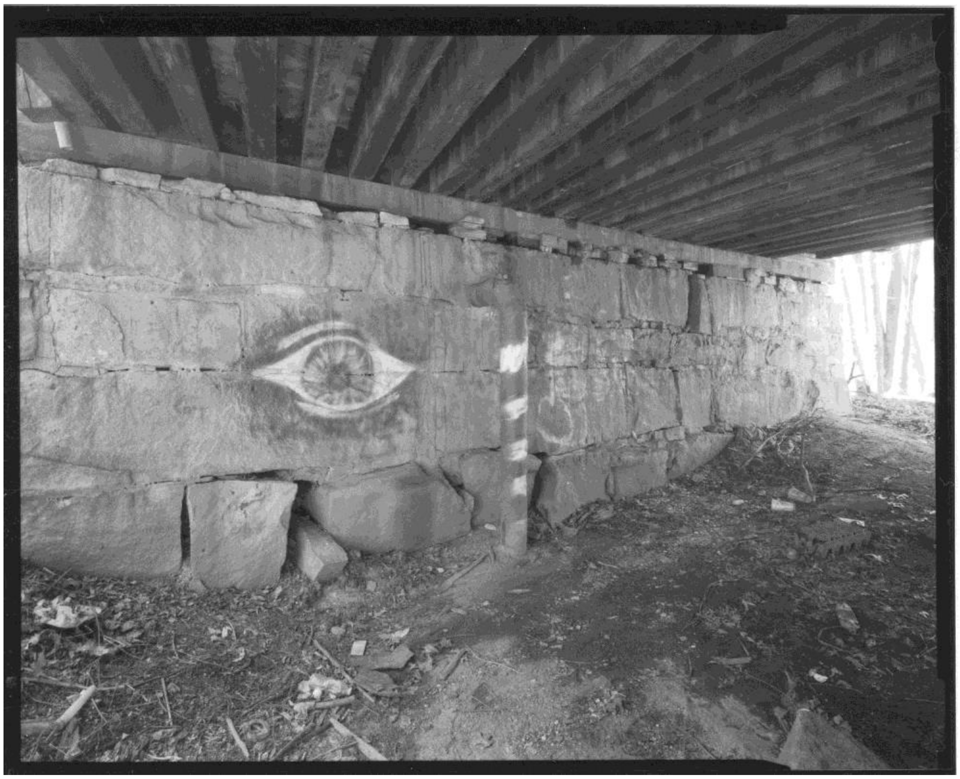
NH-714-5: South elevation. Looking north.

NH-714-6: North elevation. Looking south.

NH-714-7: West inside bent and granite footing, side facing tracks. Looking west.

NH-714-8: East outside bent and granite footing, side facing east abutment. Looking southwest.

NH-714-9: West outside bent and granite footing, side facing tracks. Looking southwest.



NH-714-10: West abutment. Looking northwest.

NH-714-11: Retaining wall along Fairmount Street, west approach, north side. Looking southeast.