

**NEW HAMPSHIRE HISTORIC PROPERTY DOCUMENTATION**  
**POWER CANAL**  
**NASHUA MANUFACTURING COMPANY, NASHUA, NH**

**NH State No. 538-G**

**LOCATION:** Nashua River at Mine Falls Dam to Pine Street Extension, passing through Mine Falls Park, Nashua, Hillsborough County, New Hampshire  
USGS Nashua North NH Quadrangle  
UTM Coordinates: 19.297615.4737120

**BUILDER:** Nashua Manufacturing Company

**DATE:** 1824

**PRESENT OWNER:** City of Nashua

**PRESENT USE:** Natural feature of Mine Falls Park, City of Nashua

**SIGNIFICANCE:** The Nashua Manufacturing Company Power Canal is a contributing resource to the National Register-listed Nashua Manufacturing Company Historic District. The district is significant due to the company's role as Nashua's first major industry and largest textile mill, and is illustrative of the importance of the textile industry to the economic development of southern New Hampshire in the nineteenth and early twentieth centuries. The Nashua Manufacturing Company significantly contributed to the history of the City of Nashua as its largest industry and employer for 125 years. The Power Canal is significant for its role as the source of power for the mills, as an intact early example of the large-scale power canals built during the industrial revolution across New England, and as the oldest surviving resource of the Nashua Manufacturing Company.

**PROJECT  
INFORMATION:**

This structure will receive impacts from the Broad Street Parkway Project, which will include the building of a road that will cross the Nashua River via a new bridge, passing through portions of the former Nashua Manufacturing Company mill yard, including the north end of the Power Canal. This recordation was undertaken in accordance with a Memorandum of Agreement between the Federal Highway Administration, the New Hampshire Division of Historical Resources and the City of Nashua. The historical documentation was completed in October 2013 by Historic Documentation Company, Inc., architectural historians Richard Casella and Philip Pendleton. The large format photographs were taken by Rob Tucher.

## DESCRIPTION

The Nashua Manufacturing Company Power Canal (Canal) is an artificial water course approximately 14,010 feet in length, 60' wide on average and perhaps as much as 8 feet deep in places. It is located in the geographical center of the City of Nashua and follows a winding course, roughly paralleling the Nashua River in its course west to east to the Merrimack River (see Figures 1 and 2). Along most of the course of the Canal the setting is a natural undeveloped wooded environment that is now a City park with improved trails. At its eastern end the Canal runs alongside Ledge Street for nearly 1000 feet before turning north and running another 1000 feet parallel to Pine Street, through the historic industrial district of the Nashua Manufacturing Company to its terminus at Pine Street Extension (see Figure 3). The Canal was completed in 1824 along with a dam, gates and mill pond to provide water to the water wheels powering the company textile mill located 1.75 miles east of the dam (see Figure 4).

The inlet of the Canal is at the Mine Falls Gatehouse, a component of the Mine Fall Dam, built for the purpose of directing and regulating the flow of water into the canal. Water exits the Gatehouse through an underground cement pipe that empties into a storage reservoir, or mill pond. The Mill Pond, as it is known, is of irregular oblong shape, measuring roughly 2300' in length and 775' at its widest point. At the east end of the Mill Pond is a low weir-type dam over which the water flows into the Canal channel proper, measuring about 60 feet in width at that point. The canal winds in a northerly direction for about 3000 feet, turns northeast, east and southeast in a sweeping arc about 3500 feet long. It then trends easterly, bounded south by a residential area, then running alongside Ledge Street and north parallel to Pine Street, as described above. It varies in width along its length from a minimum of about 45' to a maximum of about 75 feet.

The final northbound stretch of the canal, parallel to Pine Street, runs straight, with the east side of the Canal improved with a low stone retaining wall built circa 1848 with the arrival of the railroad to Nashua. The wall was evidently built to secure the embankment to allow construction of railroad tracks immediately alongside the canal and a long warehouse building (Storehouse No. 2) alongside the tracks.

The Canal now terminates at the end of the north leg just described (see Figure 3) but originally turned east and continued across the front of the mills as an open and wider channel known as the Canal Basin (see Figures 4-8, 13-19).<sup>1</sup> In 1972 the Canal Basin was filled and converted to parking facilities. In conjunction with that work, the north end of the Canal was filled and bulk-headed with large randomly placed stones, depicted on Figure 3 as the stone termination wall and in Photographs 1 and 2). Also built in 1972, on the east side of the new terminus of the Canal and abutting the termination wall, is a concrete overflow structure that regulates the level of water in

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<sup>1</sup> It is this reconstructed end section of the Canal that will be impacted by the Broad Street Parkway project requiring alteration and/or removal of the 1972 features along with a portion of the embankment adjacent to the north end section of Storehouse No. 2, slated for removal. This documentation therefore focused on the impacted portion of the Canal.

the Canal and directs overflow into an underground culvert to the Nashua River. The overflow structure is rectangular, measuring approximately 12' deep, 22' wide and 6' high above the water level. It is equipped with removable wood flashboards to adjust the elevation of the weir and the level of the water in the canal. The back, or shore side of the structure is open to a corrugated steel-plate culvert of the closed bottom, horizontal ellipse type, approximately 6' high by 10' wide. According to Nashua drainage mapping, the culvert runs underground 175' northeast, then turns north and runs 270 feet, passing under the Picker Building to empty in the Nashua River. The point where the culvert turns north is the approximate location of the former overflow structure for the Canal Basin, depicted on the 1907 plan as the Waste Way (Figure 18) and visible in the ca. 1898 aerial photo (Figure 15). It was not determined if the new culvert connects with or utilizes any components of the former Waste Way.

## **HISTORICAL BACKGROUND**

The provision of water flow from which to derive motive power formed a crucially important element for any water powered industrial site. Thus the design of the complex of hydraulic engineering structures for the industrial facility would influence the design of the overall industrial complex, as well as the organization of day-to-day work there, for so long as waterpower remained the chief source of power. When the founding partners of the Nashua Manufacturing Company were planning the construction of a textile mill to be located on the Nashua River, during 1822-1823, they intended from the first to employ the thirty-six-foot “head,” i.e., fall of water, which they could derive from the Mine Falls of the Nashua River. The location immediately surrounding the falls, however, did not offer a good site on which to build the mill facility, and it was not near an established transportation corridor such as was offered by the Merrimack River some five miles distant. The solution reached by the directors in 1823 was to locate the mill complex closer to the established village center of Dunstable (later renamed Nashua), and to dig a canal from Mine Falls to power the mills.<sup>2</sup>

To oversee the waterworks construction, the directors commissioned James F. Baldwin, an engineer who had previously worked on the construction of the Middlesex Canal in Massachusetts. Hundreds of acres along the length of the river and the canal course were purchased by the Nashua Manufacturing Company and left in their natural state to ensure a clean and uninterrupted source of power and transportation. These parcels are depicted on an impressive survey drafted in 1825 by Thomas Rust; the survey is now in the collection of the Nashua Historical Society (Figures 4 and 5). The gravity type dam built by engineer Baldwin to divert water from the river into the Power Canal was composed of split stone on a ledge foundation. The hand-dug canal, first completed in 1824, was three miles long, 35' wide and approximately 6.5' deep. Water was first let into the canal on December 5, 1824. No sooner was this accomplished than a minor breach occurred, a harbinger of future such occurrences. The overall cost of the initial construction of the combined dam and canal was \$21,415. An unforeseen benefit of the project, however, was the

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<sup>2</sup> Elston P. Ingalls, “Nashua Manufacturing Company,” pp. 173-174.

discovery of a great granite ledge along or near the course of the Canal. The directors estimated that the value of this deposit of fine building stone for the firm's activity in the year 1825 alone was \$5,000. In addition to its worth in supplying stone for construction of the mill complex, the granite quarry became an additional commercial asset for Nashua Manufacturing as the company eventually leased it to proprietors who sold granite to customers in the surrounding area.<sup>3</sup>

Nashua Manufacturing succeeded in its business and continually enlarged the scale and scope of operations as the nineteenth century progressed, but not without incident. The canal was liable to damage from natural factors such as storms, floods, and even rodents, and several times had to be repaired to enable normal operation. Particularly in the early decades, before the mill could employ steam engines as a substitute source of power, production was occasionally delayed due to breaches in the canal. In its early years, in 1824, a detractor described the canal as being "a miserable ditch, which gave endless trouble, on account of its faulty construction." Being a hand-dug canal with largely earthen walls, the canal was sometimes subject to major breaks such as the ones that occurred in 1825 (twice), in 1833, in 1837, in 1853, and twice in 1856.

Significant improvements, such as reinforcing certain segments of the canal banks with granite, were undertaken on two instances in 1825 after spring freshets and a violent late-summer storm damaged areas of the recently excavated watercourse. The canal break of February 1833 at Mine Falls, due to muskrat burrow damage, shut down the mill for two weeks while the canal was repaired. An even worse break took place in January 1837, just above Mill No. 3, said to have threatened the foundations of the mill and requiring "several weeks" to repair. By 1839 the canal was evidently enlarged, as *The New England Gazetteer*, published that year, described it as being "3 miles long, 60 feet wide, and 8 feet deep." The enlargement was probably undertaken about 1836, in association with the construction of Mill No. 3.<sup>4</sup>

The status of development of the Canal, Canal Basin and mill complex as of 1842 is shown on the map of Nashua prepared that year by J. Hoar and F. Mead (see Figure 6). The west end of the Basin depicted on the 1825 map as originally extending northwest of the canal outlet (see Figure 5), is not shown on the 1842 map, apparently having been filled in. The 1842 map shows the Basin as having been widened and two bridges added, one at the west end of Basin Street carrying it over the north end of the Canal where it enters the Basin, and the second spanning the Basin between Ash and Vine streets.

By 1858, as show on the map of Nashua by J. Chase, the mill complex and particularly the neighborhood around it had undergone dramatic development, largely due to the opening of the

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<sup>3</sup> Ingalls, pp 176-177; John Hayward, *The New England Gazetteer* (Concord, NH: Israel S. Boyd and William White, 1839); John Harrigan, "At Nashua's Mine Falls Park Peace and Progress Coexist," *The New Hampshire Sunday News*, 29 October 1972; Thomas Rust, *Map of the Estates Belonging to the Nashua Manufacturing Company, Dunstable* (1825).

<sup>4</sup> Ingalls, p 176; Caroline Elizabeth MacGill, *History of the Nashua Manufacturing Company*, typescript on file at the Nashua Historical Society (1924), pp 20-21, 65, 75-76, 84-85, 135; John H. Goodale, "History of Nashua," p. 178.

Worcester and Nashua Railroad in 1848 (see Figure 7). A branch line to serve the mill complex was extended north off the main line running west to east along Hollis Street to the Worcester Depot at Main Street and the rail yards beyond. The Nashua Manufacturing Company branch line ran north along the east side of the canal and then over the Canal Basin on a new bridge (see Figure 8) to serve a Boiler House and other future developments planned for the northwest corner of the mill complex property. The tracks were also extended east along Basin Street and a third bridge spanning the Canal Basin has been added.

During 1881, a severe and unusually persistent drought affected the area; this dearth of rain temporarily creating a loss of normal flow in the Nashua River so drastic that Nashua Manufacturing had to shut down for lack of power. The company had always relied on the Canal to provide motive power heretofore, but in 1881 the management initiated the installation of boilers and the construction of a suitable building to house them, a project completed in June 1882. The following year a detailed aerial perspective map known as a "Bird's Eye View" map of Nashua was produced by the O.H. Bailey Company of Boston that depicted the new Boiler House and other improvements to the mill (see Figure 8). The neighborhood south of the mill and the Canal Basin down to Hollis Street is shown completely filled in with buildings, with the exception of two blocks of NMC property along Basin Street between Vine and Palm streets that are cleared of earlier buildings, planted with trees and apparently serving as a park. This open space was short lived: by 1892 a one-story wood-frame warehouse would occupy the site that was replaced in 1916 with the massive eight story South Concrete Cloth Store House (see Figures 13, 18 and 19).

Despite the addition of the coal-fired steam Boiler Plant, waterpower continued to be the primary energy source for Nashua Manufacturing Company because it was essentially a free source of energy and because the mechanical equipment that transmitted the water power to the looms and other machinery remained efficient and effective. Therefore during the period 1886 to 1890, the company deemed it practical to conduct an extensive rebuilding of the Dam and Canal Gatehouse at Mine Falls to bring those facilities into a state-of-the-art condition. Amidst this program of improvements, however, a major break again took place in 1887, costing the company nearly four weeks of lost work. On 6 October 1887 a massive break in the Canal occurred at a bend in the canal about halfway between the mill and the dam. A massive washout of the north bank created a gap 125 feet in length and 25 feet high that completely drained the canal into the Nashua River within ten minutes, leaving only a foot of water in it (see Figure 9). The break was attributed to a muskrat hole and came only two weeks after the canal had been drained specifically to fill all muskrat holes and prevent small leaks turning into such disasters. The *Boston Daily Globe* reported that:

During the day hundreds of men and boys have been wading in the water left, killing the fish. One young man had a string of 43 pounds of large suckers and pickerel. Many small boys had strings as large as themselves. . . . The Nashua and Merrimack rivers for miles are mud-colored from the break and filled with yellow, dirty foam, roots and trees.<sup>5</sup>

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<sup>5</sup> "Rushing Waters". *Boston Daily Globe*, October 7, 1887.

The work to repair the canal involved a hundred or more laborers and was carried on day and night through November. Hundreds of feet of the canal bank along the curve at the location of the break, although standing, were severely undermined so it was decided to dig them down and rebuild them on a straighter alignment (see Figures 10-12).<sup>6</sup>

The last significant break in the canal occurred on 21 March 1907 when approximately 300 feet of the canal wall washed out a short distance upstream of the break twenty years earlier. The cause of the washout was attributed to a breakdown of the embankment by tree roots and the pressure of high water and thick ice in the canal. Nashua's newspaper, *The Telegraph*, reported that "Gangs of men from Lowell and Lawrence were brought to this city this morning and set to work reconstructing the embankment. Crowds of sightseers visited the scene."<sup>7</sup> Mill operations were completely shut down, restarted on steam the next day, then shut down again as a precaution against fire. The canal, now dry, was also the source of water for the mill's entire fire-fighting system of outside hydrants and inside bibs and hoses. Due to the lack of power work could not take place in some divisions for seven weeks, resulting in serious delays throughout the plant. Repairs to the canal cost the company more than \$43,000, a large sum at the time that reflects the important role that waterpower continued to play in the operation and economics of the plant at that date.<sup>8</sup>

In 1972, some twenty-five years following the closing of the Nashua Manufacturing Company mill complex, the City of Nashua carried out an extensive program of renovations to the mill yard and its buildings in order to prepare the property for use as residential, office, retail, and light-industrial facilities by a variety of entities. As part of this process, the city undertook an extensive re-landscaping of the canal and esplanade area lying between the main mill building group on the north and the Repair Shops/Cloth Room Building on the south, in effect burying the Canal Basin, from Pine Street eastward to the west end of Factory Street beneath an asphalt parking lot named Clock Tower Plaza. At the new terminus of the Canal, at Pine Street Extension between the Waste House and Storehouse No. 2, the city built a Concrete Overflow Structure to direct the excess canal flow through an underground culvert to the Nashua River.<sup>9</sup>

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<sup>6</sup> Ingalls, pp 185-187; MacGill, 165-166, 169-170; Richard M. Casella, *Mine Falls Park Gatehouse*, pp 19-21; *Nashua Daily Telegraph*, "A Bad Washout In the Nashua Manufacturing Company's Canal – The Mills Idle," 6 October 1887; *Nashua Daily Telegraph*, "Repairing the Canal," 7 October 1887; *Nashua Daily Telegraph*, "Repairing the Canal," 25 October 1887; *Nashua Daily Telegraph*, "Leaks in the Canal," 31 October 1887.

<sup>7</sup> "Nashua Manufacturing Co. Forced to Shut Down by Serious Washout." *Boston Daily Globe*, 21 March 1907; Jillian Safer, "Regenerating the Canal," *The Nashua Telegraph*, 29 October 2000.

<sup>8</sup> Ibid; Jillian Safer, "Regenerating the Canal," *The Nashua Telegraph*, 29 October 2000.

<sup>9</sup> Staff of the Engineering Department of the City of Nashua informed HDC (3 October 2013) that project plans dated November 29, 1971 and February 4, 1972 are on file for this project.

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*Nashua Daily Telegraph.*

"A Bad Washout In the Nashua Manufacturing Company's Canal – The Mills Idle." 6 October 1887.

"Repairing the Canal." 7 October 1887.

"Repairing the Canal." 25 October 1887.

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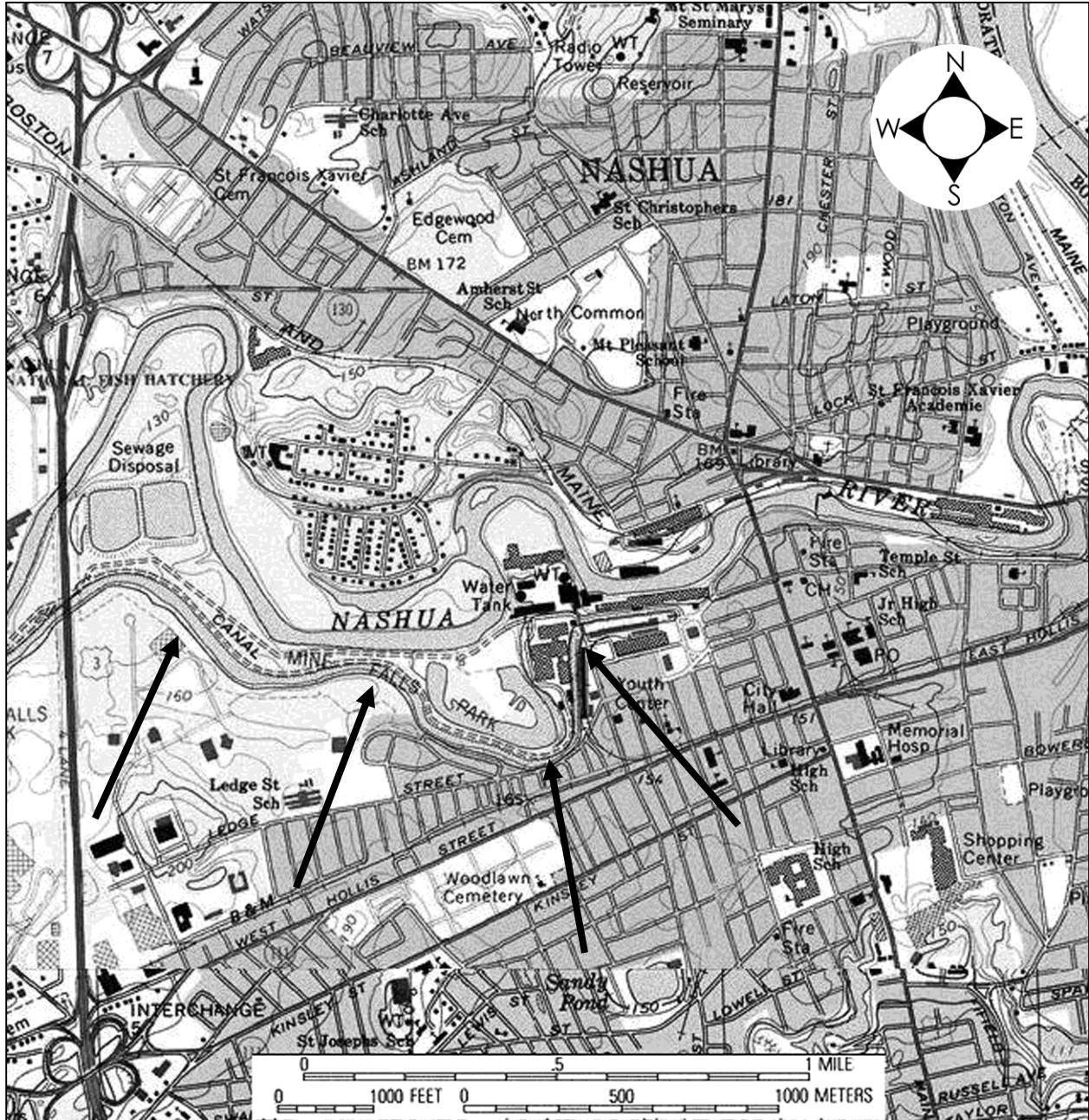
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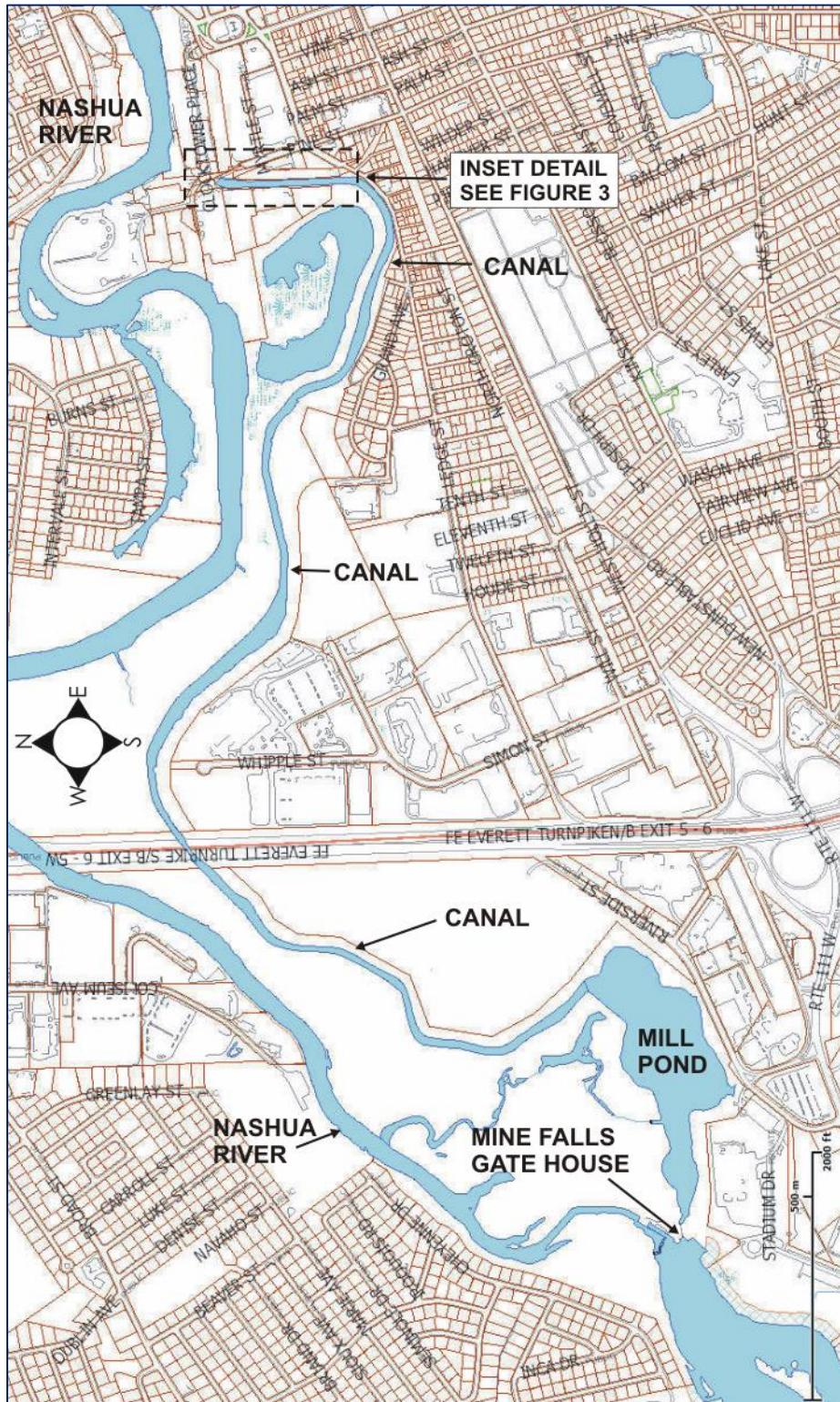
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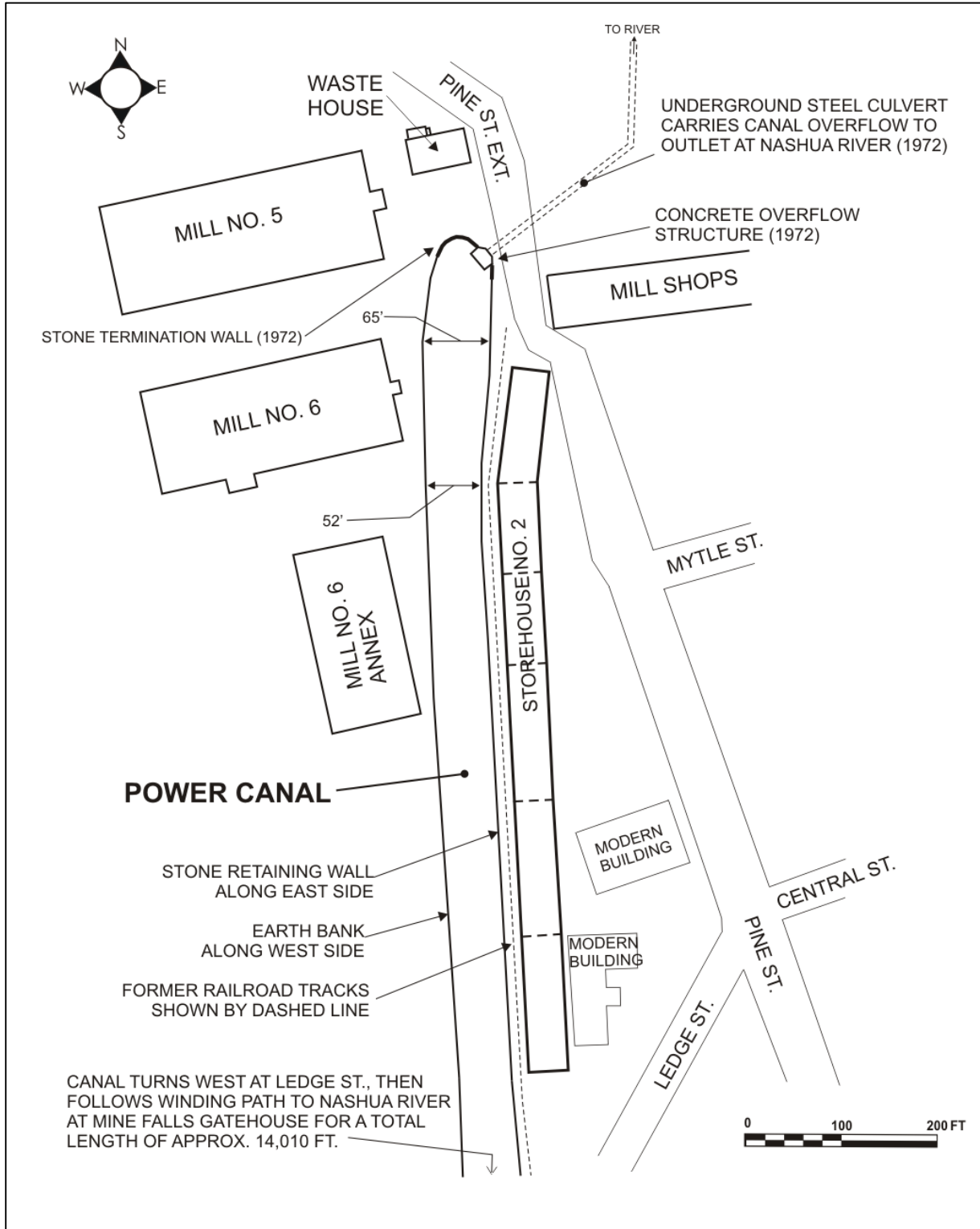




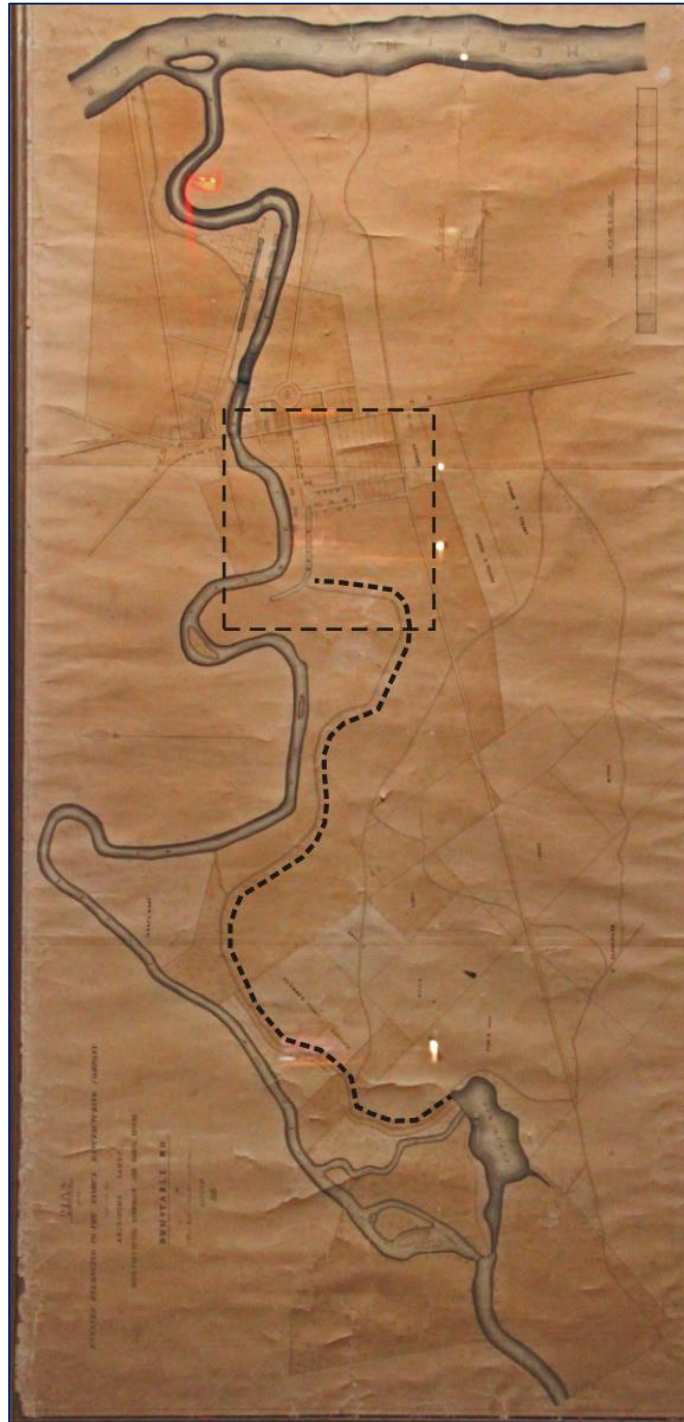
**FIGURE 1:** Location Map. Arrows point to former Nashua Manufacturing Company Power Canal, now feature of Mine Falls Park (Source: USGS Nashua North, NH 7.5 min. quadrangle, 1985).



**FIGURE 2:** Power Canal Map (Source: City of Nashua Geographic Information System).



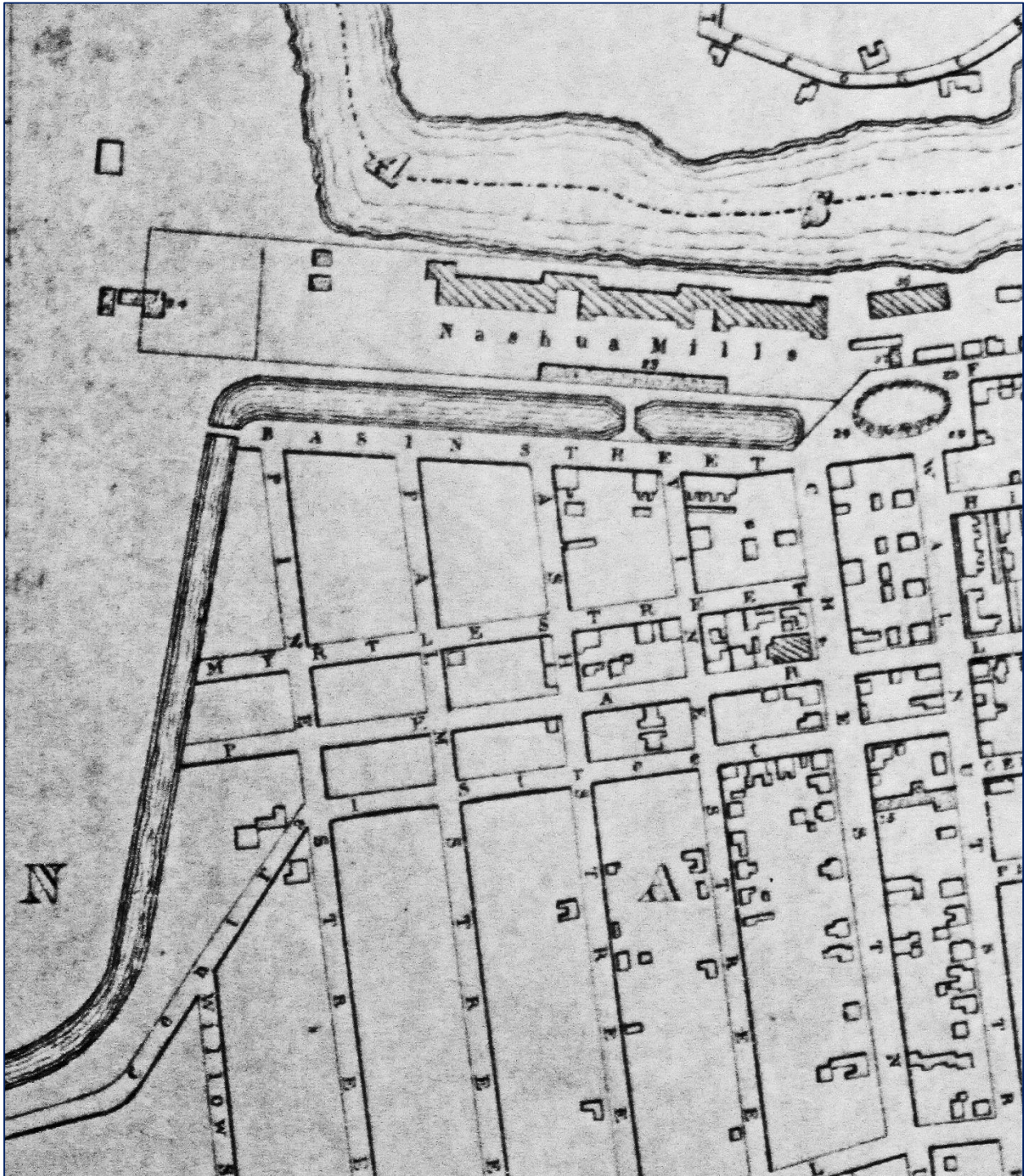
**FIGURE 3:** Resource Site Sketch showing north end of Power Canal opposite Mill Shops to be affected by project construction.



**FIGURE 4:** 1825 Map of Nashua Manufacturing Company property, showing Power Canal (beside dashed line) and mill development at Canal Basin at eastern terminus of canal (map oriented with east at top) in area of dashed box, detail of which shown below in Figure 4. (Source: Rust, 1825. Nashua Historical Society map collection).



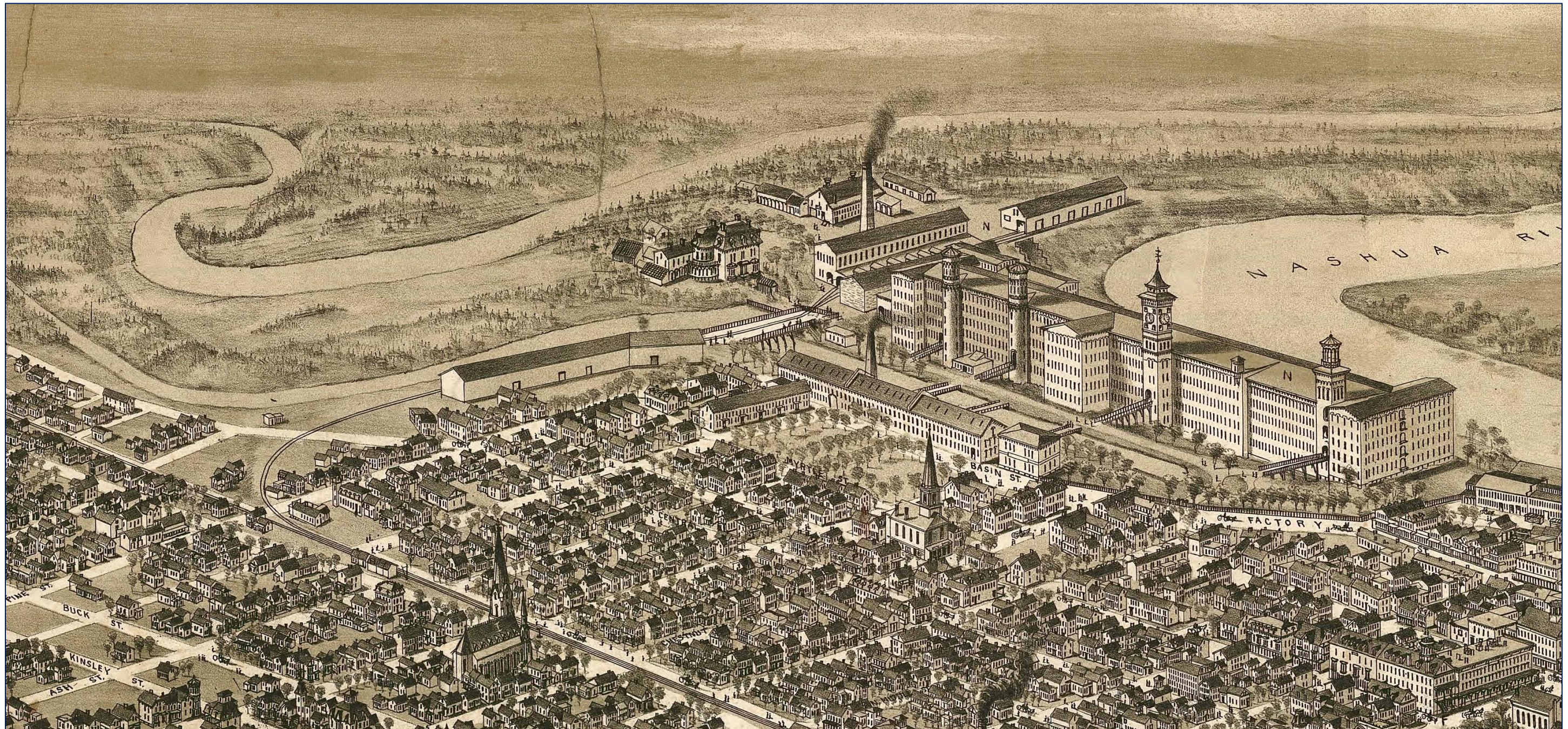
**FIGURE 5:** Detail of 1825 map of Nashua Manufacturing Company property by Thos. Rust, (area within dashed box on complete map, Figure 4) showing Canal Basin, three mill buildings, mill worker housing and other buildings along Walnut, Chestnut and Factory Streets. (Source: Rust, 1825. Nashua Historical Society map collection).



**FIGURE 6:** 1842 map of Nashua, showing further development of Nashua Manufacturing Company mill complex, with two bridges depicted spanning the Canal, one oriented east–west at the west end of Basin Street, and one oriented north–south over the Canal Basin between Ash and Vine streets. (Source: Hoar and Mead 1842).



**FIGURE 7:** 1858 map of Nashua, showing further development of Nashua Manufacturing Company mill complex, most importantly the addition of the Worcester & Nashua Railroad serving the mill with a line that runs north along the canal after branching off the main line along Hollis Street. A low stone retaining wall was built along the east side of the canal to support the bank alongside the railroad tracks. Based on a comparison to the 1842 map (Figure 6) the canal appears to have been realigned more due-north, but the difference may be a mapping inaccuracy. The tracks then extend over the Canal Basin on a new bridge (see Figure 8) and east along Basin Street. Three bridges now span the Canal Basin. (Source: Chase 1858).



**FIGURE 8:** 1883 Bird's-eye view map of Nashua, showing location of Canal, railroad tracks alongside canal and Storehouse No. 2 crossing canal basin on pile bent bridge to serve Boiler House. Note bridges over Canal Basin appear as thru-girder or parallel-chord trusses, as opposed to iron bowstring trusses shown in later photographs. (Source: O.H. Bailey & Co., 1883).





**FIGURE 9:** Photograph of canal break of 6 October 1887, showing hole in canal wall visible at far right, and curious folks posed in nearly dry canal bed. (Source: Nashua Historical Society photograph collection).



**FIGURE 10:** Photograph of repair work to canal following break of 6 October 1887, showing: work realigning canal, here reducing curvature by cutting fill from bank on inside of curve (on right) and filling opposite bank; use of steam engine (in tent) to power water pump (under steam plume) used to dewater canal and provide water to compact fill. (Source: Nashua Historical Society photograph collection).



**FIGURE 11:** Photograph of repair work to canal following break of 6 October 1887, showing: work realigning canal by cutting fill from bank on right and filling opposite bank. Note vertical timber plank retaining wall (at left) forming toe of new embankment. (Source: Nashua Historical Society photograph collection).



**FIGURE 12:** Photograph of repair work to canal following break of 6 October 1887, showing team of laborers all holding shovels posing in dry canal bed. (Source: Nashua Historical Society photograph collection).

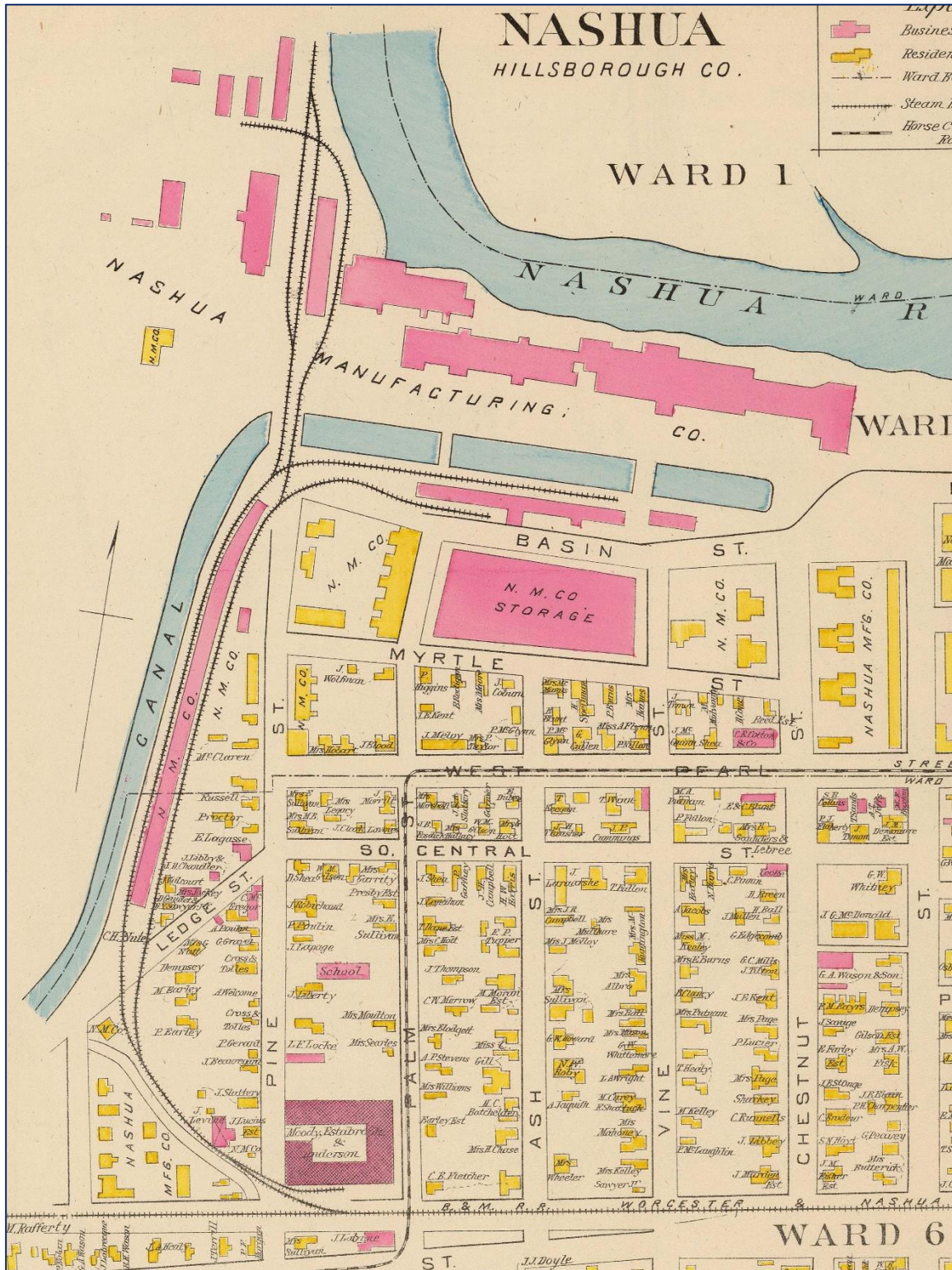


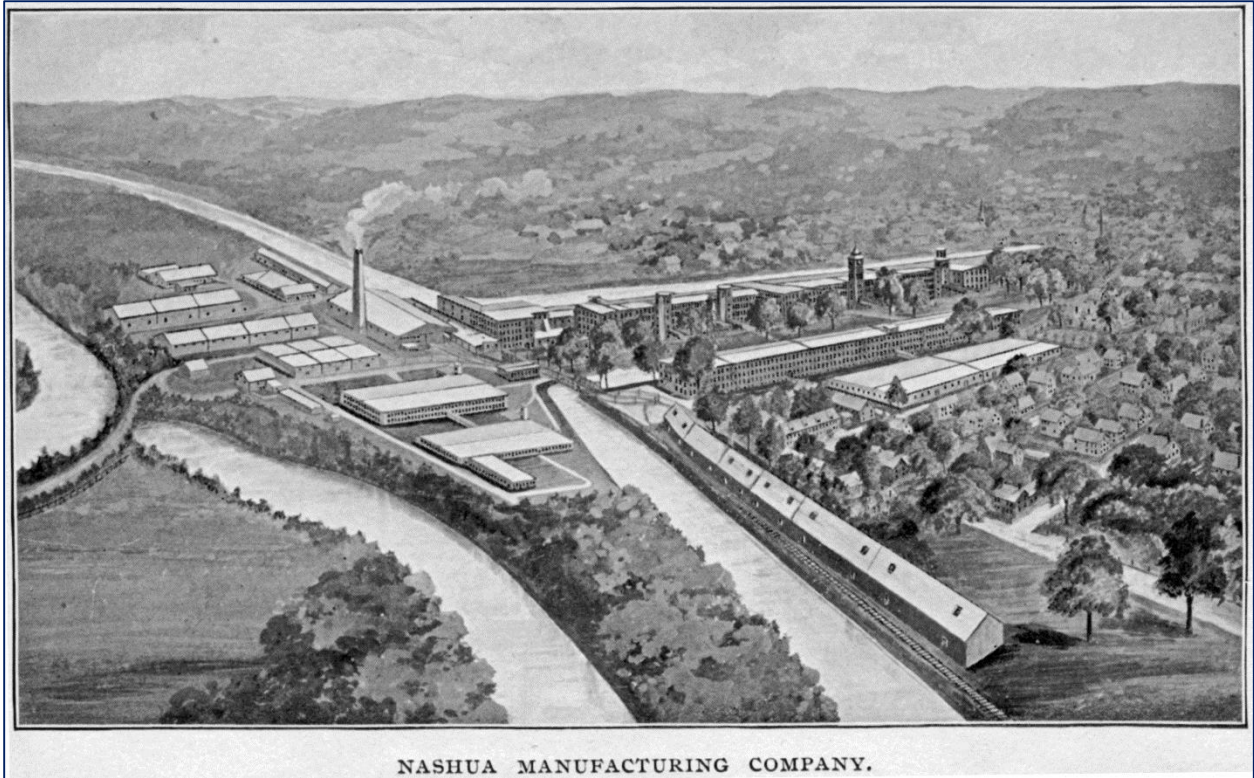
FIGURE 13: 1892 map of Nashua, showing development of Nashua Manufacturing Company canal and mill properties at that time (Source: Hurd, 1892).



**FIGURE 14:** Photograph of Nashua Manufacturing Co. circa 1898, evidently taken from scaffolding for Boiler House chimney construction, looking south and showing: Canal alongside Storehouse No. 2; Pine Street spanning canal on pony truss bridge (replacing earlier pile bent bridge) and Waste House, in foreground; portion of original Waste Way overflow structure, located on north side of Canal Basin at west end, just visible in lower left. (Source: Frank Ingalls, Photographer; Ingalls Photograph Collection, Nashua Historical Society).



**FIGURE 15:** Photograph of Nashua Manufacturing Co. circa 1898, evidently taken from scaffolding for Boiler House chimney construction, looking east and showing: Canal Basin extending east in front of main mill buildings along Basin Street; bowstring truss bridges spanning Basin; original Waste Way overflow structure at lower right; land cleared and fenced at east end of main mill buildings for construction of Mill No. 7 and east end of Basin prior to construction of penstock and gate for Mill No. 7 (see Figures 17 and 18). (Source: Frank Ingalls, Photographer; Ingalls Photograph Collection, Nashua Historical Society).



**FIGURE 16:** Aerial perspective rendering of Nashua Manufacturing Co. circa 1900, looking north, showing Power Canal and Canal Basin, at right and center, and portions of Nashua River, at left. (Source: Amory Browne & Company).





**FIGURE 17:** Photograph labeled "Cofferdam for Penstock and Gates, End of Canal, Summer 1904." The photo depicts the construction of new head gate for the 10' diameter penstock to serve water to Mill No. 7 turbine, the easternmost mill and penstock of the Nashua Manufacturing Co. complex (see 1907 plan shown in Figure 18). The Canal Basin, extending west behind the wood beam cofferdam wall behind the workers, was buried in 1972 under the present-day roadways and parking facilities. A new concrete canal outlet and overflow structure was constructed at that time at the new terminus of the open canal on Pine Street, its purpose to channel the overflow into a steel culvert that runs underground to empty in to the Nashua River. Visible in the background is a steam powered water pump for dewatering the cofferdam, and two bridges spanning the canal, an iron bowstring truss road bridge and an elevated and enclosed pedestrian bridge. (Source: Nashua Historical Society photograph collection).

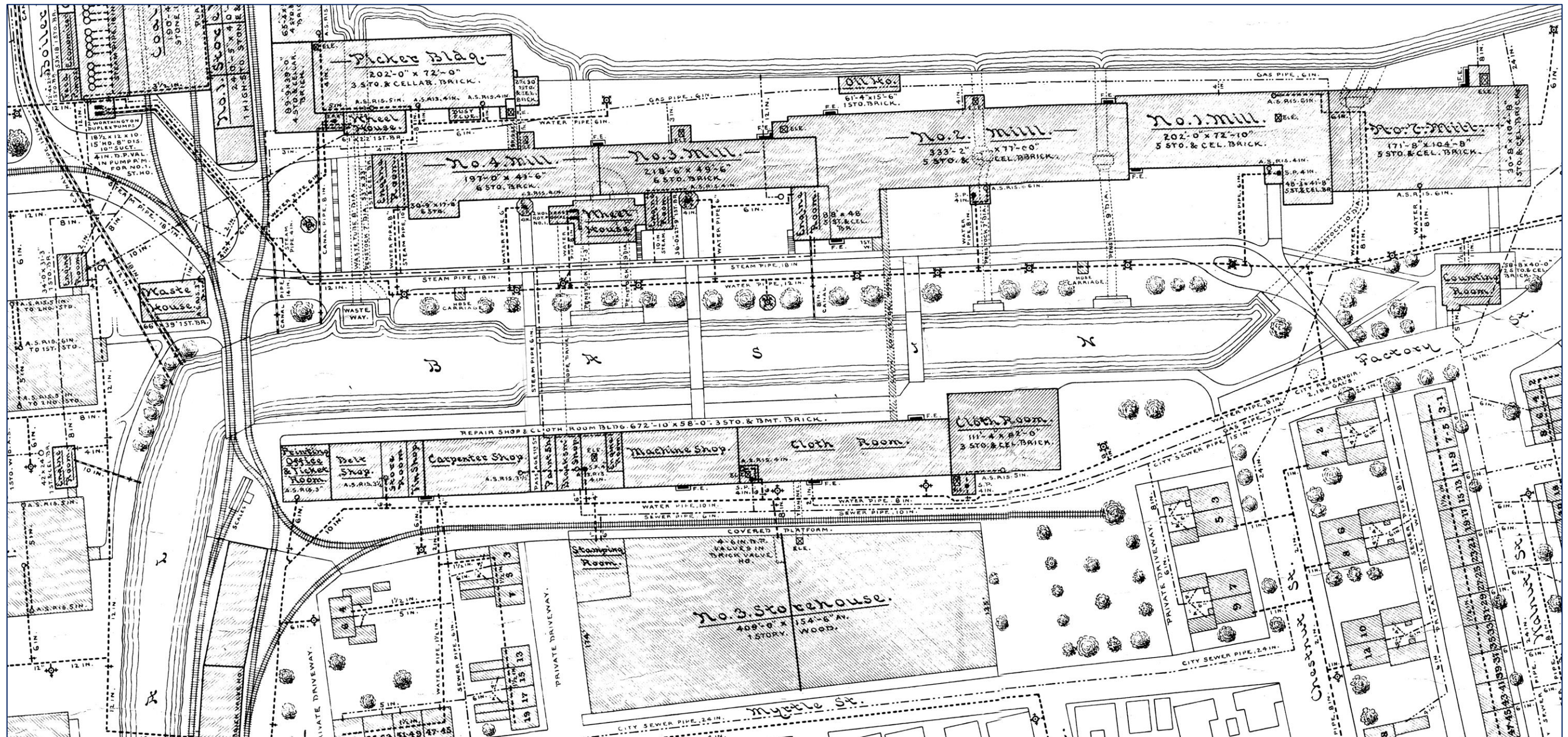


FIGURE 18: Plan of Nashua Manufacturing Co. in 1907 showing Canal Basin (removed 1972) and arrangement of bridges, penstocks and other features related to it. (Source: C.W. Collins).



**FIGURE 19:** Aerial photograph of Nashua Manufacturing Co. circa 1940, showing Canal Basin before 1972 alterations to site that removed and or buried all of its features. Note bridges over Basin still extant at that time and massive eight story South Concrete Cloth Store House (near center of photo) occupying the open park area shown on the 1883 map (Figure 8). (Source: Nashua Historical Society photograph collection).

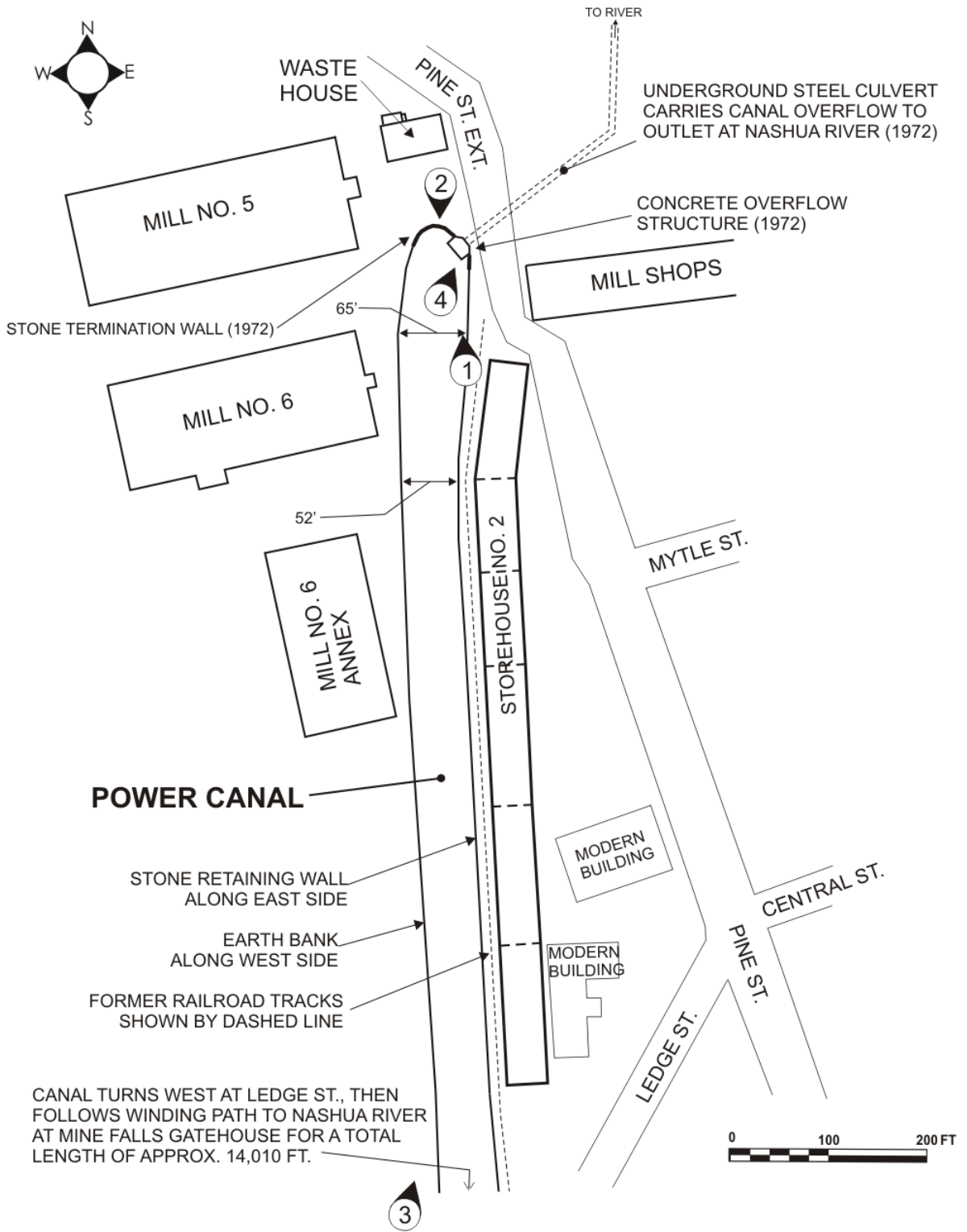
## INDEX TO PHOTOGRAPHS

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PINE STREET EXTENSION  
NASHUA  
HILLSBOROUGH COUNTY,  
NEW HAMPSHIRE.

NEW HAMPSHIRE STATE NO. 538-G  
Photographer: Rob Tucher  
April-June 2013

- NH-538-G-1: North end of Power Canal showing stone termination wall and concrete overflow structure at right. Looking north.
- NH-538-G-2: North end of Power Canal with stone termination wall in foreground, overflow structure and Storehouse No. 2 at left, and canal channel running south. Looking south.
- NH-538-G-3: Section of Power Canal at south end of Storehouse No. 2, showing earth bank on west side and stone wall along east side. Looking northeast.
- NH-538-G-4: Power Canal overflow regulating structure and inlet to underground steel culvert running east to Nashua River. Looking northeast.

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POWER CANAL  
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NH-538-G-1: North end of Power Canal showing stone termination wall and concrete overflow structure at right. Looking north.

POWER CANAL  
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NH-538-G-2: North end of Power Canal with stone termination wall in foreground, overflow structure and Storehouse No. 2 at left, and canal channel running south. Looking south.

POWER CANAL  
NASHUA MANUFACTURING COMPANY, NASHUA NH  
NH STATE NO. 538-G  
HAER PHOTOGRAPHS



NH-538-G-3: Section of Power Canal at south end of Storehouse No. 2, showing earth bank on west side and stone wall along east side. Looking northeast.



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NH-538-G-4: Power Canal overflow regulating structure and inlet to underground steel culvert running east to Nashua River. Looking northeast.