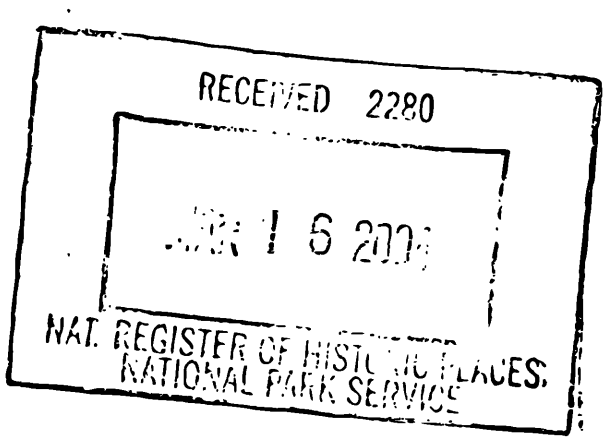
NPS Form 10-900
(Rev. 8-86)

OMB No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form



1. Name of Property

historic name: Greystone Mill Historic District

other name/site number:

2. Location

street & number: Greystone Avenue

not for publication: N/A

city/town: North Providence vicinity: N/A

state: RI county: Providence code: 007 zip code: 02911

3. Classification

Ownership of Property: private

Category of Property:

Number of Resources within Property:

Contributing	Noncontributing	
3		buildings
		sites
1	1	structures
		objects
4	1	Total

Number of contributing resources previously listed in the National Register:

Name of related multiple property listing:

4. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1986, as amended, I hereby certify that this X nomination ____ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property X meets ____ does not meet the National Register Criteria.

____ See continuation sheet.

Frederick C Williamson 10 March 04

Signature of certifying official Date

State or Federal agency and bureau

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

See continuation sheet.

Signature of commenting or other official Date

State or Federal agency and bureau

5. National Park Service Certification

I hereby certify that this property is:

✓ entered in the National Register
____ See continuation sheet.
____ determined eligible for the National Register
____ See continuation sheet.
____ determined not eligible for the National Register
____ removed from the National Register
____ other (explain): ____

Edson H. Beall 4/28/04

Signature of Keeper Date of Action

6. Function or Use

Historic:	INDUSTRY/PROCESSING/ EXTRACTION	Sub:	manufacturing facility
Current:	VACANT	Sub:	not in use
	INDUSTRY/PROCESSING/ EXTRACTION		manufacturing facility

7. Description

Architectural Classification:

No Style

Other Description:

Materials: foundation STONE/granite roof SYNTHETIC: rubber
walls BRICK other ASPHALT

Describe present and historic physical appearance.

X See continuation sheet.

8. Statement of Significance

Certifying official has considered the significance of this property in relation to other properties: locally

Applicable National Register Criteria: A, C

Criteria Considerations (Exceptions):

Areas of Significance: INDUSTRY
ENGINEERING
ARCHITECTURE

Period(s) of Significance: 1904-1953

Significant Dates: 1904, 1939

Significant Person(s):

Cultural Affiliation:

Architect/Builder: Sheldon, Frank p., & Son

State significance of property, and justify criteria, criteria considerations, and areas and periods of significance noted above.

X See continuation sheet.

9. Major Bibliographical References

_X_ See continuation sheet.

Previous documentation on file (NPS):

____ preliminary determination of individual listing (36 CFR 67) has been requested.
____ previously listed in the National Register
____ previously determined eligible by the National Register
____ designated a National Historic Landmark
____ recorded by Historic American Buildings Survey #
____ recorded by Historic American Engineering Record #

Primary Location of Additional Data:

____ State historic preservation office
____ Other state agency
____ Federal agency
____ Local government
____ University
_X_ Other -- Specify Repository: RI Historical Society, Providence Public Library, North Providence Historical Society

10. Geographical Data

Acreage of Property: 12.7 acres

UTM References: Zone Easting Northing Zone Easting Northing

A	19	293102	4637610	B	19	293278	4637589
C	19	293278	4637589	D	19	293378	4637445

__X See continuation sheet.

Verbal Boundary Description: __X See continuation sheet.

Boundary Justification:
x See continuation sheet.

11. Form Prepared By

Name/Title: Matthew A. Kiersted and Stephen A. Olausen

Organization: Public Archaeology Laboratory Date: 11/03

Street & Number: 210 Lonsdale Avenue Telephone: 401-728-8780

City or Town: Pawtucket State: RI ZIP: 02860

Description

Location/Setting

The Greystone Mill complex is located in the village of Greystone, an industrial village and residential neighborhood in the extreme northwest corner of the city of North Providence, Rhode Island. The district straddles the Woonasquatucket River, a narrow waterway that once supplied power to numerous industrial enterprises along its 19-mile route from its headwaters in North Smithfield, Rhode Island, to its confluence with the Moshassuck River in Providence. The river also acts as the boundary between North Providence and the town of Johnston. The land that contains the complex is divided into five parcels totaling 12.7 acres (11.7 acres in North Providence and 1 acre in Johnston). Most of the buildings and structures in the complex are located on the North Providence side of the river. The land on both sides of the river is flat with a slight slope toward the river, and a sharp rise to Waterman Avenue. The property is surrounded by residential properties with few small commercial buildings intermixed among them. The wooded backyards of residences that line Waterman Avenue to the east can be seen from the mill. Vehicular access to the fenced property is via four gates leading to paved parking areas and loading docks, with two gates located either side of the mill on Greystone Avenue, one east of the mill on Waterman Avenue, and one south of Angell Avenue (the westward continuation of Greystone Avenue in Johnston) and west of the Woonasquatucket River for an access road to the occupied section of the mill in Johnston.

Site Layout

The district contains three contributing buildings and one contributing structure that were associated with the historical development of the complex during its period of significance (1904-1953) and one non-contributing structure built in the late twentieth century. The site is dominated by the sprawling mill building, which consists of an agglomeration of attached, single and multi-story buildings that occupy a single, complex-plan footprint. Smaller, freestanding, ancillary buildings and structures are located in the area west of the main building.

Construction of the buildings at Greystone Mill began in 1904 and all major components were in place by the end of an extensive expansion campaign completed in 1911.[1]

The Greystone Mill consists of the following attached buildings: Main Mill (Building No. 1), Weave Shed (Building No. 2), Dye House (Building No. 3), Finishing Building (Building No. 4, partially in the town of Johnston), Singe House (Building No. 5), Tank House (Building No. 10), Heater House (Building No. 11), and Building 13. The ancillary freestanding buildings are the Bonded Warehouse (Building No. 7)/Auto House and Stable (Building No. 8), Oil House (Building 113), and Fuel Tank (in Johnston). The property also includes one noncontributing steel footbridge that spans the Woonasquatucket River and provided access to a former employee parking lot on the Johnston side of the river.

The site and the surrounding neighborhood are visually dominated by the Main Mill, a five-story brick building almost 700 ft long that parallels the river on the west side of the property. This building and the wooded backyards of the dwellings east of the complex obscure the Weave Shed, Dye House, Singe House, Tank House, and Building 13, a series of large, attached, one-story brick sheds covering more than 125,000 square feet that extend to the east and south of the Main Mill. The Finishing Building, a five-story brick building similar in design to the Main Mill, extends west from the south end of the Dye House and crosses over the river to Johnston. The Heater House is attached to the west side of the Finishing Building in North Providence. The freestanding Bonded Warehouse/Auto House and Stable, and Oil Shed are located immediately west of the main building complex, between it and the river.

All buildings are vacant, with the exception of the former Finishing Building (Building No. 4), which houses an active metal plating company, Greystone/Induplate. The interiors of the remaining buildings have been stripped of their textile machinery, and much of their mechanical equipment. The mill was a full-process manufacturer of fine worsteds until it closed in 1999 and the locations of functions as indicated on insurance maps of the first and last decades of the twentieth century show

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[1] The buildings and their components are referred to in this document by their functional names and numbers that were assigned by the mill owner and used on fire insurance maps prepared in 1911 (Associated Mutual Insurance Company 1911:Map 9736) and 1996 (IRI 1996:Map 711654). The designations appear on the site map that accompanies this form.

significant changes in location of process and equipment from the historic to modern periods.

General Building Description

All of the attached elements of the Greystone Mill were erected between 1904 and 1911, and share a common and consistent vocabulary of exterior materials and features established by the initial design of the earliest buildings by Providence mill designer/engineer Frank P. Sheldon & Son Company. The only exceptions are several small later twentieth-century materials- handling and utility additions constructed of modern materials. The ''flat'' mill roofs (actually, subtly pitched gables) have overhanging wood cornices with plank soffits and fascia, exposed beveled rafter tails, and a simple wood crown molding at the gutter line. The weave shed has a north-facing sawtooth monitor roof with simple wood moldings at the cornice. Walls are of brick construction with narrow, protruding piers; and recessed, full-width spandrels, with corbeling below the cornice. The foundations, where exposed, are built of quarry-faced granite blocks. Fenestration is consistent, with tall rectangular segmental arch windows with triple course, splayed, flush, header bond, brick lintels and slightly protruding, quarry-faced granite sills with multiple pane, double hung or center pivot, wood sash predominating. Shorter rectangular or square windows of similar detail appear in scattered locations. Unless otherwise noted, these materials and features are common to the buildings described below and are not repeated for every individual building description. With only two exceptions, the north elevation of the Main Mill and the west elevation of the Finishing Building, all walls are normal to one another. The long axes of the buildings are oriented north-northwest by south-southeast, however, for clarity of description, the Greystone Avenue elevation is referred to as the north elevation, and the Woonasquatucket River elevation is referred to as the west elevation. Overall building footprint measurements appearing in the following descriptions are taken from the 1911 insurance map.

Main Mill (Building No. 1) (1904 and 1907)

The Main Mill is a massive five-story, flat-roofed building measuring 694 ft long (east elevation)/675 ft long (west elevation) by 62 ft wide,

covering a 42,439 sq ft footprint. This long, narrow building is oriented with its long axis running north-south. Two external elevator/toilet towers are attached toward the ends of the east side of the building. The flat roofs are built up with tarred gravel on planks. All original 8-over-12 wood sash windows with moveable center-pivot lower sections have been covered with corrugated aluminum panels. A number of these window panels contain a variety of flush and protruding metal ventilation louvers and hoods, or small single-pane hopper or moveable awning windows. Window openings on the top (fifth) floor are shorter than those on the lower floors.

The Main Mill was built in two sections, each constructed with its own tower. The first, built in 1904, was a 385 ft long south section attached to the Weave Shed (Building No. 2) to the east, which was built concurrently. The 309 ft long north section was built in 1907. Both are identified as Building No. 1 on the 1911 insurance map; however, the old and new sections are identified as Buildings 101 and 100, respectively, on the 1996 insurance map.

The north (Greystone Avenue) elevation is not perpendicular to the long east and west elevations; it is parallel to the intersecting angle of northeast-southwest oriented Greystone Avenue, giving it a chisel-like plan with an obtuse angled northwest corner and acute angled northeast corner, resulting in two extra window bays on the east elevation. The north elevation is seven window bays wide, with each bay containing covered windows. The third bay from the east end is a stairwell bay with short windows on the second, third, and fourth stories. The sill line of the basement windows drops in elevation to the west, following the ground intersection line. An elaborate electric lamp bracket constructed from bent steel pipe with ornate cast iron tracery and mounting bezels extends from the northwest corner of the building.

The west elevation is the longest completely exposed elevation. It is divided into 79 window bays. The northernmost bay (1st bay) is a full-height hoist bay with original wood paneled double doors and picket safety gates on the fifth and second floors, and replacement wood doors on the other floors, all served by a block and tackle hoist I-beam above the fifth floor door. To the south, between the 10th through 24th bays, is the modern cogeneration building addition, an attached, one-and-one-half story,

20 ft wide by 129 ft long, rectangular, flat-roofed, steel-frame building with corrugated metal siding. The west elevation of this addition contains four large metal roll doors, one steel personnel door, and three large louvered ventilation fan panels. Three welded steel stacks rise from the top of the building, penetrate the overhanging cornice of the Main Mill, and rise several feet above its roofline. Proceeding south, the 34th pier is a double width pier and the 35th pier is slightly less wide than the 34th. The 35th bay marks the north end of the original 1904 section of the Main Mill. The 35th bay contains an administrative entrance with a modern replacement door. Several first floor windows to the north and south of this entrance are visible and contain modern replacement window sash. Proceeding south, the first floor of bays 62 through 65 are occupied by a raised concrete loading dock, with an original wood double door with diagonal tongue-in-groove plank panels in the 64th bay. The 69th bay is a vertical hoist bay similar to the first bay at the north end, with original doors on the second and third floors, and similar full-height doors occupy the first and second floor on the 70th bay. The 71st and 72nd bays are blocked below the third floor by a modern steel-framed cooling tower with galvanized steel sides and a rotating fan on the top, and the ground floor windows below it contain metal louvers. A modern concrete-walled pit with a cyclone fence enclosure containing electrical transformers is located at the ground floor of the 74th and 75th bays. The 76th bay contains a metal clad fireproof door, and the 79th (last) bay contains replacement metal double doors.

The south elevation of the Main Mill contains seven, shallow, recessed, blank brick bays with corbelled tops and protruding piers. The three east bays are covered by a modern, five-story high external shipping pallet elevator with a structural steel frame and corrugated metal cladding.

The east elevation is marked by the two, tall, attached elevator/toilet towers; the Weave Shed (Building No. 2); and several modern utility additions. The east elevation contains 81 window bays, two more than the west elevation. Because it is built into a shallow sloping hillside, only the second through fifth floors are exposed, with the second floor at ground level. Proceeding south from the north end, the 2nd through 6th bays are blocked by a two-story high, 20 ft wide by 34 ft long, modern waste treatment addition with a flat, built-up roof, concrete block

walls, and a high metal roll door on its east side. At the 12th bay the 24 ft by 22 ft north elevator/toilet tower rises above the roofline (a description of the towers follows below). Immediately south of the north tower is a two-story high, 24 ft wide, 49 ft long, steel-framed, flat-roofed, modern process water addition with transite sheathing and a raised concrete foundation and loading dock ramp serving a forklift door. Located 120 ft south of the north tower, an 8 ft wide by 20 ft long enclosed corridor links the Main Mill to two modern attached boiler room additions, the north one 22 ft wide by 40 ft long, and the south one 20 ft wide by 40 ft long. Both are high one-story structures with flat roofs, concrete block walls, and metal roll doors in their east elevations. A welded steel smokestack rises from the boiler house roof. Both boilers have been removed. Immediately south, 145 ft south of the north tower, the 25 ft wide modern chemical dock addition extends 132 ft east (this addition is described with the Weave Shed (Building No. 2) below). The one-story high, attached Weave Shed (Building No. 2), which begins 325 ft south of the north end of the east elevation, extends the remaining 369 ft to the south end of the east elevation, obscuring the second floor of the Main Mill. The south elevator/toilet tower is located 140 ft north of the south end of the east elevation.

The Main Mill's prominent attached north and south elevator/toilet towers are identical in size and design. The towers rise almost twice the height of the Main Mill's roofline. Both are 24 ft by 22 ft in plan, with flat plank roofs with tar and gravel surfacing. The towers are divided into horizontal sections. The lower ¾ of each tower consists of a two-bay-by-two bay brick-walled shaft with two vertical recessed rectangular panels with corbelling at the top. These panels are blank on all but the east side, where pairs of arch-topped, double-hung, 4-over-6 windows appear at each floor level. The top of this lower section of each tower shaft is marked by a narrow quarry-faced brick string course, above which is a cube-shaped section, each side containing a broad, recessed Roman arch panel containing bricked-over round window openings with white painted keystone bricks at the four compass points. On both towers this section is stabilized by two horizontal bands of bolted sectional steel. Above this section is a row of corbelled brick machicolations. The towers are capped by overhanging cornices with a row of dentils made of terra-cotta blocks, also painted white. The north tower originally had window sash in the round openings, and the south tower had clock faces. The towers originally

held 40,000-gallon water tanks for gravity-fed fire fighting lines. The north tank was later used for process water storage in the modern period. On the roof east of the south tower is a modern, square, two-by-two-bay, steel-framed, flat-roofed shed with corrugated metal siding and metal louvers. The roof formerly bore the legend ''Greystone, RI'' in large block letters, with an arrow, pointing north, painted on its surface.

On the interior, the floors of the Main Mill are divided longitudinally into two aisles by a single central row of round cast iron columns. The floors and roof are of layered plank construction supported by steel I-beams, with the exception of the roof of the 1904 section, which is carried by timber beams. The floors are divided by transverse brick party walls located at the 34th pier (west elevation), at the point where the north side of the Weave Shed begins on the east elevation; the 69th pier (west elevation), 75 ft north of the south end of the building; and at the 74th pier (west elevation), 53 ft north of the south end of the building. Interior switchback staircases are located at the center of the north end, the west side of the 35th bay, near the south tower on the east side, and in the southwest corner. Freight elevators are located in the elevator/toilet towers, and several modern elevators connecting limited groups of floors are located inside the floor area. The second through fifth floors have wood plank mill flooring and are open with some minor partitioning for small departmental administrative offices, break rooms, etc. The first floor contains numerous modern partitioned paneled offices in the central part of the building near the administrative entrance at the 35th bay. The first floor contains the only remaining textile processing equipment. The area north of the administrative area is filled with massive concrete walls, pits, and piers and retains a few of the pumps and tanks associated with modern wool sorting, dyeing, and washing. Heavy concrete piers supported dyeing and washing equipment on the second floor above. The north end of the second and third floors houses laboratory spaces that supported modern dyeing operations.

The first floor area north of the central administrative area was the location of the mill's physical plant equipment. The second floor of the area north of the 74th pier still clearly expresses its original function as a boiler room in the vestiges of its specialized construction. The east and west bays are divided by heavy riveted sectional steel columns rather that the round cast iron columns seen in the rest of the mill. The ceiling

is of true fireproof construction with segmental arch, mortared brick arches supported by parallel steel beams with exposed lower flanges. The walls in the former electrical generator and switchroom in the east half of the area are laid with glazed white tile. The room on the first floor below this space contains two large Carrier Corporation centrifugal air chillers associated with process climate control. The modern period boiler room east of this space contains one of its three horizontal oil-fired boilers. The air compressor room to the north contains one remaining Ingersoll-Rand single cylinder horizontal air compressor, and an adjacent room retains a large Joy Manufacturing pump. The area to the south contains the filters and blowers for the ventilation duct system.

As originally constructed, the section of the Main Mill south of the transverse brick wall at the 74th pier was the boiler house, and had its own name and number, Building No. 6. The former boiler house contained four coal-fired horizontal boilers, and a covered shed (no longer extant) extending from the west side for coal delivery via a spur track (no longer extant) from the Pascoag Branch of the New York, New Haven & Hartford Railroad in Johnston that crossed the Woonasquatucket River on a bridge (no longer extant) south of the boiler house and ran along the west side of the Main Mill for delivery of raw materials. The boiler house was extended further west to the east edge of the Woonasquatucket River in 1907 for a building (no longer extant) containing six vertical boilers, likely water heater units for wool processing. The tall, round, brick boiler smokestack (no longer extant) rose immediately south of the boiler house. A small pump house (no longer extant) containing two 1,000 gallon Knowles Underwriter fire pumps extended south from this part of the boiler house, and provided water pressure to a system of water mains and fire hydrants within and outside the mill buildings. At some point in the modern period the original boiler house was decommissioned and the boilers replaced with smaller, more efficient oil-fired units located east of the original units. The part of the original boiler house within the footprint of the Main Mill, originally an open, two-story-high area occupying the first and second floors, was converted to production space, and a concrete slab floor installed continuous with the existing wood plank second floor to the south.

The Main Mill housed a variety of woolen and worsted processes and equipment that changed locations over the life of the mill. In general, in

the period of significance, the Main Mill housed the early steps of the process, including washing, sorting, carding, combing, drawing, roving, spinning, etc. (Associated Mutual Insurance Co. 1911). Weaving took place in the Weave Shed, dyeing in the Dye House, and finishing in the Finishing Building. During the second half of the twentieth century dyeing operations moved to the lower floors at the north end of the Main Mill (IRI 1996).

Weave Shed (Building No. 2) (1904 and 1911)

The attached Weave Shed (Building No. 2) extending east from the south half of the Main Mill consists of two attached one-story sheds, the west and east sheds, that were constructed at different times, with some modern additions attached to the north side. Together, the two sections of the Weave Shed measure 308 ft north-south by 270 ft east-west for a total footprint of 83,160 sq ft. Photographs and illustrations of the mill prior to c. 1907 indicate that the original 1904 weave shed, or west shed (Building 102 on the 1996 fire insurance map) was constructed contiguous to and contemporaneously with the Main Mill. It extends east from the south half of that building and measures 308 ft long north-south by 156 ft east-west for a footprint of 48,048 sq ft. It is a one-story brick building with a basement and a modern, flat, built up, asbestos composite roof supporting two large, rectangular, sheet steel-walled sheds for ventilation equipment. A long, narrow, steel-framed, corrugated metal-clad modern conveyor belt house traverses the roof from the chemical dock addition on the north side to Building 13 to the south. All walls are party to adjacent connected buildings and none are visible. The interior of the building includes a basement and a high first floor. The internal structural framing system is metal with round steel columns supporting a grid of bolted steel I-beams carrying longitudinal timber joists and transverse tongue-in-groove plank roof decking supporting the roof. The floor is multiple layer wood planking. Historic photographs indicate that this building originally had a sawtooth monitor roof incorporating 28 short monitors with the steep, glazed slopes facing north. This roof was removed and replaced with the current flat one during the modern period of operations. The north elevation is obscured by the modern chemical dock addition. This is a long, narrow, 132 ft long east-west by 25 ft wide north-south, two-story building with a flat, built-up roof, concrete block walls, and concrete basement foundation. The second story is built of

concrete blocks with a faux brick rustication. The north elevation contains a steel staircase leading to a steel personnel door, a concrete loading dock, and a multi-paneled garage roll door.

The east shed of the Weave Shed (Building 103 on the 1996 insurance map) was added to the east side of the Original 1904 west shed (Building 102) in 1911. It measures 308 ft long north-south by 114 ft east-west for a total footprint of 35,112 sq ft. It is a one-story brick-walled building with an original sawtooth roof incorporating 14, high, north-facing monitors. The building has no basement and a concrete slab floor. The west and south walls are party to attached buildings and are not visible. The east elevation is 28 bays wide, with all windows in the walls and monitor gable ends blocked with corrugated metal paneling. The eighth window bay north of the south end of the building has been cut down for a modern metal door. On the north elevation the eastern 10 bays are exposed, with window openings blocked. The remainder of the elevation is obscured by a small modern one-story addition with composite wood sheathing and a rubber membrane shed roof. The internal structural framing system of the west shed is metal with round steel columns supporting a grid of bolted steel I-beams carrying the steel-framed monitor roof structure. The original windows on the steep north faces of the monitors have been blocked off and the entire monitor roof sheathed with a modern rubber membrane roof.

Both sections of the Weave Shed housed multiple rows of looms driven by individual electric motors, and were originally lit by the ambient and reflected light from the north-facing windows in the steep sides of the sawtooth monitors, which were removed or blocked in the modern period.

Building 13 (1904, rebuilt 1911)

Building 13 (Building 104 on the 1996 insurance map) is attached to the south side of the Weave Shed described above, extending east from the extreme south end of the east side of the Main Mill to a point 95 ft east of the dividing wall between the west and east Weave Shed sections. It measures 220 ft long east-west by 80 ft wide north-south for a total footprint of 17,600 sq ft. It is a one-story brick-walled building with a flat roof with five large transverse box monitors. With the exception of a 6-ft-long section at the extreme west end of the south wall, all walls are party to adjacent attached buildings and are not visible. The internal

structural framing system of the building is wood timber with square chamfered posts supporting a grid of chamfered wood beams carrying the plank roof decking and monitor structures. Staircases are located near the center of the north and south walls. The five monitors share common simple wood cornice molding and welded sheet metal siding on their short north and south elevations. From east to west, the first monitor has its original 9-light, center-pivot moveable wood sash windows intact on the east side, and plywood panels over the original windows on the west side. The second monitor to the west has its original windows on both sides. The third monitor is covered with corrugated metal on both sides. The fourth monitor retains its original windows on both sides. The fifth (westernmost) monitor is over the modern boiler room with original widows on the east side and a brick wall with segmental arch windows with original wood sash on the west side. With the exception of the west unit, the monitors have been blocked off by framed wood interior panels flush with the main roofline and are no longer functional. The 1911 insurance map indicates that Building 13 was rebuilt in 1911. The nature of the changes is unclear, although some alterations were likely made to integrate the building into the east section (Building 103) of the Weave Shed when it was added in 1911.

Tank House (Building No. 10) (1911)

The Tank House is an extension of the northeast corner of the Dye House located at the east end of Building 13, between the Weave Shed to the north and the Dye House to the south, with only its east elevation visible. It is a rectangular, brick-walled, 54 ft long north-south by 30 ft wide east-west building. The visible east elevation is essentially indistinguishable from the east elevation of the sawtooth monitor roof Dye House to the south except for its flat roof. The exposed east elevation is four bays wide with recessed panels with corbelling at the top, a personnel door, and a garage roll door. Two of the three windows are blocked with aluminum panels, and the third contains a small single-pane casement unit. The 1911 insurance map indicates a 10 ft wide acid room separated from the rest of the building at the south end, and a 50 ft by 12 ft water closet room running along the north end.

Dye House (Building No. 3) (1911)

The Dye House is located south of and attached to Building 13, and east of and attached to the Finishing Building and the Singe House to the west. It has one high main story and a basement, with a complex overall plan measuring 58,226 sq ft overall that is divided into several rectangular sections. The majority of the building occupies a 315 ft north-south by 155 ft east-west rectangle south of Building 13 and west of the Finishing Building. This rectangle extends 40 ft south of the south elevation of the Finishing House. This rectangle has a 163 ft north-south by 31 ft east-west extension running along the south end of the east elevation. A second extension projects west from the north end of the west side, and consists of a 47 ft north-south by 50 ft east-west section followed to the west by a 54 ft north-south by 37 ft east-west section. All sections share a continuous internal structural system consisting of a bolted structural steel frame with fireproof concrete cladding supporting a steel-framed sawtooth monitor roof consisting of 12 north-facing monitors. The section of roof west of the Finishing Building incorporates six large monitors, and the section to the north incorporates six slightly smaller monitors that extend west over the Singe House and western Dye House extension. The original windows on the steep north faces of the monitors have been blocked off and the entire monitor roof sheathed with a modern rubber membrane roof. Floors are built of concrete slabs on structural steel.

The south elevation contains 21 bays with blank brick spandrels with corbelling at the top. The central eight bays are obscured by a modern, 14 ft wide by 55 ft long truck loading dock with four metal roll doors with all-weather climate control diaphragms, and a personnel door on the east side with a welded steel deck and staircase. Several basement windows are covered with metal panels. A rectangular, concrete-walled water pit for dye house wastes was originally located south of where the loading dock is now located. The east elevation of the east extension is 17 bays wide, with original 6-pane, short segmental arch windows in the six monitor gable ends. The original first story windows are also visible and consist of 8-over-8 pane, double hung, wood sash units. The segmental arch basement windows are covered by metal panels. The second bay from the north end contains a modern metal frame entryway with glass windows, wood double doors, and an awning with the legend ''Greystone Fabrics'' on it. This entrance is opposite the Waterman Avenue gate and was the entrance to the administrative offices and retail fabric outlet store during the modern

period of operations. The north elevation of the east projection is three bays wide. The east elevation of the remaining section of the Dye House to the north is 18 bays long, with three blank corbelled brick panels under each of the six monitor gables, with short windows in the gables blocked by metal panels. The three south bays incorporate a raised concrete truck loading dock with a metal roll door and a steel personnel door. The only exposed elevations of the west extension are on the south and west sides. The west elevation encompasses two monitor gable ends with blank brick bays below, and the south elevation incorporates four blank brick bays. A concrete-walled substation pit is located below the south wall. The interior of the Dye House is mostly open, with modern office partitions in the vicinity of the Waterman Avenue entrance. The projection to the south is also partitioned off for offices.

The north half of the Dye House was originally where the yarn and fabric was dyed. The south half included areas for gassing, examining, drying, tentering, pressing, and permanent finishing. During the early part of the modern period of operations the Dye House was leased for machine shop space.

Singe House (Building No. 5) (rebuilt 1911)

The Singe House is located at the west edge of the Dye House, in the space between the Dye House west extension to the north and the Finishing Building to the north. It is a 94 ft long north-south by 51 ft wide east-west, rectangular, brick-walled building with a basement and high first floor. Although identified separately on insurance maps, it is visually and structurally continuous with the Dye House, and its four north-facing sawtooth monitors are continuous with the monitors of the Dye House to the east and north. Its north, east, and west walls are party to adjacent attached buildings, and only the west elevation is exposed. It is 6 bays wide, with first floor windows with replacement casement sash in the two center bays, metal louvers in the other widow openings, and double replacement metal basement personnel doors. Each monitor end gable contains a short segmental arch window, two of which contain their original six-pane wood sash. The interior structural system is the same as the Dye House to the north and west, with a structural steel frame with fireproof concrete cladding.

Photographs and illustrations of the mill prior to about 1907 show a small, gable-roofed, 1½-story, 8-bay-by-2-bay, rectangular, brick-walled ''dyeworks'' building where the Singe House is located. The 1911 insurance map indicates that the Singe House was rebuilt in 1911. This reconstruction to its present configuration was apparently part of the 1911 expansion and construction of the Dye House.

Finishing Building (Building No. 4) (1911)

The Finishing Building is the second, although less visible, tall mill building in the Greystone Mill complex. It is a five-story, flat-roofed, 15,760 sq ft building located at the southwest corner of the complex, attached to the west side of the Dye House. In plan it is L-shaped with the short leg running north-south along the west side of the Dye House, and the long leg of the main section running east-west, spanning the Woonasquatucket River and ending just west of the Johnston bank. The building is similar to the Main Mill in many of its original construction and details. Unlike the Main Mill, where the windows are blocked by metal panels, many of the 8-over-12 pane, wood sash windows with center-pivot lower sections on the Finishing Building remain in place and exposed, with scattered examples replaced with metal casement units.

The longer, east-west section of the building is, like the Main Mill, 62 ft wide. The west (Johnston) elevation is not perpendicular to the long east and west elevations; it is parallel to the former railroad right-of-way, giving it a chisel-like plan with an obtuse angled southwest corner and acute angled northwest corner. The south elevation is 182 ft long and incorporates 21 bays. The exposed portion of the 203 ft long north wall is 152 ft long and includes 17 bays. The center of this wing spans the Woonasquatucket River on its brick piers, with nine piers in the river on the south elevation, and ten piers with chiseled icebreaker north faces on the north elevation. The south elevation is 21 bays wide, with a blank bay at the west end. The three west bays of the first floor are occupied by a raised concrete truck loading dock with a shed roof awning supported by steel poles sheltering a multiple panel wood roll door flanked by steel personnel doors. This loading dock is located where the mill railroad spur originally penetrated the building. The west elevation is seven bays wide. The modern entrance consists of a metal and glass doorway located atop a poured concrete porch with metal pipe railings on the steps. This entrance

structure replaced an outbound goods shipping house and railroad loading dock that extended west to a siding on the east side of the railroad main line track. Unlike the Main Mill, the roof of this section of the Finishing Building does not overhang the walls. As originally constructed, the long section of the Finishing Building had a brick roof parapet with a subtle stepped crown at the center of the short walls and two similar crowns on the long walls. This parapet incorporated long horizontal panels that bore the legend ''Joseph Benn & Sons, Inc,'' and words advertising their products including, ''Mohair'' and ''Alpaca.'' This parapet was removed in favor of a subtle roofline corbel at some point after the 1930s.

The smaller, short leg of this L-shaped building that extends to the north from the east end measures 72 ft long north-south by 51 ft wide east-west. The exposed section of the west elevation is eight bays wide. The north elevation is divided into four bays, the east one blank, with wide corner piers. The east elevation of this section is 13 bays long. The second bay from the south end is an elevator bay with a one-story, flat-roofed, concrete block elevator hoist house on the roof above.

The Finishing Building originally housed the final steps in cloth production including finishing, storage, box making, storage, and shipping. It currently houses Greystone/Induplate, an industrial plating operation.

Heater House (Building No. 11) (1911)

The Heater House is attached to the west elevation of the north-south oriented, North Providence section of the Finishing Building. It is a small, one story, 28 ft by 28 ft, flat-roofed building, with its north wall extending west from and flush with the north wall of the Finishing Building. The north elevation contains two modern multiple panel wood garage roll doors, the west elevation contains three segmental arch windows, and the north elevation contains two similar windows that have been bricked over. A metal stack supported by wall brackets rises from the roof and bends around the roof overhang above.

Oil House (Building 113) (by ca. 1930)

The Oil House is located 35 ft south of the Main Mill and 20 ft west of the west extension of the Dye House. It is a small, 38 ft by 53 ft,

one-story, brick-walled building with a flat, built-up roof. The southeast corner of the building is chamfered where it is close to the Woonasquatucket River. The east elevation is blank. The south elevation incorporates a small cast iron hatch, and the north elevation includes two blocked window openings, a personnel door, and a metal-clad, fireproof door. The west side of the building was originally served by the railroad spur track that ran through the west end of the Finishing Building and crossed the river to run along the west side of the Main Mill. This building was used to store fuel oil and other flammable materials such as lubricants and solvents away from the main body of the mill. A small fenced former electrical substation with empty transformer pads is located immediately south of this building.

Bonded Warehouse (Building No. 7) (1904)/Auto House and Stable (Building No. 8) (1910) (Buildings 114 and 115 on 1996 insurance map)

The Bonded Warehouse and attached Auto House and Stable are located west of the south end of the Main Mill, with their west elevations rising from the east bank of the Woonasquatucket River. Both buildings have one story, brick walls, shallow shed roofs sloping to the west with rectangular, pyramidal, copper-framed glass skylights, and granite block foundations exposed on the west (river) elevations. The Bonded Warehouse is located to the south and is a 92 ft long north-south by 30 ft wide east-west building. The east elevation contains a three bay wide, paneled, wood, sliding vehicle door with corrugated glass panes in the upper panels and a steel beam lintel. The west elevation over the river is blank. The later attached Auto House and Stable to the north consists of a second 92 ft by 30 ft building with a partition for the 30 ft stable at the north end. A manure bin was originally attached to the north end of the building. The Auto House/Stable section of the building is covered with a modern wood frame and vertical novelty board siding on the north and east elevations, and the west elevation is exposed brick with four segmental arch windows.

These buildings were originally used as secure warehouse space and for servicing horse-drawn, and later, internal combustion mill vehicles.

Fuel Tank (by ca. 1930)

The Fuel Tank is located in Johnston, 115 ft south of the Finishing Building, on the west bank of the Woonasquatucket River. It is a cylindrical, 30 ft diameter, riveted sectional steel fuel oil tank with a capacity of 100,000 gallons. The tank is not in use and has a hole cut in it near the base. It was formerly surrounded by an oval, linear, raised earth spill containment berm (no longer extant). It was originally a rail-served storage tank for fuel oil for the mill boilers.

Footbridge (since 1953) NON-CONTRIBUTING

One footbridge crossing the Woonasquatucket River is located south of the mill. It is of welded steel construction with a steel grate deck. The bridge is located approximately 100 ft south of the Finishing Building, and is approximately 85 ft long. This bridge was built to provide mill workers with access to an employee parking lot on the Johnston Side of the Woonasquatucket River. Historically there were footbridges located west of the Main Mill, however, the current units, drawn outside the boundaries of this nomination, are all less than 50 years old based on appearance and method of construction.

Photographic Information

Photographer: Matthew A. Kierstead
Date of Photographs: October 2003

Address: Matthew A. Kierstead
PAL
210 Lonsdale Avenue
Pawtucket, RI 02860

Index to Photographs:

1. West elevation of Main Mill (Building No. 1) looking southeast from former employee parking lot on Johnston side of Woonasquatucket River, with north elevation of Finishing Building (Building No. 4) visible at right

2. North elevation of Main Mill (Building No. 1) looking south across Greystone Avenue, showing oblique view of west elevation and cogeneration building addition, with north elevation of Finishing Building (Building No. 4) visible in distance

3. View looking south from vicinity of west end of Oakleigh Avenue showing from left to right: part of Weave Shed (Building No. 2), north elevation of chemical dock addition, new boiler house addition, and east elevation of Main Mill (Building No. 1) including south elevator/toilet tower

4. View looking northwest from northeast corner of Weave Shed (Building No. 2) showing from left to right: chemical dock addition, new boiler house addition, process water addition, waste treatment addition, and east elevation of Main Mill (Building No. 1) including north elevator/toilet tower

5. View looking northwest from northeast corner of Building No. 13 roof, looking across sawtooth monitor roof of Weave Shed (Building No. 2) to east elevation of Main Mill (Building 1) including north and south elevator/toilet towers

6. East elevation of Dye House (Building No. 3) looking northwest from Waterman Avenue gate area, with portion of Weave Shed (Building No. 2)

in right background

7. View looking northwest from south end of property showing from left to right: south and east elevations of Finishing Building (Building No. 4) In background and south elevation of Dye House (Building No. 3), including loading dock addition, at center

8. View looking north from south end of Johnston section of property showing west end of Finishing Building (Building No. 4)

9. View looking northwest from Heater House (Building No. 11) showing from left to right: Oil House (Building No. 113), south elevation of Main Mill (Building No. 1) including pallet elevator/toilet addition, and section of Dye House (Building No. 3)

10. View looking southeast from Oil House (Building 113) showing from left to right: section of Singe House (Building No. 5), north and west elevations of Finishing Building (Building No. 4), and Heater House (Building No. 11)

11. View looking south from southwest corner of Dye House (Building No. 4) roof, showing north elevation of Finishing Building (Building No. 4)

12. View looking northwest from south end of Main Mill (Building No. 1) showing south and east elevations of Bonded Warehouse (Building No. 7)/Auto House (Building No. 8)/Stable

13. View looking southeast across Woonasquatucket River from Johnston showing from left to right: Main Mill (Building No. 1), west elevation of Bonded Warehouse (Building No. 7)/Auto House (Building No. 8)/Stable, and portion of north elevation of Finishing Building (Building No. 4)

14. Interior view, looking south on third floor of Main Mill (Building No. 1) showing typical steel column and beam frame construction

15. Interior view, looking north on first floor of Singe House (Building No. 5) showing typical concrete clad steel frame construction

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

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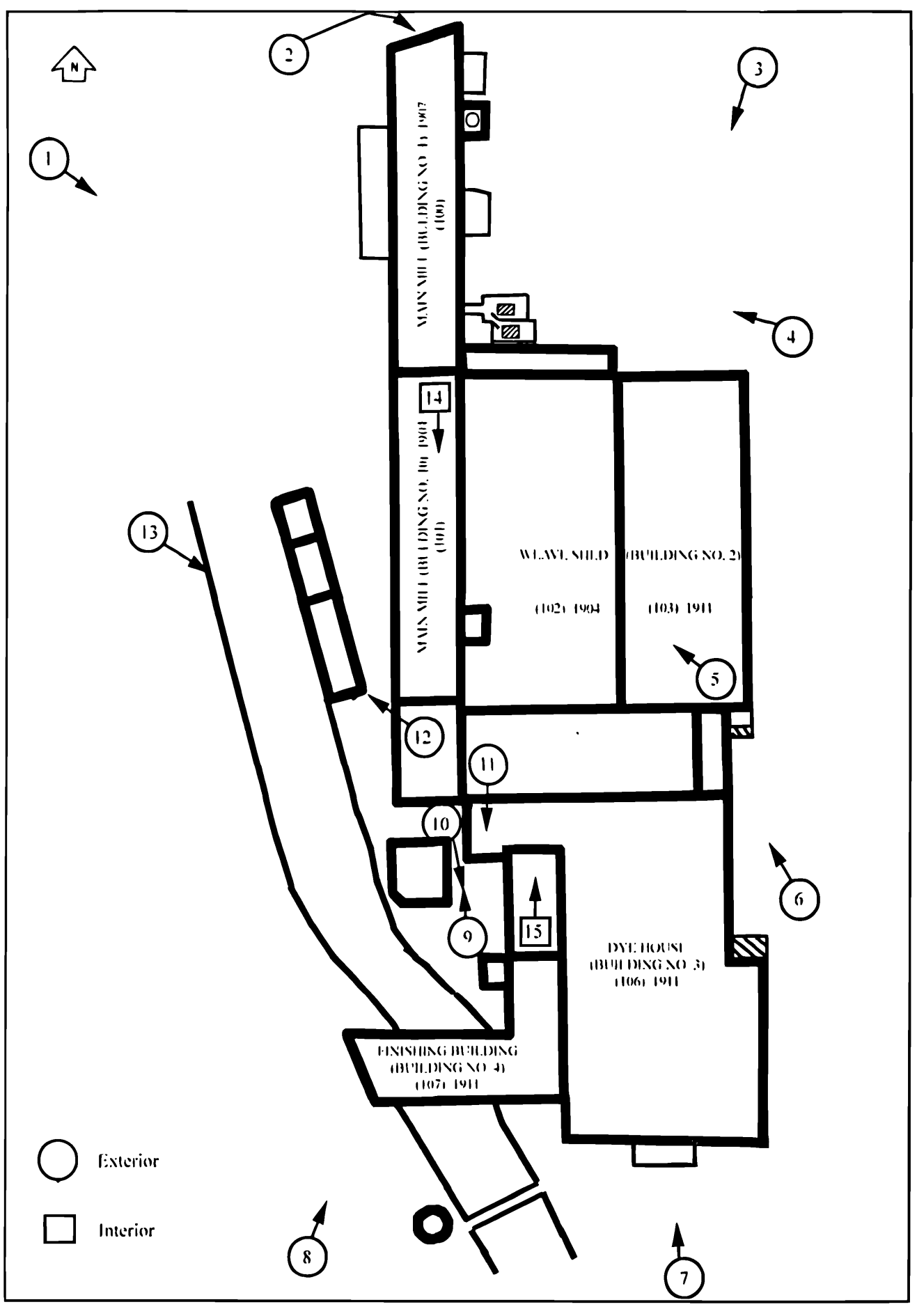
Photograph Key



Significance

Summary

The Greystone Mill Historic District contains three contributing buildings and one contributing structure associated with the development and operation of the 1904 Greystone Mill, a full production worsted woolen mill. The district is eligible for listing in the National Register of Historic Places at the state and local level under Criteria A and C. The period of significance begins in 1904, when the first mill buildings were erected, and ends in 1953, the 50-year National Register eligibility cutoff date. All of the contributing buildings within the district were constructed between 1904 and 1911, and the single structure, the Fuel Oil Tank, was erected before 1930.

Under Criterion A, the district possesses important historical associations with Rhode Island's worsted wool industry during the twentieth century. Constructed for the firm of Joseph Benn & Sons, the mill is representative of a significant trend in the history of woolen mill development during the period in Rhode Island and Massachusetts, and is an example of mill developed by English woolen manufacturers who sought to improve their competitive position in the U.S. woolen trade by manufacturing locally. Taken over by the Worcester Textile Co. just before World War II, the mill was one of the last and largest full-production worsted plants in New England when it closed in 1999.

The mill possesses significance under Criterion C as a relatively intact collection of resources that reflect the distinctive characteristics of historic textile mill architecture and engineering. It is an example of the work of the notable Rhode Island engineering firm of Frank P. Sheldon & Son, which was among the most active textile mill designers in New England during the late nineteenth and early twentieth centuries. At the time of its construction, the mill represented a state-of-the-art woolen processing facility that incorporated both a traditional vertical ''industrial loft,'' which was developed in the nineteenth century to satisfy the needs for interior lighting and power transmission via line shafting, and horizontal one-story " production shed" buildings that could accommodate increasingly heavy weaving machinery powered by electricity. Although all of the machinery has been removed, the existing buildings retain a high degree of their architectural integrity.

Historical Significance

Early Industrial Development Along the Woonasquatucket River

The Woonasquatucket River drains hilly, rolling terrain and passes over numerous small cataracts along its 19-mile course between North Smithfield and its confluence with the Moshassuck River in downtown Providence. The falls along the river became mill privileges that were dammed for industrial waterpower beginning in the early nineteenth century. North Providence, a prosperous farming community that was carved out of a portion of Providence in 1765, was the site of a significant amount of early industrial activity (Lasky 1978:1-3, 30). In 1809, Daniel Lyman established a mill downstream of the existing Greystone Mill at what became known as Lymansville. By 1817, Lyman had installed the first successful power looms in Rhode Island. The mill on the site now was built in 1885, and made worsted yarns, coat and lining fabrics (Kulick and Bonham 1978:131). Another textile mill was established at Centerdale in 1812 (Lasky 1978:5). Early textile establishments upstream in Smithfield included mills at Esmond and Georgiaville in 1813, Stillwater in 1824, Sprague ville in 1825, Mountaindale in 1826, and Greenville in the 1840s (Nebiker 1981:9-12). In 1822 a group of Woonasquatucket River valley mill owners, led by Zachariah Allen, whose Allendale Mill in North Providence was the first to use the power loom for broadcloth manufacture, formed a corporation to control the supply of water in the river by constructing a reservoir system. This organization, the first corporation of its kind in America, built a system of six reservoirs by 1853 (Greenwood 1996).

The area later known as Greystone was initially the site of the Cooper Farm, one of five large farms that dominated the North Providence economy during the late eighteenth century. The first mill privilege at Greystone was developed in 1813 by Captain Olney Angell, Peleg Williams and Materson Latham, who built a dam and two-story stone cotton mill north of the current Greystone Mill on the north side of Greystone Avenue in 1813. In 1816 they sold the mill to Richard Anthony, a founder of the Coventry Company mill at Anthony. Anthony made cotton yarn and cloth at this mill until 1835, when he sold it to Joseph Wescott who enlarged the building and installed yarn spinning frames in 1862. The name ''Greystone'' appears to date from this era, and an 1835 map of North Providence shows ''Anthony's Greystone Mill'' (Lockwood and Cushing 1835). In 1872 the building burned

and was rebuilt by James & George Campbell for rag paper production. It burned again in 1877 and was partially rebuilt by the White Brothers of Chepachet who used it as a gristmill. In 1882 it was the property of Messrs. James Campbell & Son, who made wool shoddy, and later sold their property to the Joseph Benn & Sons Company in 1903 as part of that company's land purchases for the Greystone Mill (Bayles 1891:185; Providence Board of Trade Journal 1903a). The building was used as a storehouse by the Greystone Mill during the twentieth century. It was still standing as late as the early 1950s, and was a visible ruin in the late 1970s. The ruins have been subsequently filled in and are no longer visible.

Initial Development of Greystone Mill 1904-1939

Just after the turn of the twentieth century, Joseph Benn & Sons Company, a woolen manufacturer founded in 1860 at Bradford, Yorkshire, England, sought to establish a branch manufacturing facility in the U.S. The move was part of a trend in British woolen production as a number of similar firms constructed branch plants in the U.S. during the nineteenth and early twentieth centuries to avoid high tariffs on foreign woolen goods and enable the companies to better compete in the U.S. markets (Greene and Greene 1996:71). The cost of production was thought to be lower in the U.S. when freight charges and tariffs were factored in (Providence Board of Trade Journal 1906a:566). Examples of other British firms that established plants in the U.S. include the Bradford Company, which relocated to Barre, Massachusetts, and several others that relocated to Lowell and Lawrence, Massachusetts. Closer to Greystone Mill, the Lister family's Centerdale Worsted Mills operated plants at Stillwater in Smithfield, Centerdale and Allendale in North Providence, and Olneyville in Providence, Rhode Island (Bicknell 1920:3-5).

In 1903, Joseph Benn & Sons Company chose the Greystone privilege, which at that time was located in a sparsely settled agricultural area with the exception of a few mill houses associated with the original Greystone mill, as the site for their new mill. The property owner, James Campbell's son Elisha J. Campbell, sold the old mill and several parcels of land to the south to Joseph Benn & Sons Company in November 1903 (Bayles 1891:185; Providence Board of Trade Journal 1903a). Benn incorporated under Rhode Island laws and by North Providence vote was exempted from taxes for 10 years (Providence Board of Trade Journal:1903b:491).

Joseph Benn & Sons Company hired noted Providence mill engineer Frank P. Sheldon to plan and design their new Greystone mill. Construction of the Greystone Mill complex was accomplished between 1904 and 1911. The first section to be built was the south half of the five story Main Mill and its attached elevator/toilet tower (Building No. 1) and the attached east section of the Weave Shed (Building No. 2) in 1904. In 1906 the company announced plans for a five-story addition to the north, which would employ 300 new operatives. The construction contract was awarded to J.W. Bishop (Providence Board of Trade Journal 1906b:506). The north addition to the Main Mill was completed in 1907 (Associated Mutual Insurance Company 1911). In 1908 Joseph Benn & Sons Company announced that they were planning a major expansion project that included five-story extension at the south end of the mill, extending over the Woonasquatucket River for fabric finishing (Finishing Building/Building No. 4). The company announced that the Dye House was to be enlarged and existing machinery rearranged to make room for new equipment (Providence Board of Trade Journal 1908:541). This expansion project corresponds major expansion completed by 1911, which included the Dye House (Building No. 3), Finishing Building (Building No. 4), eastward expansion of the Weave Shed (Building No. 2), Tank House (Building No. 10), and modifications/rebuilding of the Singe House (Building No. 5) and Building 13.

Along with the mill, Joseph Benn & Sons Company developed a mill village to accommodate some 1,500 workers, mostly woolen industry workers recruited from Yorkshire and Lancashire. The village was completed in 1912 and included several different types of attached and unattached row housing, a social club, and a church. The most prominent building was the Whitehall Building, a three-story, brick and concrete, combination overseers' lodging house, commercial center and assembly hall completed in 1911 (Kulik & Bonham 1978:130). Joseph Benn & Sons Company was typically paternalistic, and supplied its workers homes with electricity, collected the garbage, painted and repaired their houses, shoveled the snow, and charged them very low rents. The village was widely known for its English character, customs, and institutions. The development of the mill and associated village cost approximately $2.5 million and represented the last major industrial investment of its kind in North Providence (Bissland 1962).

The Joseph Benn & Sons Company was listed in *Davison's Textile Blue*

Book, a U.S. textile industry standard directory, beginning in 1906. The company withheld statistics for production capacity, employment, and machinery. The company was first listed as a comber, spinner, weaver, and dyer of alpaca and mohair in 1906. Harrison Benn was listed as president until 1913, when Englishman George H. Kerslake, assumed the position. In 1913 the company was said to ''comb, spin, and weave alpaca and mohair linings and dress goods, mohair coatings, all counts mohair yarns, single- and two-fold" and included dyeing and finishing. These processes and products were listed for the duration of the company's tenure at Greystone. In 1924 the Joseph Benn & Sons Company reincorporated as the Joseph Benn Corporation, Inc. (Davison 1906, 1913, 1924). About 1938 ownership of the Joseph Benn Corporation passed into the hands of an English company that was uninterested in operating a plant in the U.S., and the mill was closed. In June 1938 Benn appointed real estate agents G.L & H.J. Gross, Inc. to sell the company's dwellings, and stipulated that they first be offered to the existing tenants or mill workers in appreciation of the loyal work of the employees. About 1940 a small portion of the mill was used for flax processing for linen fiber (Bissland 1962; Gross and Gross 1938).

Worcester Textile Co., Inc. 1940-1999

In 1939 the Worcester Textile Company purchased the Greystone Mill and commenced making fine worsted fabrics for menswear. The Worcester Textile Company was founded in Worcester, MA, by Herbert and Edgar Gregson, graduates of Bradford Technical College in Bradford, England. Herbert specialized in yarn making and Edgar in fabric making. They came to America and established their company in 1919. The Gregsons operated geographically separate spinning and weaving plants in Worcester for 10 years. In 1929 the company moved to Valley Falls, Rhode Island, where they found a larger mill and more flexible labor laws, as women were not allowed to work after 11:00 p.m. in Massachusetts. Ten years later they had outgrown the Valley Falls plant, and purchased the Greystone Mill when it became available with the departure of the Joseph Benn Corporation (Edgerly 1979; Miller 1997).

In 1941 *Davison's Textile Blue Book* listed the Worcester Textile Company for the first time, and indicated that the company had 150 employees operating 3,600 worsted spindles, and 96 broad looms, and performed dyeing and finishing. In 1942 employment rose to 500, and in 1946 the number of broad looms rose to 104. In 1948 operators included the

Flax Processing & Linen Co., maker of linen yarns, with 7,200 spindles. This company appears to have been a short-lived tenant and was not listed again. Worcester Textile apparently continued to invest in new equipment, and in 1950 the number of worsted wool spindles rose to 5,400, and the number of broad looms rose to 120 (Davison 1941, 1942, 1946, 1948, 1950). The Gregsons, known as ''the two masters,'' believed in ''everyday good management practice,'' including extreme fairness to employees, installation of up-to-date equipment, close attention to details, and keeping waste to a minimum. They initiated profit sharing with all employees in 1941 (*Providence Journal* 1969).

During the Worcester Textile Company's tenure, Greystone Mill was retrofitted with architectural and mechanical elements of ''controlled conditions'' and materials handling improvements designed to improve the atmospheric conditions and efficiency of operations. Control of air quality, including temperature, moisture, and associated static electricity was important in the textile industry, and facilitated reliable, precise fiber handling operations. Industrial air conditioning began as early as 1906, and became more widespread after the 1921 introduction of the Carrier Corporation centrifugal chiller. Controlled conditions plants became more prevalent in the 1940s (Bradley 1999:173-176). The blocked windows seen at many New England textile mills are commonly thought to be associated with responses to the early 1970s energy crisis, however, this feature at Greystone Mill, and the remaining Carrier chillers, blowers, and ventilation ducts are evidence of modern period efforts to retrofit the complex for controlled conditions. During the first half of the twentieth century the ideal mill form shifted from vertical to horizontal. This was in part because of materials handling changes including the forklift truck in the World War I era and standardization of the shipping pallet by 1930. These innovations made work most efficient in tall, one-story buildings with smooth floors and high floor loading capacities and the loft became an inefficient form (Bradley 1999:104-105). At Greystone Mill, the pallet elevator at the south end of the Main Mill, internal pallet conveyor network, and dedicated, limited-floor travel elevators are evidence of efforts to improve materials handling through mechanization.

Although the period of significance for the Greystone Mill ends in 1953, the Worcester Textile Company continued to produce fine worsted yarns and fabrics until 1999. This unusual phenomenon in New England textile manufacturing can be attributed to the legacy of ''everyday good management

practice'' instituted by Edgar and Herbert Gregson. Their management philosophy was perpetuated by Edgar's son, Raymond, who took over as president in 1962, and continued to frequently replace machinery, offer a wide variety of products, and enable production flexibility. The company expanded from menswear fabrics into women's designer lines in the 1980s, and employed approximately 700 people. The company's sales jumped by two-thirds in a three-year period in the late 1980s. The company went into heavy debt in the late 1990s, and a venture capital firm assumed the debt in exchange for company stock. Shortly thereafter the mill was placed in receivership, the assets liquidated, and the looms sold to a company in Pakistan. When it closed in September 1999 the Worcester Textile Company's Greystone Mill was the last full-production, vertically integrated worsted mill in New England (Edgerly 1979; Maynard 1999; *Providence Journal* 1969, 2000; Smith 1999a, 1999b; Smith and Murphy 1999; Tooher 1988).

Worsted Wool Processing

The chief divisions of wool cloth manufacture are woolen and worsted, the main difference being in how the wool fibers are treated. In the manufacture of wool yarn, fibers of mixed lengths are intermingled with some degree of parallelization, yielding a soft, bulky, weaker yarn for heavy woven fabrics with more marked texture that often hides the pattern of the weave. Worsted yarns, on the other hand, are made from only long strand fibers from sheep and other animals. Mohair is a fabric or yarn made wholly or in part of the long silky hair of the Angora goat, and alpaca is the fine, long, wooly hair of the alpaca, a variety of the mammal guanaco that is domesticated in South America. The worsted yarn-making process rejects short fibers, combs the wool to a high degree of parallelization, and yields a smooth, stronger yarn. Worsted fabric made from this yarn is light, springy, closely woven, smooth to the touch, and has visible weave pattern.

In both wool and worsted processes, the wool is sheared from the animal, and sorted according to grade. It is then prepared by mechanically stripping it of vegetable matter, scouring it of dirt and grease, and drying it. The wool is then carded by feeding it through a series of paired, opposed, rotating, wire-studded drums, loosening the fibers and recombining them in a homogenous mix, and giving them some parallel orientation. The wool is drawn from the carding drums in strands, which are divided into loose ribbons, which are in turn drawn into loose strands

of fibers called rovings. The rovings are then spun into yarn on a mule spinner, which simultaneously draws and spins the loose wool into tighter, narrower yarn, ready for weaving. In the so-called ''Bradford System'' of worsted yarn manufacture, the worsted process diverges from the woolen process after the carding step. The wool is drawn off the carding rolls in a single strand, which is then run through a gilling, or combing, operation that removes the shorter fibers. This combing also imparts a high degree of parallelization to the remaining long fibers. The product, or ''top,'' is a continuous strand, or ''sliver.'' The sliver is drawn several times and combined with other slivers in a series of machines that stretch it, reduce its diameter, and give it considerable twist before final spinning to worsted yarn. For both woolen and worsted products, a variety of weaving, dyeing and finishing steps follow the production of the two different types of yarn (Cole 1926:284-302).

Development of the U.S. Woolen Industry

The U.S. woolen industry can be divided into four periods of development. The first three have received a good deal of scholarly attention, while the last remains to be fully examined. The first period spans from settlement to the American Revolution, and was characterized by importation of woolen fabrics from Europe, supplemented by household spinning and weaving of domestic wool. In the seventeenth century wool was considered a standard commodity. Constrictive British legislation and the desire for colonial self-sufficiency gave stimulus to the industry by the Revolution. Rhode Island's isolated coastal islands and grasslands were ideal for raising sheep safe from predators, and Rhode Island wool's ''clip'' was superior in length and texture to that from other colonies (Providence Community Research Center 1940:11-12).

The second period, from the Revolution to the Civil War, was characterized by a gradual production shift from the home to the factory, with fully integrated production mills and associated villages emerging by the early 1800s. Importation of Merino sheep allowed higher volumes of finer product, and early-nineteenth-century trade restrictions encouraged domestic production. Skilled English woolen operatives fled the disruption of the English wool manufacturing in the wake of the Napoleonic Wars and many settled in Rhode Island. This led to rapid technical advances, including power looms and spinning. High wool import tariffs boosted the industry, which thrived to the Civil War (Providence Community Research

Center 1940:12-13).

The third period began with the enormous expansion to satisfy military demand during the Civil War, and ended with the prosperity enjoyed in World War I. After the post Civil War collapse in demand, the industry consolidated and concentrated with fewer, larger mills in a handful of cities in the Northeast, notably Providence, RI, and Philadelphia, PA, which were closer to style centers, sources of imported dyes, patterns and fibers, and skilled labor. During this period several large woolen operations were established in Rhode Island, including the Providence and National Worsted Mills on the Woonasquatucket River in the Olneyville section of Providence, founded in 1876 and once considered the most extensive single worsted plant in the world (Kulick and Bonham 1978:174). By the end of the nineteenth century the industry reorganized to reduce competition, with a few large companies such as American Woolen and United Woolen emerging to dominate the industry. Rhode Island became the biggest woolen/worsted producing state in the U.S. in 1890, and in 1900 woolen/worsted production outstripped cotton in the state (Carroll 1936:866-868).

After the turn of the twentieth century the regional woolen industry experienced an economic boost that resulted from high protective tariffs and technological advances in worsted production (Providence Community Research Center 1940:13-14). Pawtucket and Woonsocket became major woolen manufacturers during this period. Upstream from Greystone in Smithfield, the Esmond Mills were founded in 1906 and later made fine Jacquard woven blankets of camel's hair, wool, cotton, and blends (Kulick and Bonham 1978:225). The Lister family's Centerdale Woolen Company also dates from this time. The Joseph Benn & Sons Company's operations at Greystone Mill began just prior to World War I. In 1913 the Underwood-Simmons Tariff Act placed wool on the list of materials free of import duties, which led to a drop in wool prices, and an influx of foreign finished wool products. This was more than offset by World War I-era profits from export of woolen fabric for war blankets and uniforms (Young 1928:6-7).

The fourth period of the U.S. Woolen industry, about which little has been written, includes the remainder of the period of significance for Greystone Mill, which ends at 1953, and extends into the modern period. This period was characterized by problems in the New England textile industry overall, with a dramatic decline in cotton, but steadier progress

for woolen, especially worsted products. The wool industry became geographically concentrated to an exceptional degree in several New England cities, especially Providence. In 1919, 73.6 percent of U.S. woolen spindles were in Massachusetts, Rhode Island, and Pennsylvania, closer to the big U.S. wool markets in Boston and Philadelphia, near the machine builders and mill suppliers, and nearer consuming centers (Cole 1926:187-188).

Post World War I prosperity in the textile industry only lasted until the early 1920s. Although cotton and woolen/worsted took different trajectories, in general New England's mills suffered from a panoply of ills. Much of the blame was placed on competition from Southern U.S. mills, which had the advantages of lower wages, better hours of labor, lower freight rates, cheaper electricity, and lower taxes (Young 1928:14). New England mills engaged in overproduction in effort to compete with Southern mills, which included speed-ups and stretch-outs to compensate for declining profits. Other threats to the industry during the 1930s were foreign competition, labor agitation, unfavorable tariffs, clothing trends requiring less material, popularity of new synthetics including Rayon, and high wages (Young 1928:19). In 1938 Rhode Island had the highest textile wages in the U.S. (*Providence Journal* 1938). Despite these conditions, the worsted industry expanded and strengthened, mostly based in Woonsocket with French and Belgian capital and technology (Kulick and Bonham 1978:21).

The Rhode Island worsted industry was generally steady through the 1930s, with 66 factories producing worsted yarns or cloth in 1930 (Carroll 1936:866-868). In 1940, 20 percent of U.S. worsted workers were in Rhode Island, and one-third of all U.S. worsted production in 1935 came from the state (Providence Community Research Center 1940:14). After a profitable period during World War II, the industry suffered from a postwar fabric glut and an inability to recapture the civilian market. The textile industry overall suffered from competition from synthetic fabrics, old buildings and machinery, high overhead, lack of flexibility, high costs, and poor, old-style, absentee management. Operators sold off residential properties for cash, and failed to reinvest in modern equipment. In 1951 the textile industry went into its worst slump in a decade. Between 1948 and 1958, 44 woolen and worsted mills in Rhode Island closed. Woonsocket was particularly hard hit, with 29 woolen and worsted mill closings. The Rhode Island textile industry lost 40,000 jobs between 1929 and 1954 (Kulick and Bonham 1978:23-25).

Despite this situation, in 1953 Providence County remained the leading textile county in the U.S. in terms of total employment and value added products. Fifteen percent of the nations woolen industry was still concentrated in Providence and Woonsocket, with the largest percentage of employment in the worsted category. Most large plants were fully integrated, taking in mostly Australian wool and making finished cloth that was sold directly to the cutting trade with selling offices in New York City (Tanner 1953:125-134). Tellingly, a 1928 woolen industry report noted that smaller, closely owned companies were enjoying more profitability than the larger, more widely spread ones, and that the chief advantage for the smaller producers was flexibility to adapt machinery for new style lines or specialty goods. The report stated that it was a tribute to New England woolen management that they had been able to hold or improve their relative position despite the struggles in the textile industry in general, struggles that would ultimately result in the survival of the fittest (Young 1928:27).

Architectural/Engineering Significance

Greystone Mill is a large, representative example of a state-of-the art ca. 1900 textile mill. The Main Mill and Finishing Building are examples of the expression of the nineteenth century tradition of long, narrow, multistory buildings, and the Weave Shed and Dye House are examples of the transition to flat, one-story production sheds.

The Main Mill is a large example of the ''industrial loft,'' a specialized type of building often associated with textile manufacturing, consisting of two or more stories in a long narrow configuration. This shape was developed in the nineteenth century to satisfy the combined needs for interior light and linear power transmission via lineshafting. Useable floor space was maximized by concentrating vertical circulation in exterior towers that typically held water tanks for gravity-fed firefighting systems (Bradley 1999:29-34, 93). These buildings employed fire resistive, or ''slow-burning" construction, with heavy, brick, self-supporting outer walls with narrow piers and wide window spandrels, and internal firebreak walls. The interior framing system, which supported the floor load, consisted of widely-spaced, heavy timber (or sometimes cast iron) posts, timber or steel beams, and thick, multilayer plank floors, providing

limited surfaces for fire to take hold. Interior structures sometimes also included limited examples of true British ''fireproof'' construction using brick arches and steel beams, a method not widely used in U.S. factories. This type of construction is found in the Greystone Main Mill boiler room, and represents 1 percent of the floor construction in the complex (Bradley 1999:117-121, 126-129, 155; Brooks 1906:50, 54-68; IRI 1996; Wermiel 2001).

The Weave Shed (Building No. 2) and Dye House (Building No. 3) are examples of the single-story production shed, or " weave shed" as it was known in textile mills. This building type, with its distinctive multiple monitor sawtooth profile roof, was known as the ''British weave shed roof.'' This form began to appear in the U.S. in the 1880s, but did not come into general use in New England until after 1900. This type of building evolved because of several factors. The interior structure of the older, vertical mill buildings could not withstand the vibration of the increasingly large weaving looms being introduced at the time, and the advent of direct electrical drive using individual motors allowed for more flexible arrangement of machinery. The weave shed employed a 30-60-90-degree triangle monitor roof profile, glazed on the short north side to allow interior diffusion of indirect natural light over a wide enclosed space. The new building form allowed vibration free, rationally arranged, well lit production space, which enabled precision operation and increased output per machine (Bradley 1999:192-193; Cole 1926:95, 98; Kulick and Bonham 1978:22).

Frank P. Sheldon

Greystone Mill was designed by engineer Frank P. Sheldon, one of the most prolific mill engineers in New England during the early twentieth century. Sheldon was born in Providence on February 16, 1846. He had a natural aptitude for engineering and gained firsthand experience through mill employment in Rhode Island and Massachusetts. In 1870 he designed the first automatic machine screw threading machine for the American Screw Company. He then chose to apply his practical experience to the establishment of a mill engineering business, and designed many prominent plants in New England and the southern states over the next 45 years. He served as director of textiles for the U.S. at the Paris Exposition Universelle Internationale in 1900. He was listed in Providence city directories as a mill engineer with Westminster Street offices until 1913. He died August 17, 1915 (*Providence Journal* 1915:14). After his death in

1915, Frank P. Sheldon's son continued the business, and in 1921, F.P Sheldon & Son published *A Half Century of Achievement*, a 50th anniversary corporate retrospective. By then the firm offered a wide variety of industrial plant design, equipment and construction services, including textile mills for all fabrics. The book summarized the firm's accomplishments, and listed clients and illustrated buildings. Examination of their client list reveals that the firm had 566 contracts with 289 clients, 27.7 percent of which had multiple contracts with the firm, in 20 U.S. states and four Canadian provinces. Sixty-seven of those clients were located in Rhode Island, representing 23.1 percent of all clients, with 116 contracts, or 20.5 percent of the firm's entire output. Most major regional textile concerns were included in the firm's client list. The firm was known for research and development of industrial building features and innovation in the use of sawtooth roofs (Sheldon 1921; Woodward 2003).

Frank P. Sheldon's career evolved during a period when factory design evolved from the practice of the ''mill doctor'' to the professionalization of industrial engineering. Many firms like F.P. Sheldon, Lockwood Greene, and others came to prominence in the late nineteenth century. These firms grew from the formal training and practical experience of individuals, who later formed consulting practices, and established the specialty field of industrial engineering by 1910 (Bradley 1999:18-21, 81-83). Many practitioners, like Sheldon, advocated research--his company publications included treatises on testing roofing materials, heat transmission through types of sash, and evaluation of natural illumination in sawtooth roofs. The 1921 corporate retrospective contained a summary of its calculated approach to weave shed geometry in an accompanying article originally published by the American Society of Mechanical Engineers (Sheldon 1921). F.P. Sheldon & Son executed eight contracts for Joseph Benn & Sons Company by 1921 (Sheldon 1921). It is not clear which buildings were included but the limited number of buildings and the marked continuity of their detail and design suggest an exclusive Sheldon-Benn relationship.

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Geographical Data

UTM Coordinates (continued):

E: 19.293400.4637308
F: 19.293313.4637343
G: 19.293240.4637319
H: 19.293239.4637367
I: 19.293254.4637401

Boundary Description

Beginning at a point at the northeast corner of Map 20, Parcel 642 (20/642) in North Providence
-southeast to a point at the south tip of 20/626
-northeast along the north boundary of the Waterman Avenue access right-of-way in the northeast corner of 20/662 to the west edge of Waterman Avenue
-south along the west edge of Waterman Avenue to the north tip of 20/627
-southwest along the southeast edge of the Waterman Avenue right-of-way to the west tip of 20/267
-south to the southeast corner of 20/662
-south to the southwest corner of 20/564
-east to Waterman Avenue
-south to the northeast corner of 20/631
-southwest to the northwest corner of 20/631
-south to the south tip of 20/32
-northwest along the east bank of the Woonasquatucket River to a point opposite the southeast corner of 39/338 in Johnston
-southeast in a line of convenience across the east half of the Woonasquatucket River to the southeast corner of 39/81 at the centerline of the river (North Providence - Johnston boundary)
-southeast and northwest to the southeast corner of 39/81
-north along the east boundary of 39/81 to the southeast corner of 39/80
-east on the angle of the north-south boundary of 39/80 and 39/81 on a line of convenience across 39/338 and the Johnston - North Providence boundary to the east bank of the Woonasquatucket River
-north along the east river bank to the northwest corner of 20/642 in North Providence
-east along the south edge of Greystone Avenue to the northeast corner of 20/642, the point of beginning.

Boundary Justification

The boundaries include the full extent of contiguous historic and structural resources associated with the activity in the district during its period of significance. The boundaries follow legally recorded property lines, roads, and natural watercourses. Lines of convenience cross the Woonasquatucket River at the south end of the district and crosses one private road.

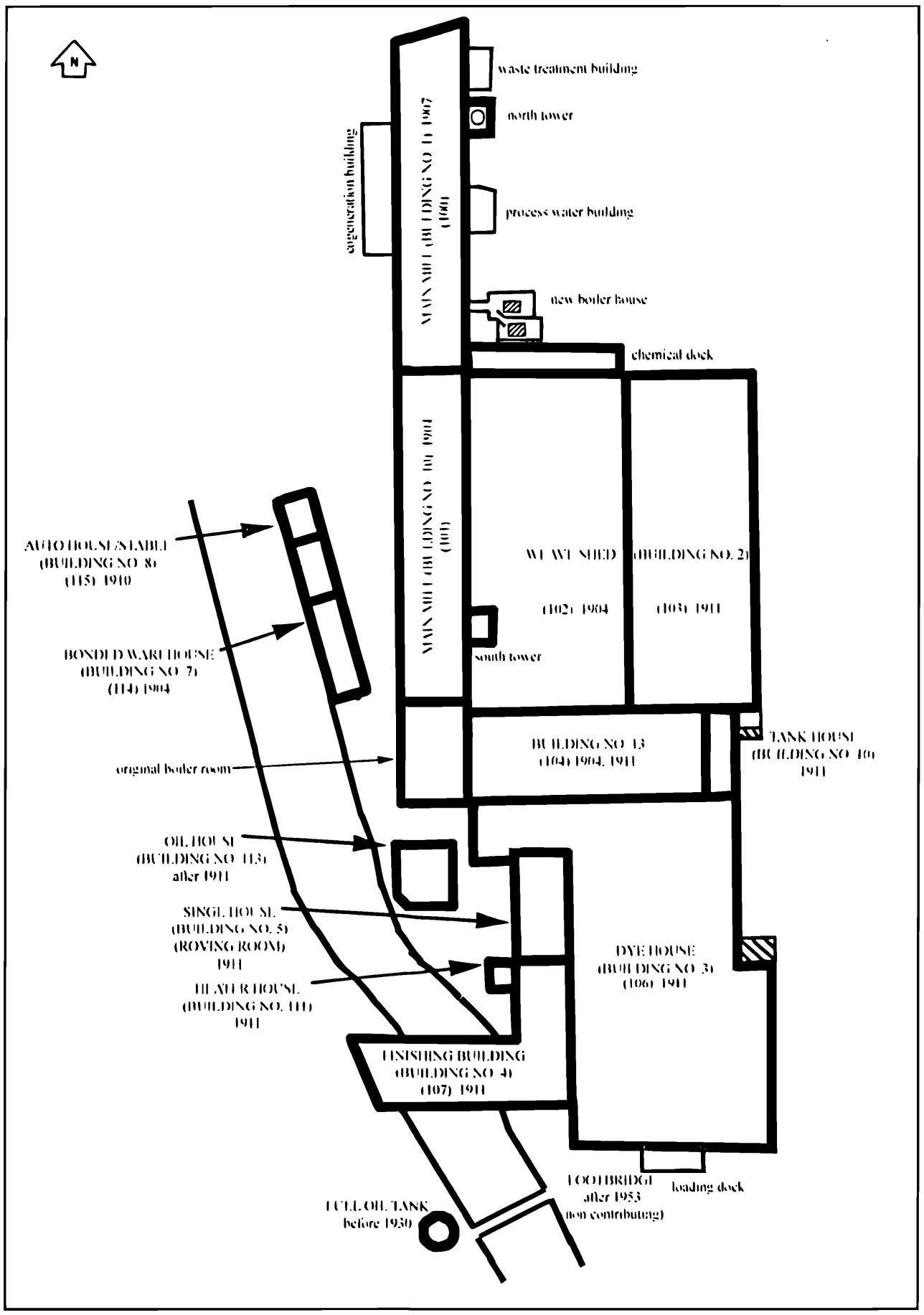
United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Property name Greystone Mill Historic District, Prov. County, N. Prov., RI

Section number 10

Mill Plan



Assessor's Map: North Providence Map 20/Johnston Map 39