Public Archaeology Laboratory

McLane and Goldman Dams
National Register Integrity Assessment
Milford, New Hampshire

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PAL No. 2506

Submitted to:
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Introduction

PAL is providing cultural resources services to Gomez & Sullivan Engineers, PC, the National Oceanic and Atmospheric Administration (NOAA, the lead federal agency), the Town of Milford, and project partners for the McLane and Goldman Dams Removal Feasibility Study (Project) in Milford, New Hampshire. In June 2011, PAL prepared New Hampshire Division of Historical Resources (NHDHR) individual inventory forms for the Goldman Dam/Morse & Kaley Dam (MIL0063) and the McLane Dam (MIL0064) on the Souhegan River, and recommended that the structures are not eligible for listing in the National Register of Historic Places (National Register) based on their lack of integrity. The NHDHR provided its comments on the forms in correspondence dated July 1, 2011, stating in its opinion that the dams are not individually eligible, but are contributing resources within the potential Downtown Milford Commercial, Civic, and Residential Historic District (MIL-DTW, hereinafter referred to as the "Downtown Milford HD"). The opinions included a statement that "A valid argument has not been made to change the current contributing status of the structure[s]" (Black 2011a, 2011b). Due to the conflicting eligibility opinions offered by PAL and the NHDHR, NOAA requested that PAL provide a more thorough analysis of the integrity of the dams. The following report provides the results of that analysis and is intended to assist NOAA in further consultation with the NHDHR regarding the identification of historic properties within the Area of Potential Effect (APE) for the Project.

Methodology

The following assessment of integrity of the McLane and Goldman dams was prepared in accordance with the guidance provided in National Register Bulletin 15: *How to Apply the National Register Criteria for Evaluation* (NPS 2002). PAL utilized a variety of primary source materials, including historic maps and views that provide information about the physical evolution of the dams and their relationship to the surrounding built environment over time. The NHDHR Area Form for the Downtown Milford HD, which was prepared in 2010 by the Preservation Company and provides the documentation under which the district was evaluated eligible for listing in the National Register, was consulted to determine the proposed areas and period of significance for the district, and to identify the rationale for including the dams within the boundaries of the district. PAL also reviewed the Determination of Eligibility (DOE) forms that were prepared by the NHDHR in response to the individual inventory forms that PAL prepared for the McLane and Goldman dams and provide NHDHR's summary evaluation of the significance of the dams.

In accordance with the National Register guidelines, properties that are eligible for listing in the National Register must be significant under one or more of the National Register criteria *and* must have sufficient integrity to convey their significance. These rules apply whether the property is considered for individual listing or as a contributing resource within a historic district. In assessing historic integrity, the National Register recognizes seven aspects or qualities that, in various combinations, define integrity. In order to retain historic integrity "a property will always possess several, and usually most, of the aspects" (NPS 2002: 44). The seven aspects of integrity are:

- Location – the location where the historic property was constructed or the place where the historic event occurred.
- Design – the combination of elements that create the form, plan, space, structure, and style of a property.
- Setting – the physical environment of a historic property or the character of the place in which the property played its historic role.
- Materials – the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property.
- Workmanship – the physical evidence of crafts of a particular culture or people during any given period in history or prehistory.
- Feeling – a property's expression of the aesthetic or historic sense of a particular period of time.
- Association – the direct link between an important historic event or person and a historic property.

National Register Bulletin 15 outlines four steps to be followed in assessing integrity:

1. Define the **essential physical features** that must be present for a property to represent its significance. The National Register recognizes that all properties change over time and that it is therefore not necessary for a property to retain all of its physical features or characteristics. It is necessary, however, that a property retain the essential features that enable it to convey its historic identity. Essential physical features are those that define why a property is significant in relation to the applicable National Register Criteria and areas of significance and when it achieved significance. For a property to be eligible under Criteria A and B, it must retain the essential physical features that made up its character or appearance during the period of its association with a historic event or person. A property that is significant under Criterion C as an important illustration of a particular architectural style or construction technique must retain *most* of the physical features that constitute that style or technique.

2. Determine whether the **essential physical features are visible** enough to convey their significance. Properties eligible under Criteria A, B, and/or C must exhibit their essential physical features to a degree significant enough to convey their historical associations. Even if a property is physically intact, its integrity is questionable if the majority of its essential physical features are concealed under modern construction.

3. Determine whether the property needs to be **compared with similar properties**. The need to compare a property with others of similar type generally arises when there is a lack of scholarly information on the type or it is an extremely rare resource. In cases where the resource is extremely rare, the National Register allows for a greater degree of alteration, provided enough of the property survives to identify it as a significant resource.

4. Determine, based on the significance and essential physical features, **which aspects of integrity** are particularly vital to the property being nominated and if they are present. While ideally a property that is associated with a historic event or person (Criteria A and B) would retain some features of all seven aspects of integrity, integrity of design, materials, and workmanship may not be as important as location, setting, feeling, and association. Properties that are significant as architectural or engineering resources under Criterion C must retain those physical features that characterize their type. Retention of design, workmanship, and materials are usually the most important aspects, but location and setting are equally important when the design is a reflection of their immediate environment (NPS 2002: 44).

Steps 1, 2, and 4 apply to the McLane and Goldman dams and were used to prepare the following evaluation of integrity. Step 3 does not apply because the dams are not rare examples of any property type and there is extensive information regarding historic dams available to assist in assessing their significance and integrity.

Downtown Milford HD Documentation

The Statement of Significance contained in the Area Form for the Downtown Milford HD states that the district is eligible under Criterion A as a center of political, commercial, and ecclesiastical activities. It also identifies the district as eligible under Criterion C as a collection of civic, commercial, ecclesiastical, and residential buildings that displays a range of types and styles and provides information about the historic building fabric of a town center that developed in the nineteenth and early twentieth centuries.

The district's period of significance extends from 1783 to 1959. The district includes 114 contributing and 20 non-contributing resources. Of the 20 non-contributing resources, 14 were constructed within the period of significance, but were evaluated as being substantially altered to the point where "their historic character is unrecognizable" (Driemeyer 2010:45-46). The NHDHR concurred with the evaluation, stating that the district is eligible "under Criterion A for its association with the development of a town center in Milford beginning in the late eighteenth century and under Criterion C for its range of late eighteenth to mid-twentieth century civic, commercial, institutional, and residential architecture and structures characteristic of a town center" (NHDHR 2010).

Both the McLane and Goldman Dams are identified in the Area Form as contributing resources in the potential Downtown Milford Historic District. The justification for including the dams within the boundary is stated as follows:

> "The Souhegan River along the northeast boundary is a part of the district as it was one of the reasons for initial European settlement in the area, serving [as] an important source of power for industry and manufacturing beginning in the mid-eighteenth century. It remained so well into the twentieth century and though it no

> longer serves that purpose two dams, the Goldman Dam and the McLane Dam further east on the river are included in the area" (Driemeyer 2010:49-50).

The Railroad Pond Dam, located on Great Brook at the corner of Elm and Union streets, also is included in the district as a contributing resource. It was associated with a blacksmith shop that was in operation for more than 100 years and was rebuilt in 1934 as a timber and stone dam. In 1947 the dam was rebuilt again as a granite dam (Dreimeyer 2010: 18, 57).

The evaluation of the McLane and Goldman dams appears to have been made without the benefit of the full historical record of the structures, and there are inconsistencies in the logic behind their classification as contributing resources. The Area Form notes that the Town of Milford rebuilt the Goldman Dam in 1966, but does not address the extent of the changes to the design and function of the dam and the fact that the reconstruction occurred outside the period of significance for the district. Similarly, there is no mention of the extensive modifications made to the McLane Dam in 1992 in anticipation of its conversion for use for modern hydro power generation.

The Area Form's List of Properties that identifies all contributing and non-contributing resources does not include a construction date for either dam. In the case of the Railroad Pond Dam, the reconstruction date of 1947, which is within the period of significance, is used. It would follow, therefore, that the dates of the equally extensive reconstructions of the McLane and Goldman dams, 1966 and 1992, respectively, would be the assigned dates. These dates are outside the period of significance for the district and present technical problems for listing the district in the National Register if they are to be considered contributing properties. The period of significance would have to be expanded to 1992, and Criteria Consideration G for properties of exceptional significance that are less than 50 years of age would have to apply. The changes to the design, setting, materials, workmanship, feeling, and association of the dams would make it difficult to justify the extension of the end date of the period of significance (Driemeyer 2010:18, 42, 56).

Previous National Register Evaluations of the McLane Dam

The McLane Dam has been the subject of project review under Section 106 of the National Historic Preservation Act on two occasions. In both instances, the dam was evaluated as ineligible for listing in the National Register. When Northeast Hydrodevelopment Corporation applied for a FERC permit to rebuild the dam in 1985, FERC consulted with the NHDHR (formerly housed within the New Hampshire Department of Resources and Economic Development) regarding the potential effects of the project on significant properties. At that time, the dam was over 60 years of age. The NHDHR offered the opinion that there were "no known properties of architectural, historical, archeological, engineering, or cultural significance within the area of the undertaking's potential environmental impact" (Quinn 1985).

In 1999, Northeast Hydrodevelopment Corporation filed a petition to surrender the current license for the McLane Dam Hydroelectric Project (FERC no. 8924). In correspondence with the NHDHR, the FERC Director of the Division of Licensing and Compliance offered an opinion of "no effect" for this undertaking, noting that "Although the dams associated with these projects are more than 50 years old, they do not meet the criteria for evaluation for eligibility due to the major renovations which have occurred to the structures" (Robinson 1999). The NHDHR, in its official response, concurred with the FERC determination of effect (Dutton 1999).

Integrity Assessment of the McLane and Goldman Dams

Based on the information contained in the Individual Inventory Forms that PAL prepared, the NHDHR evaluated both dams as eligible under National Register Criteria A and C and assessed them as possessing integrity in terms of their location, design, setting, and association, and lacking integrity of materials, workmanship, and feeling. The NHDHR opinions are based on the assertions that the dams have been altered, not reconstructed as PAL indicated in the forms, and that "Though altered, elements of the nineteenth and early twentieth-century dam incarnations and use are visible on the landscape demonstrating [the dams] as part of a larger engineering system along the Souhegan River and contributing to the district's ability to convey its history" (Black 2011a, 2011b).

PAL agrees that the dams possess integrity of location due to the fact that dams have been located at both privileges since the nineteenth century. PAL further agrees that the Goldman Dam possesses integrity of setting and that both dams lack integrity of materials, workmanship, and feeling. The following assessments, therefore, focus on the remaining aspects of integrity: design, setting (McLane only), and association.

Goldman Dam

Design

Throughout the period of significance for the district, the Goldman Dam's defining feature was its timber crib and frame spillway (Figures 1–3). In cross-section, the dam approximated a right triangle with a shallow sloping, wood-plank upstream face and a near-vertical downstream face. The dam designers would have relied on stone rubble within the cribbing and iron pins driven into the rock ledge in the steam channel to allow the dam to withstand the mass of water upstream of the dam. The sloping upstream profile of the spillway would have supplemented this resistance by transferring some of the lateral force of the water down through the dam into its substructure and underlying stream bed. Tight-fitting wood planking provided the dam with the ability to retain water and directed debris in the river up and over the dam. In plan, the dam crossed the Souhegan River in three legs at varying angles. Cribbing was utilized in the southern-most leg, while timber bents were used on the other two legs, which were over exposed bedrock. The difference in construction techniques across these legs was probably a response to the changing river channel conditions. Cribbing would have provided a better solution for a soft river channel bottom, while bents could more readily be anchored into the exposed ledge and the frame structure more easily adapted to this irregular surface. At the north end of the spillway was a stone culvert low-flow outlet. This was operated using a vertical-lift gate whose mechanism rested on a headframe atop the outlet.

In 1966–1967 the Town of Milford removed the historic dam spillway, which constitutes approximately 170 feet (or 87 percent) of the dam's 195-foot length, and replaced it with a concrete gravity structure, a completely different type of construction than the previous dams at the privilege (Figures 4–7). This change was not a singular alteration to one aspect of the structure's integrity (materials), but occurred within shifting engineering practices that allowed for fundamental changes in the form, structure, and style of the resource. As a result, the design integrity of the nineteenth-century timber crib dam was lost.

In cross-section, the dam remains a right triangle, but is reversed in orientation, with a vertical upstream face and shallow sloping downstream face. The shallow, wood plank upstream side of the spillway was no longer needed as concrete is impervious to water and the dam's chamfered crest is sufficient to pass debris. The new spillway's downstream face diffuses the force of water falling over the dam, slowing erosive forces on the concrete and serving as an apron to prevent scouring from water as it hits the base of the structure. Concrete's plastic qualities allowed a different, simplified response to the shifting conditions in the floor of the river channel: the dam's plan became a shallow chevron plan. The endpoints of the dam remained constant, reflecting the decision to rehabilitate the low-flow outlet at the north end of the structure and limitations imposed by the presence of the gates underneath the Morse, Kaley & Company Mill. These limitations were spatial, not functional, since water was no longer used by the mill for manufacturing purposes in the 1960s. The low-flow outlet was modified through the removal of the old gates and headframe and the addition of new poured concrete stop log slots across the outlet's upstream elevation. Concrete also was added to cover the top and south elevation of the outlet, leaving older stonework only exposed on the east (downstream) elevation.

Association

In order to convey its associations with the "engineered system" along the Souhegan River, the Goldman Dam would need to demonstrate its relationship specifically with the Milford Cotton and Woolen Manufacturing Company Mill (a/k/a Morse, Kaley & Company Mill), which was constructed in 1813, expanded in 1870 and 1916, and stopped using water for power before 1951. There is a locational relationship between the dam and the mill that would appear to convey a historical association. This spatial relationship is misleading, however, since there is no direct historical or functional link between the dam structure as it exists today and industrial activity at the mill or in the district.

In fact, the current dam was not constructed to perform any sort of industrial function, but was designed to provide an impoundment for recreational and scenic purposes. It is a visual analog for earlier structures that once provided power for industry, but it is not the same structure. Only one element of the old dam – the low-flow outlet, was retained in a highly modified form for use in the new structure. Furthermore, the dam's overall workmanship, design, and materials are demonstrative of its 1966–1967 rehabilitation, regardless of whether the structure is considered a modern dam or a heavily modified nineteenth-century structure. It therefore cannot convey any associations with the earlier industrial use of the site and the Downtown Milford District's period of significance (1783–1959). While portions of the low-flow outlet date to within the district's period of significance, this infrastructure has been altered and is not sufficient on its own to convey associations with industrial use of the Souhegan River. Low-flow outlets are common to dams built for variety of uses, including manufacturing, hydroelectric generation, and water supply.

McLane Dam

Design

The McLane Dam underwent a rehabilitation in 1982 that compromised the form and plan of the structure (Figures 8–17). The basic footprint (location) of the dam has been retained, but the dam's cross-section, spillway length, and ancillary flow control structures were altered during an aborted 1992 project intended to rehabilitate the structure for hydroelectrical generation. The L-shaped

"dog leg" spillway has a stone core built in 1846 that is surrounded by up to 2 feet of concrete from a 1909 rehabilitation, and between 1 and 1.5 feet of additional concrete added in 1992. The overall length of the west spillway was reduced by about 11 feet, and the east spillway reduced by 1 foot. The crest of the dam has been raised between 0.5 and 1.0 foot, depending on the location. A concrete apron also was added to the downstream side of the west spillway leg, covering and/or filling a former low-flow outlet at the base of the spillway. New reinforced concrete abutment walls were built in front of the earlier stone abutments on the east and west river banks. The stone and wood gate structure at the east end of the dam was severely altered. Two wood gate leaves, the gate frames, and a granite pier adjoining the gate on the east river bank were removed and replaced with the current steel and concrete stop log slots and wood stop logs. Concrete cladding covers three of four elevations of the remaining granite pier west of the gate. The upper portion of the power canal, where it connected to the gates, was removed, so the stoplogs now function as a low-flow outlet rather than a canal gate.

Setting

The McLane Dam was intended to function as a source of power for industrial and, later, hydroelectric enterprises on both the east and west banks of the Souhegan River. The industrial resources on the river's west bank consisted of wood mill loft structures used for manufacturing between 1842 and 1935. The mill lofts were immediately proximate to the west end of the dam, and powered by a short raceway at this location. Neither the mill lofts nor the raceway survive on the west bank, which is now occupied by an apartment complex (compare Figures 8 and 15). On the east bank, an approximately 1,200 foot-long power canal supplied power to the Souhegan Mill (demolished) between 1848 and 1872. The canal then supplied a hydroelectric facility at the same location as the mill between 1890 and an unknown date in the 1940s. The upper 40 feet of canal adjacent to the dam is demolished, and the lower 600 feet of canal adjacent to the former hydroelectric powerhouse are filled. The powerhouse is highly altered and is located outside of the boundaries of the Downtown Milford District. Because of the missing industrial and hydropower fabric at the east and west ends of the dam, the dam no longer reflects the manufacturing and hydroelectric functions that it was intended to serve. The McLane Dam therefore lacks integrity of setting.

Association

As noted above, historic properties that retain their association convey a direct link between an important historic event or person and a historic property. In this instance, the link between the McLane Dam and the industrial and economic history of the Downtown Milford District was conveyed by the presence of the east and west mill raceways and industrial and hydroelectric infrastructure. The demolition of the majority of this infrastructure has broken the linkage between the dam and its historical functions. Therefore, the dam lacks integrity of association.

Conclusions

PAL concludes that the McLane and Goldman dams are not eligible for the National Register as contributing resources in the Downtown Milford HD because they do not do not meet the minimum integrity standard of retaining at least "several" aspects of integrity. The Goldman Dam retains integrity of location and some elements of its setting. The McLane Dam retains integrity of location only. Just like the buildings that were constructed during the period of significance and evaluated in

the Area Form for the district as non-contributing, the dams no longer retain the essential physical features that characterized their type and function during the district's period of significance. In the case of the Goldman Dam, most of the current structure dates to 1966. The current structure lacks "the essential physical features" necessary to convey its significance. It was reconstructed to serve a different purpose and exhibits a different design and materials than the historic timber crib dam that existed in this location throughout the historic period. The core of the McLane Dam dates from the historic period, but has been entirely encased and enlarged by modern materials that obscure its essential physical features. The structure exists as a modern looking run-of-the-river dam that does not convey any specific function or historical association.

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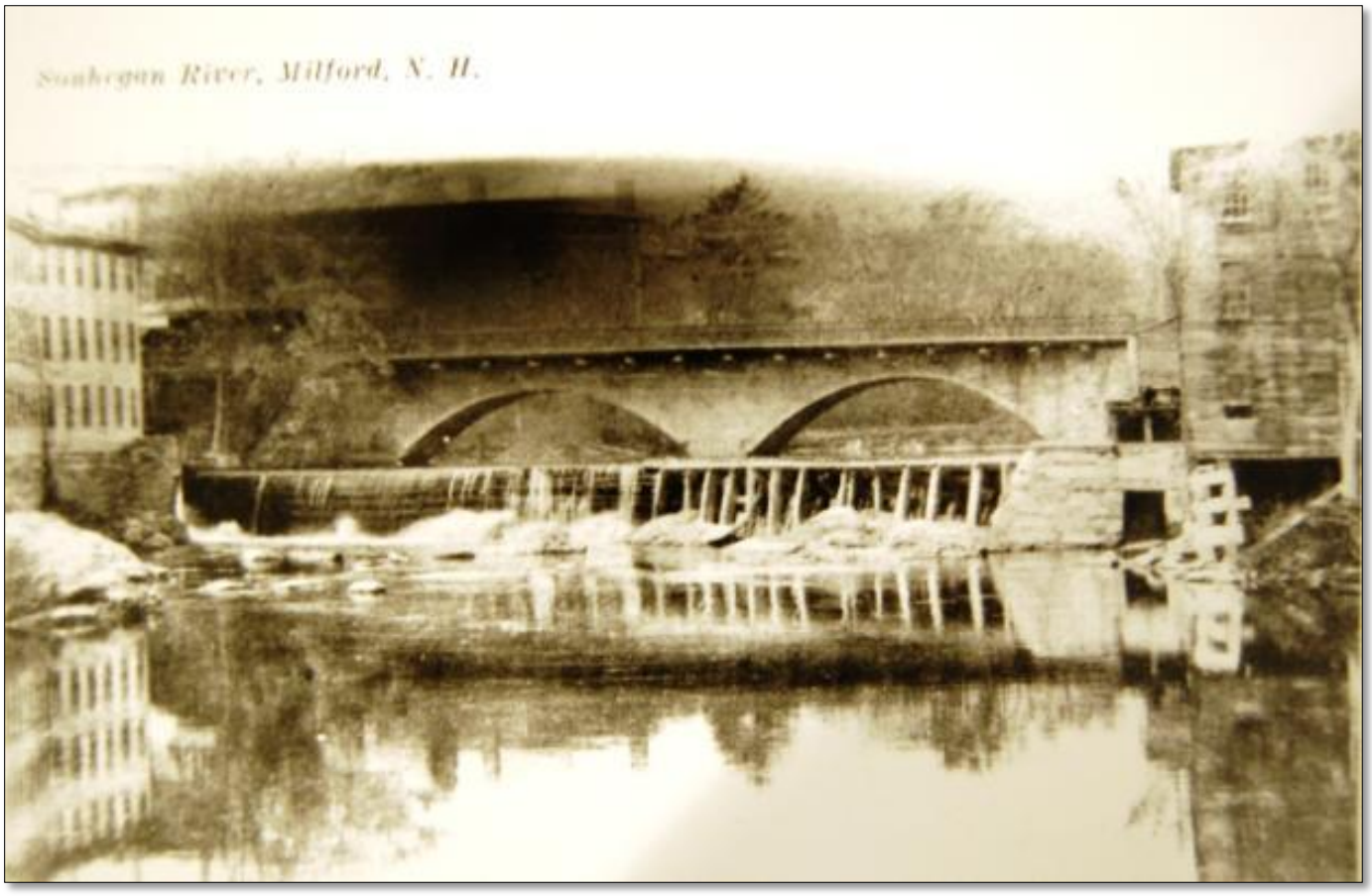

Figure 1. View of the Goldman Dam between 1885 and 1924, looking west (upstream). Timber crib and timber A-frame portions of spillway are shown on left and right, respectively. The stone low-flow outlet (a/k/a sluiceway) at the right end of the spillway is extant, but has been altered through its partial encasement in concrete (source: Milford Historical Society Photograph Collection: P-890).

Figure 2. View of the Goldman Dam between 1912 and 1924, looking south (river flows right to left) (source: Milford Historical Society Photograph Collection: P-1020).

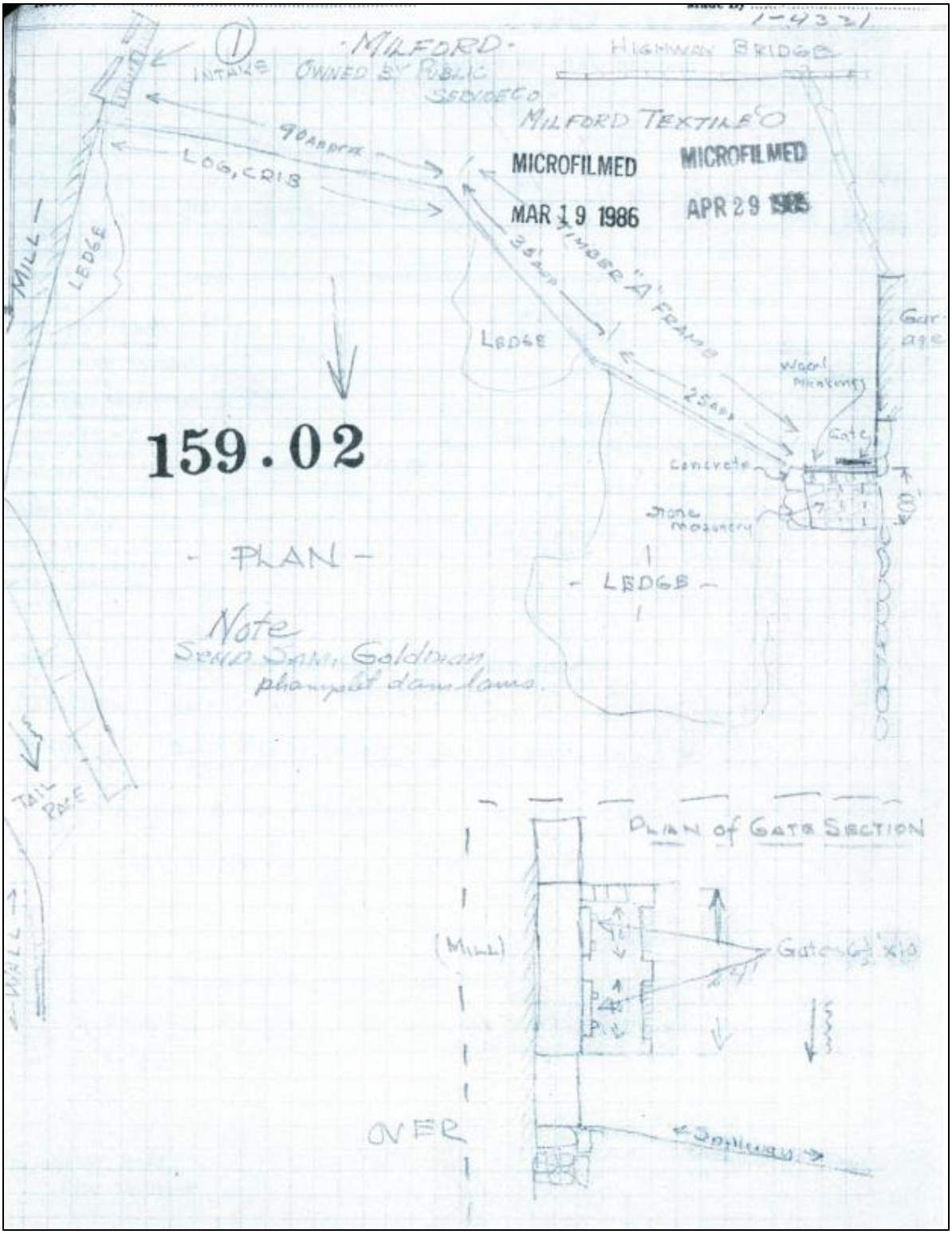

Figure 3. 1935 sketch plan of Goldman Dam (source: New Hampshire DES – Department of Water Resources Dam Bureau File for the Goldman Dam [Dam No. 159.02]).

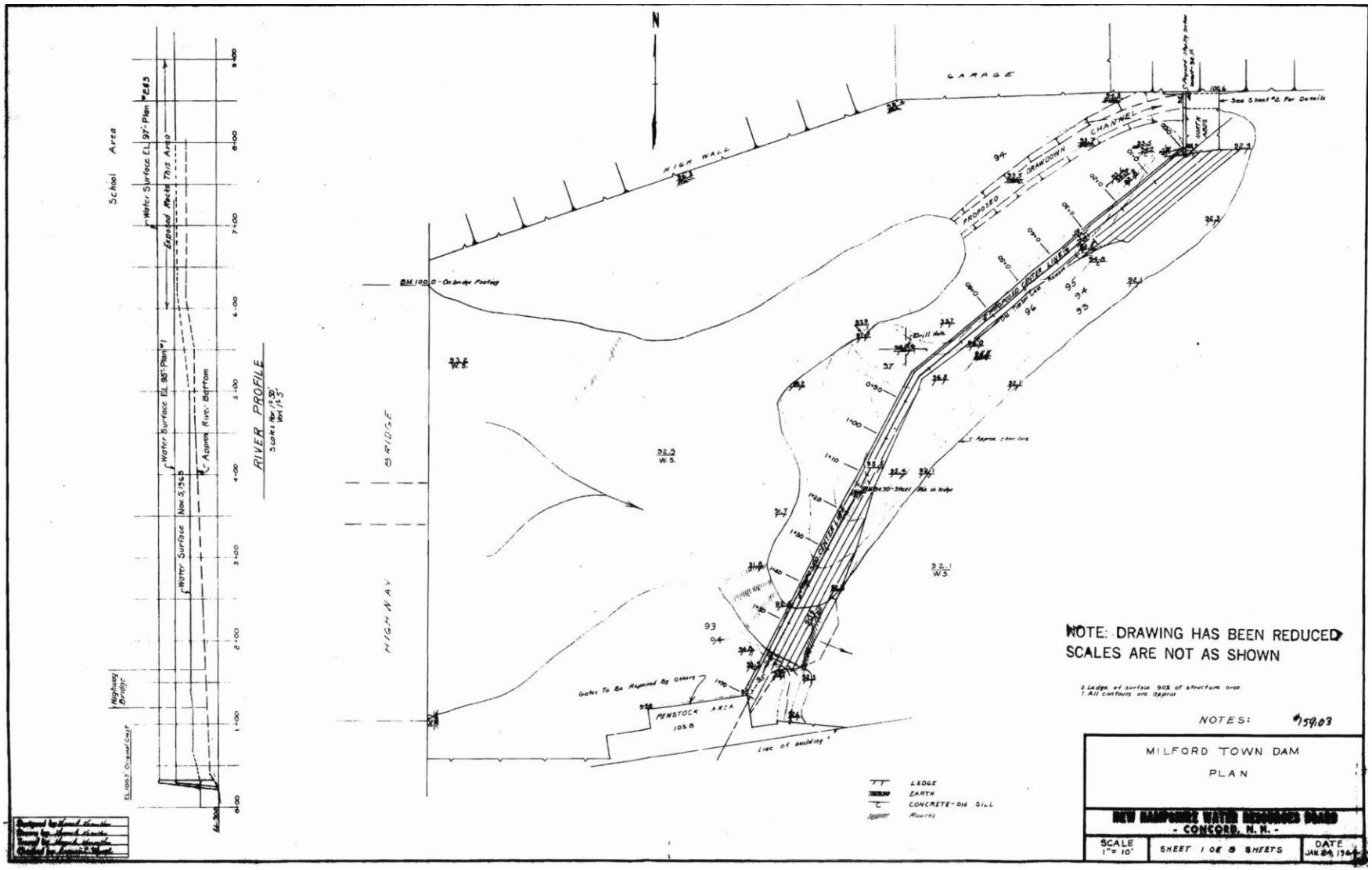

Figure 4. 1964 plan view for Goldman Dam reconstruction (source: New Hampshire DES – Dam Bureau File for the Goldman Dam [Dam No. 159.02]).

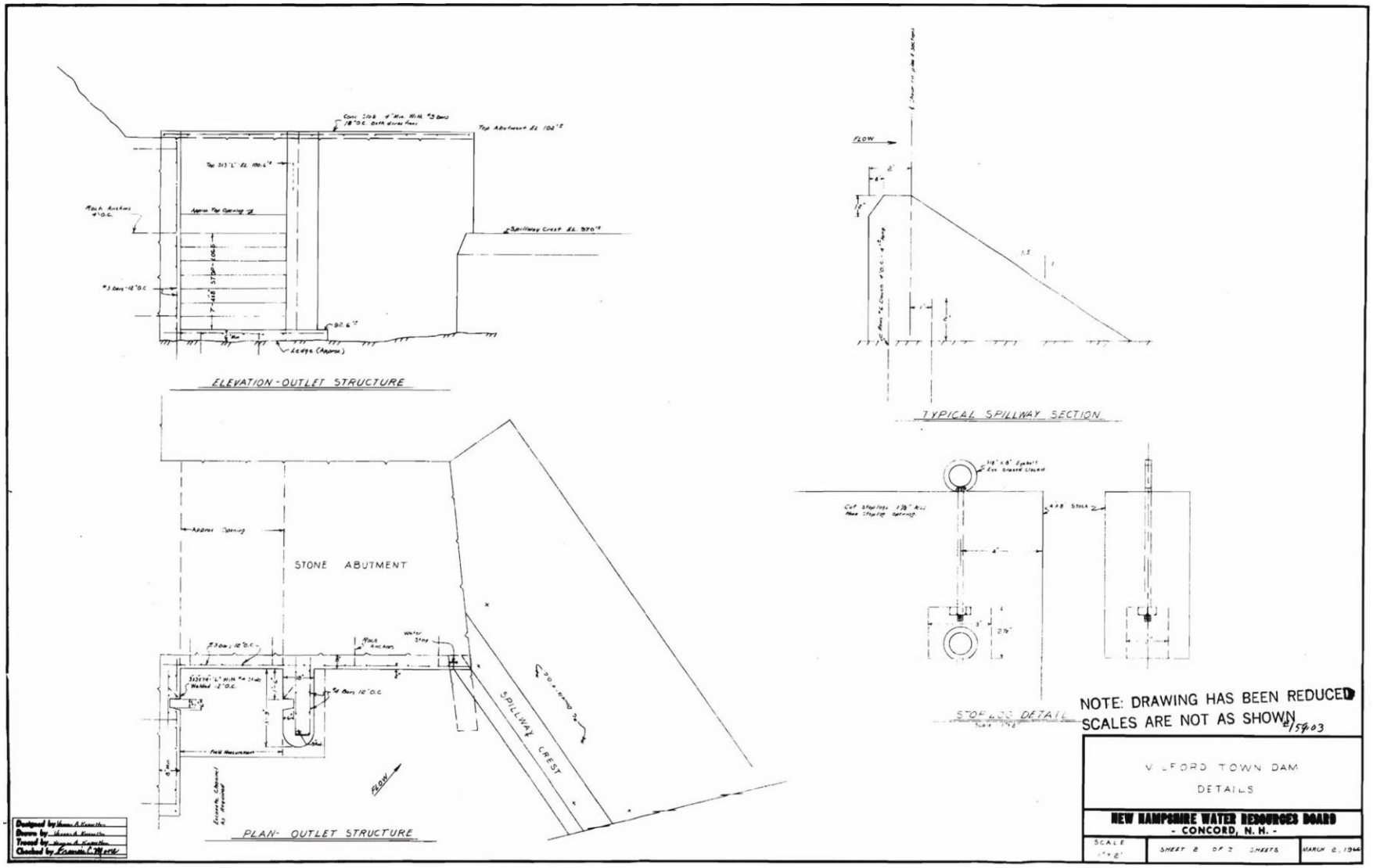

Figure 5. Sluiceway details and spillway cross-section from 1964 plans for Goldman Dam reconstruction (source: New Hampshire DES – Dam Bureau Files for the Goldman Dam [Dam No. 159.02]).

Figure 6. View of current Goldman Dam, looking southwest.

Figure 7. View of current Goldman Dam, looking northeast.

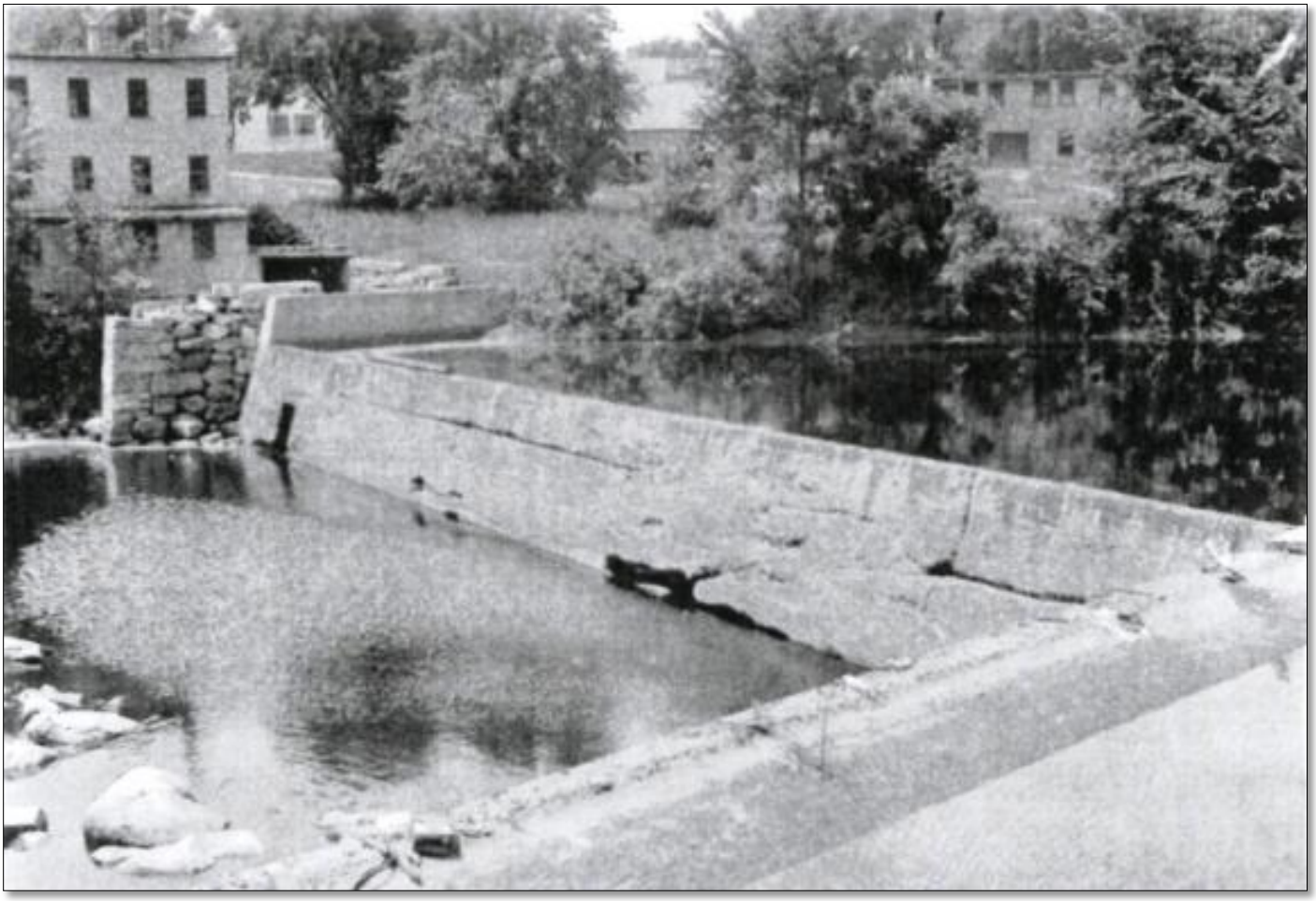

Figure 8. 1935 photographic view of McLane Dam, looking west. The former mill and headrace (both demolished) of John McLane are visible at upper left corner of the image (source: New Hampshire DES – Dam Bureau File for the McLane Dam [Dam No. 159.03]).

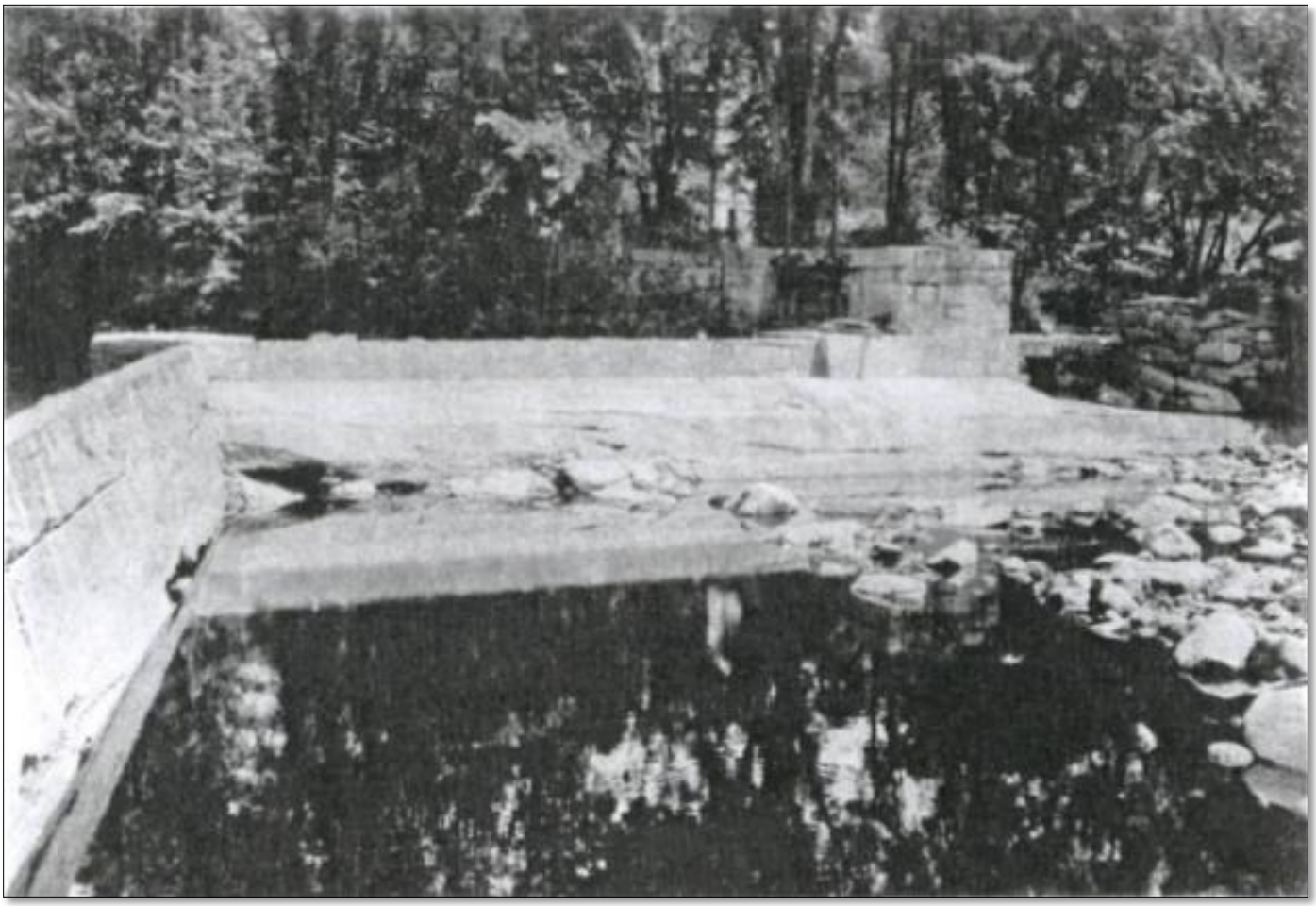

Figure 9. 1935 photographic view of McLane Dam, looking east. The top of the now demolished power canal is visible at the extreme right of the image, adjacent to the gate (source: New Hampshire DES – Dam Bureau File for the McLane Dam [Dam No. 159.03]).

Figure 10. 1979 photographic view of the McLane Dam power canal gate, looking southeast. The stone pier to the right of the gate survives encased in concrete. The gates and the stone pier to the left of the gate have been replaced with the current low-flow outlet (source: New Hampshire DES – Dam Bureau File for the McLane Dam [Dam No. 159.03]).

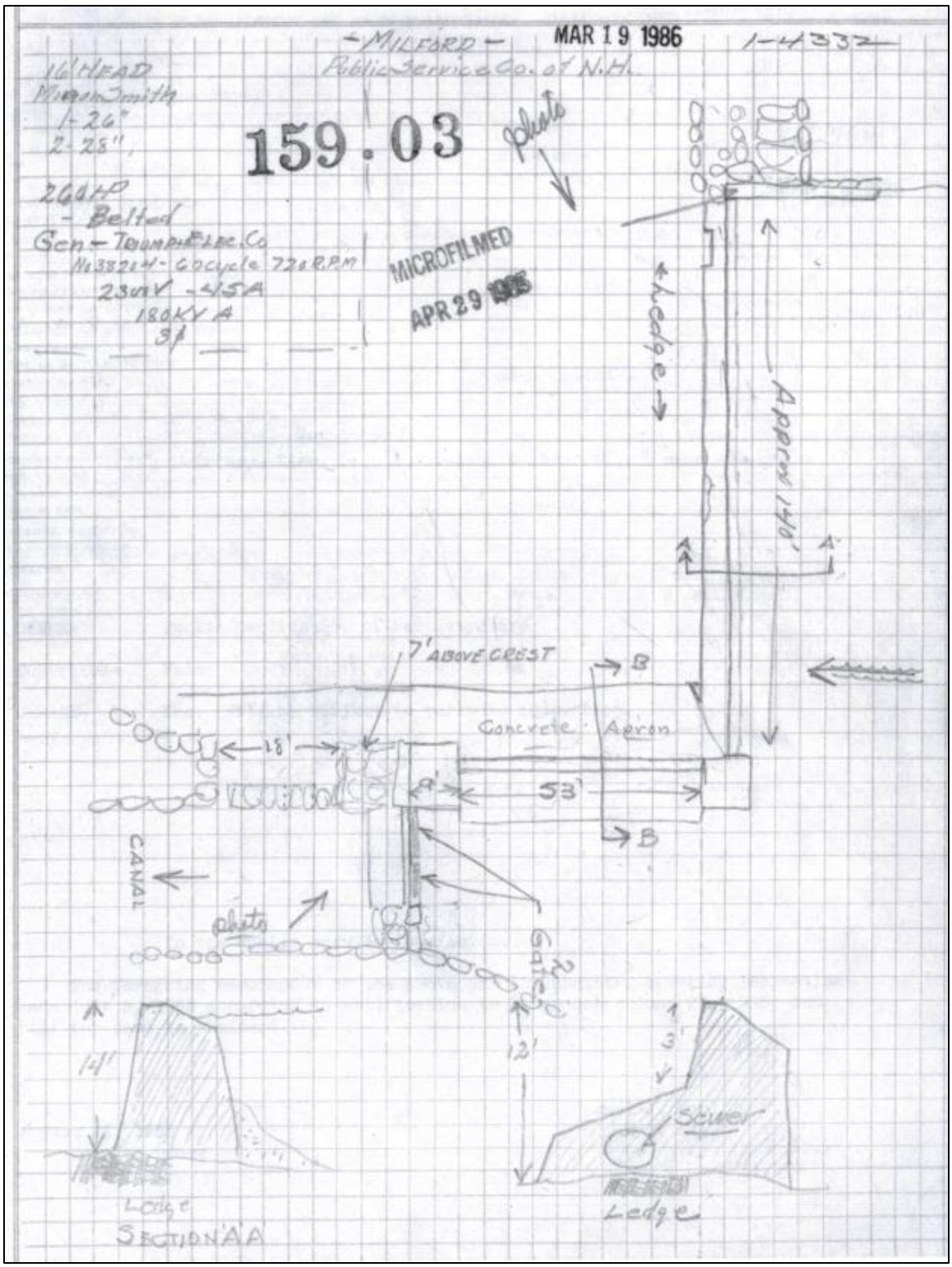

Figure 11. 1935 sketch plan of the McLane Dam. Now-demolished gates and power canal are visible at the bottom of the drawing (source: New Hampshire DES – Dam Bureau File for the McLane Dam [Dam No. 159.03]).

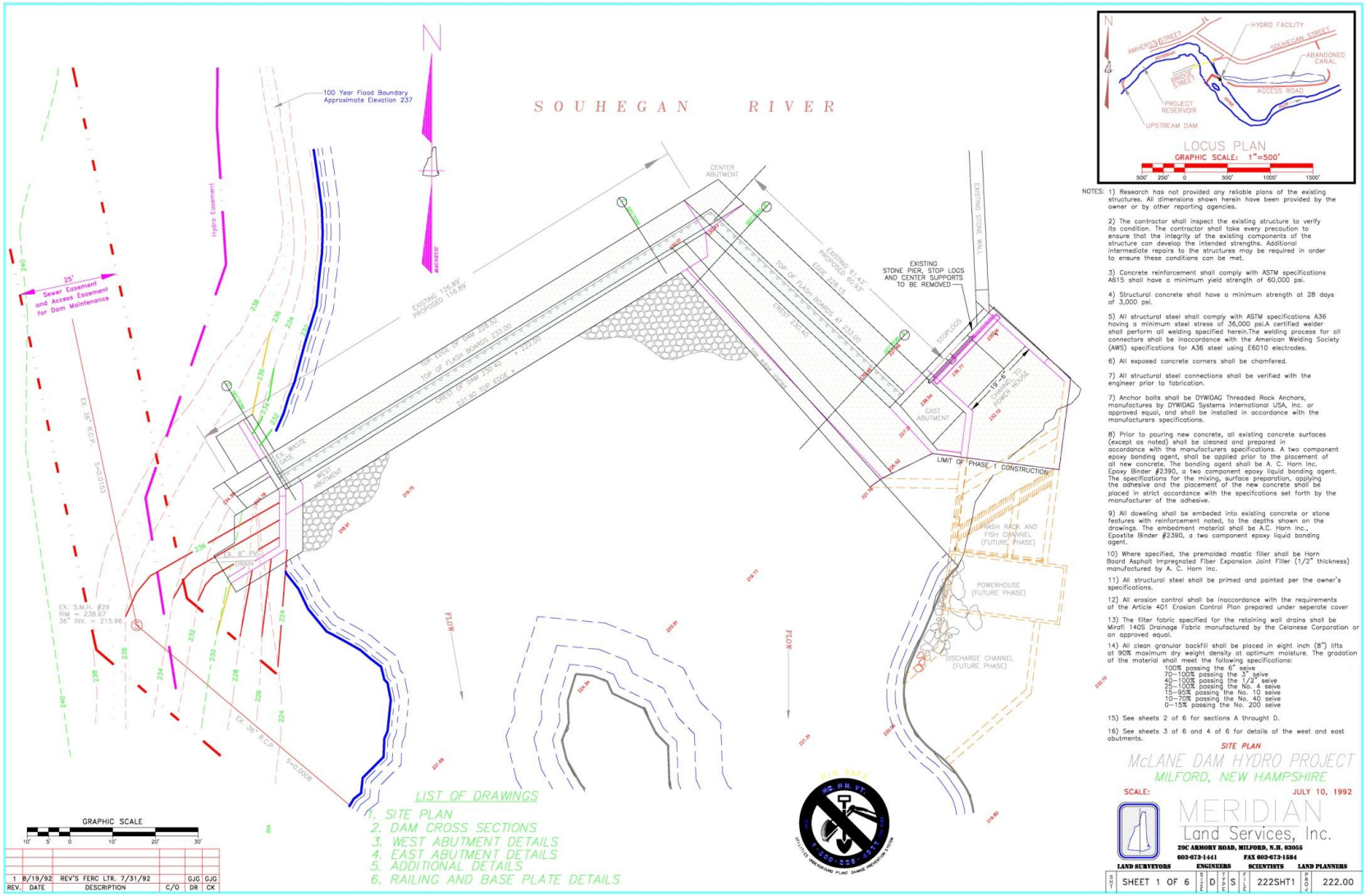

Figure 12. 1992 plan for rehabilitation of the McLane Dam showing existing and proposed conditions (source: Meridian Land Services 1992).

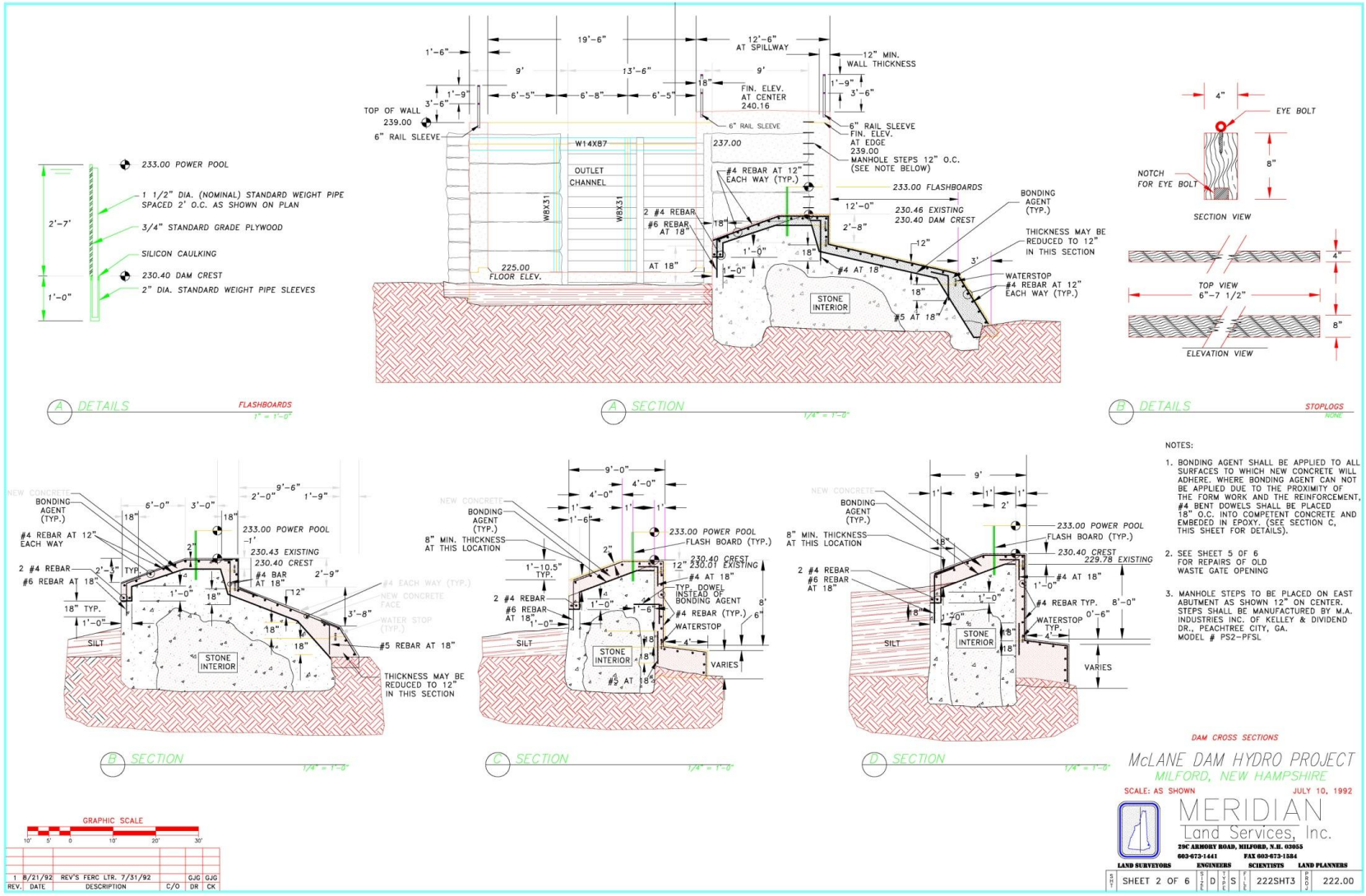

Figure 13. 1992 cross sections of the McLane Dam showing existing and proposed concrete work (source: Meridian Land Services 1992).

Figure 14. View of the McLane Dam gate during 1992 dam rehabilitation, looking north. Pier in center foreground is still extant, now encased in concrete. To the right of pier, the old wood gate structure, a second stone pier, and the top of power canal have been completely removed (source:Anonymous ca. 1992).

Figure 15. View of McLane Dam, looking west (compare to Figure 6). The industrial setting and infrastructure on the river's west bank is entirely gone, destroying the structure's association with the industrial and commercial development of the Downtown Milford HD.

Figure 16. View of McLane Dam, looking east (compare to Figure 7). The former power canal where it connected to the dam is demolished.

Figure 17. Detail of McLane Dam low-flow-outlet, looking south (compare to Figure 8).