U.S. DEPARTMENT OF AGRICULTURE

Natural Resources Conservation Service UIN: EAXX-005-033-1265405860 August 2026

Appendix E: Environmental Assessment of the Souhegan Supplemental Watershed Plan No. 5 and Finding of No Significant Impact

For More Information Contact:
Matt Brown, State Conservation Engineer
273 Locust Street, Ste 2D, Dover, N.H. 03820
Matt.brown@usda.gov
603-285-9175

PROPOSAL INFORMATION

General Information

Proposal Name: Souhegan Supplemental Watershed Plan Number 5 for rehabilitation of Sites 12A North and South, Site 25B and Site 26

Unique Identification #: UIN: EAXX-005-033-1265405860

Proposal Initiation Date: 7/24/2025

Proponent Name: New Hampshire Department of Environmental Services

Signing Authority: NRCS State Conservationist

Responsible Official: Travis Thomason

Unit: New Hampshire NRCS State Office

Anticipated Implementation of Proposal: Construction 2030-2033

Proposal Record Location: Electronic files located in the NRCS, N.H. digital document library

GIS Info: Electronic files located in the NRCS, N.H. digital document library

Proposal Webpage: https://www.nrcs.usda.gov/programs-initiatives/watershed-rehabilitation-program/new-hampshire/dam-rehabilitation-new

General Location of Proposal: The project sites are in the towns of Temple and Wilton in Hillsborough County, New Hampshire.

Purpose and Need: Why is action needed?

The purpose of the federal action is to 1) maintain flood protection for residential, commercial, and agricultural structures and transportation infrastructure in the study area, 2) maintain adequate water storage capacity and quality for drinking water supply for the Town of Greenville, and 3) manage river water flow conditions consistent with the state's Souhegan River Water Management Plan instream flow targets.

Project Need*:*

Safety: The existing Sites 12A North, 12A South, 25B, and 26 dams are classified as High Hazard dams. This hazard classification is based on the prevalence of population, roads and buildings located within the dam breach inundation zone that would be exposed to potential loss of life in the unlikely event of dam failures. Based on the latest dam failure hydraulic analysis, a total of 332 properties with structures fell within the inundation limits of the Breach event floodplain, 283 properties with structures fell within the inundation limits of the 500-year without-dam flood event and, and a total of 176 properties with structures fell within the inundation limits of the 100-year without-dam flood event. Based on prior dam assessments, the sites do not comply with NRCS current performance and safety standards for high-hazard dams. Deficiencies include inadequate conveyance capacity and integrity of auxiliary spillway (erodibility concerns).

Flood Damage Reduction: Flood damage reduction is a major resource problem that led to the development of the 1961 Watershed Work Plan. Flood damage to crops and pastureland, industrial and residential areas, and other fixed improvements periodically caused high damage and inconvenience to the public. At the time of the 1961 report, the average annual benefit of the project was valued at $70,229 ($738,774 in 2024 dollars). Additional downstream development has occurred since the dams were constructed. Under the current analysis, average annual flood damage reduction from the presence of the dams (compared to the No Action condition) is estimated at $55,625.

Maintain Water Supply: The Sites 12A North and South reservoir (Tobey/Greenville Reservoir) serves as a public water supply for the Town of Greenville. This community water system which includes a raw water intake and pumping station at Tobey Reservoir serves domestic and fire flow to about 440 connections and a population of approximately 1,100. In addition, the reservoir provides water to Pilgrim Foods to aid in industrial processes to produce canned/bottled food products (NHDES, 2015). There is a need to maintain drinking water supply for the town and industrial users.

Water Quality Management: The Souhegan River, from its south and west branch confluences in New Ipswich downstream to the Merrimack River, was listed as a Designated River under the New Hampshire Rivers Management Protection Program Act (RSA 483) in 1988. The designation acknowledges the river as important to the state for its outstanding natural and cultural resources. In 2002, the state legislature directed the NHDES to establish protected instream flows and a watershed management plan for the Souhegan River. A protected instream flow is the amount of water needed to support the human and natural uses that depend on the river, and the 2013 management plan details the actions to be implemented to maintain the protected flows (NHDES 2013). Site 12A does not currently have infrastructure that would allow dam operators to help achieve instream flow targets through two-day flow pulses to offset drought conditions.

Proposed Action: What actions are needed?

Rationale for the Preferred Alternative

The alternatives retained for detailed study were discussed during a stakeholder alternatives meeting held on July 26, 2024. As a result of the alternatives meeting, NRCS and NHDES chose Site 12A Alternative 2C, Site 12A Release Pulse Option 1, Site 25B Alternative 1B, and Site 26 Alternative 1C as the Preferred Alternative. The Preferred Alternative was selected based on its ability to meet the purpose and need for the project and provide the most beneficial effects to environmental, social, and economic resources.

The Preferred Alternative brings all four dams (Site 12A North and South, Site 25B and Site 26) into compliance with current NRCS and NHDES dam safety regulations, reducing the potential for downstream economic loss and potentially loss of life in the unlikely event of a dam failure. The Preferred Alternative is also the least costly and has similar or fewer environmental impacts in comparison to the other alternatives considered.

Measures to be Installed

The Preferred Alternative includes modifications to all four dams (Sites 12A North and South, Site 25B and Site 26). The measures to be installed are summarized below for each dam:

Site 12A North:

- Maintain the existing top of dam elevation (El. 878. 6± feet).
- Strip topsoil from the downstream embankment face and install a new internal seepage collection and conveyance system in the form of a chimney and toe drain system.
- Flatten the downstream embankment face to a slope of 3H:1V or flatter.
- Extend the low-level outlet pipe (set in a concrete cradle) and toe drain system to a new concrete endwall as needed to accommodate the flattened embankment slope.
- Remove woody vegetation, including trees and tree stumps, within 25 feet of the new downstream embankment toe.

Site 12A South:

- Strip topsoil from the crest and downstream embankment face and armor the embankment crest and downstream embankment face with Roller Compacted Concrete (RCC). Set RCC on a dual aggregate drainage system which also serves as a new internal seepage collection system. Place RCC in lifts, creating a stepped face having a 3H:1V slope or flatter on the downstream embankment face and extend the RCC downstream beyond the downstream embankment toe to form a stilling basin. The stilling basin is to be founded on competent rock, or in the absence of competent rock, install a sheetpile cutoff wall at the downstream end of the stilling basin to prevent scouring and undermining of the RCC system. Provide a smooth finish on the left and right sidewalls of the RCC chute to direct overtopping flow towards the stilling basin.
- Lower the dam crest to match the elevation of the existing auxiliary spillway crest (El. 872. 4± feet) and provide 280 feet (minimum) of crest length which is armored with RCC.
- Fill in the existing auxiliary spillway, creating a top of dam elevation that is no lower than the top of dam elevation of Site 12A North (El. 878. 6±).
- Remove the existing concrete impact basin and extend the principal spillway conduit through the RCC overtopping protection into the new RCC stilling basin. Configure RCC as needed to provide adequate energy dissipation for the principal spillway outfall.
- To minimize visual and cultural impacts associated with the RCC overtopping protection, cover the RCC with two feet (minimum) of topsoil. The top-soil covering is not to be provided over the RCC located on the crest of the dam or within the impact basin for the principal spillway outfall.
- Modify the two orifices in the principal spillway riser which set normal pool to accommodate a two-day release pulse into Richardson Brook during extreme drought conditions. This includes lowering the invert of each orifice by 12 inches and mounting a stop log system in front of each orifice capable of raising the normal pool of the reservoir by two feet (i. e., from El. 860. 2 to El. 862. 2). The modifications should include a trash rack over each stop log system and the addition of a working platform or extension of the principal spillway riser top slab as needed to allow maintenance personnel to safely access each stop log system.

Site 25B:

- Raise the top of dam to contain the Freeboard Hydrograph (raise to El. 809. 0± feet).
- Strip topsoil from the downstream embankment face and install a new internal seepage collection and conveyance system in the form of a chimney and toe drain system.

- Flatten the downstream embankment face to a slope of 3H:1V or flatter.
- Extend the principal spillway conduit (set in a concrete cradle) and toe drain system to a new plunge pool set at the toe of the flattened downstream embankment.
- Replace the principal spillway riser structure with a new structure that (1) meets earthquake loading requirements, and (2) contains additional conveyance capacity within the flood retarding zone to meet the 10-day drawdown requirement.
- Move the auxiliary spillway control section downstream and add a concrete cutoff wall to interrupt potential head cutting through the auxiliary spillway. Locate the cutoff wall such that it is at or beyond the downstream embankment toe and use excavated material to extend the left training berm of the auxiliary spillway to direct spillway flows away from the dam embankment. Maintain the existing auxiliary spillway crest elevation (El. 801. 8 feet). Regrade the auxiliary spillway approach channel to slope uniformly from the new control section back into the reservoir at a one percent slope (minimum). Regrade the auxiliary spillway discharge channel to slope uniformly at an 11± percent slope from the new control section in a downstream direction to meet existing ground.

Site 26:

- Raise the top of dam to contain the Freeboard Hydrograph (raise to El. 928. 5± feet).
- Strip topsoil from the downstream embankment face and install a new internal seepage collection and conveyance system in the form of a chimney and toe drain system.
- Flatten the downstream embankment face to a slope of 3H:1V or flatter.
- Extend the principal spillway conduit (set in a concrete cradle) and toe drain system to a new plunge pool set at the toe of the flattened downstream embankment.
- Replace the principal spillway riser structure with a new structure that (1) meets earthquake loading requirements, and (2) contains additional conveyance capacity within the flood retarding zone to meet the 10-day drawdown requirement.
- Add a RCC stepped cutoff wall with a 320-foot-wide control weir will be added at the auxiliary spillway control section to interrupt potential erosion and head cutting, preventing a breach of the dam through the auxiliary spillway. Founded on bedrock, the RCC cutoff will be located below grade and will contain left and right training walls to ensure flows are directed over the structure. A RCC stepped cutoff wall is assumed due to the depth to bedrock found during the limited subsurface exploration plan performed as part of this Plan-EA. Should future subsurface exploration programs performed during preliminary/final design determine competent rock is higher in elevation, the use of conventional concrete should be evaluated to determine the most economical construction material. Disturbed areas within the auxiliary spillway will be restored to their current grades and stabilized with vegetation.

Alternatives to the Proposed Action: Are there other ways to meet the purpose and need?

No Action Alternative

The No Action Alternative assumes no work beyond routine operation and maintenance will be undertaken by the local sponsor, until such time that the dams are expected to fail. The dams will be assumed to operate under the existing performance until the recurrence rainfall event is reached which is expected to result in a dam breach under the existing conditions. Once the

first failure inducing event is determined for any one of the four dams, it is assumed that this event would cause a failure at all four dams.

The minimum rainfall depth causing failure at any of the four dams is that which will cause a headcut failure of the auxiliary spillway leading to a breach of the dam. Based on analyses completed, rainfall depth leading to headcut failure is less than rainfall leading to overtopping failure at each site; therefore, the headcut failure is the most probable failure mode. The auxiliary spillway integrity analysis was performed using the previously developed SITES model for each individual dam, which included soil properties developed as part of this planning study. For each dam, the rainfall depth was incrementally increased by 0.5" until an event resulting in a breach was reached. The rainfall depths and approximate recurrence interval of the event leading to an auxiliary spillway breach are summarized in Table 1. The approximate recurrence interval for the failure precipitation depth was determined by extrapolating the NRCC (Northeast Regional Climate Center) rainfall frequency data.

Site 12A would fail due to head cutting during a 16.5" rainfall event. As all four dams are considered as a unit, inundation modeling was conservatively developed assuming that all four dams fail during the 16.5-inch storm (approach confirmed with NRCS).

Table 1. Estimated Rainfall Depths Which Induce Dam Failure for the No Action Alternative

Site	Auxiliary Spillway Crest (ft)	Rainfall event (in)	Frequency (yr)
12A North and South	872.4	16.5	2100
25B	801.8	18.0	3000[1]
26	922.1	28.5	19300[1]

[1]For this study, it was assumed that all four dams would fail at the most frequent storm that causes failure at one of the dams. This simplified approach was adopted to accommodate study funding availability and was confirmed with the NRCS during scoping.

For the No Action Alternative dam breach analyses, the current HEC-RAS models were used as the base geometry for each dam's downstream reach. The inflow hydrograph from the SITES analysis was routed into a storage area for each respective dam in HEC-RAS. The breach parameters were developed based on previous experience, according to the dam type, and modified as needed to ensure model stability. Breach parameters are summarized in Table 2.

Table 2. Breach Parameters for the No Action Alternative

Site	Final Bottom Width (ft)	Side Slopes	Breach Formation Time (hr.)	Breach Height (ft)
12A North and South	79	1:1	1	29.5
25B	235	1:1	1	56
26	185	1:1	1	69

The downstream inundation area resulting from a dam breach is shown on Figure 94 in Appendix C and Figures D.14 and D.15 in Appendix D and is used as the Economic Study Area Boundary.

Future Without Federal Investment

Based on coordination with NHDES, the owner of the dams and sponsor, it was determined that the Future Without Federal Investment (FWOFI) Alternative would be the same as the No Action Alternative. NHDES's most likely course of action, in the absence of federal funding, would be to leave the dams in place with routine maintenance. The risk of a breach would remain with the same likelihood of occurrence.

Action Alternatives

Various structural dam rehabilitation alternatives were considered to bring Sites 12A (North and South), 25B and 26 into compliance with current dam safety standards. Table 3 summarizes the structural alternatives considered and identifies whether the alternative was retained for detailed study.

Table 3. Structural Rehabilitation Alternatives Considered

Site	Alternative No.	Alternative Description[1]	Retained for Detailed Study?
12A	1	Raise top of dam and flatten downstream embankment face (North & South Dams). Add RCC auxiliary spillway drop structure (South Dam).	No
	2A	Flatten downstream embankment face (North & South Dams). Widen auxiliary spillway & add RCC auxiliary spillway drop structure (South Dam).	No
	2B	Flatten downstream embankment face (North & South Dams). Add labyrinth spillway with concrete chute within existing auxiliary spillway (South Dam).	No
	2C	Flatten downstream embankment face (North Dam). RCC overtopping protection & backfill existing auxiliary spillway (South Dam).	Yes
	3	Release Pulse (to be considered in addition to the other Site 12A Alternatives) (South Dam).	Yes
25B	1A	Raise top of dam, replace principal spillway riser structure, add cutoff wall and ACB armoring to auxiliary spillway	No
	1B	Raise top of dam, replace principal spillway riser structure, add cutoff wall to auxiliary spillway & move control section downstream	Yes
	2A	Widen auxiliary spillway, replace principal spillway riser structure, add cutoff wall and ACB armoring to auxiliary spillway	No
	2B	Widen auxiliary spillway, replace principal spillway riser structure, add cutoff wall to auxiliary spillway & move control section downstream	No
26	1A	Raise top of dam, replace principal spillway riser structure, add cutoff wall and ACB armoring to auxiliary spillway	No

Site	Alternative No.	Alternative Description[1]	Retained for Detailed Study?
	1B	Raise top of dam, replace principal spillway riser structure, add mass RCC cutoff wall at auxiliary spillway control section	No
	1C	Raise top of dam, replace principal spillway riser structure, add stepped RCC cutoff wall at auxiliary spillway control section	Yes
	2A	Widen auxiliary spillway, replace principal spillway riser structure, add cutoff wall and ACB armoring to auxiliary spillway	No
	2B	Widen auxiliary spillway, replace principal spillway riser structure, add mass RCC cutoff wall at auxiliary spillway control section	No
	2C	Widen auxiliary spillway, replace principal spillway riser structure, add stepped RCC cutoff wall at auxiliary spillway control section	No

[1]All alternatives (not including the Site 12A Release Pulse) include flattening the downstream embankment face and addition of internal seepage collection and conveyance systems.

[2]Alternatives considered but eliminated from detailed study are described in Section 4.3 and alternatives retained for detailed study are described in Section 4.4 of the Supplemental Watershed Plan.

Final Array of Alternatives

Sites 12A (North and South), 25B and 26 each contain similar deficiencies which will be addressed in the same manner for all alternatives. These include (1) material compatibility concerns and pipe deterioration associated with the internal seepage collection and conveyance systems, (2) embankment slope stability concerns with the reservoir at the flood surcharge elevation, and (3) the NRCS 10-day drawdown requirements are not met. The rehabilitation approach for each of these deficiencies at each dam is as follows:

Internal Seepage Collection and Conveyance and Embankment Slope Stability: The existing toe drain systems will be abandoned and a new toe drain system will be installed at the downstream toe of the existing dams. The new toe drain will consist of a dual aggregate filtering system designed to be compatible with the embankment soils and will contain a perforated non-corrosive plastic or HDPE pipe for collecting and conveying seepage to the downstream receiving channel. Weir boxes or other devices are recommended to allow accurate monitoring of seepage flow.

Additional seepage protection will be provided by the installation of a chimney (or blanket) drain on the downstream embankment face consisting of a fine aggregate designed to be compatible with the embankment soils. Topsoil and organic material will be stripped from the embankment to receive the chimney drain. The chimney drain will connect to the new toe drain system to allow collected seepage to be conveyed to the downstream toe of the dam. A filter diaphragm will be added around the principal spillway conduit which may be connected to the toe drain system.

Approved fill from project excavations will be used to cover the seepage collection system and flatten the downstream embankment slope to 3H:1V or flatter to improve slope stability and meet NRCS factors of safety.

Flattening the downstream embankment slope will require an extension of the principal spillway conduit, and, in the case of Site 12A North, an extension of the low-level outlet conduit. All pipe extensions will be set on a concrete cradle. The existing energy dissipation feature at each principal spillway/low-level outfall (i.e., either riprap-lined plunge pools or, in the case of Site 12A South, a concrete impact basin), will be reconstructed at the new outfall location. During the extension of the principal spillway conduits, base flow will be temporarily pumped around the dam to allow work to occur in the dry.

NRCS 10-Day Drawdown: NRCS requires the principal spillway to dewater at least 85 percent of the spillway hydrograph within 10-days following the 100-year storm event. The intent of this requirement is to reduce the frequency of activating the auxiliary spillway as flows in a vegetated earth auxiliary spillway can damage vegetation, make the auxiliary spillway vulnerable to erosion, and increase maintenance costs for the Sponsor(s). Typically, the elevation of the auxiliary spillway crest is set such that the frequency of activation is less than the one-percent chance flood event (i.e., the 100-year event). Although the auxiliary spillway crest for Sites 12A, 25B and 26 are all set above the estimated 100-year water elevation, the NRCS 10-day drawdown criteria is not met due to the hydraulics of the principal spillway.

The 10-day drawdown requirement can be met by increasing the size or number of orifices in the principal spillway riser structures. Based on the 2016 Assessments, the existing orifice heights for Sites 12A, 25B and 26 would need to be increased by 7 inches, 10 inches, and 6 inches, respectively, to comply with the 10-day drawdown requirement. Modifications to Site 12A to accommodate the dry weather release pulse (such as raising normal pool), could eliminate the need to modify the orifice which sets normal pool. Depending upon how the dry weather release pulse is addressed, the need to modify the Site 12A orifice should be reevaluated during preliminary/final design.

Concerns associated with erosion and increased maintenance costs resulting from frequent activation of the auxiliary spillway would be reduced for alternatives involving a hardened spillway, such as Articulated Concrete Blocks or Roller Compacted Concrete. For alternatives that involve a hardened auxiliary spillway, the Sponsor may consider requesting a waiver of the 10-day drawdown requirement to maintain the existing dimensions of the orifices that set normal pool.

Based on the 2016 Assessments, Sites 12A South, 25B and 26 each have inadequate conveyance capacity and auxiliary spillway integrity concerns, meaning each dam is at risk of (1) being overtopped during the freeboard hydrograph event and (2) the auxiliary spillway is at risk of erosion during events which activate the auxiliary spillway. Both scenarios could lead to a breach of the dam resulting in an uncontrolled release of the reservoir. The following alternatives address conveyance capacity, spillway integrity and other identified deficiencies and include the rehabilitation options listed above for addressing internal seepage collection and conveyance, embankment stability and the NRCS 10-day drawdown requirements.

Site 12A Alternative 2C

This alternative consists of increasing the conveyance capacity of Site 12A by armoring the downstream embankment face of Site 12A South with RCC and allowing the freeboard

hydrograph to overtop the dam. The existing auxiliary spillway crest elevation (El. 872. 4±) and the top of dam elevation (El. 878. 6± at Site 12A North) would remain unchanged to maintain the current level of flood protection and avoid upstream impacts around the rim of the reservoir. The embankment crest of Site 12A South would be lowered to match the auxiliary spillway elevation to create a minimum crest length of 280 feet to pass the freeboard hydrograph event without overtopping Site 12A North. This alternative places the existing water supply intake building within the approach channel to the RCC overtopping protection. While small in comparison to the overall length of the RCC crest, the impact the water supply intake building may have on the hydraulic performance of the auxiliary spillway should be evaluated during preliminary/final design.

The RCC would be placed in one-foot-thick horizontal lifts to form steps (typically 1 to 2 feet high) having a slope of 3H:1V to cover the downstream embankment face. The RCC would extend beyond the downstream embankment toe to form a stilling basin. Due to the depth of bedrock in this area, a sheetpile cutoff wall will be installed along the downstream edge of the stilling basin to prevent potential scouring and erosion within the downstream receiving channel from undermining the RCC structure. The left and right sidewalls of the RCC structure will be provided with a smooth finish and sloped at 2. 5H:1V to direct overtopping flows into the stilling basin. The principal spillway conduit would be extended through the RCC overtopping protection, utilizing the RCC stilling basin to dissipate energy, eliminating the need for a separate impact basin. To avoid large areas of standing water within the stilling basin (which may be viewed as a safety concern), those portions of the stilling basin beyond the location of the principal spillway outfall could be backfilled with earth material. This material would be considered sacrificial and may be scoured out in the event the auxiliary spillway is activated. To reduce the visual impacts associated with the RCC overtopping protection, it is recommended the RCC steps and side walls be covered with topsoil and seeded. The 280-foot-long auxiliary spillway crest should remain exposed to create a uniform and stable crest elevation. Extension of the principal spillway conduit and the work associated with the RCC stilling basin would require base flows in Richardson Brook to be temporarily pumped over the dam to allow the work to occur in the dry. Excavated material from the RCC overtopping protection activities will be used to backfill the existing auxiliary spillway. Refer to Appendix C, Figures 38 through 41 for a conceptual plan of the RCC overtopping protection alternative.

The Site 12A Alternative 2C does not impact high sensitivity cultural resource areas but does alter Site 12A (North and South) which are NRHP-eligible dams. The project would restore Site 12A North to a vegetated condition, minimizing visual impacts. The RCC overtopping protection on the downstream face of Site 12A South will be covered with topsoil and seeded to create a vegetated condition, minimizing visual impacts. Coordination with the New Hampshire Department of Natural and Cultural Resources, Division of Historical Resources, has determined that this approach will result in “no adverse effect” on the resource (refer to Appendix A). Alternative 2C is expected to have environmental impacts, including 0. 30± acres of permanent wetland disturbance, 65± linear feet of permanent stream disturbance, and 0. 5± acres of tree clearing. This alternative will not result in increased reservoir elevations. Currently, NHDES owns the land surrounding the reservoir to the east of Route 45, and, according to the property deeds, flowage easements are in place for lands up to El. 876. 1 (NAVD88) located to the west of Route 45 along Richardson Brook and Miller Gamble Brook. Consequently, land rights are in place for all lands located below the auxiliary spillway crest elevation except for properties owned by Marta M. and Marck C. Scott located along the

eastern side of the reservoir. These properties are identified as “Conservation Easements”, restricting the type and extent of development which is allowed. Refer to Table 4 for a side-by-side comparison of the alternatives retained for detailed study.

Construction costs for Site 12A Alternative 2C to modify both Sites 12A North and South are estimated at $10. 6 million, which include a 30 percent contingency to account for unknowns and alterations of the design which may occur during the preliminary and final design phases. Incorporating costs for Engineering, Permits, and Construction Management (assumed to be 10%, 0. 5% and 12%, respectively, of the estimated construction costs), the total program costs for this alternative are estimated at $13. 0 million. Refer to Appendix D for additional information related to the estimated construction costs.

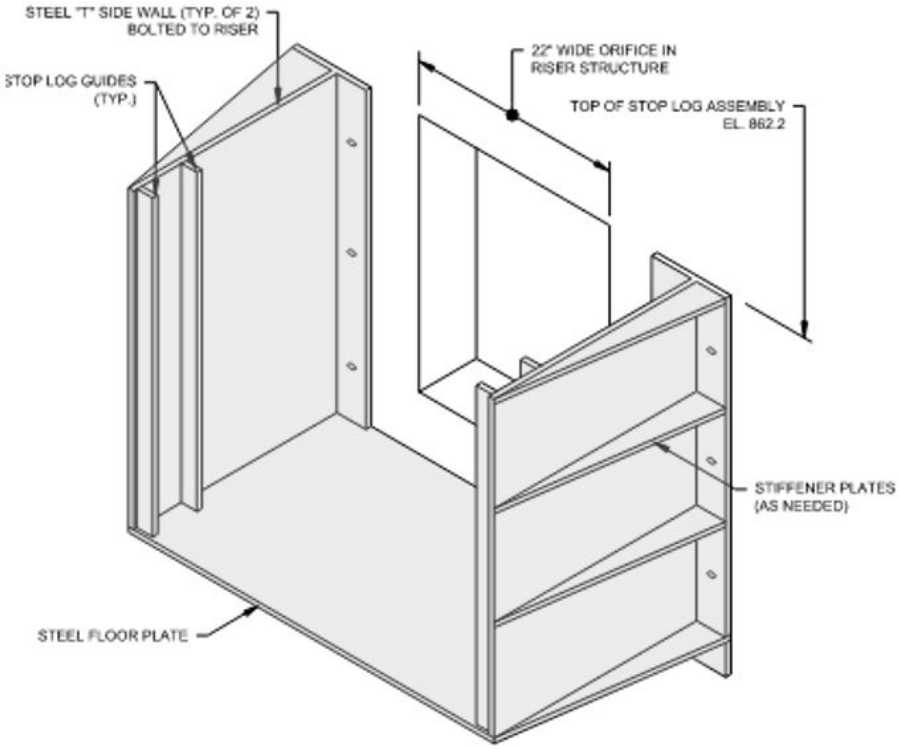
Site 12A - Release Pulse

During the scoping process, NHDES requested the Plan-EA consider modifications to Site 12A to dedicate two feet of reservoir storage for a two-day release of water into Richardson Brook during extreme drought conditions, targeting a release rate of 37 cfs to 47 cfs. This release, when coordinated with release pulses from other dams in the watershed, is intended to improve water quality and support aquatic life in the downstream reaches of the Souhegan River. While not required to bring Site 12A into compliance with current dam safety regulations, NHDES wishes to accommodate the release pulse to the greatest extent practicable.

The dedicated release pulse volume could be located below the normal pool elevation. Should this be considered, a safe yield study is recommended to evaluate the impact this will have on the water supply volume for the Town of Greenville. For this Plan-EA, it is assumed the normal pool elevation will be raised by two feet (i. e., from El. 860. 2 to El. 862. 2) to accommodate the release pulse volume, reducing the flood retarding volume of the reservoir. An evaluation of the 100-year storm event found the reservoir elevation would increase by approximately 1.6 feet (from El. 869. 8 feet to El. 871. 4 feet) due to the reduced flood retarding volume and would remain below the elevation of the auxiliary spillway crest (El. 872. 4 feet). Consequently, modifications to the auxiliary spillway are not required as a result of raising the normal pool by two feet. When combined with Site 12A Alternative 2C, the increase in the normal pool elevation will not result in increased reservoir levels during the freeboard hydrograph. The increase in normal pool will impact approximately 0. 9 acres of wetlands around the rim of the reservoir (refer to Appendix C, Figure 43).

Raising the normal pool elevation by 2 feet can be accomplished by modifying or replacing the Site 12A South principal spillway riser structure. As a cost savings to replacing the riser structure, a stop log system can be added in front of each orifice that sets normal pool to create the desired rise in water elevation (refer to Figure 4. 1 and Appendix C, Figure 42). A robust trash rack is recommended that can prevent debris from clogging the orifices when the stoplogs are either in place or removed. To assist with installation and removal of the stop logs, a working platform is recommended that extends beyond the top of the principal spillway riser structure and over the stop log system to allow access from the top of the riser.

Figure 4. 1. Isometric View of Conceptual Stop Log Assembly (Typical of Two)



Note: Stop logs not shown for clarity.

The following options were evaluated for creating the 37 cfs to 47 cfs release from the reservoir during extreme drought conditions. Option 1 was selected by NHDES as a component of the preferred alternative.

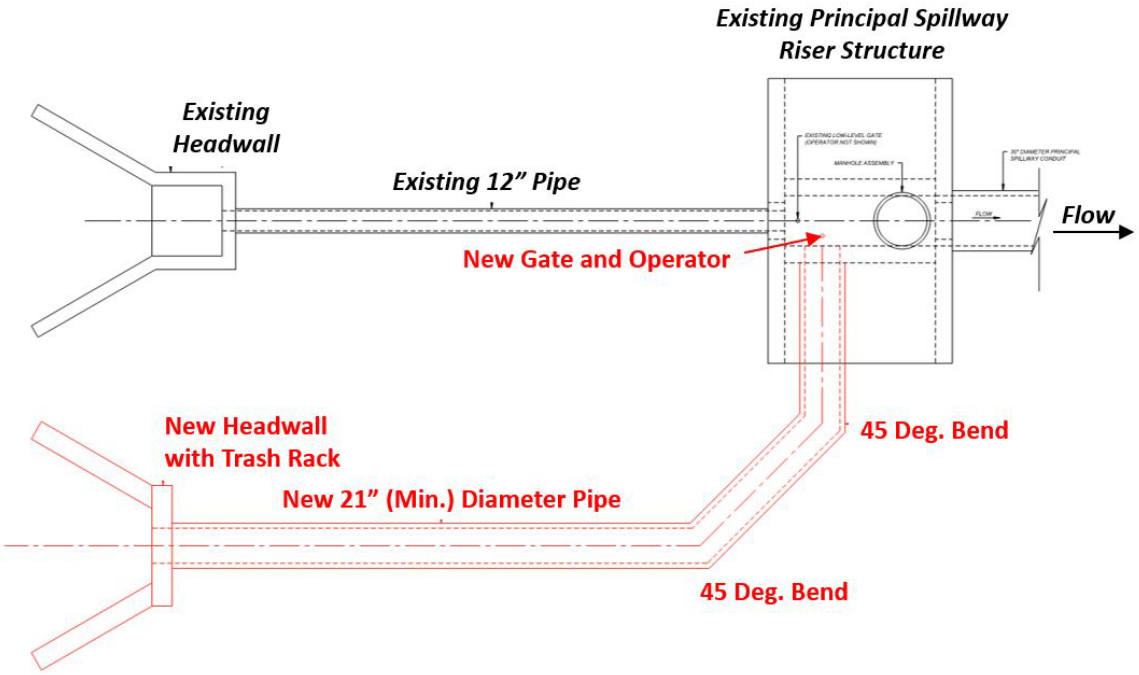
Option 1 (Operation of the Stop Log System): Permanently lower the invert of each orifice (2) that sets normal pool by 12 inches to increase the capacity of the system. Initiate the release pulse by removing all stop logs from one stop log bay which will produce a flow rate of approximately 46 cfs when combined with the operation of the existing low-level outlet works (assuming the reservoir is at normal pool). As the reservoir level falls the release rate will drop to approximately 36 cfs after the first day of operation, at which time the second set of stop logs can be removed to reestablish the release rate of approximately 46 cfs. Construction costs could range between $100k and $200k, depending upon the complexity and robustness of the stop log system and associated trash rack and working platform.

Option 1 is a simple and cost-effective approach to producing the desired release pulse from Site 12A. However, it relies on the reservoir being at the normal pool elevation at the start of the release pulse, which may or may not be the case depending upon the severity of the drought and water withdrawals from the reservoir. Options which pull water from the bottom of the reservoir would provide a more reliable means for ensuring the release pulse can be created (refer to Options 2 and 3).

Option 2 (Addition of Larger Low-Level Outlet System): The existing low-level outlet at Site 12A South is a 12” conduit controlled by a gate on the interior of the principal spillway riser structure. With the gate in the fully open position and with the reservoir at normal pool, the

existing system can release approximately 14 cfs, approximately 30 percent of the target release rate. To achieve the target release rates, a low-level outlet having a minimum diameter of 21 inches is required to produce flow rates of 40 cfs to 45 cfs with the reservoir between El. 860 feet and El. 862 feet, respectively. The new low-level outlet would parallel the existing system and enter either the left or right side of the principal spillway riser where a slide gate would control the operation of the system. Figure 4. 2 provides a conceptual layout of the new low-level outlet system with the new features shown in red. Construction of the new low-level outlet would require the reservoir to be drained, or a cofferdam and diversion of water system would be needed to perform the work in the dry. Excavation and backfilling activities for the new low-level outlet system should be carefully considered so as not to compromise the integrity of the dam embankment. Construction costs could range between $300k and $400k.

Figure 4. 2. Conceptual Layout of New Low-Level Outlet



Low-level outlet systems are subject to sedimentation, debris buildup, and gate failures which could reduce the effectiveness of the system in delivering the required flow rates, and in the case of Site 12A, a failure of the gate could inadvertently drain the reservoir, resulting in the loss of water supply volume for the Town of Greenville. The use of a siphon would eliminate the concern associated with inadvertently draining the reservoir (refer to Option 3).

Option 3 (Addition of Siphon System): Siphons can be an effective way to move water over low-height structures. For Site 12A South, a siphon having a diameter of at least 24 inches would be needed to produce the target release rates. In addition to piping, the system would likely include a multiple port intake structure situated on the bottom of the reservoir immediately upstream of the dam embankment and priming/control valves located at the high point of the system and at the downstream end of the system. An energy dissipation structure should be included at the siphon outfall to ensure flows do not cause erosion of the receiving

channel. The effectiveness of siphon systems can be reduced by sedimentation and debris buildup; consequently, the siphon entrance should be cleared of all objectionable material prior to operation.

Construction of the upstream portion of the siphon system could be performed in the wet with dive crews, or a cofferdam system could be installed to isolate the work area from the reservoir to allow the work to be performed in the dry. The siphon can be added to Site 12A as a stand-alone system or it can be integrated into other improvements, such as the RCC overtopping option. Based on recently constructed siphon systems of similar size and length, the construction cost of the Site 12A siphon could range between $500k and $600k.

Option 4 (Portable Pumps): In lieu of constructing one or more permanent structures for the purpose of producing the release pulse, portable pumps could be mobilized to the site each time the release pulse is needed. It is estimated five Godwin Dri-Prime DPC300 standard diesel pumps with 12-inch suction and discharge lines would be required to produce the target release rates. Staging the pumps within the auxiliary spillway approach channel would be preferred over staging on the crest of the dam to reduce the pumping head that needs to be overcome. The pump discharge lines would discharge into the downstream receiving channel and be provided with adequate scour protection to prevent erosion.

Based on 2024 pricing from Xylem, the weekly rental rate for five pumps and their appurtenant features is approximately $90k per week plus additional costs on behalf of NHDES to provide lifting equipment and manpower to assist with setup and breakdown of the pumping system. Purchase cost of the pumping equipment is approximately $1 million.

Site 25B Alternative 1B

This alternative consists of increasing the conveyance capacity of Site 25B by filling low areas on the dam crest to pass the freeboard hydrograph through the existing 350-foot-wide auxiliary spillway. The embankment raising will be extended beyond the left abutment to tie into high ground. The existing auxiliary spillway crest elevation (El. 801. 8±) would remain unchanged to maintain the current level of flood protection and the top of dam would be raised from El. 808. 3± (existing low point) to El. 809. 0. Note most of the dam crest is current at or above El. 809. 0. To address auxiliary spillway integrity concerns, a concrete cutoff wall will be added at the control section to interrupt potential erosion and head cutting, preventing a breach of the dam through the auxiliary spillway, and the control section will be moved downstream to a point beyond the toe of the downstream embankment to prevent auxiliary spillway flows from impacting the downstream right embankment groin. A conventional concrete cutoff wall is assumed due to the shallow depth to bedrock found during the limited subsurface exploration plan performed as part of this Plan-EA. Should future subsurface exploration programs performed during preliminary/final design determine competent rock is deeper in elevation, the use of RCC should be evaluated to determine the most economical construction material. Upstream of the new control section, the auxiliary spillway approach channel will be graded at a 1% slope towards the reservoir. Excess excavation material will be used to extend the left spillway training berm in a downstream direction to direct auxiliary spillway flows away from the dam embankment. Refer to Appendix C, Figures 53 through 56 for conceptual drawings of Site 25B Alternative 1B.

NHDES has determined the Site 25B principal spillway riser structure will be replaced due to inadequacy of the riser footer to withstand the maximum credible earthquake. Replacement

of the riser will require dewatering the reservoir and diversion of water around the work area. To aid in management of water, the new riser can be constructed upstream of the existing riser, allowing diversion of water through the existing riser until the new riser is complete, at which time the existing riser may be abandoned.

The Site 25B Alternative 1B does not impact high sensitivity cultural resource areas but does alter Site 25B which is a NRHP-eligible dam. The project would restore Site 25B to a vegetated condition, minimizing visual impacts. The auxiliary spillway would also be restored to a vegetated condition except for a narrow band of exposed concrete at the cutoff wall location. Coordination with the New Hampshire Department of Natural and Cultural Resources, Division of Historical Resources, has determined that this approach will result in "no adverse effect" on the resource (refer to Appendix A). Alternative 1B is expected to have environmental impacts, including 0. 53± acres of permanent wetland disturbance and 75± linear feet of permanent stream disturbance. Minimal tree cleaning is required to construct the proposed improvements. In addition to lands owned by NHDES, Site 25B impounds water on lands owned by Lisa Beaudoin (Tax Parcel 6-59) and Timothy Fiske (Tax Parcels 6-61 and 6-62) within the Town of Temple and lands owned by the Greeley Family Trust (Tax Parcel E-6) and the Society for the Protection of New Hampshire Forests (Tax Parcel E-44) in the Town of Wilton. The filling of the low areas on the dam crest is expected to have a negligible impact on the reservoir elevation during the freeboard hydrograph. Refer to Table 4 for a side-by-side comparison of the alternatives retained for detailed study.

Construction costs for Site 25B Alternative 1B are estimated at $7. 3 million, which include a 30 percent contingency to account for unknowns and alterations of the design which may occur during the preliminary and final design phases. Incorporating costs for Engineering, Permits, and Construction Management (assumed to be 10%, 0. 5% and 12%, respectively, of the estimated construction costs), the total program costs for this alternative are estimated at $8. 9 million. Refer to Appendix D for additional information related to the estimated construction costs.

Site 26 Alternative 1C

This alternative consists of increasing the conveyance capacity of Site 26 by filling low areas on the dam crest to pass the freeboard hydrograph through the existing 320-foot-wide auxiliary spillway. The existing auxiliary spillway crest elevation (El. 922. 1±) would remain unchanged to maintain the current level of flood protection and the top of dam would be raised from El. 928. 1± (existing low point) to El. 928. 5. Note most of the dam crest is current at or above El. 928. 5. To address auxiliary spillway integrity concerns, a RCC stepped cutoff wall with a 320-foot-wide control weir will be added at the auxiliary spillway control section to interrupt potential erosion and head cutting, preventing a breach of the dam through the auxiliary spillway. Founded on bedrock, the RCC cutoff will be located below grade and will contain left and right training walls to ensure flows are directed over the structure. A RCC stepped cutoff wall is assumed due to the depth to bedrock found during the limited subsurface exploration plan performed as part of this Plan-EA. Should future subsurface exploration programs performed during preliminary/final design determine competent rock is higher in elevation, the use of conventional concrete should be evaluated to determine the most economical construction material. Disturbed areas within the auxiliary spillway will be restored to their current grades and stabilized with vegetation. Consequently, the proposed improvements would not impact

the future use of the auxiliary spillway by the Timberdoodle Club. Refer to Appendix C, Figures 77 through 80 for conceptual drawings of Site 26 Alternative 1C.

NHDES has determined the Site 26 principal spillway riser structure will be replaced due to inadequacy of the riser footer to withstand the maximum credible earthquake. Replacement of the riser will require dewatering the reservoir and diversion of water around the work area. To aid in management of water, the new riser can be constructed upstream of the existing riser, allowing diversion of water through the existing riser until the new riser is complete, at which time the existing riser may be abandoned.

The Site 26 Alternative 1C does not impact high sensitivity cultural resource areas but does alter Site 26 which is a NRHP-eligible dam. The project would restore Site 26 to a vegetated condition, minimizing visual impacts. The RCC cutoff wall in the auxiliary spillway would be backfilled and covered with topsoil and seeded to create a vegetated condition, minimizing visual impacts. Coordination with the New Hampshire Department of Natural and Cultural Resources, Division of Historical Resources, has determined that this approach will result in "no adverse effect" on the resource (refer to Appendix A). Alternative 1C is expected to have environmental impacts, including 0. 27± acres of permanent wetland disturbance, 95± linear feet of permanent stream disturbance and 0. 7± acres of tree cleaning. With the exception of the right abutment, which is owned by NHDES, the remainder of the Site 26 dam and auxiliary spillway are located on lands owned by the Timberdoodle Club on which NHDES has an easement. The easement encompasses the dam, auxiliary spillway and sediment pool; however, at the auxiliary spillway elevation, Site 26 Dam impounds water beyond the easement on lands owned by Whitcomb & Trust, Randall H. Martin, James W. Quinn, Martin Connolly, an RT/Trust within the Town of Temple. The filling of the low areas on the dam crest is expected to have a negligible impact on the reservoir elevation during the freeboard hydrograph. Refer to Table 4 for a side-by-side comparison of the alternatives retained for detailed study.

Construction costs for Site 26 Alternative 1C are estimated at $12. 5 million, which include a 30 percent contingency to account for unknowns and alterations of the design which may occur during the preliminary and final design phases. Incorporating costs for Engineering, Permits, and Construction Management (assumed to be 10%, 0. 5% and 12%, respectively, of the estimated construction costs), the total program costs for this alternative are estimated at $15. 3 million. Refer to Appendix D for additional information related to the estimated construction costs.

Table 4. Summary of Alternatives Preliminary Screening Evaluation

Plan Description	No Action	Decommissioning	Site 12A Alts Eliminated (1, 2A & 2B)	Site 25B Alts Eliminated (1A, 2A & 2B)	Site 26 Alts Eliminated (1A, 1B, 2A, 2B & 2C)	Site 12A Alt 2C, Site 25B Alt 1B, Site 26 Alt 1C
NEPA Purpose and Need	Partially meets purpose and need. Does not provide dry weather release pulse and does not bring structures into compliance with current dam safety standards.	Partially meets purpose and need. Does not maintain flood protection, maintain water supply or provide dry weather release pulse.	Meets purpose and need.	Meets purpose and need.	Meets purpose and need.	Meets purpose and need.
Contribution to Planning Objectives						
Maintain Current Level of Flood Protection	Yes.	No. Removal of dams would eliminate current flood protection benefits.	Yes. No change in flood retarding volume. Normal pool & auxiliary spillway crest elevations remain unchanged.	Yes. No change in flood retarding volume. Normal pool & auxiliary spillway crest elevations remain unchanged.	Yes. No change in flood retarding volume. Normal pool & auxiliary spillway crest elevations remain unchanged.	Yes. No change in flood retarding volume. Normal pool & auxiliary spillway crest elevations remain unchanged.
Maintain Water Supply	Yes.	No. Removal of Site 12A North & South Dams would eliminate the storage capacity and associated water supply volume.	Yes. No change to normal pool.	N/A. Site 25B not used for water supply.	N/A. Site 26 not used for water supply.	Yes. Raise normal pool for Site 12A release pulse to avoid reducing water supply volume.
Contribution to Planning Objectives						
Provide Dry Weather Release Pulse	No. Existing low-level outlet at Site 12A South does not produce desired release rate and may be unreliable.	No. Removal of Site 12A North and South Dams would eliminate the storage capacity and the ability to provide a dry weather release pulse.	Yes. The release pulse can be implemented with each of the Alternatives.	N/A. Souhegan River Water Management Plan does not identify Site 25B as a candidate for a dry weather release pulse.	N/A. Souhegan River Water Management Plan does not identify Site 26 as a candidate for a dry weather release pulse.	Yes. Modify riser and raise normal pool by 2 feet to accommodate a dry weather release pulse.
Bring Structures Into Compliance with Current Safety Standards	No. Structures would be maintained but would not be brought into compliance with current safety standards.	Yes. Decommissioning would eliminate the need to comply with current dam safety standards.	Yes. Alternatives address identified dam safety deficiencies.	Yes. Alternatives address identified dam safety deficiencies.	Yes. Alternatives address identified dam safety deficiencies.	Yes. Alternatives address identified dam safety deficiencies.
Response to Planning Constraints						
Avoid/Minimize Cultural Resource Impacts	No impacts to high sensitivity cultural resource areas. No impact to NRHP-eligible dams.	No impacts to high sensitivity cultural resource areas. All dams, which are NRHP-eligible, would be adversely impacted.	No impacts to high sensitivity cultural resource areas for Alts 1 and 2B. Alt 2A would require work in high sensitivity cultural resource areas. Visual impacts to NRHP-eligible dams could be mitigated by restoring each dam to a vegetated condition.	No impacts to high sensitivity cultural resource areas. Visual impacts to NRHP-eligible dams could be mitigated by restoring each dam to a vegetated condition.	No impacts to high sensitivity cultural resource areas. Visual impacts to NRHP-eligible dams could be mitigated by restoring each dam to a vegetated condition.	No impacts to high sensitivity cultural resource areas. Visual impacts to NRHP-eligible dams could be mitigated by restoring each dam to a vegetated condition.
Response to Planning Constraints						
Avoid/Minimize Water Resource Impacts	No impacts	The decommissioning alternative will create 4. 2± ac of direct wetland impacts. Additional indirect impacts would be expected around the perimeter of each normal pool. These impacts may be offset by new wetlands that may form within the dewatered reservoirs.	When combined with the Site 12A release pulse, these alternatives either match or exceed the water resource impacts of the preferred alternative.	When combined with the Site 12A release pulse, Site 25B Alternative 2B has similar water resource impacts when compared to the preferred alternative and Site 25B Alternatives 1A and 2A result in 0. 3± acres less wetland impacts when compared to the preferred alternative.	When combined with the Site 12A release pulse, Site 26 Alternatives 1B, 2B and 2C have similar water resource impacts when compared to the preferred alternative and Site 26 Alternative 1A and 2A have 0. 3± acres of additional wetland impacts when compared to the preferred alternative.	2. 0± ac wetland impacts 235± ft stream impacts
Maintain Water Supply	Yes.	No. Removal of Site 12A North & South Dams would eliminate the storage capacity and associated water supply volume.	Yes. No change to normal pool.	N/A. Site 25B not used for water supply.	N/A. Site 26 not used for water supply	Yes. Raise normal pool for Site 12A release pulse to avoid reducing water supply volume.
Plan Description	No Action	Decommissioning	Site 12A Alts Eliminated (1, 2A & 2B)	Site 25B Alts Eliminated (1A, 2A & 2B)	Site 26 Alts Eliminated (1A, 1B, 2A, 2B & 2C)	Preferred Alternative
Response to Evaluation Criteria						
Acceptability	Does not address known deficiencies, placing downstream property and individuals at increased risk of flooding from a dam failure.	Eliminates the flood attenuation capabilities of each structure, increasing the frequency and magnitude of downstream flooding.	Meets purpose and need.	Meets purpose and need.	Meets purpose and need.	Meets purpose and need and is preferred by the Sponsor NHDES.
Completeness	Complete. No outside action required to implement.	Partially complete. Public action required to implement downstream floodproofing.	Complete. No outside action required to implement.	Complete. No outside action required to implement.	Complete. No outside action required to implement.	Complete. No outside action required to implement.
Efficiency	Not evaluated as project does not fully meet the purpose and need.	Less Efficient. Total cost of decommissioning could exceed $143 million (refer to Table 2)	Partially efficient when compared to the cost of the preferred alternative.	Partially efficient when compared to the cost of the preferred alternative.	Partially efficient when compared to the cost of the preferred alternative.	Most efficient. The preferred alternative is the most cost-effective alternative evaluated.
Effectiveness	Partially meets purpose and need. Does not provide dry weather release pulse and does not bring structures into compliance with current dam safety standards	Partially meets purpose and need. Does not maintain flood protection, maintain water supply or provide dry weather release pulse.	Meets purpose and need.	Meets purpose and need.	Meets purpose and need.	Meets purpose and need.

Alternatives Considered but Not Analyzed in Detail

Several alternatives considered in the planning process were eliminated from detailed consideration. The evaluation is summarized in the sections below.

Dam Decommissioning

Decommissioning describes an alternative which removes the flood detention capacity of the dam by removing a portion or all the existing embankment (i.e., a breach of the embankment) down to the valley floor. The bottom of the breach typically contains a pilot channel and left and right overbank areas to mimic the natural drainage patterns and floodplain that existed prior to the original construction of the dam. Should the decommissioning option be considered, a more detailed hydraulic analysis is recommended to establish the minimum breach cross section, including bottom widths, overbank configuration, and channel bottom and side slopes.

The breach of Sites 12A North, 12A South, 25B, and 26 would require removal and spoiling of approximately 16,000, 12,000, 78,000, and 129,000 cubic yards, respectively, of material as well as removal of the low-level dewatering system at Site 12A North and the principal spillway risers, outlet conduits and impact structures at Sites 12A South, 25B and 26. Excavated material would be spoiled both in the dewatered reservoirs and within the existing auxiliary spillways. The spoil areas would be provided with mild slopes to facilitate site stabilization and potentially future agricultural, livestock or recreational use.

Reconnection of the stream through each breach would allow upstream movement of aquatic species. Stream restoration may be required through the dewatered reservoirs of Sites 25B and 26, which appear to contain sediment accumulation of depths that obstruct the natural stream channel. To the greatest extent possible, stream restoration activities would mimic the original channels which existed prior to the original construction of the dam. While revegetation of the reservoir bottom is expected to occur naturally, a planting/vegetation plan would be recommended to quickly stabilize the reservoir bottom and prevent/minimize/minimize/minimize intrusion of invasive species. Refer to Appendix C, Figures 44, 45, 65 and 93 for conceptual plans showing the decommissioning alternative for Sites 12A South, 12A North, 25B and 26, respectively.

The decommissioning alternative would (1) eliminate the use of Site 12A as a source of water supply for the Town of Greenville, (2) expose the existing sediment contained within each reservoir providing an immediate threat of erosion and downstream sedimentation, (3) eliminate future sediment trapping capabilities, resulting in increased long-term downstream sedimentation rates, and (4) result in increased flow rates during more frequent storm events. The immediate release of sediment from each reservoir could be addressed by physically removing the accumulated sediment from each reservoir prior to breaching the dam. Increases in flow rates would be expected to result in changes to the downstream channels as the stream bed and banks respond to the increased flows. Mitigation of increased stream flows during more frequent storm events would not be possible without the installation of additional detention facilities located within the dewatered reservoir and/or within the headwaters of each watershed. Alternate sources for water would be required for the Town of Greenville.

If the dams are removed, the structures located within the breach zone would no longer be at risk from potential flooding caused by a dam failure leading to an uncontrolled release of the contents of the reservoir. However, downstream roads, bridges, homes and businesses would be at risk of more frequent, uncontrolled flooding during storm events due to the loss of flood control previously provided by the dams. To meet the purpose and need of the project, induced damages must be mitigated so that there would be no increase in the amount of damaged sustained by structures previously protected by the dams. Mitigation of induced damages includes relocation or flood proofing the impacted structures.

Construction costs associated with the decommissioning alternative (for all four dams) could exceed $19 million. Table 5 lists major cost components associated with the decommissioning alternative.

Table 5. Estimated Costs Associated with Decommissioning

Work Item	Cost
Mobilization & Demobilization	$1.2 million
Site Preparation & Surveys	$0.7 million
Erosion and Sediment Control	$1.0 million
Dam Breach Activities	$11.5 million
Environmental Mitigation	$0.6 million
Contingency (30%)	$4.5 million
Subtotal of Construction Costs:	$19.5± million
Mitigation of Induced Damages to Downstream Homes (Floodproofing and/or Relocation)	$22.9-$124 million
Mitigation of Induced Damages to Downstream Infrastructure (Roads, Bridges, Utilities, Etc.)	Not estimated due to high cost and logistical impracticality
Total Cost of Dam Decommissioning:	$42.4-$143.5 million

Floodproofing or relocation of properties within the 100-year without-dam floodplain could cost in the range of $22.9-$124 million, bringing the total cost of decommissioning to more than $42.4-$143.5 million. This alternative would also have very high legal and financial consequences. Flood proofing costs were estimated based on a planning level analysis of structures in similar watersheds. Relocation costs were estimated using tax assessment valuation data from the Hillsborough County Tax Assessors Office (2023) for affected tax parcels within the 100-year floodplain without-dam inundation zone. The assessed value was used as a proxy for market value that would be paid to purchase each property and relocate residents. Actual relocation costs would likely exceed this figure, both because assessed value underrepresents market value and because of the administrative costs associated with acquiring the properties. Additional costs would also be expected to raise or otherwise protect impacted roads, bridges and utilities. Such improvements would be considered logistically impractical. Therefore, this alternative was not considered further.

Non-Structural- Relocation or Floodproofing

Non-Structural measures must be considered under NRCS policy (NWPM Part 505.35). Sites 12A (North & South), 25B and 26 were classified as high hazard structures when constructed between 1967 and 1971. Subsequent analysis performed as part of the 2016 dam assessments confirms the high hazard classification.

Non-Structural measures could consist of flood proofing or relocating structures in the breach zone as determined under the No Action Alternative of the dam to remove the unacceptable safety risk for the 148 residences, 132 other structures and greater than 370 persons at risk in the breach inundation zone. High Hazard structures provide significant downstream flood damage reduction to homes, buildings, and transportation corridors. Flood proofing or relocating the 280 total breach zone structures that would experience damage would cost more than $36.4 million based on the estimate of flood proofing costs discussed earlier. Relocating or elevating 14.5 miles of roads and 26 bridges, protected by the dams out of the inundation zone, is judged to be impractical and would generate substantial adverse economic and environmental impacts within the watershed. Furthermore, the non-structural alternative would not address the need for rehabilitation of each dam to bring it into compliance with current dam safety standards. This alternative was determined not to be cost effective compared to the structural alternatives available to rehabilitate the dams (refer to Table 1). Therefore, the non-structural alternative was eliminated from further consideration.

Site 12A Alternative 1

Site 12A North: Raise top of dam to El. 882.0, flatten the downstream embankment slope to 3H:1V, add an internal seepage collection system and extend the low-level outlet conduit to the new downstream embankment toe.

Site 12A South: This alternative consists of increasing the conveyance capacity of Site 12A by raising the top of dam up to 3.4 feet to pass the freeboard hydrograph through the existing 144-foot-wide auxiliary spillway. The existing auxiliary spillway crest elevation (El. 872.4±) would remain unchanged to maintain the current level of flood protection and the top of dam would be raised from El. 879.4± (at 12A South) and El. 878.6± (at 12A North) to El. 882.0. To address auxiliary spillway integrity concerns, a Roller Compacted Concrete (RCC) drop structure would be constructed at the downstream end of the existing auxiliary spillway to convey auxiliary spillway flows to the downstream receiving channel (Richardson Brook), preventing erosion and head cutting of the auxiliary spillway. The crest of the RCC drop structure would be set at the existing auxiliary spillway crest elevation (El. 872.4±), moving the spillway control section downstream to the new RCC drop structure. A notch in the RCC spillway control section would allow localized drainage to pass through the new control section to the receiving waterway, and the left and right training dikes that approach the new RCC drop structure would be raised to match the new top of dam elevation. The stilling basin of the RCC drop structure would extend into Richardson Brook and could be treated in one of two ways to minimize environmental impacts. The first would involve allowing Richardson Brook to fill the stilling basin, creating open water within the stilling basin, and the second would involve backfilling the stilling basin with native material to reestablish the stream bed and banks through this area. Material placed within the

stilling basin would be sacrificial and may be scoured out in the event the auxiliary spillway is activated. During construction of the RCC stilling basin, flow in Richardson Brook would be temporarily diverted to allow work to occur in the dry. Refer to Appendix C, Figures 23 through 27 for conceptual drawings of Site 12A Alternative 1.

The Site 12A Alternative 1 does not impact high sensitivity cultural resource areas but does alter both Site 12A North and Site 12A South which are NRHP-eligible dams. The project would restore the dams to a vegetated condition, minimizing visual impacts. Alternative 1 is expected to have environmental impacts, including 0.18± acres of permanent wetland disturbance, 205± linear feet of permanent stream disturbance, and 0.6± acres of tree clearing. This alternative also increases the storage volume of the Site 12A and would result in increased reservoir elevations during the freeboard hydrograph event as a result of raising the embankment, which could result in increased flooding of lands around the rim of the reservoir and may increase downstream consequences in the unlikely event of a dam failure. Currently, NHDES owns the land surrounding the reservoir to the east of Route 45, and according to the property deed, flowage easements are in place for lands up to El. 876.1 (NAVD88) located to the west of Route 45 along Richardson Brook and Miller Gamble Brook. Consequently, land rights are in place for all lands located below the auxiliary spillway crest elevation except for properties owned by Marta M. and Marck C. Scott located along the eastern side of the reservoir. These properties are identified as “Conservation Easements”, restricting the type and extent of development which is allowed. Raising the Site 12A top of dam elevation could increase the flooding on these properties during the freeboard hydrograph and may impound water onto Tobey Highway (Route 45) in several areas. Refer to Table 4 for a side-by-side comparison of the alternatives retained for detailed study.

Construction costs for Site 12A Alternative 1 to modify both Site 12A North and South, when combined with Alternative 3 for the dry weather release pulse, are estimated at $12.1 million, which includes a 30 percent contingency to account for unknowns and alterations of the design which may occur during the preliminary and final design phases. Incorporating costs for Engineering, Permits, and Construction Management (assumed to be 10%, 0.5% and 12%, respectively, of the estimated construction costs), the total program costs for this alternative are estimated at $14.8 million. Refer to Appendix D for additional information related to the estimated construction costs. In comparison to the preferred alternative, Alternate 1 increases stream impacts and increases construction costs due to factors including but not limited to increased volumes of earth fill and RCC. For these reasons, Site 12A Alternative 1 was not selected for detailed analysis.

Site 12A Alternative 2A

Site 12A North: Flatten the downstream embankment slope to 3H:1V, add an internal seepage collection system and extend the low-level outlet conduit to the new downstream embankment toe.

Site 12A South: This alternative consists of increasing the conveyance capacity of Site 12A by widening the auxiliary spillway from 144 feet to 280 feet to pass the freeboard hydrograph. The spillway widening would occur to the right of the existing auxiliary

spillway, requiring excavation into the wooded hillside, which is identified as a high sensitivity cultural resource area. While the project would alter both Site 12A North and Site 12A South, which are NRHP-eligible dams, the dams would be restored to a vegetated condition, minimizing visual impacts. The existing auxiliary spillway crest elevation (El. 872.4±) would remain unchanged to maintain the current level of flood protection and the top of dam for both Sites 12A North, and 12A South would remain unchanged. To address auxiliary spillway integrity concerns, a 280-foot-wide Roller Compacted Concrete (RCC) drop structure would be constructed at the downstream end of the auxiliary spillway to convey auxiliary spillway flows to the downstream receiving channel (Richardson Brook), preventing erosion and head cutting of the auxiliary spillway. The crest of the RCC drop structure would be set at the existing auxiliary spillway crest elevation (El. 872.4±), moving the spillway control section to the new RCC drop structure. A notch in the RCC spillway control section would allow localized drainage to pass through the new control section to the receiving waterway and the left and right training dikes that approach the new RCC drop structure would be raised to match the top of dam elevation. The stilling basin of the RCC drop structure would extend into Richardson Brook and could be treated in one of two ways to minimize environmental impacts. The first would involve allowing Richardson Brook to fill the stilling basin, creating open water within the stilling basin, and the second would involve backfilling the stilling basin with native material to reestablish the stream bed and banks through this area. Material placed within the stilling basin would be sacrificial and may be scoured out in the event the auxiliary spillway is activated. During construction of the RCC stilling basin, flow in Richardson Brook would be temporarily diverted to allow work to occur in the dry. New internal seepage collection and conveyance systems in the form of chimney and toe drains would be added to Site 12A North and Site 12A South and the downstream embankment face of each dam would be flattened to a slope of 3H:1V. Refer to Appendix C, Figures 28 through 32 for conceptual drawings of Site 12A Alternative 2A.

In comparison to Site 12A Alternative 1, the 280-foot-wide auxiliary spillway and associated RCC drop structure encroach into high sensitivity cultural resource areas, increase stream impacts, and increase construction costs due to the increased volume of required earthwork and RCC. For these reasons, Site 12A Alternative 2A was not selected for detailed analysis.

Site 12A Alternative 2B

Site 12A North: Flatten the downstream embankment slope to 3H:1V, add an internal seepage collection system and extend the low-level outlet conduit to the new downstream embankment toe.

Site 12A South: This alternative consists of increasing the conveyance capacity of Site 12A through the addition of a six-cycle labyrinth spillway with concrete chute and stilling basin to convey auxiliary spillway flows to the receiving channel. The existing auxiliary spillway crest elevation (El. 872. 4±) would remain unchanged to maintain the current level of flood protection and the top of dam for both Sites 12A North and 12A South would remain unchanged. The left auxiliary spillway training wall would be raised to match the existing top of dam elevation and the approach channel to the labyrinth

spillway would be lowered to El. 865. 0. To address auxiliary spillway integrity concerns, a concrete chute and stilling basin would be constructed to convey flows from the labyrinth spillway to the downstream receiving channel (Richardson Brook), preventing erosion and head cutting of the auxiliary spillway. The crest of the labyrinth spillway would be set at the existing auxiliary spillway crest elevation (El. 872. 4±), moving the spillway control section to the new labyrinth spillway. New internal seepage collection and conveyance systems in the form of chimney and toe drains will be added to Site 12A North and Site 12A South and the downstream embankment face of each dam would be flattened to a slope of 3H:1V. Refer to Appendix C, Figures 33 through 37 for conceptual drawings of Site 12A Alternative 2B.

The Site 12A Alternative 2B does not impact high sensitivity cultural resource areas but does alter both Site 12A North and Site 12A South which are NRHP-eligible dams. The project would restore the dams to a vegetated condition, minimizing visual impacts. Labyrinth spillways require intricate formwork and contain a significant amount of steel reinforcing, both of which can increase the price per cubic yard of concrete. In comparison to the RCC spillway, which is part of Site 12A Alternate 1, the labyrinth spillway is expected to have higher costs and contain high walls and slopes that could create public safety concerns. For these reasons, Site 12A Alternative 2B was not selected for detailed analysis.

Site 25B Alternative 1A & 2A

Both of these alternatives involve armoring of the auxiliary spillway with Articulated Concrete Blocks (ACBs) and the addition of a conventional concrete cutoff wall near the downstream end of the auxiliary spillway to interrupt potential erosion and head cutting, preventing a breach of the dam through the auxiliary spillway. For Alternative 1A the top of dam is raised by 0. 7 feet and the existing auxiliary spillway width is maintained at 350 feet. For Alternative 2A the existing top of dam is maintained, and the auxiliary spillway width is increased to 400 feet. For both alternatives, the existing auxiliary spillway crest elevation (El. 801. 8±) remains unchanged to maintain the current level of flood protection. A new principal spillway riser structure, capable of withstanding the maximum credible earthquake, would replace the existing riser. A new internal seepage collection and conveyance system in the form of a chimney and toe drain would be added, and the downstream embankment face would be flattened to a slope of 3H:1V to address slope stability factors of safety. Refer to Appendix C, Figures 49 through 52 and Figures 57 through 60 for conceptual drawings of Site 25B Alternatives 1A and 2A, respectively.

Both Alternatives 1A and 2A avoid high sensitivity cultural resource areas. Both alternatives alter Site 25B which is a NRHP-eligible dam. The project would restore the dam embankment to a vegetated condition, minimizing visual impacts. The open cells of ACB lining within the auxiliary spillway could be swept with topsoil and seeded to reduce the visual impacts associated with the ACB system.

Site 25B Alternatives 1B and 2B are similar to Site 25B Alternatives 1A and 2A, respectively, but with the auxiliary spillway control section moved downstream to coincide with the proposed concrete cutoff wall. In doing so, the ACB armoring of the

spillway can be eliminated, reducing construction costs. For this reason, Site 25B Alternatives 1A and 2A were not retained for detailed study.

Site 25B Alternative 2B

This alternative consists of increasing the auxiliary spillway width from 350 feet to 400 feet to pass the freeboard hydrograph. The existing auxiliary spillway crest elevation (El. 801. 8±) would remain unchanged to maintain the current level of flood protection and the top of dam would remain at its current elevation (El. 808. 3± at low point). To address auxiliary spillway integrity concerns, a concrete cutoff wall would be added at the control section to interrupt potential erosion and head cutting, preventing a breach of the dam through the auxiliary spillway, and the control section would be moved downstream to a point beyond the toe of the downstream embankment to prevent auxiliary spillway flows from impacting the downstream right embankment groin. A conventional concrete cutoff wall is assumed due to the shallow depth to bedrock found during the limited subsurface exploration plan performed as part of this Plan-EA. Should future subsurface exploration programs performed during preliminary/final design determine competent rock is deeper in elevation, the use of RCC should be evaluated to determine the most economical construction material. Upstream of the new control section, the widened auxiliary spillway approach channel would be graded at a 1% slope towards the reservoir. Excess excavation material would be used to extend the left spillway training berm in a downstream direction to direct auxiliary spillway flows away from the dam embankment. Refer to Appendix C, Figures 61 through 64 for conceptual drawings of Site 25B Alternative 2B.

NHDES has determined the Site 25B principal spillway riser structure would be replaced due to inadequacy of the riser footer to withstand the maximum credible earthquake. Replacement of the riser would require dewatering the reservoir and diversion of water around the work area. To aid in management of water, the new riser can be constructed upstream of the existing riser, allowing diversion of water through the existing riser until the new riser is complete, at which time the existing riser may be abandoned.

The Site 25B Alternative 2B does not impact high sensitivity cultural resource areas but does alter Site 25B which is a NRHP-eligible dam. The project would restore the dam and the auxiliary spillway to a vegetated condition, minimizing visual impacts. Alternative 2B is expected to have environmental impacts, including 0. 53± acres of permanent wetland disturbance, 75± linear feet of permanent stream disturbance and 0. 9± acres of tree clearing. As discussed under Site 25B, Alternative 1B, in addition to lands owned by NHDES, Site 25B impounds water on lands owned by Lisa Beaudoin (Tax Parcel 6-59) and Timothy Fiske (Tax Parcels 6-61 and 6-62) within the Town of Temple and lands owned by the Greeley Family Trust (Tax Parcel E-6) and the Society for the Protection of New Hampshire Forests (Tax Parcel E-44) in the Town of Wilton. NHDES reports easements are in place for all lands located within the reservoir below the auxiliary spillway crest elevation. Alternative 2B would not increase flooding depths around the rim of the reservoir. Refer to Table 4 for a side-by-side comparison of the alternatives retained for detailed study.

Construction costs for Site 25B Alternative 2B are estimated at $8. 2 million, which include a 30 percent contingency to account for unknowns and alterations of the design

which may occur during the preliminary and final design phases. Incorporating costs for Engineering, Permits, and Construction Management (assumed to be 10%, 0. 5% and 12%, respectively, of the estimated construction costs), the total program costs for this alternative are estimated at $10. 0 million. Refer to Appendix D for additional information related to the estimated construction costs.

Site 25B Alternative 2B results in more tree clearing, earth disturbance, and higher construction costs in comparison to Site 25B Alternative 1B. For these reasons, Site 25B Alternative 2B was not selected as the preferred alternative.

Site 26 Alternative 1A & 2A

Both of these alternatives involve armoring of the auxiliary spillway with Articulated Concrete Blocks (ACBs) and the addition of a mass Roller Compacted Concrete (RCC) cutoff wall near the downstream end of the auxiliary spillway to interrupt potential erosion and head cutting, preventing a breach of the dam through the auxiliary spillway. For Alternative 1A the top of dam is raised by 0. 4 feet and the existing auxiliary spillway width is maintained at 320 feet. For Alternative 2A the existing top of dam is maintained, and the auxiliary spillway width is increased to 350 feet. For both alternatives, the existing auxiliary spillway crest elevation (El. 822. 1±) remains unchanged to maintain the current level of flood protection. A new principal spillway riser structure, capable of withstanding the maximum credible earthquake, would replace the existing riser. A new internal seepage collection and conveyance system in the form of a chimney and toe drain would be added, and the downstream embankment face would be flattened to a slope of 3H:1V to address slope stability factors of safety. Refer to Appendix C, Figures 69 through 72 and Figures 81 through 84 for conceptual drawings of Site 26 Alternatives 1A and 2A, respectively.

Both Alternatives 1A and 2A avoid high sensitivity cultural resource areas. Both alternatives alter Site 26 which is a NRHP-eligible dam. The project would restore the dam embankment to a vegetated condition, minimizing visual impacts. The open cells of ACB lining within the auxiliary spillway could be swept with topsoil and seeded to reduce the visual impacts associated with the ACB system.

Site 26 Alternatives 1A and 2A can be simplified by moving the mass RCC cutoff wall to coincide with the auxiliary spillway control sections (refer to Site 26 Alternatives 1B and 2B), eliminating the need for the ACB armoring and reducing construction costs. For this reason, Site 26 Alternatives 1A and 2A were not retained for detailed study.

Site 26 Alternative 1B & 2B

Both of these alternatives involve the addition of a mass Roller Compacted Concrete (RCC) cutoff wall at the auxiliary spillway control section to interrupt potential erosion and head cutting, preventing a breach of the dam through the auxiliary spillway. For Alternative 1B the top of dam is raised by 0. 4 feet and the existing auxiliary spillway width is maintained at 320 feet. For Alternative 2B the existing top of dam is maintained, and the auxiliary spillway width is increased to 350 feet. For both alternatives, the existing auxiliary spillway crest elevation (El. 922. 1±) remains unchanged to maintain the current level of flood protection. A new principal spillway riser structure, capable of withstanding the maximum credible earthquake, will replace the existing riser. A new

internal seepage collection and conveyance system in the form of a chimney and toe drain will be added, and the downstream embankment face will be flattened to a slope of 3H:1V to address slope stability factors of safety. Refer to Appendix C, Figures 73 through 76 and Figures 85 through 88 for conceptual drawings of Site 26 Alternatives 1B and 2B, respectively.

Both Alternatives 1B and 2B avoid high sensitivity cultural resource areas. Both alternatives alter Site 26 which is a NRHP-eligible dam. The project would restore the dam embankment to a vegetated condition, minimizing visual impacts. The crest of RCC cutoff wall would be visible within the auxiliary spillway; however, visual impacts could be reduced by lowering and covering the crest of the RCC with topsoil and seeding to create a vegetated condition. A less obtrusive conventional concrete weir, or curb, could be added to the crest of the RCC cutoff wall to set and maintain the auxiliary spillway crest elevation.

The mass RCC cutoff wall assumed under Site 26 Alternatives 1B and 2B can be optimized to reduce the amount of required excavation and RCC volume by constructing a stepped RCC structure (refer to Site 26 Alternatives 1C and 2C). For this reason, Site 26 Alternatives 1B and 2B were not retained for detailed study.

Site 26 Alternative 2C

This alternative consists of increasing the auxiliary spillway width from 320 feet to 350 feet to pass the freeboard hydrograph. The existing auxiliary spillway crest elevation (El. 922. 1±) would remain unchanged to maintain the current level of flood protection and the top of dam would remain at its current elevation (El. 928. 1± at low point). A RCC stepped cutoff wall with a 350-foot-wide control weir would be added at the auxiliary spillway control section to interrupt potential erosion and head cutting, preventing a breach of the dam through the auxiliary spillway. Founded on bedrock, the RCC cutoff will be located below grade and will contain left and right training walls to ensure flows are directed over the structure. A RCC stepped cutoff wall is assumed due to the depth to bedrock found during the limited subsurface exploration plan performed as part of this Plan-EA. Should future subsurface exploration programs performed during preliminary/final design determine competent rock is higher in elevation, the use of conventional concrete should be evaluated to determine the most economical construction material. Disturbed areas within the auxiliary spillway would be restored to their current grades and stabilized with vegetation. Consequently, the proposed improvements would not impact the future use of the auxiliary spillway by the Timberdoodle Club. Refer to Appendix C, Figures 89 through 92 for conceptual drawings of Site 26 Alternative 2C.

NHDES has determined the Site 26 principal spillway riser structure will be replaced due to inadequacy of the riser footer to withstand the maximum credible earthquake. Replacement of the riser will require dewatering the reservoir and diversion of water around the work area. To aid in management of water, the new riser can be constructed upstream of the existing riser, allowing diversion of water through the existing riser until the new riser is complete, at which time the existing riser may be abandoned.

The Site 26 Alternative 2C does not impact high sensitivity cultural resource areas but does alter Site 26 which is an NRHP-eligible dam. The project would restore the dam and the auxiliary spillway to a vegetated condition, minimizing visual impacts. The crest of RCC cutoff wall would be visible within the auxiliary spillway; however, visual impacts could be reduced by lowering and covering the crest of the RCC with topsoil and seeding to create a vegetated condition. A less obtrusive conventional concrete weir, or curb, could be added to the crest of the RCC cutoff wall to set and maintain the auxiliary spillway crest elevation. Alternative 2C is expected to have environmental impacts, including 0. 27± acres of permanent wetland disturbance, 95± linear feet of permanent stream disturbance and 0. 8± acres of tree cleaning. Except for the right abutment, which is owned by NHDES, the remainder of the Site 26 dam and auxiliary spillway are located on lands owned by the Timberdoodle Club on which NHDES has an easement. The easement encompasses the dam, auxiliary spillway and sediment pool; however, at the auxiliary spillway elevation, Site 26 Dam impounds water beyond the easement on lands owned by Whitcomb & Trust, Randall H. Martin, James W. Quinn, Martin Connolly, an RT/Trust within the Town of Temple. NHDES reports easements are in place for all lands within the reservoir located below the auxiliary spillway crest elevation. Refer to Table 4 for a side-by-side comparison of the alternatives retained for detailed study.

Construction costs for Site 26 Alternative 2C are estimated at $13. 1 million, which includes a 30 percent contingency to account for unknowns and alterations of the design which may occur during the preliminary and final design phases. Incorporating costs for Engineering, Permits, and Construction Management (assumed to be 10%, 0. 5% and 12%, respectively, of the estimated construction costs), the total program costs for this alternative are estimated at $16. 0 million. Refer to Appendix D for additional information related to the estimated construction costs. In comparison to Site 26 Alternative 1C, Alternative 2C increases construction costs due to the increased volume of required earthwork (i. e., excavation and fill) and RCC. For this reason, Site 26 Alternative 2C was not selected for detailed analysis.

INTERDISCIPLINARY PROPOSAL SCREENING

Given the nature of the proposal, the responsible official is requesting documentation to demonstrate compliance with the following legal and regulatory considerations in addition to NEPA:

☒ Endangered Species Act (ESA)

☒ National Historic Preservation Act (NHPA)

☒ Tribal Consultation (EO 13175)

☒ Clean Air Act (CAA)

☒ Clean Water Act (CWA)

☒ Pertinent Executive Orders

Special Management Areas:

☐ Coastal Zone Management Areas

☒ Conservation Easements

☐ Coral Reefs

☐ Inventoried Roadless

☐ Marine Sanctuaries

☐ National Recreation Areas

☐ National Scenic & Historic Trails

☐ Research or Experimental Areas

☐ Wild & Scenic River Corridors

☐ Wilderness

☐ Other:

Scope of Analysis

The following describes how the agency drew a reasonable and manageable line relating to its consideration of environmental effects from the proposed action (and action alternatives, if any) that extend outside the geographical territory of the proposal, might materialize later in time, that fall outside of the agency's regulatory authority, or that would have to be initiated by a third party.

Planning Area

Selected Watershed

The project is within the Souhegan River Hydrologic Unit Code (HUC) 10 (0107000609) that encompasses 141,051 acres. The project area contains one HUC12: Blood Brook (010700060902). See Appendix B- Figure 1.

The Souhegan Site 12A North and Site 25B Dams are located within the Temple Brook Watershed, which is a tributary to Blood Brook. The Souhegan Site 26 Dam is located within the Blood Brook Watershed, which ultimately drains to the Souhegan River. The Souhegan Site 12A South Dam is located within the Souhegan River Watershed. All four dams ultimately drain to the Souhegan River, which is a tributary to the Merrimack River.

Study Area

The study area includes three separate areas that encompassed the four dams: Site 12A North and South, 25B, and 26.

Site 12A: The study area encompassed 169.5 acres and consisted of the Souhegan Site 12A North and South Dams, the Greenville Reservoir, Temple Brook, Gambol Brook, Richardson Brook, one unnamed tributary to the Souhegan River, and mowed and maintained areas around the dams, upland forest, and access roads from Senator Tobey Highway/Route 45. See Appendix B- Figure 2.

Site 25B: The study area encompassed 61.5 acres and consisted of the Souhegan Site 25B Dam and its sediment pool, Temple Brook and its floodplain downstream of the dam and upstream of the sediment pool, mowed areas downstream of the dam, and adjoining forested slopes and wetlands. The project study area also included the existing access road from General Miller Highway. The project study area was bordered primarily by forested slopes and rural residential properties. See Appendix B- Figure 3.

Site 26: The study area encompassed 47.5 acres and consisted of the Souhegan Site 26 Dam and its sediment pool, Blood Brook and its floodplain downstream of the dam and upstream of the sediment pool, fallow meadow in the dam's auxiliary spillway and headwater areas, mowed areas downstream of the dam, and adjoining forested slopes and wetlands. The project study area is located primarily on privately-owned property associated with the Timberdoodle Club, a private hunting and fishing club. The area downstream of the dam is used as a sporting clay and shooting range. The study area also included the existing access road from Gibbons Highway (Route 101) and the existing access roads associated with the hunting club property. The study area was bordered by forested slopes, fallow fields and meadows, and rural commercial properties. See Appendix B- Figure 4.

Areas(s) of Potential Effects for NHPA Section 106 Compliance

The NRCS defines the area of potential effect (APE), as an area that includes all Project construction and excavation activity required to construct, modify, improve, or maintain any facilities; any right-of-way or easement areas necessary for the construction, operation, and maintenance of the Project; all areas used for excavation of borrow material and habitat creation; all construction staging areas, access routes, utilities, spoil areas, and stockpiling areas. Impacts that come from the undertaking at the same time and place with no intervening causes, are considered "direct" regardless of its specific type (e.g., whether it is visual, physical, auditory, etc.). "Indirect" effects to historic properties are those caused by the undertaking that are later in time or farther removed in distance but are still reasonably foreseeable.

The APE for direct and indirect effects includes the entirety of the study areas for Sites 12A North and South, Site 25B and Site 26 as noted above.

Planning Process and Study Scope

Stepwise Planning Process

The watershed planning process is a formalized framework that guides plan development from the beginning stages through final implementation and evaluation of the project. There are three interrelated planning processes, each with its own specific goals and requirements, that contribute to the development of a watershed project plan.

1. NRCS's nine-step planning process (described in 180 National Planning Procedures Handbook (NPPH), Part 600) focuses on developing and implementing plans that protect, conserve, and enhance natural resources.
2. PR&G outlines a similar eight-step planning process that provides more information for plan development and emphasizes an ecosystem service framework. The NRCS Chief's decision memo approved on April 18, 2018, requires all Pub. L. No. 83-566 projects implement PR&G regardless of cost but take costs into consideration for commensurate level of detail for the analysis.
3. The NEPA planning process ensures that federal agencies consider the environmental consequences of proposed actions prior to implementation and provide the public an opportunity to comment. The goal of the watershed planning process is to identify the most economically, socially, and environmentally beneficial means of achieving the projects' purpose.

Ecosystem Services Framework

In accordance with the PR&G guidelines, an ecosystem service framework is used in the Plan-EA. Ecosystem services are a way to characterize the comprehensive set of benefits that people receive from nature. Ecosystem services can be described as ecological goods and services provided by a healthy, functioning environment (USDA 2017). This framework applies an integrative and holistic approach to evaluate benefits and costs associated with alternatives considered for the analysis. Changes to ecosystem services can be represented in monetary and non-monetary terms using appropriate practices for quantifying affected services.

The period of analysis is 105 years which includes two years for planning, three years for construction and 100 years of expected useful life. The service life of 100 years was used in compliance with the NWPM 506.60.FF.

Project Scope

The scope of this project is to develop a Supplemental Watershed Plan-EA for the modification of the existing Souhegan River Watershed Flood Control Dam Sites 12A North, 12A South, 25B, and 26 to bring them into compliance with current NRCS dam safety standards. The authority for preparation of the Plan-EA is the Watershed Protection and Flood Prevention Act (Public Law 83-566), and the project will address the following PL 83-566 authorized project purposes – Flood Prevention (Flood Damage Reduction), Municipal and Industrial Water Supply, and Water Quality Management. The project includes 1) investigating potential deficiencies at each dam via hydrologic

and hydraulic analysis, geotechnical exploration and analysis, and sediment studies, 2) environmental investigations to identify resource concerns, 3) development and evaluation of alternatives, 4) analysis of environmental consequences, 5) selection of a preferred alternative 6) avoidance, minimization and mitigation of potential impacts, and 6) public involvement in decision-making.

External Scoping

The scoping process generally followed the scoping procedures contained in the NRCS National Watershed Program Manual (June 2024). External scoping is to be used early in the planning process to aid in identifying issues, concerns, and potential impacts that require a detailed analysis.

Early coordination letters were mailed and/or emailed to 103 regulatory and resource agencies, government officials, local stakeholders, tribal nations and residents on October 19, 2021. The letter provided a summary of the proposed project, location maps, and asked for comments regarding relevant environmental concerns. Recipients were also invited to participate in the public scoping meeting. A scoping notice announcing the scoping period, and the public scoping meeting was posted in the Monadnock Ledger Transcript newspaper (print and online) on October 21, 2021. A public scoping meeting was held virtually at 2 PM on October 28, 2021. The project team delivered project information via a PowerPoint presentation. Attendees were able to ask questions and provide comments during the presentation for the project team to address prior to the end of the meeting. A webpage located on the NHDES website was launched on October 28, 2021, to include information on the Souhegan Supplemental Watershed Plan-EA. Additionally, the public meeting notice, sample public scoping meeting invite letter and attachments, public scoping presentation slides and a video of the public scoping meeting can be access via the webpage link. Additional details on the scoping process can be found in Appendix A.

Related Projects and Studies

The 2013 Souhegan River Water Management Plan implements the protected flows described in the Instream Flow Report with input from affected users through a stakeholder advisory committee. See Chapter 3, Regional Water Resource Plans for more information.

Agencies and Persons Consulted

Given the nature of the proposal, the responsible official consulted the following agencies, organizations, tribes, and persons during development and analysis of the proposal:

Agencies

- U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS)
- New Hampshire Department of Environmental Services (NHDES)
- Hillsborough County Soil Conservation District, New Hampshire
- Middlesex County Soil Conservation District, Massachusetts
- New Hampshire Water Resources Board
- Town of Greenville, New Hampshire
- Town of Milford, New Hampshire
- U.S. Fish and Wildlife Service (USFWS)
- New Hampshire Natural Heritage Bureau (NH NHB)
- U.S. Army Corps of Engineers (USACE) New England District
- U.S. Environmental Protection Agency (EPA)
- Water Management Bureau, NHDES
- State Historic Preservation Office (SHPO)

Native American Tribes

- Abenaki Nation of New Hampshire
- Golden Hill Indian Reservation
- Schaghticoke Tribal Nation
- Nulhegan Band of the Coosuk Abenaki Nation
- Eastern Pequot Reservation
- Paucatuck Eastern Pequot Tribe
- Koasek of the Koas of the Abenaki Nation
- Sovereign Abenaki Nation of Missisquoi, St. Francis/Sokoi Band
- Cowasuck Band Pennacook/Abenaki People
- Koasek (Cowasuck) Traditional Band of the Sovereign Abenaki Nation
- Koasek (Cowasuck) Traditional Band of the Abenaki Nation
- Laconia Indian Historical Association LIHA, Inc
- N.H. Intertribal Native American Council
- THPO, Penobscot Indian Nation
- Tribal Chief, Penobscot Indian Nation
- THPO, Wampanoag Tribe of Gay Head-Aquinnah
- Mashantucket Pequot Tribal Nation, Eastern Area Office
- Mohegan Tribal Council, Eastern Area Office
- THPO, Narragansett Indian Tribe
- THPO, Passamaquoddy Tribe

Individuals

- Federal agency representatives (e.g., NRCS State Conservationist, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers)
- State agency representatives (e.g., Commissioner, Department of Environmental Services)
- Local government officials (e.g., Town Manager, Select Board Chair, Conservation Commission Chair)
- Soil Conservation District representatives (e.g., District Chair, District Manager)
- Tribal liaisons or representatives (e.g., Tribal Historic Preservation Officer)
- Regional planning commission contacts
- Other stakeholders (e.g., watershed association, environmental NGOs, utility representatives)
- Landowners potentially impacted by construction or breach

Table 6: Applicable proposal record documentation to support agencies/persons consulted

Documentation Type	File Name (if applicable/needed)
Land Cover Map	2020 Wildlife Habitat Land Cover Map
Wildlife Plan	2015 New Hampshire State Wildlife Action Plan
State Assessment	2013 Souhegan River Water Management Plan

Substantive Issues Considered for Analysis

Table 7. Summary and Comparison of Alternatives- Planning Process

Item or Concern	No Action Alternative	Preferred Alternative
Alternative Major Features/ Works of Improvement by Authorized Purpose		
Flood Prevention		
Maintain flood protection for residential, commercial, and agricultural structures and transportation infrastructure in the study area	Yes.	Yes. No change in flood retarding volume. Normal pool & auxiliary spillway crest elevations remain unchanged.
Municipal & Industrial Water Supply		
Maintain adequate water storage capacity and quality for drinking water supply for the Town of Greenville	Yes.	Yes. Raise normal pool for Site 12A Alternative 3 to avoid reducing water supply volume.
Water Quality Management		
Manage river water flow conditions consistent with the state's Souhegan River	No. Existing low-level outlet at Site 12A South does not	Yes. Modify Site 12A riser and raise normal pool by 2

Item or Concern	No Action Alternative	Preferred Alternative
Water Management Plan instream flow targets.	produce desired release rate and may be unreliable.	feet to accommodate a dry weather release pulse.
Project Objectives*		
Bring Structures Into Compliance with Current Safety Standards	No. Structures would be maintained but would not be brought into compliance with current safety standards.	Yes. Alternatives address identified dam safety deficiencies.
Constraints		
Avoid/Minimize Cultural Resource Impacts	No impacts to high sensitivity cultural resource areas or historic resources.	No impacts to high sensitivity cultural resource areas. No adverse effects to eligible historic resources.
Avoid/Minimize Water Resource Impacts	No impacts.	2. 0± ac wetland impacts 235± ft stream impacts
Maintain Water Supply	Yes.	Yes. Raise normal pool for Site 12A Alternative 3 to avoid reducing water supply volume.
Evaluation Criteria		
Completeness	Complete. No outside action required to implement.	Complete. No outside action required to implement.
Efficiency	Not evaluated as project does not fully meet the purpose and need.	Most efficient. The preferred alternative is the most cost-effective alternative evaluated.
Effectiveness	Partially meets purpose and need. Does not provide dry weather release pulse and does not bring structures into compliance with current dam safety standards	Meets purpose and need.
Acceptability	Does not address known deficiencies, placing downstream property and individuals at increased risk of flooding from a dam failure.	Meets purpose and need.

*Same as Alternative Major Features/ Works of Improvement by Authorized Purpose

Summary and Comparison of Alternatives- Ecosystem Services

Chapter 3 presented ecosystem services (or resources of concern) to be considered in the analysis and described existing conditions for these services. Chapter 5 presents the analysis of environmental consequences for each ecosystem service. To quantify the change in ecosystem services over time, relevant indicators were identified. Using these relevant indicators, impacts to the flows of the ecosystem service and its consequences for human well-being are presented. The change in ecosystem service flows resulting under each alternative is presented as a range to highlight the uncertainty involved in quantifying the flows. While considering impacts to ecosystem services, reasonably foreseeable changes within the study areas were taken into consideration. Table 8 provides a summary of magnitude of effects for each ecosystem service.

Table 8. Summary and Comparison of Alternative – Ecosystem Services Tradeoff Analysis

Criterion	No Action	Preferred Alternative
Alternative Identification		
Locally Preferred		X
Environmentally Preferred		X
Maximum Net Monetized Benefits Plan		X
Preferred Alternative (Maximum Net public benefits identified through trade off analysis)		X
Guiding Principles		
Healthy and Resilient Ecosystems	Does not meet guiding principles in the event of dam failure and resulting impact on ecosystem services in the study area.	Meets guiding principles by maintaining and improving ecosystem functions in the long-term, but short-term impacts (during construction) will occur to some ecosystem service functions. Allowing a conservation release of water during low flow periods is beneficial to restoring ecosystem functions in the Souhegan River.
Sustainable Economic Development	Does not meet the guiding principle as the threat to human life and property for downstream residents and for municipal water supply for the town of Greenville from operation of high hazard dams, with known dam safety deficiencies, continues.	Meets the guiding principle as the threat to human life and property is reduced, and municipal water supply for the town of Greenville is maintained. Flood protection to the study area is maintained.

Criterion	No Action	Preferred Alternative
Floodplains	Does not substantially affect current floodplain uses that have evolved since the dams were first constructed.	Does not substantially affect current floodplain uses that have evolved since the dams were first constructed.
Public Safety	No rehabilitation to meet dam safety standards. Continuation of threat to human life and ecosystem services in downstream communities from a dam failure event.	Rehabilitation to meet dam safety standards. Under this option threat from a dam failure event to human life and ecosystem services in downstream communities is reduced.
Watershed Approach	Does not meet the guiding principle as flood damage risk to the watershed associated with dam failure event remains unchanged.	Meets the guiding principle as the alterative reduces the risk of flood damage by considering the four dams as an integrated system providing watershed flood protection and municipal water supply.
ECOSYSTEM SERVICES EFFECTS		
Provisioning Services		
Food (non-monetized)	Maintains current level of protection for prime farmlands and drinking water supply and thereby supports food provision until a dam failure event. In the event of a dam failure, potential for the farmland of prime importance in the study area to support food provision will be adversely affected.	Maintains current level of protection for prime farmlands and drinking water supply. Reduces risk of dam failure event. During drought conditions the release pulse will lead to improved aquatic health.
Water Quality and Quantity	Risk to potable water supply for the Town of Greenville and water quality in the study	Reduction in risk to potable water supply for the Town of Greenville and water quality in

Criterion	No Action	Preferred Alternative
	area from a dam failure event remains unchanged. Monetized value of the drinking water supply $405,143 remains at risk of loss.	the study area from a dam failure event. Monetized value of the drinking water supply $405,143 has a reduced risk of loss. Allowing a conservation release of water during low flow periods is beneficial for maintaining water quality in the study area during drought conditions.
Regulating Services		
Flood and Disease Control	Forgoes rehabilitation needed to meet federal dam safety standards that would reduce risk of dam failure to the study area. Flood control protection (damage potential of $4,483,258) provided by all four sites remains at risk until a potential dam breach event. No reduction in risk to Site 12A North and South which provide disease control through environmental monitoring of the water supply.	Maintains current level of flood protection for the study area. Rehabilitation to state and federal dam safety requirements would reduce risk of potential dam failure and resulting impacts (damage potential of $4,420,217). Disease control through environmental monitoring of the water supply provided at Site 12A North and South would continue.
Water Filtration	Natural water filtration, sediment retention, and erosion control supported by wetlands and forested areas remains at the same risk of disruption from dam failure. In the event of a dam failure, water filtration services would be affected negatively due to higher turbidity and sediment deposition.	Maintains the current level of natural water filtration, sediment retention, and erosion control supported by wetlands and forested areas, and reduces risk of disruption from dam failure. Short term disruption of water filtration services during construction would be mitigated to minimize impacts. Addition of a release pulse would positively impact water filtration services provided during drought conditions.

Criterion	No Action	Preferred Alternative
Cultural Services		
Community cohesion and quality of life	Does not reduce the risk of a dam failure event that would negatively impact quality of life and community cohesion.	Rehabilitation would reduce the risk of dam failure that would negatively impact quality of life and community cohesion.
Aesthetic Viewsheds	Maintains the current aesthetic value to the surrounding region.	Maintains the current aesthetic value to the surrounding region.
Supporting Services		
Nutrient Cycling	Nutrient cycling provided by the ecological resources in the study area remain at the same risk of disruption from a dam failure event.	Nutrient cycling provided by the ecological resources in the study area would have a reduced risk of disruption from a dam failure event. The addition of the release pulse for site 12A improves nutrient cycling during drought conditions.
Plant and Animal Habitat	Does not reduce risk of migration and gene flow of plant and animal species in the study area from a dam failure event.	Reduces risk of migration and gene flow of plant and animal species in the study area from a dam failure event.
ECONOMIC ANALYSIS		
Cost		
Total Project Investment		$38,338,794
Annual Project Investment		$859,535
Annual OM&R Costs	$30,000	$30,000
Total Annual Project Costs	$30,000	$889,535

Criterion	No Action	Preferred Alternative
Monetized Benefits for Ecosystem Services		
Provisioning		$405,143
Regulating*		$94,047
Cultural	Not Monetized	Not Monetized
Supporting	Not Monetized	Not Monetized
Total Annual Monetized Benefits	NA	$514,869 in avg. annual equivalents ($499,190 annually)
Total Annual Monetized Costs	NA	$884,044
Benefit-Cost Ratio	NA	0. 58
Annual Monetized Net Benefit	NA	$(369,174)

*Flood damage protection offered under the No Action and the Preferred Alternative is an important regulating service provided by the dams. It is the reduction in flood damage potential achieved by the Preferred Alternative as compared to the No Action Alternative that is used for calculation of the benefit-cost ratio.

Table 9. Summary and Comparison of Alternatives – Effects on Resource Concerns

Resource Concern	No Action Alternative	Preferred Alternative
SOILS-RELATED CONCERNS		
Soil Resources	Flooding associated with an eventual failure of the dam is likely to erode soils downstream of the impoundments and adjacent to the dams.	Earth disturbances are anticipated. Permanent impacts to soil resources include the construction of RCC structures within the auxiliary spillways at Site 25B and Site 26 and inundating soils around the rims of the reservoirs under increased pool elevations.
Prime and Unique Farmland, and Farmland of Statewide or Local Importance	Flooding associated with a dam failure would be likely to erode topsoil which would result in reduced suitability of these soils for agricultural use.	Earth disturbances are anticipated. Permanent impacts to soil resources include the construction of RCC structures within the auxiliary spillways at Site 25B and Site 26 and inundating soils around the rims of the reservoirs under increased pool elevations.
WATER-RELATED CONCERNS		
Water Quality	Water quality provided by the dams would continue under the No Action Alternative until a potential dam failure. The flood wave resulting from a dam failure would alter downstream channel geometry and increase sedimentation, impacting the water quality benefits provided by a stable channel and floodplain system, and the loss of the sediment pool would result in increased future downstream sedimentation rates.	The Preferred Alternative would maintain existing water resources and water quality at all sites.
Floodplain Management	Flood protection would continue under the No Action Alternative, until a potential dam failure.	Flood protection would continue under the Preferred Alternative, and the risk of dam failure would be reduced.

Resource Concern	No Action Alternative	Preferred Alternative
Waters of the U. S., Wetlands, & Special Aquatic Sites	Temporary impacts to wetlands would occur under an eventual failure of the dam due to the lowering of the normal pool of their impoundments and subsequent lowering of the water table.	At the Site 12A North and South Dams, 0. 3± acre of permanent wetland impacts and 65± linear feet of permanent stream impact are anticipated. An additional 0. 9± acre of permanent wetland impacts are anticipated under the release pulse.
Regional Water Resource Plans	The Souhegan River Water Management Plan (2013) would not be supported.	The two-day release pulse is included for Site 12A, supporting the Souhegan River Water Management Plan.
AIR RELATED CONCERNS		
Air Quality (Clean Air Act)	No anticipated impacts to air quality under the No Action Alternative.	Emissions from equipment and vehicles would occur during construction activities. However, these emissions would be short-term and would only occur during construction.
PLANTS AND ANIMAL-RELATED CONCERNS		
Endangered and Threatened Species	No impacts to endangered or threatened species are anticipated.	No impacts to listed species are anticipated. Seasonal tree clearing restrictions would be implemented to avoid impacts to potential summer roosting habitat of protected bat species.
Migratory Birds	Temporary impacts may occur during an uncontrolled breach event.	Impacts are anticipated to be minimal due to the availability of other suitable habitats nearby.
Bald and Golden Eagles	No anticipated impacts to eagles.	Conservation measures will be utilized to protect Eagle nest areas.
Ecologically Critical Areas	No impacts to ecologically critical areas are anticipated at Site 12A or Site 25B. Temporary impacts at Site 26 during an uncontrolled breach of the dam are anticipated.	No impacts to ecologically critical areas are anticipated at Site 12A or Site 25B. Temporary impacts at Site 26 are anticipated during construction.

Resource Concern	No Action Alternative	Preferred Alternative
Invasive Species	Encroachment of invasive species would be anticipated in disturbed areas after a potential dam failure.	Areas disturbed would be seeded with appropriate native seed mixes to reduce the chance of invasive plant species becoming established in disturbed areas.
Fish and Wildlife	Minimal anticipated impacts to fish and wildlife. Temporary impacts to aquatic fauna utilizing the reservoirs and principal spillway channels as habitat would occur during a dam failure.	There would be minor temporary impacts to fish and wildlife. Construction during the spring may affect the migration and breeding habitat of waterfowl and birds. Fish and aquatic species that use the reservoirs or streams for habitat would be temporarily affected during the construction season but would likely disperse until construction is complete.
Natural Areas	Natural areas would be minimally impacted.	Natural areas would be minimally impacted. Natural areas may be encroached into for the purpose of access and staging but would be restored to previous conditions following construction.
Riparian Areas	Riparian areas within the flood zone associated with an uncontrolled breach may suffer habitat destruction due to erosive flows. These areas would be temporarily impacted and vegetation would reestablish overtime.	Riparian areas adjacent to the principal spillway channels at each site may be temporarily impacted by construction activities. Permanent alterations to the principal spillway conduit at the 12A South Dam would result in 65± linear feet of permanent impacts to the vegetated riparian area.
Forest Resources	No impacts to forest resources are anticipated.	Construction would be confined to the dams and their appurtenances and would minimally impact forest resources. Anticipated tree clearing at Site 12A will total 0. 5± acre. Minimal tree clearing is anticipated at Site 25B. At Site 26, 0. 7± acre of tree clearing is anticipated.
HUMANS USE – RELATED CONCERNS		

Resource Concern	No Action Alternative	Preferred Alternative
Cultural Resources/ Historic Properties and Tribal Consultation	No impacts to cultural or tribal resources are anticipated. No high sensitivity areas for archaeological resources would be impacted.	The project would not result in the removal, neglect, or transfer of ownership of the historic sites. Therefore, a finding of No Adverse Effect was issued by the NHSHPO. The dam rehabilitations were designed to avoid high sensitivity areas identified during the Phase 1A investigation. No tribal lands would be impacted. During project coordination, no tribes or other consulted entities informed the NRCS that there were areas of cultural sensitivity.
Civil Rights	Existing population and demographic trends would continue.	The Preferred Alternative would have a beneficial effect on study area populations by reducing the risk of dam failure. No residential or business displacements are anticipated.
Social Issues	Existing population and demographic trends would continue.	The Preferred Alternative would have a beneficial effect on study area populations by reducing the risk of dam failure. No residential or business displacements are anticipated.
Local, Regional, and National Economy	Risk of dam failure will continue to threaten Sites 12A North and South's ability to provide drinking water to the Town of Greenville and Pilgrim Foods Manufacturing Plant.	Sites 12A North and South would continue to provide drinking water to the Town of Greenville and Pilgrim Foods Manufacturing Plant.
Public Health and Safety	An elevated risk of dam failure would remain. Rainfall in excess of 16. 5 inches would be expected to cause a dam breach, causing flooding in areas downstream within the flood zone, impacting public health and safety. Impacts to transportation and infrastructure would not occur.	The risk of dam failure impacting residential and commercial structures, land, and infrastructure would be reduced, which would benefit public health and safety. Direct impacts to transportation and infrastructure would not occur. During construction, a temporary increase in traffic due to heavy vehicles, construction equipment,

Resource Concern	No Action Alternative	Preferred Alternative
	However, roadways and infrastructure would remain at elevated risk from a potential dam failure. No project-related sound or vibrations would be produced.	and workforce would occur on roadways near the three project sites. Increased noise would be temporary during construction activities.
Scenic Beauty	Impacts to visual resources are not anticipated.	Long term impacts to visual resources would be minimal. Top of dam elevation would be raised by less than one foot at Site 25B (0. 7 feet) and Site 26 (0. 4 feet). Majority of RCC at Site 12A would be covered with topsoil and seeded. Following construction, the project sites and surrounding areas would resemble current visual conditions.
Land Use/Recreation	No impacts to land use or recreation would occur.	No permanent changes to land use, land cover, or recreation would occur.
CLIMATE		
Climate Resiliency	The existing dams would not impact current climate, but climate resiliency would not be addressed. The dams do not meet current New Hampshire and NRCS dam design and safety standards and are at risk of failure during flood events.	Direct impacts to climate are not anticipated. Climate resiliency in the study areas would be improved by reducing the risk of dam failure during heavy precipitation events.
HAZARDOUS WASTE-RELATED CONCERNS		
Hazardous Materials	Hazardous materials and waste would not be produced or stored at any of the sites.	Hazardous materials and waste would not be produced or stored during operation of the dams. However, during construction, hazardous materials and waste such as fuel, lubricants, chemicals, and excavated material would be present in the study area. Contractors would be required to comply with local, state, and federal pollution and contamination regulations. BMPs

Resource Concern	No Action Alternative	Preferred Alternative
		would be implemented to handle, transport, store, and dispose of hazardous materials and waste.
ECOSYSTEM SERVICES		
Provisioning Services	Continued risk of negative impacts to farmland of prime importance and threat to water quality & quantity in the event of a dam failure.	Risk of negative impacts to farmland of prime importance and threat to water quality & quantity in the event of a dam failure is reduced. Water quality improvements during low flow periods possible due to the conservation release.
Regulating Services	Flood control benefits provided by the dams and disease control through environmental monitoring of the water supply provided by Site 12A remains at risk from a dam failure event.	Risk to flood control benefits provided by the dams and disease control through environmental monitoring of the water supply provided by Site 12A from a dam failure event is reduced. Water filtration improvements during low flow periods possible due to the conservation release.
Supporting Services	Nutrient cycling service and species habitat service provided by the ecological resources in the study area remain at risk of disruption from a dam failure event.	Risk to nutrient cycling service and species habitat service provided by the ecological resources in the study area from a dam failure event is reduced. Nutrient cycling improvements during low flow periods possible due to the conservation release.
Cultural Services	The risk of a dam failure event continues to threaten quality of life, community cohesion and aesthetic views in the study area.	The risk of a dam failure event to the quality of life, community cohesion and aesthetic views in the study area is reduced.

ENVIRONMENTAL REVIEW & CONSULTATION

The following documents compliance with the National Environmental Policy Act (NEPA) and other relevant environmental laws, executive orders, and regulations.

NEPA: Potentially Affected Environment

Refer to the above study area on page 28 and the following species reviews below.

Endangered Species Act

Endangered and Threatened Species

Coordination with the USFWS and the NHB was completed to determine if there were any known occurrences of threatened or endangered species within the study areas (Appendix A).

The USFWS IPaC online tool was used to identify federally listed wildlife species. Two (2) species were identified as may occur or could be potentially affected by activities at all three Sites: Northern Long-eared Bat (federally endangered), and Monarch Butterfly (federally-proposed threatened). One (1) additional species, the Small Whorled Pogonia (federally threatened) was identified as potentially present or affected by activities at Site 12A North and South and Site 25B. No critical habitat was identified within the project study areas. The Northern Long-eared Bat and Tricolored Bat Range-wide Determination Key (DKey) was run and resulted in a Not likely to adversely affect determination for the Northern Long-eared Bat. The Northeast DKey was run for the Small Whorled Pogonia and resulted in a No Effect determination.

Coordination with the NHB was conducted for each project site in May 2022 and February 2026. The N.H. Natural Heritage Database was checked for records of rare species and exemplary natural communities near each project site. As of February 2026, the N.H. NHB had no recorded occurrences for sensitive species at Site 25B or Site 26. Two species of special concern were identified at Sites 12A North and South. As a result, an ecological review was conducted with NHDES, and conservation measures were recommended for each species.

Endangered Species Act Consultation

Consultation with the USFWS was conducted in accordance with the Endangered Species Act (16 U. S. C. § 1008). Resource lists were generated using the Information for Planning and Consultation (IPaC) online tool. The results of the consultation are presented in Chapter 3 Affected Environment. As designs are developed and the project is closer to implementation reviews will need to be ongoing as updates to species lists could occur or listing status.

In addition to consultation with USFWS, consultation occurred with New Hampshire NHB utilizing the NHB DataCheck tool, on May 4, 2022, to identify any known rare species or natural communities within the study areas. Negative results were received for each of the study areas. Consultation lapsed and reopened February 3, 2026. Negative results were received for Sites 25B and Site 26. An Ecological Review was required for Site 12A North and South. As a result of the Ecological Review, NHDES

recommended a number of conservation measures to avoid impacts to the species of concern identified and would be implemented. Copies of the consultation with USFWS, NHB are provided in Appendix A.

National Historic Preservation Act – Section 106 Review

NRCS N.H. has reviewed the proposed action (and action alternatives, if any), with the assistance of the New Hampshire Division of Historical Resources, State Historic Preservation Office (SHPO) and made the following determination:

No adverse effects to historic properties. Section 106 Review has been completed and National Register eligible cultural sites are located within the project area. Modifications/design criteria can avoid/protect cultural resources (see comment section).

Consultation with the N.H. Division of Historical Resources SHPO was conducted in accordance with NHPA Section 106 (36 CFR § 800. 1(a)). SHPO coordination was initiated in May 2022 through a New Submittal Request for Project Review (RPR) to N.H. DHR, including Phase 1A Archaeological Sensitivity Assessment. Submitted by N.H. Division of Environmental Services (NHDES) - Dam Bureau. In response to a Request for Project Review submitted by NHDES, SHPO requested survey of the four dams on an Area Form. The survey results identified the dams as contributing elements of a discontinuous historic district, the Souhegan River Flood Control Project. This historic district was determined to be eligible for the National Register of Historic Places under Criterion A and Criterion C. Consultation concluded with a No Adverse Effects determination by NRCS sent on August 5, 2025.

A Phase 1A Archeological Sensitivity assessment was completed by the Public Archaeology Laboratory (2022) determined that all three areas studied (herein referred to as “study areas” for this subsection) contained large, disturbed areas related to severe earthmoving, including clearing and grubbing of vegetation and cutting and filling of soils for the construction of the dams and associated infrastructure during the 1960s and early 1970s. Each of the three study areas where preexisting disturbance was not identified had areas of high archeological sensitivity where archeological resources may be present and were recommended for a Phase 1B Intensive Archeological Investigation. Through consultation with SHPO the selected alternatives were determined to avoid areas of high sensitivity, and a Phase 1B investigation was no longer warranted. However, if impacts change and no longer avoid high sensitivity areas, a Phase IB archaeological investigation will be implemented to evaluate impacts for mitigation discussions on an adverse effect. The Phase 1B investigation would consist of subsurface archaeological hand testing to locate and identify potentially significant archaeological resources in areas of proposed ground disturbances.

A Historic District Area Form was prepared by Preservation Company (2023) evaluating architectural resources associated with the Souhegan River Flood Control Project. The evaluation focused on the four dams at Sites 12A North and South, Site 25B, and Site 26, but included 8 additional dams, within the same system, which were constructed with funding provided under the Watershed Protection and Flood Prevention Act of 1954

during the 1960s to the 1970s. The series of 12 dams were inventoried as the Souhegan River Flood Control Project Historic District, and determined to be Eligible for Inclusion on the National Register of Historic Places under Criterion A and C. Under Criterion A, the Historic District exemplifies the investments and efforts of federal, state, county and local entities to address ongoing flood issues in the Souhegan River Watershed. The Historic District is also eligible under Criterion C for its engineering significance, being an excellent example of flood control systems with typical features from the 1960s to 1970s.

Due to the project requiring modifications of four of the twelve dams within the Historic District, a recommended finding of Historic Property Affected. While the dams would require demolition of parts of the earthen embankments to install new internal seepage collection and conveyance systems, replace or modify riser structures and principial spillway features, and install concrete fortifications the dams would be reconstructed with loam and turf to match the existing appearances, with the exception of the dam crest of Site 12A and the impact basin for the principal spillway outfall. The Project will not result in the removal of the resource from its location, nor will it cause neglect or deterioration of the property. The Project will not cause a change of the character of the resources' use or feature in the physical setting; and the dams will continue to function as such with the appearance of earthen banks restored. The atmospheric and audible elements of construction will be temporary and not diminish the integrity of the property after construction is complete. The project will not introduce visual elements that diminish the property's integrity of setting and feeling. As the property's use and physical setting will be retained and there would be no lasting effects, it was determined that the proposed Project would result in No Adverse Effect.

The Souhegan River Flood Control Project, constructed in the 1960s and 1970s consists of 12 dams and related infrastructure, intended to provide watershed protection, flood prevention, and fish and wildlife development for the Souhegan River Watershed.

Table 10: Applicable proposal record documentation to support NHPA compliance

Documentation Type	File Name (if applicable/needed)
Phase 1A Archeological Sensitivity Assessment (2022)	Phase 1A Archaeological Sensitivity Assessment, Souhegan River Dams, Watershed Planning Study Areas (Site 26 Dam, 25B Dam, and 12A North and South Dams). (See Watershed Plan Appendix A)
Historic District Area Form (2023)	Souhegan River Flood Control Project Historic District Area Form, Determination of Eligibility (See Watershed Plan Appendix A)
Effect Evaluation (2025)	Souhegan River Supplemental Watershed Plan, RPR #13895, Results of Effect Evaluation for Souhegan River Flood Control Project (See Watershed Plan Appendix A)
SHPO Effect Finding (2025)	NHDHR, SHPO Effect Finding of No Adverse Effect (See Watershed Plan Appendix A)

Documentation Type	File Name (if applicable/needed)
NRCS Effect Finding (2025)	NRCS N.H. Effect Finding of No Adverse Effect (See Watershed Plan Appendix A)

Consultation with Federally Recognized Tribes

Consultation with federally recognized tribes was conducted as follows:

Tribal consultation was conducted in accordance with the NHPA of 1966 and EO 13175. Tribal Ancestral Lands Consultation (TALC) was initiated by New Hampshire NRCS. Invitations were sent were sent to the SHPO and Native American Tribes with ancestrally affiliated lands located within the study area on October 19, 2021, to participate in the development of the Project. Six (6) Federally Recognized Tribes and 14 non-Federally Recognized Tribes were scoping invitation letters. No responses were received from any tribe or interested parties to initial correspondence. A copy of the letter to the Abenaki Nation of New Hampshire can be found in the Watershed Plan Appendix A. The same letter was sent to both Federally Recognized Tribes and non-Federally Recognized Tribes listed below.

Federally Recognized tribes:

- Mashantucket Pequot Tribal Nation, Eastern Area Office
- Mohegan Tribal Council, Eastern Area Office
- Narragansett Indian Tribe
- Passamaquoddy Tribe
- Penobscot Indian Nation
- Wampanoag Tribe of Gay Head (Aquinnah)

Non-Federally Recognized Tribes and potential Interested Parties:

- Abenaki Nation of New Hampshire
- Cowasuck Band Pennacook/Abenaki People
- Eastern Pequot Reservation
- Golden Hill Indian Reservation
- Koasek of the Koas of the Abenaki Nation
- Koasek (Cowasuck) Traditional Band of the Sovereign Abenaki Nation
- Koasek (Cowasuck) Traditional Band of the Abenaki Nation
- Laconia Indian Historical Association LIHA, Inc
- Mashantucket Pequot Tribal Nation, Eastern Area Office
- N.H. Intertribal Native American Council
- Nulhegan Band of the Coosuk Abenaki Nation
- Paucatuck Eastern Pequot Tribe
- Schaghticoke Tribal Nation
- Sovereign Abenaki Nation of Missisquoi, St. Francis/Sokoi Band

Only two federally recognized tribes have stated an interest in being included as consulting parties for projects in New Hampshire; this includes the Narragansett Indian

Tribe and Wampanoag Tribe of Gay Head (Aquinnah). The other federally recognized tribes listed above were included during the scoping process; however, currently none of these tribes have stated an interest in being a consulting party for projects that occur in New Hampshire. The NRCS N.H. sent finding of effect consultation packages to the Narragansett Indian Tribe and Wampanoag Tribe of Gay Head (Aquinnah) on August 5, 2025. No response was received regarding NRCS N.H.'s finding of "No Adverse Effect" (see Watershed Plan Appendix A).

Table 11: Applicable proposal record documentation to support tribal consultation

Documentation Type	File Name (if applicable/needed)
Scoping Letter (October 19, 2021)	See Watershed Plan Appendix A
NRCS Effect Finding (2025)	See Watershed Plan Appendix A

Clean Water Act

The pertinent subject matter expert has reviewed the proposed action (and action alternatives, if any) and made the following determination:

Coordination was initiated with a letter notifying the agency of project. No response was received. During this planning stage, project design and impacts are not advanced to a level to submit a permit application for Clean Water Act Section 404 compliance. During the design stage, a pre-application meeting will be requested with USACE, and agency concerns and recommendations will be addressed prior to submission of a 404-permit application package.

Clean Air Act

The pertinent subject matter expert has reviewed the proposed action (and action alternatives, if any) and made the following determination:

USEPA National Ambient Air Quality Standards identified Hillsborough County as in attainment for all NAAQS criteria. Although the County is in attainment, short-term air quality during construction will be considered in the development of the proposed action.

The project will not result in permanent air emissions, and no modifications or further coordination needs to occur to ensure compliance

Special Management Area Considerations

The pertinent subject matter expert has reviewed the proposed action (and action alternatives, if any) and made the following determinations based on special management area presence, proximity, or lack of:

No activities are proposed within or in the vicinity of Special Management Areas.

Pertinent Executive Orders

The applicable subject matter experts have determined the proposed action (and action alternatives, if any) are in compliance with the following Executive Orders (EO), which were deemed pertinent based on the nature of the proposal:

EO 11988, Floodplain Management – requires determination of action occurring in a floodplain, using HUD floodplain map or more detailed map if available.

Souhegan Sites 12A North and South, 25B, and 26 provide flood protection for downstream properties. There are critical facilities per 7 CFR 650.25 located in the existing 500-year floodplain.

EO 11990, Protection of Wetlands – avoid actions within wetlands unless there are no practical alternatives, and the action includes all practicable means to minimize harm to wetlands.

Project activities may require a Clean Water Act Section 404 permit. Waterways and wetlands are present within the study areas and were identified and delineated in October 2021.

EO 13007, Indian Sacred Sites – Not Applicable

EO 13112, Invasive Species – prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.

EO 13186, Migratory Birds – Bald Eagle nest located at one site and project will follow National Bald Eagle Management Guidelines and conservation measures. Bald Eagle Screening Form will be used at time of construction.

EO 13443, Facilitation of Hunting Heritage and Wildlife Conservation – land access for support hunting heritage will not be impacted.

NEPA: Consideration of Reasonably Foreseeable Impacts

The Preferred Alternative has been developed to avoid and minimize impacts to regulated features while meeting the project needs. As the Preferred Alternative is refined in the design stage, avoidance and minimization of impacts to regulated features will remain a top priority. During construction, erosion controls will be implemented to avoid secondary impacts to regulated features. Unavoidable impacts will be mitigated through the NHDES Wetland Mitigation Program.

The NHDES on-line guidance for wetland mitigation indicates that mitigation is required for projects with 10,000 square feet or more permanent impacts to freshwater wetlands. The USACE requires mitigation for unavoidable wetland impacts over 5,000 square feet according to the Compensatory Mitigation Thresholds Update for the New England District Regulatory Division published in 2024. Permanent wetland impacts are anticipated to exceed 10,000 square feet at Site 12A, Site 25B, and Site 26. Therefore, compensatory mitigation for wetland impacts is anticipated at all sites. However, the anticipated impacts to wetlands will primarily involve wetlands that have developed within the dam embankments and appurtenances, and regulatory authorities may deem that mitigation is not required. Stream mitigation is not required by NHDES or USACE because anticipated permanent stream impacts are less than 200 linear feet at each site.

Wetland mitigation options include In-Lieu Fee (ILF) Payment to the Aquatic Resources Mitigation (ARM) Fund. Payments are determined using the ARM Fund Calculator, which publishes updated rates annually. Another mitigation option is enhancement, such as through the establishment of riparian buffers to improve water quality and wildlife habitat, and through plantings or reseeding of native plants in disturbed areas. According to the New England District Compensatory Mitigation Standard Operating Procedures published by USACE in 2020, the New England District recommends contacting the Corps prior to developing a mitigation strategy and indicates a preference for ILF mitigation programs.

Cost and Cost-Sharing

Costs are shown in Section 6. 11, Economics Table 1. Economics Table 2 shows the costs by category and the distribution of how the costs would be shared by the Sponsor and NRCS for each cost item. Total annual costs are shown in Economics Table 4 along with the estimated costs for operation and maintenance. Economics Table 5 displays the average annual flood damage reduction benefits by flood damage categories, and Economics Table 6 displays a comparison of annual costs and benefits. A 2024 price base was used and amortized at 3. 0 percent for the 105-year period of analysis.

The planning costs for the proposed rehabilitation measures are estimated costs only. Detailed structural designs and construction cost estimates would be prepared prior to contracting for the work to be performed. The final cost would be the low price received by competitive bidding plus or minus the amounts of contract modifications.

An incremental analysis to determine the optimal level of flood protection was conducted. Since the four dam sites were treated as a single unit in the analysis,

incremental analysis conducted considered the benefits and costs of providing a level of flood protection other than flood protection benefits from the 100-year event. Expected damages, both in singular event total and expressed as Expected Annual Damages for flood events ranging from the 2-year storm to the 500-year storm (shown in Exhibit tables D4.32, D4.33, D4.34 and D4.38 in Appendix D4, Economics) under the Without Dam (decommissioned) and the No Action conditions were the basis for calculating incremental benefits. The monetized damages were estimated for 1) Structures and Vehicles (buildings, residences, commercial, institutional), and 2) Roadways and Bridges.

The results of the analysis demonstrate the incremental benefits for flood damage reduction exceed the annualized installation cost of rehabilitation through the 100-year flood event, resulting in a benefit to cost ratio of approximately 3.2. Providing additional flood protection beyond the 100-year level was considered, but the cost to provide 500-year protection was estimated to be approximately $53 million, or $1,816,592 in annualized cost. This cost would exceed the additional benefits provided ($1,046,592, the sum of the expected annual damages under Without Dam conditions for the 200- through 500-year events). As such, the optimal level of flood damage protection at the Souhegan dam sites remains the 100-year flood event.

Will the proposed action or *action alternatives (if any) make an irreversible and irretrievable commitment of Federal resources?*

No. No areas of controversy have been identified. Note that lands around the Site 26 dam and reservoir, including the auxiliary spillway, are used by the Timberdoodle Club for hunting and as outdoor recreational areas. To minimize impacts to the Timberdoodle Club, the RCC stepped cutoff wall which is proposed at the auxiliary spillway control section will be located below grade, backfilled and vegetated such that the proposed improvements will not be visible on the ground surface. Consequently, said work will not alter how the Timberdoodle Club uses this space.

How will *the irreversible and irretrievable commitment of Federal resources, if any, contribute to a loss of long-term productivity for the human environment?*

N/A.

Certifying Statement for EA Page Limit and Deadline

The Responsible Official certifies that this EA:

☒ Demonstrates the agency has thoroughly considered the factors mandated by NEPA;

☒ Represents the agency's good-faith effort to prioritize documentation of the substantive issues and most important considerations required by NEPA within the congressionally mandated page limits;

☒ Reflects the agency's expert judgment;

☒ Addressed briefly, or left unaddressed, any issues or considerations that were, in the agency's judgment, comparatively not of a substantive nature;

☒ Represents the agency's good-faith effort to fulfill NEPA's requirements within the Congressional timeline (or within the minimally extended timeline, if applicable) and this effort is substantially complete; and

☒ Contains analysis that is adequate to inform and reasonably explain the responsible official's final decision regarding the proposed action or selected alternative.

APPENDICES

Refer to the Souhegan Supplemental Watershed Plan No.5 for the following appendices:

APPENDIX A-CONSULTATION, COMMUNICATION, AND RESPONSES

APPENDIX B- WATERSHED MAPS

APPENDIX C-SUPPORT MAPS

APPENDIX D-INVESTIGATIONS AND ANALYSIS REPORTS

FINDING OF NO SIGNIFICANT IMPACT (FONSI)

Proposal Name: Souhegan Supplemental Watershed Plan Number 5 for rehabilitation of Sites 12A North and South, Site 25B and Site 26 From above

Proposal Tracking #: EAXX-005-033-1265405860

Agency Name: USDA Natural Resources Conservation Service

Unit Name: NRCS, N.H. State Office

Documentation Informing the FONSI

This Finding of No Significant Impact incorporates the Environmental Assessment and relies on documentation in the associated proposal record.

Activities Approved

I have decided to approve the rehabilitation of four structures, Site 12A North, Site 12A South, Site 25B and Site 26, as described in the "Proposal Information" section of the Environmental Assessment.

Determination of No Significant Impacts

I have determined no significant impacts are anticipated for the activities approved based on the discussion provided under the "NEPA: Consideration of Significant Impacts" section, and as informed by other analysis and determinations provided in the "Environmental Review" section of the Environmental Assessment.

Under the Principles, Requirements, and Guidelines for Water Resource Projects federal agencies are directed to consider tradeoffs between the economic, social, and environmental consequences of plan alternatives. Agencies are directed to select the federally preferred alternative based on no single one of these three objectives being higher priority than another.

As summarized in "NEPA: Consideration of Reasonably Foreseeable Impacts" section, No Action is the National Economic Efficiency Alternative because there are no construction costs involved and the probabilistic analysis indicates that the 16.5-inch runoff event that would cause dam failure has a statistically derived return interval of 2,100 years. Therefore, economic analysis credits flood protection and recreation benefits of the dam being present for 2,100 years prior to applying the initial economic losses due to the dam breach and discounting those back to present value. Note that this is simply a probabilistic assessment; in reality it is possible runoff event(s) could trigger a dam failure at any point in time given its current condition. Of the remaining alternatives, the proposed action (Structural Rehabilitation) provides a significantly higher benefit cost ratio than decommissioning.

As summarized in "NEPA: Consideration of Reasonably Foreseeable Impacts" section, the proposed action is the preferred alternative from the standpoint of social impacts. The alternative would ensure flood protection benefits to homes, public roads and the local economy remain in place for the next 100 years. From a social standpoint, No Action has

significant negative social impacts in the event of a dam breach, including the projected loss of lives, damage to homes, bridges, and 14.5 miles of roads.

As summarized "NEPA: Consideration of Reasonably Foreseeable Impacts" section, from an environmental standpoint, proposed action and No Action both have merit from the standpoint of certain ecosystem services and resources. Structural Rehabilitation was determined to be the environmentally preferred alternative due to the important benefits it provides for water quality with instream flow releases.. No Action would have severe environmental consequences in terms of degraded surface and groundwater quality, loss of wetlands, degradation of the river channel, and loss of mature trees within riparian woodland habitat.

The proposed action is federally preferred alternative of Structural Rehabilitation, based on social and environmental benefits. As the owner of the dam, the final decision on action to be taken was made by the Sponsor, the New Hampshire Department of Environmental Services (NHDES), who selected Structural Rehabilitation as the locally preferred alternative because of its ability to maintain current flood protection, water supply and environmental benefits of the dam. Because the federal and locally preferred alternatives are the same, USDA-NRCS and the NHDES intend to move forward with implementation of Structural Rehabilitation through the NRCS Watershed Rehabilitation Program, subject to availability of federal funding.

Anticipated Implementation of Authorized Activities

I intend to implement the approved activities approximately 3 years from authorization, depending on funding availability. Following authorization, design phase funding will be requested. The design phase is expected to take one to two years. Upon completion of the design phase, construction funding will be requested. Therefore construction (implementation) is anticipated to start in 3-4 years.

Signature and Authorization Date

Travis Thomason New Hampshire State Conservationist

August 10, 2026

Digitally signed by Travis L. Thomason
Date: 2026.08.10 16:12:07 -04'00'