
Feasibility Report

Continuing Authority Investigation

Section 14 Emergency Stream Bank Erosion Protection

Connecticut River – River Road Lyme, New Hampshire



US ARMY CORPS

OF ENGINEERS

New England District

July 2019

FEASIBILITY REPORT
EMERGENCY STREAM BANK EROSION PROTECTION
CONNECTICUT RIVER – RIVER ROAD
LYME, NEW HAMPSHIRE

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FEASIBILITY REPORT

EMERGENCY STREAM BANK EROSION PROTECTION

CONNECTICUT RIVER – RIVER ROAD LYME, NEW HAMPSHIRE

- 1. Project:** Connecticut River, Lyme, New Hampshire
- 2. Authority:** Section 14 of the Flood Control Act of 1946, as amended - Emergency Stream Bank Protection
- 3. Location:** The study area is located along the left bank of the Connecticut River in the town of Lyme, Grafton County, west-central New Hampshire, about 10 miles north of Hanover, NH (Figures 1 & 2). The project area is located along the Connecticut River embankment, between the river and River Road.

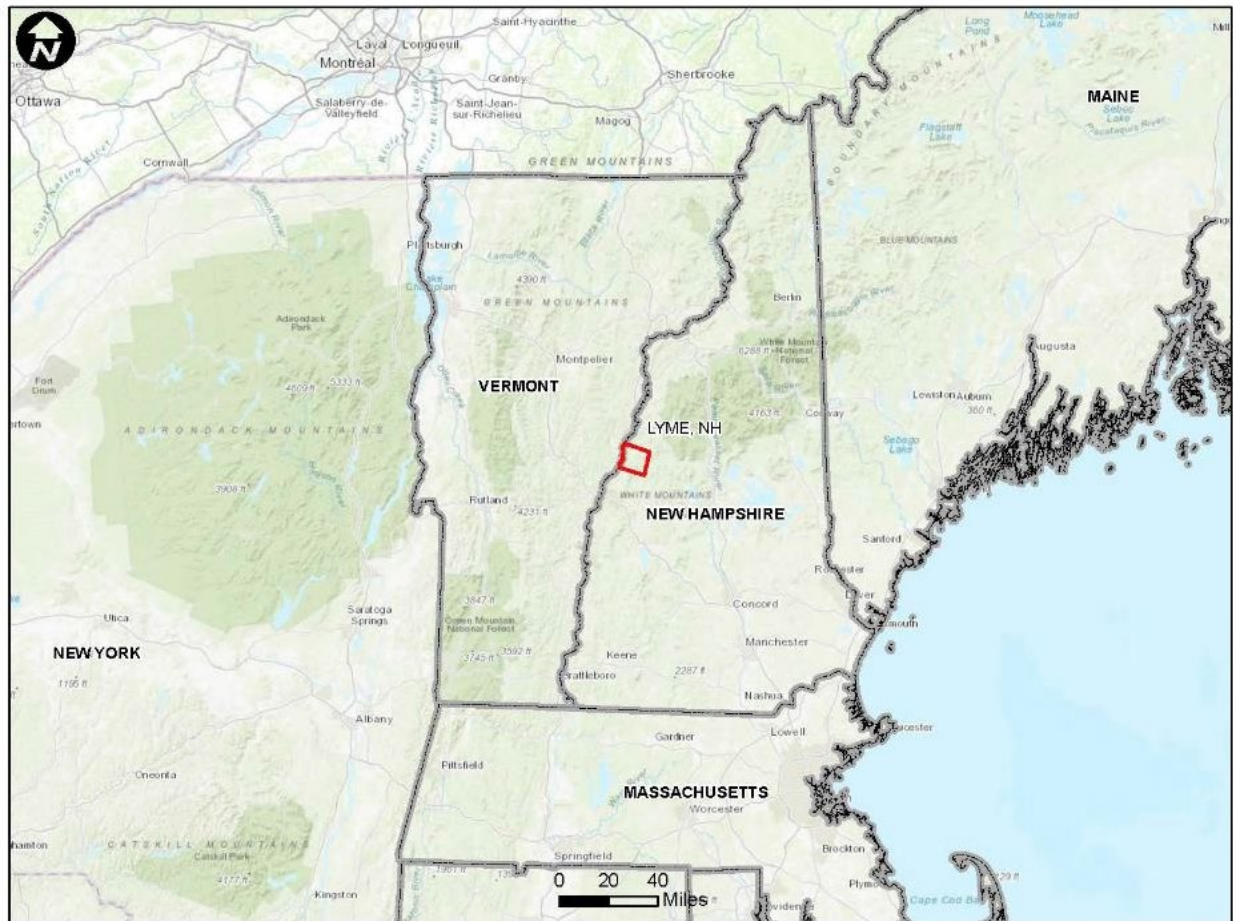


Figure 1. Study Location

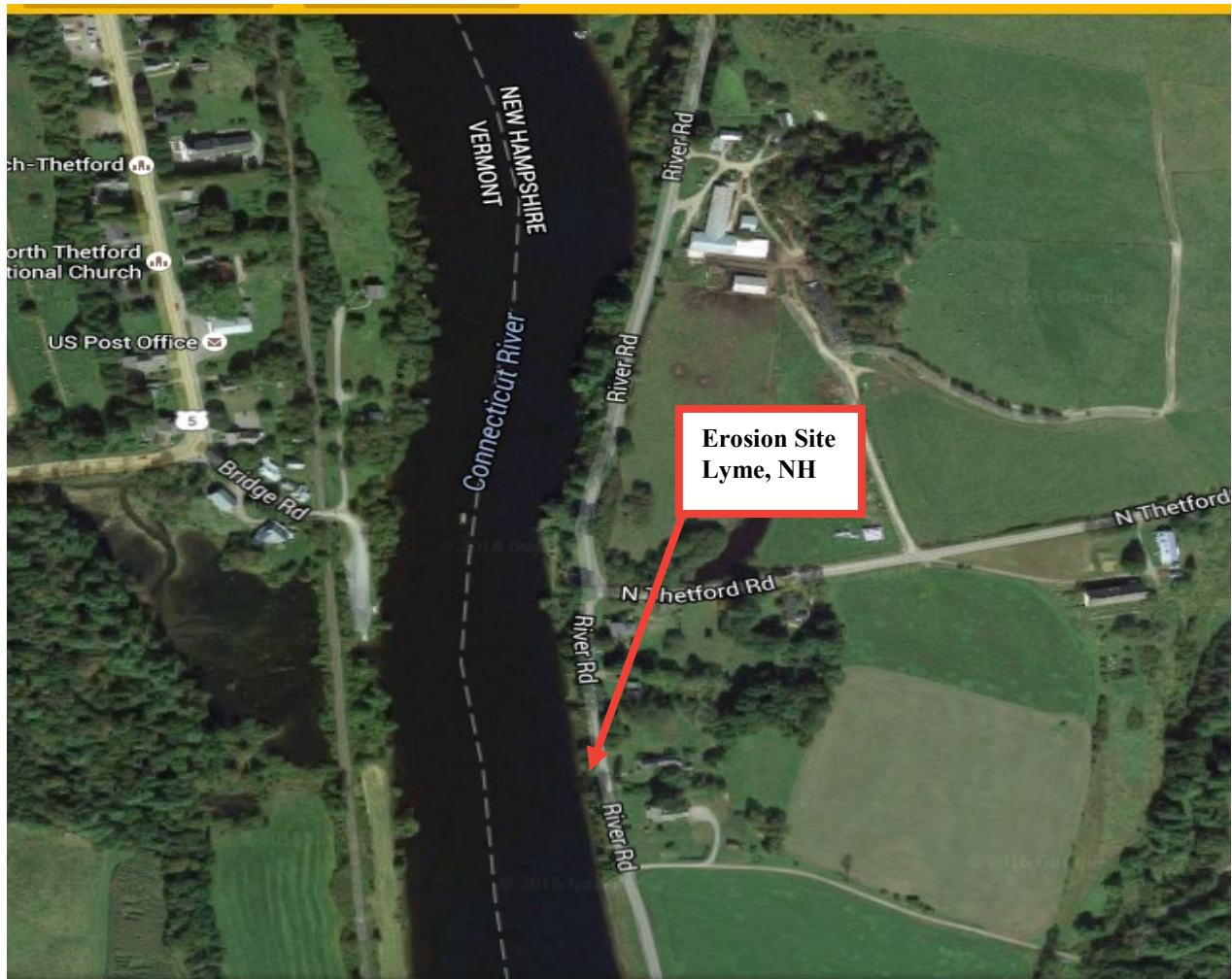


Figure 2. Erosion Site

4. Problem Identification: The primary cause of erosion at the site is natural scour from high river flows and ice. Surficial inspection of failed slopes along the Connecticut River indicates primarily non-plastic silt/sand deposits with interspersed light brown sand deposits. Although much of Lyme's riverbanks are well vegetated, which adds to riverbank stability, some forested bank locations have been undercut by erosion (Figure 3). The cavities created by these undercuts, extend back some four to six feet. In such places, the root structures of the trees are currently the sole means of bank stabilization. Once the root systems of the trees fail, a large root ball falls to the river. Additionally, the Connecticut River is highly susceptible to erosion caused by ice flows. Anticipated flooding and ice flows may accelerate failure of the slope. The erosion area is about 500 feet in length. Along the roadway, tension cracks have appeared parallel to the river (Figure 4). The unstable areas are heavily undercut, and the bank above it, some 30 feet high, is made of very poor fill. The endangered banks have unstable brush and some small trees on it.



Figure 3. Photograph of Bank Erosion below River Road



Figure 4. Tension Cracks along River Road

Very little distance exists between the road and the undercut bank. The town estimates that the active erosion experienced is at a rate of two feet per year. There is an eddy along the bank of the stream, and this was during relatively low flows during the site visit. The slope ranges from 1:1 (vertical to horizontal) to 1:2.

Section 14 assistance was requested by the town of Lyme on August 24, 2011 as they are a small community with limited resources to address this problem on their own. Funding to begin the feasibility study was received in early 2016. A Federal Interest Determination (FID) was completed in December 2016 and approved in January 2017.

5. Alternative Plans Considered: Several possible methods of protecting the roadway were investigated including the ‘No Action’ plan. Road relocation, a sheet pile wall, precast modular retaining wall, gabions and stone slope revetment were all potential structural solutions considered for the stabilization of the site.

Under the ‘No Action’ alternative stream bank erosion would continue and the road and associated utilities would eventually fail. Access to several homes could be cut off completely. Therefore, the ‘No Action’ alternative is an unacceptable solution to the town of Lyme. The relocation of River Road and utilities alternative was found to cost over \$2,000,000 and would require the acquisition of significant real estate (outright purchase of several properties and the partial acquisition of several others). This alternative was dropped from further consideration. The sheet pile wall alternative was found to be infeasible due to shallow bedrock and was also dropped from further consideration.

The final list of structural alternatives that were evaluated during initial plan formulation, along with their construction cost, is shown in Table 1.

TABLE 1
EROSION PROTECTION ALTERNATIVES
Connecticut River – Lyme, New Hampshire

<i>Alternatives</i>	<i>Construction Cost</i> <i>(October 2016 price levels)</i>
1. Precast Modular Retaining Wall	\$650,000
2. Gabions	\$723,000
3. Stone Slope Revetment	\$568,000

Although the remaining alternatives investigated could provide protection of the riverbank and roadway, the stone slope revetment alternative was chosen as it is the least costly (\$568,000) and is the selected plan for this erosion site. The recommended plan, according to Section 14 policy, is the least cost alternative that is also less than the cost of relocating the threatened facility, in this case River Road. If erosion continues to remove bank material such that the riverbank’s slope becomes too steep to construct the stone revetment, the precast modular retaining wall will be the next best option. This will be addressed during the Design & Implementation phase.

6. Description of Recommended Plan: The proposed action consists of armoring 500 feet of stream bank with 18" D50 (12"-24") stone placed on a bedding of gravel (1') and sand (1'). Boulders or cut stone found on site could be placed at the base of the revetment below the river's water's edge. Above the stone, trees and shrubs will need to be removed. See Figures 5 and 6.



Figure 5. Plan View of the Recommended Plan

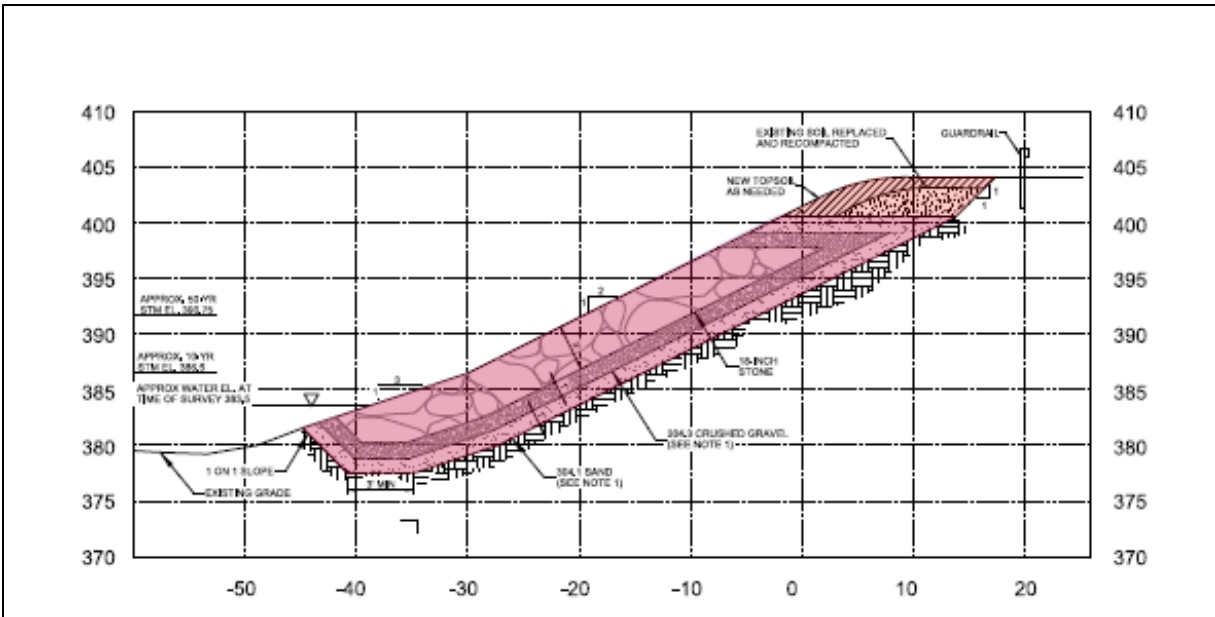


Figure 6. Cross Section of the Recommended Plan

The total cost for this project is estimated to be about \$1,591,000. Table 2 shows the breakdown of the cost estimate.

TABLE 2
Cost Estimate of Recommended Stone Slope Protection
Connecticut River – Lyme, New Hampshire

	<i>Construction Cost (FY 2019 price level)</i>
1. Construction Contract	\$875,000
2. LERRDs	\$ 15,000
3. Plans & Specifications (P&S)	\$169,000
4. Supervision & Administration (S&A)	\$200,000
5. Contingency (26%)	<u>\$332,000</u>
Total	\$1,591,000

The increase in cost from the time of the FID is due mainly to the anticipated need to use a cofferdam to excavate within the river as well as the inclusion of the P&S and S&A costs. These added costs would have been needed for all the alternatives initially examined and so the study team was comfortable with the decision to continue with the stone protection recommendation. The work is expected to take just over 3 months to complete.

7. Real Estate (RE) Report: The project is primarily located on privately owned land. Two permanent easements and a temporary work area easement have currently been estimated for this project (~\$15,000). These will be further refined during the Design and Implementation (D&I) phase of the project. The town has indicated that they are capable of obtaining the necessary

lands (either in fee or easement) from the private landowners. See the attached Real Estate report for further details.

8. Hazardous Toxic Radioactive Waste (HTRW): Based on the knowledge of the sponsor, there is no evidence or history of HTRW in the areas of the project.

9. Views of Sponsor: The town of Lyme stated that they understand and agree to the terms of local cooperation and cost sharing, and are willing to act as the non-Federal sponsor for the proposed project. Correspondence with the local community indicate support of the project.

10. Views of Federal, State and Regional Agencies: Local, state and Federal agencies were coordinated with during the study and development of the Environmental Assessment. There were no objections made as a result of the proposed project.

11. Status of Environmental Statutes Compliance: The draft Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) attached to this report are sufficient to meet National Environmental Policy Act (NEPA) requirements. The EA/FONSI and the Section 404 (b)(1) Evaluation will be finalized at the completion of the project's Public Notice and final review/approval by North Atlantic Division. A summary of the draft EA's conclusions area as follows:

- a. The project will have no permanent negative impacts on any State or Federal rare or endangered species. The National Marine Fisheries Service has concurred that the construction of the project as proposed will not affect any listed species (specifically Atlantic and short nose sturgeon); and the U.S. Fish and Wildlife Service has concurred that the proposed project will have no effects on the Federally endangered dwarf wedge mussel and is not likely to adversely affect the Federally threatened Northern long-eared bat.
- b. The proposed project is not expected to negatively affect Essential Fish Habitat (EFH) for species listed under the Magnuson Stevens Conservation Act. USACE consulted with the Habitat Conservation Division of the National Marine Fisheries Service and determined that the undertaking would not result in an adverse effect to EFH. Therefore, no EFH assessment was required.
- c. The project will have no known negative impacts on any prehistoric archaeological sites recorded by the State of New Hampshire.
- d. Artificial habitat features may be added to the toe of the bank, during the D&I phase, in order to restore fish habitat in the river lost by the removal of the undercut banks.
- e. This project will have no long-term impacts on air quality and conforms to the Federal requirements for activities under the Clean Air Act.
- f. Sediment loading would be minimized by employing erosion control plans. Detailed erosion control measures will be in place prior to construction activities including those in the water to minimize turbidity. A turbidity curtain will be deployed around the work area in order to prevent

sediment loading into the Connecticut River, as well as to prevent fish species from entering the work area.

New England District will obtain State water quality certification for the project. The request will be filed during the D&I phase when the preliminary drawings are prepared. The non-Federal sponsor will be responsible for ensuring compliance with any additional state of New Hampshire environmental compliance requirements.

12. Implementation Schedule: Contract award is scheduled for June 2020, contingent upon, project approval, execution of a Project Partnership Agreement (PPA) with the non-Federal sponsor, all construction funding (Federal and non-Federal) being provided, all necessary permits being obtained, and the non-Federal sponsor certifying the necessary lands have been acquired for the project. Physical completion of the work should occur 4 months after award.

13. Supplemental Information: None

14. Recommendations: I recommend that the proposed action consisting of armoring (stone rip-rap revetment) 500 feet of stream bank along the Connecticut River and River Road in Lyme, New Hampshire be implemented. The recommended project for Lyme will be implemented under the Emergency Streambank & Shoreline Protection authority (Section 14 of the Continuing Authorities Program). The project's total cost is estimated to be \$1,591,000. The USACE would be responsible for 65% of this cost or \$1,034,000 and the non-Federal sponsor would be responsible for the other 35% or \$557,000. Annual O&M costs are estimated to be \$500 and will be the responsibility of the non-Federal sponsor. See Table 3. The requirements for maintaining the project will be addressed in a Corps-prepared operation and maintenance manual and future maintenance will be the responsibility of the local sponsor.

I further recommend that this Feasibility Report be the basis for proceeding with the Design and Implementation phase of the approved plan under the authority of Section 14 of the Flood Control Act of 1946 (as amended). This recommendation to proceed to the Design and Implementation Phase is contingent on a commitment on the part of the town of Lyme, New Hampshire, to perform repairs and reconstruction, as deemed necessary, to the revetment.

The recommendations contained herein reflect information available at this time and current Department of the Army policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of the national civil works construction program nor the perspective of higher review levels of the Executive Branch. Consequently, the approval may be modified before transmission for authorization and /or implementation.

Date

William M. Conde
Colonel, Corps of Engineers
District Engineer

TABLE 3
ECONOMIC AND FINANCIAL DATA
RECOMMENDED PLAN
Lyme, New Hampshire
Section 14 – Connecticut River
(All costs in thousands of dollars)

a. Estimated Implementation Costs:

(Oct 2018 price level)

Federal	1,034,000
Non-Federal	557,000
LERRDs	15,000
Cash	542,000
TOTAL	\$1,591,000

b. Economic Data:

(2.875%, 25 year life, FY 19)

Annual Charges: \$90,600

(Includes Annual \$500 OM&R)

c. Allocations to Date:

	<u>Federal</u>	<u>Non-Federal</u>
Feasibility Phase	\$ 100,000	\$ 0
Design & Implementation Phase	<u>\$ 0</u>	<u>\$ 0</u>
TOTAL	\$ 100,000	\$ 0

d. Remaining Requirements:

Feasibility Phase	\$ 0	\$ 0
Design & Implementation Phase	<u>\$1,034,000</u>	<u>557,000</u>
TOTAL	\$1,034,000	\$ 557,000

e. Total Allocations:

\$1,134,000	\$ 557,000
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Note: All Feasibility Phase costs in excess of \$100,000 are cost shared.