



DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT
696 VIRGINIA ROAD
CONCORD MA 01742-2751

March 3, 2015

Engineering/Planning Division
Geotechnical/Water Resources Branch

Lenny Laakso
Commissioner of Public Works
166 Boulder Drive, Suite 108
Fitchburg, Massachusetts 01420

Dear Mr. Laakso:

The most recent routine inspection (RI) of the federally constructed North Nashua River Flood Damage Reduction (FDR) System, in the city of Fitchburg, Massachusetts, was conducted on September 25, 2014. The last RI was conducted on October 17, 2006 and had an overall rating of Unacceptable. Enclosed is a detailed inspection report for the City's records.

The RI is an element of the U.S. Army Corps of Engineers (USACE) Levee Safety Program, the primary objective of which is to assure that levee systems are reliable and do not present unacceptable risks to the public, property, or the environment. The principles that guide the program include the shared responsibility among partners at all levels for levee safety, the adoption of uniform inspection standards and the need for routine and periodic inspections and screening level risk assessments.

The FDR System was evaluated on the basis of several general criteria (e.g. flood damage reduction channels) and associated items (e.g. vegetation and obstructions). Each of these items is rated "acceptable", "minimally acceptable", or "unacceptable". The system rating is derived from the ratings of the individual system components.

The North Nashua River FDR System has an overall rating of Unacceptable. The unacceptable rating means that deficiencies were identified that require immediate attention and may prevent the system from performing as intended during the next significant flood event. This rating is reflective of longstanding problems identified at the system that have not been addressed within prior established timeframes not exceeding two years.

The deficiencies that form the basis for the system rating are summarized below. The deficiencies need to be addressed in order for the system to be elevated to acceptable condition. The Sponsor must review the report in its entirety to gain a

proper appreciation of the required work effort in order to formulate a realistic labor and cost schedule. Please note that the deficiencies reflect the condition of the system at the time of the inspection, and may not reflect work that has been performed in the period between the inspection and the issue date of the report.

a) Items rated Unacceptable

- Flood Damage Reduction Channels: Significant vegetation consisting of large brush and trees was observed along the riprap slopes, adjacent to and within 15 feet of concrete walls, and in the river channels. Removal of trees and saplings and spraying the rip rap areas with an appropriate herbicide to control/eliminate woody vegetation and weed growth should be performed and a routine program established (i.e., annually) to keep growth off these areas. Once the majority of vegetation is removed, the Sponsor should perform a thorough inspection of the concrete walls and project features. Shoaling with significant vegetation was present along the majority of the project limits. Shoaling should be removed and original channel capacity restored.

b) Additional Concerns

- Minimally Acceptable Rated Items: Please refer to the inspection report for all "minimally acceptable" rated items. Please note that failure to correct the noted deficiencies in the inspection report could lead to the item being rated "unacceptable".
- Semi-Annual Reports: Start submitting semi-annual reports as required by the Operation and Maintenance manual. The reports should include a summary of work performed, significant flood events and any other information pertinent to the operation and maintenance of the system over the reporting period. Reports should be submitted every February and August.
- Emergency Action Plan: Provide USACE with a copy of the current system Emergency Action Plan (EAP). The EAP can be submitted as part of the next semi-annual report.

Please note that at this time the authority of the New England District to make PL-84-99 Rehabilitation and Inspection Program (RIP) eligibility decisions has been suspended by USACE Headquarters until further notice. Therefore, the North Nashua River FDR System will remain in an "Inactive" status. USACE will provide the Sponsor with status updates and further guidance once the PL-84-99 policy is finalized; please contact USACE if you have any questions regarding the PL-84-99 eligibility status.

If you have any questions concerning the inspection, or other matters pertaining to the North Nashua River FDR System, please call me at (978) 318-8350 or Mike Bachand, Levee Safety Program Manager, at (978) 318-8075.

Sincerely,



Scott C. Michalak, P.E.
Chief, Geotechnical/Water Resources Branch
Levee Safety Officer

Enclosure

Copy Furnished (w/Encl):

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Mr. Dean Savramis, P.E.
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Senator Edward Markey, U.S. Senate
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Representative Stephen L. DiNatale, U.S. House of Representatives
State House
24 Beacon Street, Room 276
Boston, Massachusetts 02133-1000



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Flood Damage Reduction Segment / System Inspection Report

Name of Segment / System: North Nashua River

Public Sponsor(s): City of Fitchburg, MA

Public Sponsor Representative: Lenny Laakso, Commissioner of Public Works

Sponsor Phone: (978) 829-1910

Sponsor Email: llaakso@fitchburgma.gov

Corps of Engineers Inspector: Andrew Cattano, Alex Garneau

Inspection Start Date: 9/25/2014

Inspection End Date: 9/25/2014

Date Report Prepared: 12/5/2014

Date of ITR: 12/9/2014

Date Approved: 2/25/2015

Inspection Report Prepared By: Andrew Cattano

Internal Technical Review (for Periodic Inspections) By: Alex Garneau

Final Approved By: Michael Bachand, P.E.

Type of Inspection:

☐

Initial Eligibility Inspection

☒

Continuing Eligibility Inspection (Routine)

☐

Continuing Eligibility Inspection (Periodic)

☐

Contents of Report:

☒

Instructions

☐

Initial Eligibility Inspection

☒

General Items for All Flood Control Works

☐

Levee Embankment

☐

Concrete Floodwalls

☐

Sheet Pile and Concrete I-walls

☐

Interior Drainage System

☐

Pump Stations

☐

FDR System Channels

☒

Overall Segment / System Rating:

☐

Acceptable

☐

Minimally Acceptable

☒

Unacceptable

Note: In addition to the report contents indicated here, a plan view drawing of the system, with stationing, should be included with this report to reference locations of items rated less than acceptable. Photos of general system condition and any noted deficiencies should also be attached.

Note: This inspection rating represents the Corps evaluation of operations and maintenance of the flood damage reduction system and may be used in conjunction with other information for a levee certification determination for National Flood Insurance Program (NFIP) purposes if applicable. An Acceptable Corps inspection rating, alone, does not equate to a certifiable levee for the NFIP. It is recommended for levee systems currently accredited by the Federal Emergency Management Agency (FEMA) for NFIP purposes receiving a Corps Minimally Acceptable or Unacceptable rating, be evaluated by the levee owner to determine the potential impacts to the certification for FEMA.

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Flood Damage Reduction Segment / System Public Sponsor Pre-Inspection Form

The following information is to be provided by the levee district sponsor prior to an inspection. This information will be used to help evaluate the organizational capability of the levee district to manage the levee segment / system maintenance program.

1. Levee segment / system and district: (name of the segment / system and levee district) North Nashua River Flood Damage Reduction System
2. Reporting period: (month/day/year to month/day/year) 10/17/2006 to 9/25/2014
3. Summary of maintenance required by last inspection report: Vegetation removal, routine maintenance.
4. Summary of maintenance performed this reporting period: None.
5. Summary of maintenance planned next reporting period: Vegetation removal, shoaling removal, routine maintenance.
6. Summary of changes to segment / system since last inspection: None.
7. Problems/ issues requiring the assistance of the US Army Corps of Engineers: None.



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**Flood Damage Reduction Segment / System
Inspection Report**

**Pre-Inspection Form
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The following information is to be provided by the levee district sponsor prior to an inspection

The following information is to be provided by the levee district sponsor prior to an inspection

8. Levee district organization: (elected or appointed levee district officials and key employees)

[illegible]

General Instructions for the Inspection of Flood Damage Reduction Segments / Systems

A. Purpose of USACE Inspections:

The primary purpose of these inspections is to prevent loss of life and catastrophic damages; preserve the value of Federal investments, and to encourage non-Federal sponsors to bear responsibility for their own protection. Inspections should assure that Flood Damage Reduction structures and facilities are continually maintained and operated as necessary to obtain the maximum benefits. Inspections are also conducted to determine eligibility for Rehabilitation Assistance under authority of PL 84-99 for Federal and non-Federal systems. (ER 1130-2-530, ER 500-1-1)

B. Types of Inspections:

The Corps conducts several types of inspections of Flood Damage Reduction systems, as outlined below:

Continuing Eligibility Inspections		
Initial Eligibility Inspections	Routine Inspections	Periodic Inspections
IEIs are conducted to determine whether a non-Federally constructed Flood Damage Reduction system meets the minimum criteria and standards set forth by the Corps for initial inclusion into the Rehabilitation and Inspection Program.	RIs are intended to verify proper maintenance, owner preparedness, and component operation.	PIs are intended to verify proper maintenance and component operation and to evaluate operational adequacy, structural stability, and safety of the system. Periodic Inspections evaluate the system's original design criteria vs. current design criteria to determine potential performance impacts, evaluate the current conditions, and compare the design loads and design analysis used against current design standards. This is to be done to identify components and features for the sponsor that need to be monitored more closely over time or corrected as needed. (Periodic Inspections are used as the basis of risk assessments.)

C. Inspection Boundaries:

Inspections should be conducted so as to rate each Flood Damage Reduction "Segment" of the system. The overall system rating will be the lowest segment rating in the system.

Project	System	Segment
A flood damage reduction project is made up of one or more flood damage reduction systems which were under the same authorization.	A flood damage reduction system is made up of one or more flood damage reduction segments which collectively provide flood damage reduction to a defined area. Failure of one segment within a system constitutes failure of the entire system. Failure of one system does not affect another system.	A flood damage reduction segment is defined as a discrete portion of a flood damage reduction system that is operated and maintained by a single entity. A flood damage reduction segment can be made up of one or more features (levee, floodwall, pump stations, etc).

D. Land Use Definitions:

The following three definitions are intended for use in determining minimum required inspection intervals and initial requirements for inclusion into the Rehabilitation and Inspection Program. Inspections should be considered for all systems that would result in significant environmental or economic impact upon failure regardless of specific land use.

Agricultural	Rural	Urban
Protected population in the range of zero to 5 households per square mile protected.	Protected population in the range of 6 to 20 households per square mile protected.	Greater than 20 households per square mile; major industrial areas with significant infrastructure investment. Some protected urban areas have no permanent population but may be industrial areas with high value infrastructure with no overnight population.



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Flood Damage Reduction Segment / System Inspection Report

E. Use of the Inspection Report Template:

The report template is intended for use in all Army Corps of Engineers inspections of levee and floodwall systems and flood damage reduction channels. The section of the template labeled "Initial Eligibility" only needs to be completed during Initial Eligibility Inspections of Non-Federally constructed Flood Damage Reduction Systems. The section labeled "General Items" needs to be completed with every inspection, along with all other sections that correspond to features in the system. The section labeled "Public Sponsor Pre-Inspection Report" is intended for completion before the inspection, if possible.

F. Individual Item / Component Ratings:

Assessment of individual components rated during the inspection should be based on the criteria provided in the inspection report template, though inspectors may incorporate additional items into the report based on the characteristics of the system. The assessment of individual components should be based on the following definitions.

Acceptable Item	Minimally Acceptable Item	Unacceptable Item
The inspected item is in satisfactory condition, with no deficiencies, and will function as intended during the next flood event.	The inspected item has one or more minor deficiencies that need to be corrected. The minor deficiency or deficiencies will not seriously impair the functioning of the item as intended during the next flood event.	The inspected item has one or more serious deficiencies that need to be corrected. The serious deficiency or deficiencies will seriously impair the functioning of the item as intended during the next flood event.

G. Overall Segment / System Ratings:

Determination of the overall system rating is based on the definitions below. Note that an Unacceptable System Rating may be either based on an engineering determination that concluded that noted deficiencies would prevent the system from functioning as intended during the next flood event, or based on the sponsor's demonstrated lack of commitment or inability to correct serious deficiencies in a timely manner.

Acceptable System	Minimally Acceptable System	Unacceptable System
All items or components are rated as Acceptable.	One or more items are rated as Minimally Acceptable or one or more items are rated as Unacceptable and an engineering determination concludes that the Unacceptable items would not prevent the segment / system from performing as intended during the next flood event.	One or more items are rated as Unacceptable and would prevent the segment / system from performing as intended, or a serious deficiency noted in past inspections (which had previously resulted in a minimally acceptable system rating) has not been corrected within the established timeframe, not to exceed two years.

H. Eligibility for PL84-99 Rehabilitation Assistance:

Inspected systems that are not operated and maintained by the Federal government may be Active in the Corps' Rehabilitation and Inspection Program (RIP) and eligible for rehabilitation assistance from the Corps as defined below.

If the Overall System Rating is Acceptable	If the Overall System Rating is Minimally Acceptable	If the Overall System Rating is Unacceptable
The system is active in the RIP and eligible for PL84-99 rehabilitation assistance.	The system is Active in the RIP during the time that it takes to make needed corrections. Active systems are eligible for rehabilitation assistance. However, if the sponsor does not present USACE with proof that serious deficiencies (which had previously resulted in a minimally acceptable system rating) were corrected within the established timeframe, then the system will become Inactive in the RIP.	The system is Inactive in the RIP, and the status will remain Inactive until the sponsor presents USACE with proof that all items rated Unacceptable have been corrected. Inactive systems are ineligible for rehabilitation assistance.



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I. Reporting:

After the inspection, the Corps is responsible for assembling an inspection report (or a summary report if it was a Periodic Inspection) including the following information:

- a. All sections of the report template used during the inspection, including the cover and pre-inspection materials. (Supplemental data collected, and any sections of the template that weren't used during the inspection do not need to be included with the report.)
- b. Photos of the general system condition and noted deficiencies.
- c. A plan view drawing of the system, with stationing, to reference locations of items rated less than acceptable.
- d. The relative importance of the identified maintenance issues should be specified in the transmittal letter.
- e. If the Overall System Rating is Minimally Acceptable, the report needs to establish a timeframe for correction of serious deficiencies noted (not to exceed two years) and indicate that if these items are not corrected within the required timeframe, the system will be rated as Unacceptable and made Inactive in the Rehabilitation Inspection Program.

J. Notification:

Reports are to be disseminated as follows within 30 days of the inspection date.

If the Overall System Rating is Acceptable	If the Overall System Rating is Minimally Acceptable	If the Overall System Rating is Unacceptable
Reports need to be provided to the local sponsor and the county emergency management agency.	Reports need to be provided to the local sponsor, state emergency management agency, county emergency management agency, and to the FEMA region.	Reports need to be provided to the local sponsor, state emergency management agency, county emergency management agency, FEMA region, and to the Congressional delegation within 30 days of the inspection.



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General Items for All Flood Damage Reduction Segments / Systems

For use during all inspections of all Flood Damage Reduction Segments / Systems

Rated Item	Rating	Rating Guidelines	Location/Remarks/Recommendations
1. Operations and Maintenance Manuals	A	A Levee Owner's Manual, O&M Manuals, and/or manufacturer's operating instructions are present.	Sponsor maintains a copy of the Operation and Maintenance Manual. (A)
		M Sponsor manuals are lost or missing or out of date; however, sponsor will obtain manuals prior to next scheduled inspection.	
		U Sponsor has not obtained lost or missing manuals identified during previous inspection.	
2. Emergency Supplies and Equipment (A or M only)	M	A The sponsor maintains a stockpile of sandbags, shovels, and other flood fight supplies which will adequately supply all needs for the initial days of a flood fight. Sponsor determines required quantity of supplies after consulting with inspector.	Sponsor needs to verify that an adequate supply of flood fighting materials is available. Provide USACE with an update in the next semi-annual report. (M)
		M The sponsor does not maintain an adequate supply of flood fighting materials as part of their preparedness activities.	
3. Flood Preparedness and Training (A or M only)	M	A Sponsor has a written system-specific flood response plan and a solid understanding of how to operate, maintain, and staff the FDR system during a flood. Sponsor maintains a list of emergency contact information for appropriate personnel and other emergency response agencies.	No Emergency Action Plan (EAP) has been provided to USACE. Provide USACE with a copy of an EAP in the next semi-annual report. (M)
		M The sponsor maintains a good working knowledge of flood response activities; but documentation of system-specific emergency procedures and emergency contact personnel is insufficient or out of date.	

Key: A = Acceptable. M = Minimally Acceptable; Maintenance is required. U = Unacceptable. N/A = Not Applicable. FDR = Flood Damage Reduction



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Inspection Report

General Items for All Flood Damage Reduction
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Flood Damage Reduction Channels

For use during Initial and Continuing Eligibility Inspections of flood damage reduction channels

Rated Item	Rating	Rating Guidelines		Location/Remarks/Recommendations
1. Vegetation and Obstructions	U	A	No obstructions, vegetation, debris, or sediment accumulation within the channel. Concrete channel joints and weep holes are free of grass and weeds.	Significant vegetation consisting of large brush and trees greater than 2-inches in diameter along the channel slopes of the entire project. Vegetation needs to be cleared to prevent any reduction in flow during a flood event in accordance with Engineering Technical Letter 1110-2-583. Refer to Photos 1-18. (U)
		M	Obstructions (including log jams), vegetation, debris, or sediment are minor and have not impaired channel flow capacity, but should be removed. Sediment shoals have not developed to the extent that they can support vegetation other than non-aquatic grasses. A limited volume of grass and weeds may be present in concrete channel joints and weep holes.	
		U	Obstructions (including log jams), vegetation, debris or sediment have impaired the channel flow capacity. Sediment shoals are well established and support woody and/or brushy vegetation. Sediment and debris removal required to re-establish flow capacity.	
2. Shoaling ¹ (sediment deposition)	U	A	No shoaling or minor, non-vegetated shoaling is present.	Shoaling with significant vegetation present along entire project. Remove vegetation and excavate shoaling to restore original capacity. Provide USACE with an update in the next semi-annual report. Refer to Photos 1-14. (U)
		M	More widespread vegetated and non-vegetated shoaling is present. Non-aquatic grasses are present on shoal. No trees or brush is present on shoal, and channel flow is not significantly reduced. Sediment and debris removal recommended.	
		U	Shoaling is well established, stabilized by saplings, brush, or other vegetation. Shoals are diverting flow to channel walls. Channel flow capacity is reduced and maintenance is required.	
3. Encroachments	A	A	No trash, debris, unauthorized structures, excavations, or other obstructions present within the easement area. Encroachments have been previously reviewed by the Corps, and it was determined that they do not diminish proper functioning of the channel.	No encroachments noted. (A)
		M	Trash, debris, unauthorized structures, excavations, or other obstructions present, or inappropriate activities noted that should be corrected but will not inhibit operations and maintenance or emergency operations. Encroachments have not been reviewed by the Corps.	
		U	Unauthorized encroachments or inappropriate activities noted are likely to inhibit operations and maintenance, emergency operations, or negatively impact the integrity of the channel.	
4. Erosion	U	A	No head cutting or horizontal deviation observed.	Channel embankments could not be inspected due to high vegetation. Clear vegetation and provide USACE with an update in the next semi-annual report. (U)
		M	Head cutting and horizontal deviation evident, but is less than 1 foot from the designed grade or cross section.	
		U	Head cutting and horizontal deviation of more than 1 foot from the designed grade or cross section. Corrective actions required to stop or slow erosion.	
5. Concrete Surfaces	U	A	Negligible spalling, scaling or cracking. If the concrete surface is weathered or holds moisture, it is still satisfactory but should be seal coated to prevent freeze/thaw damage.	All floodwalls could not be inspected due to high vegetation. Clear vegetation and provide USACE with an update in the next semi-annual report. Efflorescence and cracking noted along walls adjacent to Water Street. Refer to Photos 1-4. (U)
		M	Spalling, scaling, and open cracking present, but the immediate integrity or performance of the structure is not threatened. Reinforcing steel may be exposed. Repairs/sealing is necessary to prevent additional damage during periods of thawing and freezing.	

Key: A = Acceptable. M = Minimally Acceptable; Maintenance is required. U = Unacceptable. N/A = Not Applicable. FDR = Flood Damage Reduction



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Flood Damage Reduction Channels

For use during Initial and Continuing Eligibility Inspections of flood damage reduction channels

Rated Item	Rating	Rating Guidelines	Location/Remarks/Recommendations
6. Tilting, Sliding or Settlement of Concrete Structures ²	U	Surface deterioration or deep cracks present that may result in an unreliable structure. Any surface deterioration that exposes the sheet piling or lies adjacent to monolith joints may indicate underlying reinforcement corrosion and is unacceptable.	All floodwalls could not be inspected due to high vegetation. Clear vegetation and provide USACE with an update in the next semi-annual report. (U)
	N/A	There are no concrete items in the channel.	
	A	There are no significant areas of tilting, sliding, or settlement that would endanger the integrity of the structure.	
	M	There are areas of tilting, sliding, or settlement (either active or inactive) that need to be repaired. The maximum offset, either laterally or vertically, does not exceed 2 inches unless the movement can be shown to be no longer actively occurring. The integrity of the structure is not in danger.	
	U	There are areas of tilting, sliding, or settlement (either active or inactive) that threaten the structure's integrity and performance. Any movement that has resulted in failure of the waterstop (possibly identified by daylight visible through the joint) is unacceptable. Differential movement of greater than 2 inches between any two adjacent monoliths, either laterally or vertically, is unacceptable unless it can be shown that the movement is no longer active. Also, if the floodwall is of I-wall construction, then any visible or measurable tilting of the wall toward the protected side that has created an open horizontal crack on the riverside base of a monolith is unacceptable.	
7. Foundation of Concrete Structures ³	N/A	There are no concrete items in the channel.	All floodwalls could not be inspected due to high vegetation. Clear vegetation and provide USACE with an update in the next semi-annual report. (U)
	A	No active erosion, scouring, or bank caving that might endanger the structure's stability.	
	M	There are areas where the ground is eroding towards the base of the structure. Efforts need to be taken to slow and repair this erosion, but it is not judged to be close enough to the structure or to be progressing rapidly enough to affect structural stability before the next inspection. For the purposes of inspection, the erosion or scour is not closer to the riverside face of the wall than twice the floodwall's underground base width if the wall is of L-wall or T-wall construction; or if the wall is of sheetpile or I-wall construction, the erosion is not closer than twice the wall's visible height. Additionally, rate of erosion is such that the wall is expected to remain stable until the next inspection.	
	U	Erosion or bank caving observed that is closer to the wall than the limits described above, or is outside these limits but may lead to structural instabilities before the next inspection. Additionally, if the floodwall is of I-wall or sheetpile construction, the foundation is unacceptable if any turf, soil or pavement material got washed away from the landside of the I-wall as the result of a previous overtopping event.	
	N/A	There are no concrete items in the channel.	
8. Slab and Monolith Joints	U	The joint material is in good condition. The exterior joint sealant is intact and cracking/desiccation is minimal. Joint filler material and/or waterstop is not visible at any point.	All floodwalls could not be inspected due to high vegetation. Clear vegetation and provide USACE with an update in the

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Flood Damage Reduction Channels

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Rated Item	Rating	Rating Guidelines	Location/Remarks/Recommendations
9. Flap Gates/ Flap Valves/ Pinch Valves ⁴	M	The joint material has appreciable deterioration to the point where joint filler material and/or waterstop is visible in some locations. This needs to be repaired or replaced to prevent spalling and cracking during freeze/thaw cycles, and to ensure water tightness of the joint.	Not applicable.
	U	The joint material is severely deteriorated or the concrete adjacent to the monolith joints has spalled and cracked, damaging the waterstop; in either case damage has occurred to the point where it is apparent that the joint is no longer watertight and will not provide the intended level of protection during a flood.	
	N/A	There are no concrete items in the channel.	
	A	Gates/ valves open and close easily with minimal leakage, have no corrosion damage, and have been exercised and lubricated as required.	
	M	Gates/ valves will not fully open or close because of obstructions that can be easily removed, or have minor corrosion damage that requires maintenance.	
10. Riprap Revetments & Banks	U	Gates/ valves are missing, have been damaged, or have deteriorated to the point that they need to be replaced.	Riprap slopes could not be inspected due to high vegetation. Clear vegetation and provide USACE with an update in the next semi-annual report. (U)
	N/A	There are no flap gates.	
	A	No riprap displacement or stone degradation that could pose an immediate threat to the integrity of channel bank. Riprap intact with no woody vegetation present.	
	M	Minor riprap displacement or stone degradation that could pose an immediate threat to the integrity of the channel bank. Unwanted vegetation must be cleared or sprayed with an appropriate herbicide.	
	U	Significant riprap displacement, exposure of bedding, or stone degradation observed. Scour activity is undercutting banks, eroding embankments, or impairing channel flows by causing turbulence or shoaling. Rock protection is hidden by dense brush, trees, or grasses.	
11. Revetments other than Riprap	N/A	There is no riprap protecting this feature of the segment / system, or riprap is discussed in another section.	Not applicable.
	A	Existing revetment protection is properly maintained, undamaged, and clearly visible.	
	M	Minor revetment displacement or deterioration that does not pose an immediate threat to the integrity of the levee. Unwanted vegetation must be cleared or sprayed with an appropriate herbicide.	
	U	Significant revetment displacement, deterioration, or exposure of bedding observed. Scour activity is undercutting banks, eroding embankments, or impairing channel flows by causing turbulence or shoaling. Revetment protection is hidden by dense brush and trees.	
	N/A	There are no such revetments protecting this feature of the segment / system.	

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Flood Damage Reduction Channels

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- ¹ If weather and flow conditions allow, inspectors should walk in the channel and probe shoal areas in order to estimate extent of blockage of the cross-sectional area where shoaling is present.
- ² The sponsor should be monitoring any observed movement to verify whether the movement is active or inactive.
- ³ Inspectors must have as-built drawings available during the inspection so that the lateral distance to the heel and toe of the floodwalls can be determined in the field.
- ⁴ Proper operation of this item must be demonstrated during the inspection.

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**Flood Damage Reduction Segment / System
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Photos

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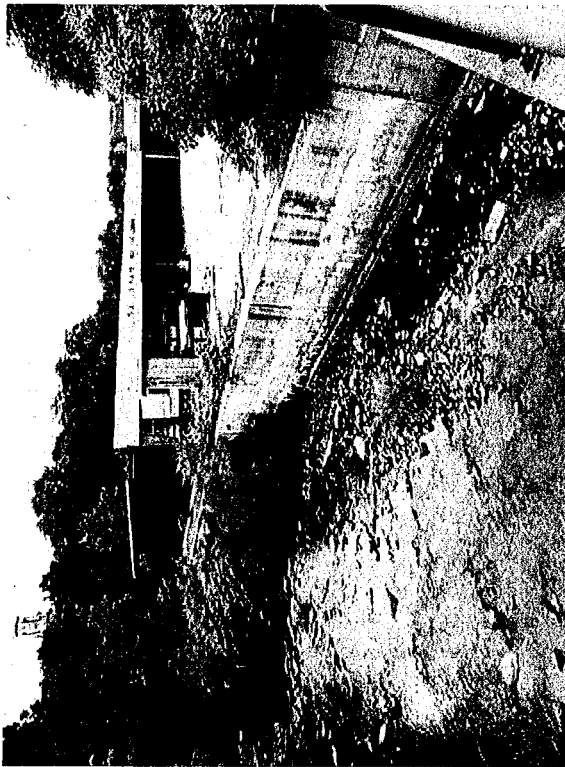


Photo 1: View upstream from Water Street of cracking and efflorescence along channel wall.

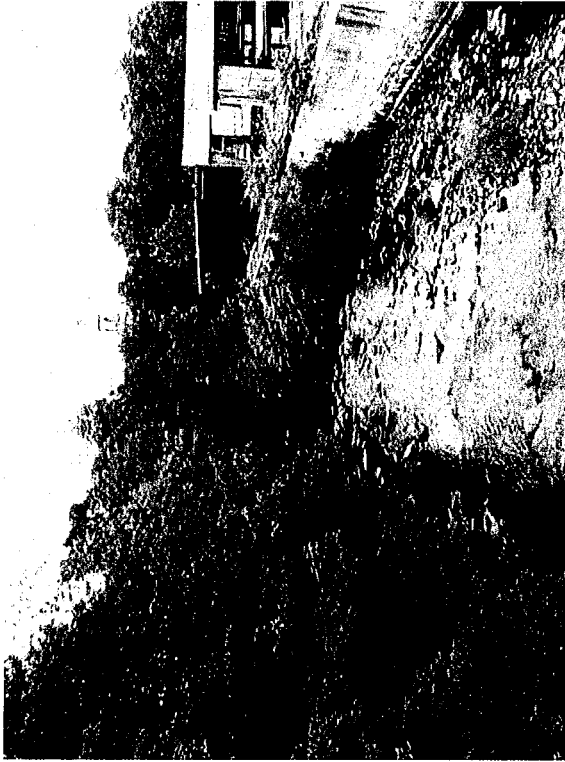


Photo 2: View upstream from Water Street of vegetation and shoaling.



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Photo 3: View downstream from Water Street of vegetation and shoaling.



Photo 4: View downstream from Water Street of vegetation and shoaling.



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Photo 5: View downstream from Sawyers Passway of vegetation along channel.



Photo 6: View downstream from Sawyers Passway of vegetation and shoaling.



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Photo 7: View upstream from Sawyers Passway of vegetation along channel wall.



Photo 8: View upstream from Sawyers Passway of vegetation along channel.



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Photo 9: View downstream from 5th Street of vegetation along channel.



Photo 10: View downstream from 5th Street of vegetation along channel.



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Photos

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Photo 11: View upstream from 5th Street of vegetation along channel.



Photo 12: View upstream from 5th Street of vegetation along channel.



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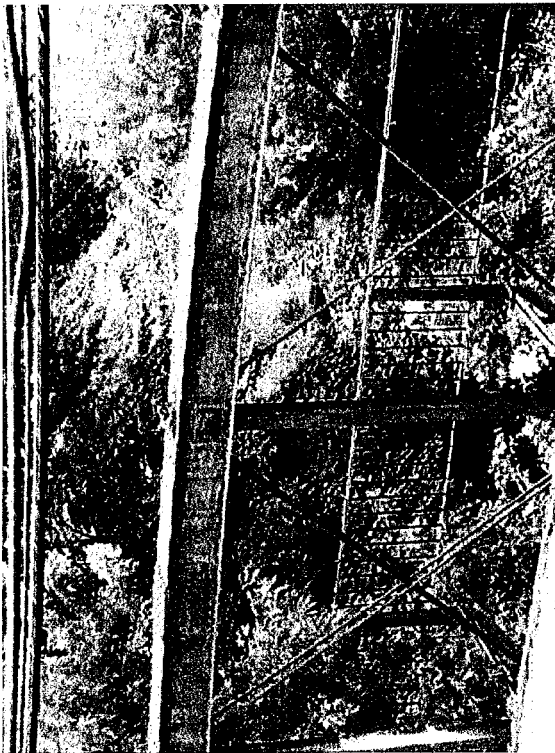


Photo 13: View of vegetation and shoaling along channel from Rollstone Street.



Photo 14: View of vegetation and shoaling along channel from Rollstone Street.

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Photo 15: View downstream from Kimball Street of vegetation along channel.



Photo 16: View downstream from Kimball Street of vegetation along channel.



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Photo 17: View downstream from River Street of vegetation along channel walls.

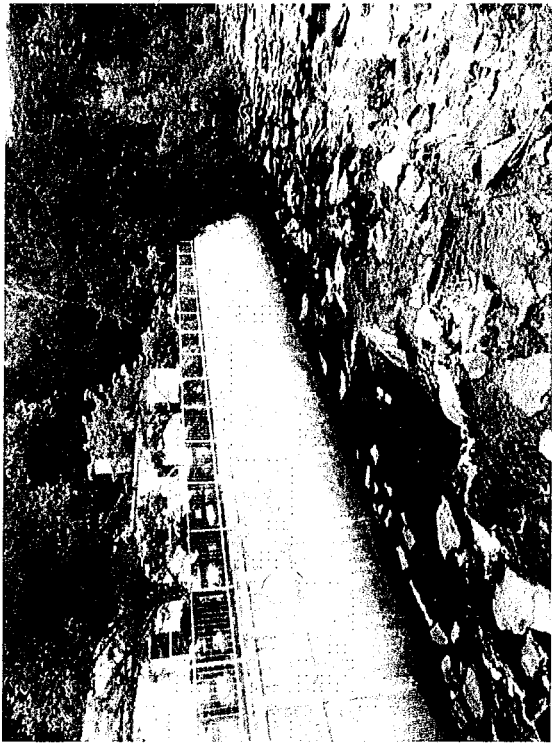


Photo 18: View downstream from River Street of vegetation along channel walls.



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0 650 1,300 2,600 3,900 5,200 Feet

North Nashua River
Flood Damage Reduction Project
Fitchburg, MA
Routine Inspection
September 25, 2014