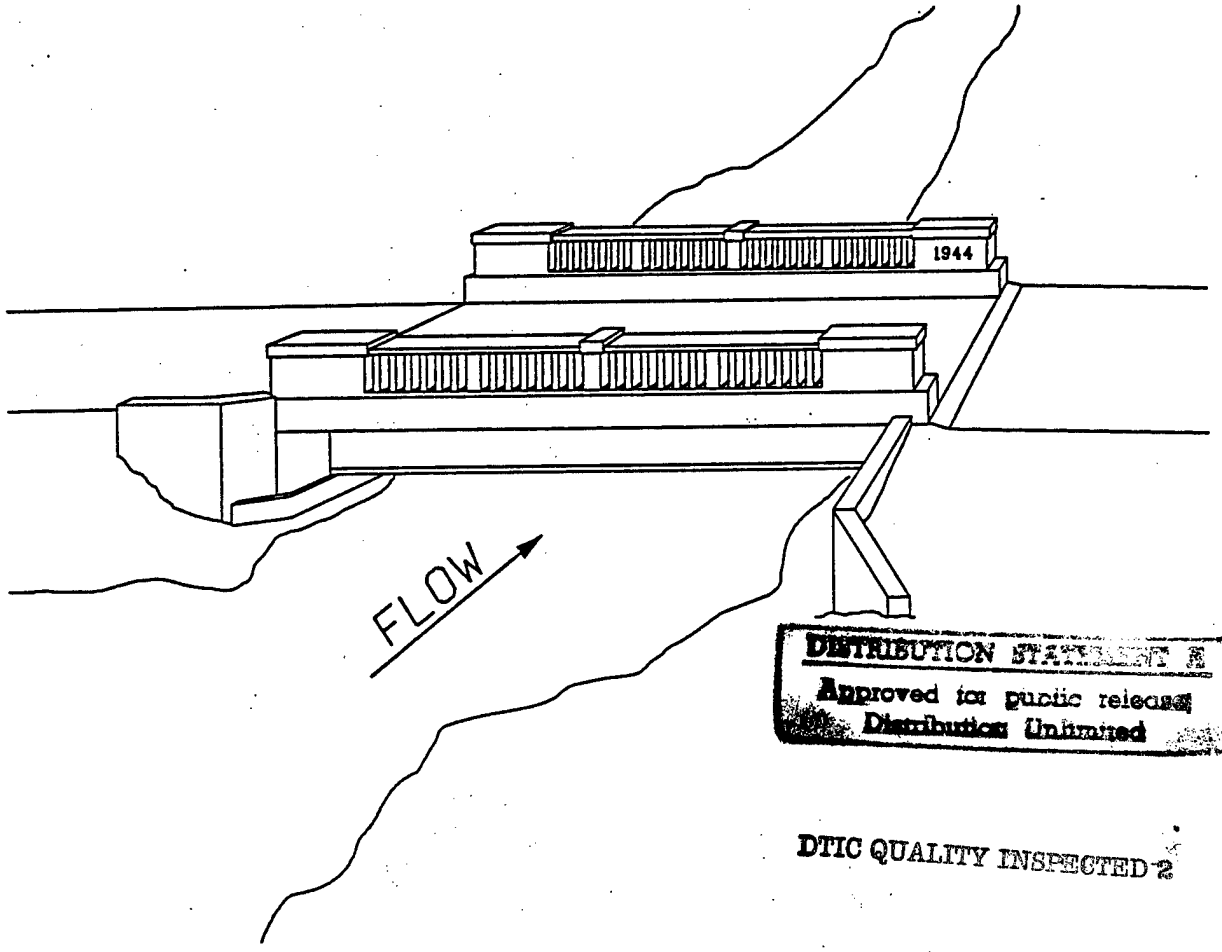
US Army Corps
of Engineers

Bridge Inspection Program

FY 93 Routine Inspections



October 1993

New England Division

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The purpose of this routine bridge inspections is to inspect the physical condition of the structures and to verify and update the findings and evaluations reported in the last in-depth and routine inspection.

Twenty-two bridges were inspected for the 1993 Interim Bridge Inspection Program. For each bridge, an overall summary has been prepared. Included are the vehicle ratings, evaluation of each structural component, and overall structural evaluation, all compared with those from all previous inspections.

14. SUBJECT TERMS
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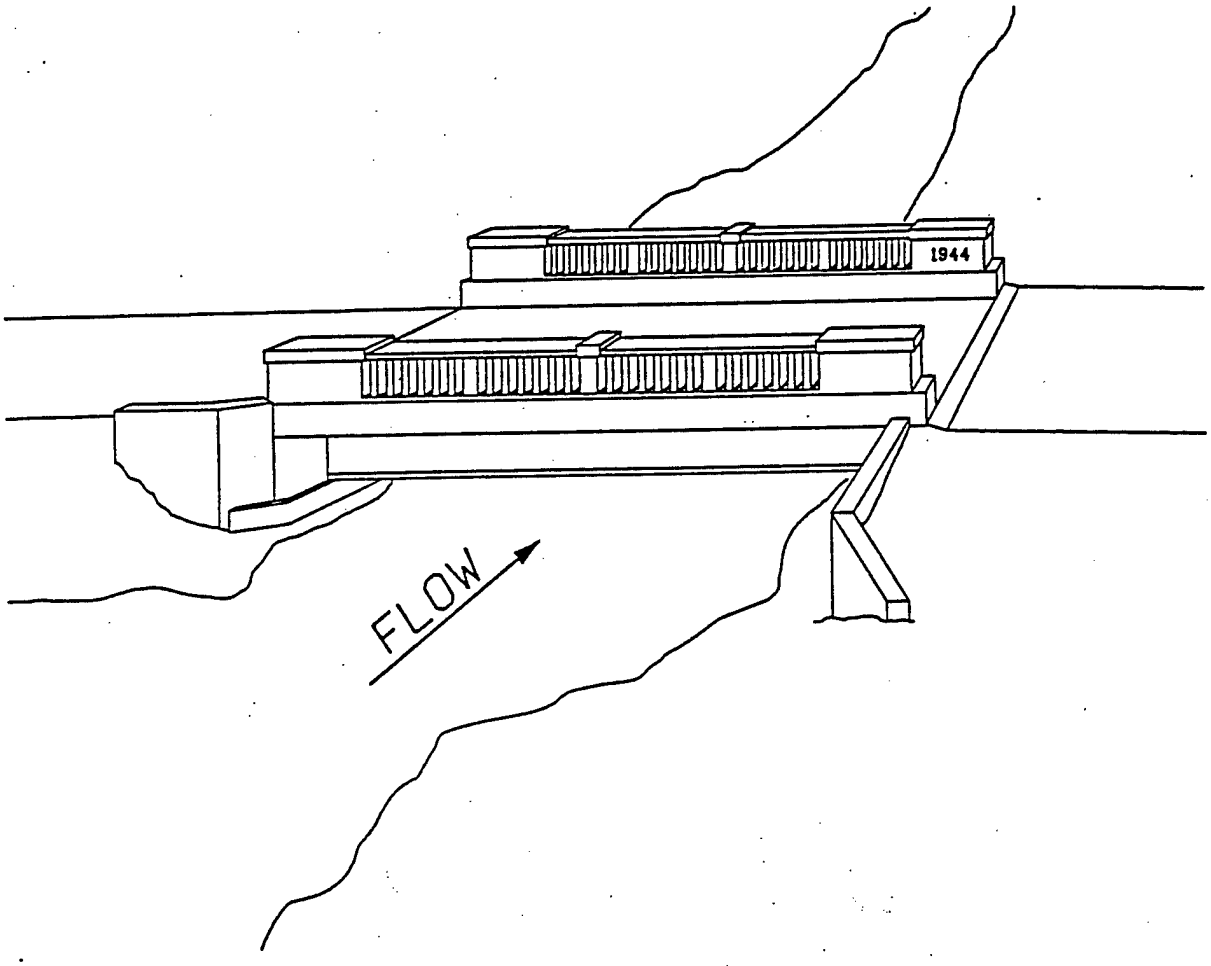

October 1993

New England Division

BRIDGE INSPECTION PROGRAM
FY 93 ROUTINE INSPECTIONS
NEW ENGLAND DIVISION

OCTOBER 1993

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

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NEW ENGLAND DIVISION
FY 93 ROUTINE BRIDGE INSPECTION PROGRAM

PURPOSE AND SCOPE

The purpose of the routine bridge inspections is to inspect the physical condition of the structures and to verify and update the findings and evaluations reported in the last in-depth and routine inspection. All previously detected areas of structural distress or operational inadequacies were reevaluated and any new deficiencies documented with the overall goal being to increase the useful life of the structures and to ensure the continued safety of the bridge users.

AUTHORITY

The basis for the inspections is contained in ER 1110-2-111 "Periodic Safety Inspection and Continuing Evaluation of United States Army Corps of Engineers Bridges."

INSPECTION PROCEDURE

The overall inspections were performed in accordance with AASHTO's 1983 "Manual for Maintenance Inspection of Bridges", the Department of Transportation's "Bridge Inspector's Training Manual 90" (1990 edition) and all applicable sections of ER 1110-2-111. The inspection program was carried out under the direct supervision of a licensed Professional Engineer. The most recent in-depth inspection reports were thoroughly reviewed by inspection personnel prior to and during the field inspections.

The underside of all smaller Reservoir Area bridges were accessed using a ladder, waders and a small boat, or some combination thereof, as required.

During all inspections, all pertinent safety equipment was utilized and all pertinent safety procedures were followed.

REPORTING PROCEDURE

For each bridge, an overall summary has been prepared. Included are the vehicle ratings, evaluation of each structural component, and overall structural evaluation, all compared with those from all previous inspections. Also included are the previous recommended remedial repairs, the status of these recommendations and any new recommendations and/or comments based on the current inspections.

Field-completed checklists for each bridge are the Standard Structures Inspection Field Report and the Scour Checklist (an NED devised checklist based on recent Federal Highway Administration guidelines to more precisely address any potential or active scour-related problems).

BRIDGES INSPECTED

For the 1993 Interim Bridge Inspection Program, 22 bridges were inspected as indicated herein. Bridges inspected, projects, 1993 and 1991 condition ratings, inspection dates, estimated rehabilitation costs, rehabilitation priorities (see below) with temporary posting required, and degree of existing scour (see below) are summarized on next page:

Rehab. Priority (Posting,if necessary, in tons required)

1. Bridge currently cannot tolerate present traffic/loads. Prompt remedial measures are required. Bridge should be posted and restricted as indicated until corrective measures can be accomplished.
2. Major items require rehabilitation. Minimum adequacy to tolerate present traffic/loads. Further deterioration may cause priority 1.
3. Minor items require rehabilitation to maintain condition.

Scour

1 Major Scour Activity/Potential
2 Moderate Scour Activity/Potential
3 Minimal or No Scour Activity/Potential

Project/Bridge	Condition Rating		Date Inspected	Est.Rehab. Cost (K)		Rehab. Scour Priority (see below)
	1991	1993				
FRANKLIN FALLS						
1. Lower Mill Brook	4	4	7/14/93	55.5	1*	3**
2. Upper Mill Brook	4	4	7/15/93	40.5	1*	2**
3. Knox Brook	4	9	7/14/93	0.0	3	2
4. Blake Brook	7	7	7/14/93	15.0	3	3
5. Smith River	5	5	7/14/93	180±	1	(5)*2**
BIRCH HILL						
6. Middle Road	7	7	6/25/93	0.5	3	3**
7. New Boston Road	7	8	6/24/93	0.5	3	3
8. Burgess Road	7	7	6/24/93	7.5	2	3
9. Old Route 202	7	7	6/24/93	1.5	3	2**
10. Goodnow Road	7	7	6/25/93	5.0	3	2**
WEST HILL						
11. West Hill Road	5	7	9/08/93	91.5	2	2
THOMASTON						
12. Leadmine Brook	8	8	8/24/93	0.0	3	2
NORTHFIELD BROOK						
13. Old Rt.254 (upper)	8	7	8/24/93	0.0	3	2
14. Old Rt.254 (lower)	8	7	8/24/93	0.0	3	3
BLACK ROCK						
15. Old Northfield Rd.	8	8	8/24/93	31.0	3	3
HOP BROOK						
16. Old Route 63	5	7	8/24/93	0.5	3	3
TULLY LAKE						
17. Doane Hill Road	7	7	6/25/93	25.0	3	3
EVERETT LAKE						
18. Choate Brook	4	7	9/09/93	0.0	3	2**
OTTER BROOK						
19. Rec Area (Exit)	6	6	8/18/93	31.0	2	2**
20. Rec Area (Entran.)	7	7	8/18/93	32.0	2	2**
COLEBROOK						
21. Old Route 8	7	8	8/25/93	0.0	3	3
KNIGHTVILLE						
22. Indian Hollow	7	7	8/25/93	5.0	3	3

LEGEND

* See overall assessment.

** Scour analysis performed.

OVERALL ASSESSMENT

During FY93, only reservoir area bridges (no spillway bridges) were inspected. Overall, the condition of the bridges inspected ranged from good to fair to poor, with overall condition ratings and rehabilitation priorities as listed above.

REHAB PRIORITY 1

Bridges that were assessed a rehab priority of 1, with corresponding reduction in capacity are as follows:

Project	Bridge	Temporary Posting
Franklin Falls	Upper Mill Brook	close
Franklin Falls	Lower Mill Brook	6
Franklin Falls	Smith River	5

These three bridges have been given the highest priority, with recommendations listed herein to be expeditiously carried out. Until these bridges have been rehabilitated as indicated, the above posting for each bridge shall be strictly adhered to.

Operation Directorate has made an assessment of the future intended usage of the bridges to determine what level of rehabilitation, if any, is required. Based on their decision, the following has been recommended by Engineering Directorate with concurrence from Operations Directorate:

1. Upper Mill Brook will be permanently closed to vehicular traffic
by installation of permanent barriers on the east and west approaches.

2. Lower Mill Brook will be rehabilitated as recommended with design and construction budgeted for FY 94.

3. Smith River Bridge will be immediately posted for a 5 tons weight rating and 10 mph speed limit in order to limit usage to small truck traffic. Interim inspections will be performed on the structure at six month intervals to determine if further deterioration requires further reduction of capacity or complete closure.

FRACTURE CRITICALITY

Of the bridges inspected, only Old Route 8 Bridge falls into the fracture critical category. It is a two truss, simple span, through truss, steel structure with built up members and riveted connections. Some of the rivets have been replaced with high strength bolts. Because of its location (within the reservoir), it is subjected to very minimal traffic, in general, and therefore, minimal truck traffic. Because of this low traffic volume and the overall good condition of the structure, no additional testing is required and continued two year inspection

intervals is considered sufficient.

SCOUR

The FY 93 routine inspections also include a scour checklist (an NED devised checklist based on recent FHWA guidelines) which was encorporated to better define any active or potential scour related problems.

Scour problems have been noted at the following bridges and listed in order of relative severity:

Otter Brook ----- Recreation Area (Exit)
Otter Brook ----- Recreation Area (Entrance)
Birch Hill ------ Goodnow Road
Thomaston ------- Leadmine Brook
Birch Hill ------ Old Route 202
Everett Lake ---- Choate Brook

Remedial measures have been listed in the recommendation section of the text for each structure. None of these conditions are considered to be of such criticality that immediate action is warranted. Repairs should be performed in a timely manner through normal budgetary procedures and priorities, and continued monitoring of scour conditions should be performed during all future inspections.

FY 93 scour assessments, both Hydrologic/Hydraulic and Geotechnical were performed on bridges at Everett Lake (Choate Brook) and Birch Hill (Goodnow Road, Middle Road, Old Route 202) with the results encorporated into the inspection reports. This makes a total of nine bridges as indicated in the summary above, in the inventory, which have been assessed in this manner for scour criticality. Based on the extremely low probability of failure from scour, it is recommended that not further in-depth Hydrologic/Hydraulic scour assessments be performed, on any bridges, unless recommended as a result of specific findings during future inspections.

FRANKLIN FALLS DAM
LOWER MILL BROOK BRIDGE, HILL, NH
FY 93 ROUTINE INSPECTION REPORT

DATE OF INSPECTION: 14 July 93

DATE OF PREVIOUS INSPECTIONS: In-Depth, 9, 10 July 85
Routine, 17 July 87
Routine, 28 April 89
Routine, 15 May 91

RATING (T=TONS)

Type	Inventory	Operating	Comments
H15	6.8T	15.2T	No change in ratings

EVALUATION (See attached "Structures Inspection Field Report")

A. Roadway and Railings: Overall condition is poor (condition 4). The gravel wearing surface is well graded. Vegetative growth and debris are evident on the deck and approaches. The growth includes one 4- and one 6-inch tree on the shoulder. The approaches are in good condition. The transitions are good on both approaches. The load rating is not posted. There are no drains on the deck. The steel pipe bridge and approach railings are missing large sections and are heavily corroded. There is a steep drop to the streambed.

B. Fascias & Curbs: The fascias and curbs are in fair condition. There is some concrete spalling evident on the exterior of the west fascia. There is minor efflorescence from the concrete over and around the exterior steel beams.

C. Underside of Deck: The overall condition of the underside of the concrete deck is fair (condition 5). One moderate spall was noted on the inside southwest corner of the exterior concrete arch beam. The area of this spall was described in the 91 investigation to be approximately four square feet. There has been no significant increase in size since that observation. Minor efflorescence was observed on the underside of the deck. Minor cracks were observed in the

concrete arch between the two exterior beams. There is some minor surface corrosion of the exposed steel beams and tie rods. Graffiti is evident.

D. Wingwalls/Abutments: The condition of the abutments is fair (condition 5). The north and south abutments contain minor hairline cracks and efflorescence. There is an approximately 36-inch crack at the junction of the north abutment and west bridge deck which intersects the west wingwall.

The overall condition of the channel training walls is fair (condition 5). The northwest channel training wall has minor cracks. The southwest channel training wall is of stone rubble masonry and exhibits minor effects of erosion. The mortar is eroded but there is no evidence of rock loss or movement.

The wingwalls are is fair condition. All wingwalls have minor cracks, spalls and efflorescence. Wingwall drainage pipes are covered by vegetation. No catch basin was observed. Several full-length vertical cracks were found on northeast and northwest wingwalls.

E. Channel: The channel shows no sign of scour. There are no obstructions or debris in the channel.

CONDITION RATINGS:

In-depth, 1985:	7
Routine, 1989:	5
Routine, 1991:	4
Routine, 1993:	4

Status of Previous Recommendations

Item	Current Status
1. Install steel beam guardrail.	Not Done
2. Repair cracks at approaches and NW corner of deck.	Not Done
3. Patch spalled concrete and repair sidewalk.	Not Done

4. Sandblast and paint steel beams. Not Done

5. Regrade roadbed. Done

Revised Recommendations

1. Install steel beam guardrail.
Estimated cost $30,000.

2. Repair cracks on the wingwalls of the north abutments and crack at NW corner of the deck. Patch mortar on the southwest training wall.
Estimated cost $5,000.

3. Patch all areas of spalled concrete on fascia and curbs and the inside southwest corner of the exterior arch beam. Repair sidewalk.
Estimated cost $10,000.

4. Sandblast and paint exposed steel surfaces.
Estimated cost $10,000.

5. Post load rating on approaches.
Estimated cost $500.

Total cost $55,500.

STRUCTURES INSPECTION FIELD REPORT

Franklin Falls Dam
Lower Mill Brook Bridge

ROUTINE INSPECTION

city, town Hill NH		bridge dept. no.	8-structure no. CEPNEDNH33100004		90-date inspected 14 July 93
2-dist.	104-highway system 4	22-owner COE	27-year built 1910 ±	106-year rebuilt 0000	11-milepoint 00000
43-structure type Single span rolled beam bridge w/ reinforced concrete deck			quality control engineer Nick Forbes		
07-facility carried Access Road - Recreation Area			team leader Joseph Colucci		
06-features intersected Needle Shop Brook			team members M. Walsh, M. Deschenes, L. Bacchanor		

item 58	4	item 59	5	item 60	5
DECK		SUPERSTRUCTURE		SUBSTRUCTURE	
1. Wearing Surface	4	1. Bearing Devices	N	1. Abutments	
2. Deck-Condition	5	2. Stringers	6	a-Wings	5
3. Stay in Place Forms	N	3. Diaphragms	7	b-Backwall	N
4. Curbs	5	4. Girders or Beams	N	c-Bridge Seats	N
5. Median	N	5. Floor Beams	N	d-Breastwall	7
6. Sidewalks	4	6. Trusses	N	e-Footings	7
7. Parapet	N	7. Rivets or Bolts	N	f-Piles	N
8. Railing	4	8. Welds	N	g-Erosion	6
9. Anti Missile Fence	N	9. Collision Damage	N	h-Settlement	6
10. Drains	4	10. Load Deflection	8	2. Piers or Bents	
11. Lighting Standards	N	11. Member Alignment	8	a-Caps	N
12. Utilities	N	12. Load Vibration	N	b-Column	N
13. Deck Joints	N	13. Paint-Epoxy	5	c-Web	N
14. Approach Settlement	6	14. Year Painted	N	d-Footing	N
		15. Under Clearance ____ ft ____ in		e-Piles	N
		Clearance Signs ☐ yes ☑ no		f-Scour	N
				g-Settlement	N
				3. Collision Damage	N
				4. Hydraulic-Adequacy	5

	H	3	3S2	Single
Actual Posting	☐	☐	☐	15.2
Recommended Posting From Rating Book	☐	☐	☐	6.8

	at bridge	advance
SIGNS IN PLACE Y or N	N	N
LEGIBILITY	—	—

Overhead Signs (attached to bridge) ☐ yes ☑ no

1. Welds	N
2. Bolts	N
3. Condition	N

Item93b U/W Inspection Date: ____

ITEM 61-channel and channel protection 7

1. channel scour	8	5. rip rap or slope paving	N
2. embankment erosion	7	6. effectiveness	—
3. fender system	N	7. debris	7
4. spur dikes & jetties	N	8. vegetation	7

36-Traffic Safety features

	36	condition
1. bridge railing	0	3
2. transitions	0	3
3. approach guardrail	0	3
4. guardrail terminal	N	N

U = UNKNOWN N = NOT APPLICABLE I = INACCESSIBLE

PROJECT: Franklin Falls Dam
NAME: Lower Mill Brook Bridge
LOCATION: Hill NH

BRIDGE INSPECTION
SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity?	yes
2. Is the streambed erodible? If so, does the structure have any vulnerable design features?	yes
a. Piers, abutments with spread footings or short pile foundations.	yes
b. Superstructure with simple spans or non-redundant support systems.	yes
c. Inadequate waterway openings.	no
d. Designs which collect ice and debris.	no
e. All water must pass through or over structure.	yes
f. Other.	–
3. Are any characteristics of an aggressive stream or waterway present?	no
a. Active degradation or aggredation of streambed.	no
b. Significant lateral movement or erosion of streambanks.	no
c. Steep slopes.	no
d. High velocities.	no
e. Any history of highway or bridge damage during past floods.	no
f. Other.	–
4. Is the bridge located on a stream reach with any adverse flow characteristics?	no
a. Crossing near stream confluence.	no
b. Crossing of tributary stream near confluence with larger streams.	no
c. Crossing on sharp bend in stream.	no
d. Location on alluvial fan.	no
e. Other.	–
5. Other comments or observations.	yes

Minor erosion (mortar scour) on southwest channel training wall.

FRANKLIN FALLS DAM
UPPER MILL BROOK BRIDGE, HILL, NH
FY 93 ROUTINE INSPECTION REPORT

DATE OF INSPECTION: 15 July 93

DATE OF PREVIOUS INSPECTIONS:

In-Depth,	9, 10	April 85
Routine,	17	July 87
Routine,	28	April 89
Routine,	13	May 91

RATING (T=TONS)

Type	Inventory	Operating	Comments
H15	7.2T	10.7T	No change in ratings

EVALUATION (See attached "Structures Inspection Field Report")

A. Roadway and Railings: Overall condition is poor (condition 4). The gravel wearing surface is very rutted. There are deep (3 inch) depressions evident at several spots on the deck. The depth of gravel wearing surface on the concrete deck is indeterminate and it is not possible to determine whether the top of the deck is damaged. Vegetative growth and debris are evident on the deck and approaches. A 10-inch tree grows on the approach near the southwestern retaining wall. There are no drains on the deck. The steel pipe bridge and approach railings are heavily rusted with large sections missing. There is a steep drop to the streambed.

The eastern approach is in poor condition with excessive settlement on the north edge of the road where the embankment and approach retaining wall are slumping. Three Jersey barriers have been placed along the north edge of the road to steer vehicles away from the failing embankment. There is a sharp transition at the east approach and a steep drop to the streambed below. The western approach is similarly rutted but the transition is good. The load rating is not posted at either approach.

B. Fascias & Curbs: The fascia is in fair condition

B. Fascias & Curbs: The fascia is in fair condition (condition 5). The curbs are hidden by a thick gravel wearing surface. There is moldy growth along the exterior edge of the steel beams.

C. Underside of Deck: The overall condition of the underside of the concrete deck is good (condition 7). There are no spalls or cracks, but there is some efflorescence. There is some minor surface corrosion of the exposed steel beams and tie rods.

D. Wingwalls/Abutments: The condition of both abutments is good (condition 7). The east and west abutments contain cold joints. Minor efflorescence is evident. The western abutment has 24 to 28 inches of moderate scour under an apron of the same width. The eastern abutment is slightly undermined to a depth of 16 inches under a solid apron of approximately 3 feet.

The southwest wingwall has minor cracks and efflorescence. The northwest wingwall is very overgrown by trees and other vegetation. Its general appearance is the same as that of the southwest wall. There is a 5 foot (full length), 1/2 inch wide vertical crack halfway along the wall. The southeast wingwall is covered with vegetative growth. There is some minor efflorescence. There is a full length, full depth (3 inch), 1-inch wide vertical crack midway along the wall. The northeast wingwall embankment is undercut by scour. There is a full length, full depth (3 inch), 1 1/4 inch wide crack at the 1/3 point. There is a full length, full depth, 2-inch wide crack halfway along the wall. The FY 91 bridge inspection contains diagrams detailing the site. The horizontal distance along crack 2 was measured to be 5 7/8 inches in the 91 report vs 5 3/4 inches in 93. A full length, full depth, 4-inch wide crack is located at the 2/3 point along the wall. The wall has rotated outward from the bank.

E. Channel: There is an 8-inch diameter corroded cast iron pipe crossing the upstream side of the streambed. There are numerous boulders and cobbles throughout the channel. A bend in the streambed downstream of the bridge is causing eddies which are undermining the east embankment.

CONDITION RATINGS:

In-depth, 1985:	7
Routine, 1989:	5
Routine, 1991:	4
Routine, 1993:	4

Status of Previous Recommendations

Item	Current Status
1. Temporarily close bridge and extend barriers at north and south ends.	Not Done
2. Complete scour analysis.	Done

Revised Recommendations

The hydrologic and hydraulic assessment of Upper Mill Brook Bridge completed in 1992 recognizes a need to repair the stone and mortar aprons surrounding the bridge abutments. It also recommends that a 100 foot stone revetment which would vary in height from 5 to 15 feet be placed along the steambed to control bank erosion. The revetment would consist of 2 to 3 feet of stone protection underlain by 1 to 1.5 feet of stone bedding. Granular fill will be needed to fill eroded areas behind the revetment. A small stone dam downstream from the bridge which could be altering the direction of stream flow may need to be removed. This would require rental of a crane for a few hours to remove the stone.

Total cost $40,000

The report notes that conditions at the bridge are severe and the cost of repairs high. It recommends closure of the bridge by installing permanent barriers on east and west approaches allowing only pedestrian and bicycle traffic. (A park gate presently exists on the east approach road only.)

Total cost (40 feet of Jersey barrier) $500

STRUCTURES INSPECTION FIELD REPORT

Franklin Falls Dam
Upper Mill Brook Bridge

ROUTINE INSPECTION

a. [redacted] Hill NH	bridge dept. no.	8-structure no. CEP NED NH 32 10005	90-date inspected 15 July 93

2-dist.	104-highway system	22-owner	27-year built	106-year rebuilt	11-milepoint
	4	COE	1920	0000	.1 M S. ECEM

43-structure type: single span rolled beam w/ reinforced concrete deck	quality control engineer: Nick Forbes
07-facility carried: Access Road-Recreation Area	team leader: Joseph Colucci
06-features intersected: Needle Shop Brook	team members: M. Walsh, M. Deschenes, L. Beauchamp

item 58	4	item 59	5	item 60	3
DECK		SUPERSTRUCTURE		SUBSTRUCTURE	
1. Wearing Surface	4	1. Bearing Devices	N	1. Abutments	
2. Deck-Condition	5	2. Stringers	6	a-Wings	3
3. Stay in Place Forms	N	3. Diaphragms	7	b-Backwall	N
4. Curbs	N	4. Girders or Beams	N	c-Bridge Seats	N
5. Median	N	5. Floor Beams	N	d-Breastwall	7
6. Sidewalks	N	6. Trusses	N	e-Footings	3
7. Parapet	N	7. Rivets or Bolts	N	f-Piles	N
8. Railing	3	8. Welds	N	g-Erosion	3
9. Anti Missile Fence	N	9. Collision Damage	N	h-Settlement	3
10. Drains	N	10. Load Deflection	8	2. Piers or Bents	
11. Lighting Standards	N	11. Member Alignment	8	a-Caps	N
12. Utilities	N	12. Load Vibration	N	b-Column	N
13. Deck Joints	N	13. Paint-Epoxy	N	c-Web	N
14. Approach Settlement	3	14. Year Painted	N	d-Footing	N
		15. Under Clearance ____ ft ____ in		e-Piles	N
		Clearance Signs ☐ yes ☑ no		f-Scour	N
				g-Settlement	N
				3. Collision Damage	N
				4. Hydraulic-Adequacy	3

Actual Posting	H	3	3S2	Single
	☐	☐	☐	☐
Recommended Posting From Rating Book	☐	☐	☐	7

SIGNS IN PLACE Y or N	at bridge	advance
	N	N
LEGIBILITY	–	–

Overhead Signs (attached to bridge) ☐ yes ☑ no

1. Welds	N
2. Bolts	N
3. Condition	N

Item93b U/W Inspection Date: —

ITEM 61-channel and channel protection: 2

[redacted]hannel scour	3	5. rip rap or slope paving	N
2. embankment erosion	3	6. effectiveness	3
3. fender system	N	7. debris	7
4. spur dikes & jetties	N	8. vegetation	7

36-Traffic Safety features

	36	condition
1. bridge railing	0	3
2. transitions	0	3
3. approach guardrail	0	3
4. guardrail terminal	N	N

U-UNKNOWN NA-NOT APPLICABLE IA-INACCESSIBLE

PROJECT: Franklin Falls Dam
NAME: Upper Mill Brook Bridge
LOCATION: Hill NH

BRIDGE INSPECTION
SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity?	yes
2. Is the streambed erodible? If so, does the structure have any vulnerable design features?	yes
a. Piers, abutments with spread footings or short pile foundations.	yes
b. Superstructure with simple spans or non-redundant support systems.	yes
c. Inadequate waterway openings.	yes
d. Designs which collect ice and debris.	yes
e. All water must pass through or over structure.	yes
f. Other.	–
3. Are any characteristics of an aggressive stream or waterway present?	yes
a. Active degradation or aggredation of streambed.	yes
b. Significant lateral movement or erosion of streambanks.	yes
c. Steep slopes.	yes
d. High velocities.	yes
e. Any history of highway or bridge damage during past floods.	no
f. Other.	–
4. Is the bridge located on a stream reach with any adverse flow characteristics?	no
a. Crossing near stream confluence.	no
b. Crossing of tributary stream near confluence with larger streams.	no
c. Crossing on sharp bend in stream.	no
d. Location on alluvial fan.	no
e. Other.	–
5. Other comments or observations.	yes

Erosion beneath northeast embankment causing slump.

FRANKLIN FALLS DAM
KNOX BROOK BRIDGE
FISCAL YEAR 1993
ROUTINE INSPECTION REPORT

DATE OF ROUTINE INSPECTION: 14 July 93

DATE OF PREVIOUS INSPECTIONS: Routine Inspection, 14 May 91
Inventory Inspection, April 85

RATING (T = TONS)

Type	Inventory	Operating	Comments
H	20 T	Estimated	The bridge was reconstructed in 1992. Load rating calculations are forthcoming.

EVALUATION (See attached "Structures Inspection Field Report")

A. Superstructure
-Above Deck

-Overall condition is very good.
-The bridge was rebuilt in 1991. The stone abutments were capped with new concrete bridge seats. The superstructure is constructed of pre-stressed concrete planks.
-Both north and south approaches are in fair condition. The gravel roadway is slightly rutted as it transitions to the bridge deck.
-The southeast stone wingwall is capped with three W12 steel beams, presumably salvaged from the old superstructure.
-The joint at the interface between the south west stone wingwall and the new concrete abutment is wide and allows gravel to wash down off of the road.
-There are no approach guard rails or bridge railings.
-Joints between the deck and both abutment backwalls are improperly sealed with concrete. This is causing some cracking and spalling at the joint.
-All of the wingwalls are in good condition, with only moderate growth of vegetation between the stones.

B.	Superstructure -Below Deck	-Overall condition is very good. -There is a foam backer rod protruding from between the two eastern precast planks. -Underside of deck is in good condition.
C.	Substructure	-Overall condition is good. -The stone abutments are in good condition. -There is a beaver dam constructed against the upstream (east) wingwalls. -Clear water is flowing out from between the stones of both abutments. The water is flowing from behind the beaver dam. The water does not appear to be carrying soils out from behind the abutments. -Slight scour is present under the north abutment.
D.	Channel	-The channel under the bridge is in fair condition, with only slight scouring.
E.	Overall Numerical Condition Rating	Inventory 1985: 7 Routine 1991: 4 Routine 1993: 9

RECOMMENDATIONS

Status of Previous Recommendations

1. Post the load limit at both approaches.

2. Remove existing deck and girders, and recap both abutments with new concrete bridge seats. Install a new prestressed concrete plank bridge deck with parapets.

3. Install guard rails on both approaches.

Item No. 2 has been completed. Items 1 and 3 have not.

Revised Recommendations

1. Post the load limit at both approaches.

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

city/town	bridge dept. no.	8-structure no.	90-date inspected
San Bornton, NH		CEPNEDNH3310006	7/14/93

2-dist.	104-highway system	22-owner	27-year built	106-year rebuilt	11-milepoint
	8 Non-Federal Aid	COE	1920	1992	

43-structure type: Prestressed, Precast Concrete Planks	quality control engineer: Nick. Forbes
07-facility carried: Reservoir Access Road	team leader: Joe. Colucci
06-features intersected: Knox Brook	team members: M. Walsh, M. Deschenes, L. Brachaner

item 58	9	item 59	9	item 60	8
DECK		SUPERSTRUCTURE		SUBSTRUCTURE	
1. Wearing Surface	9	1. Bearing Devices	9	1. Abutments	
2. Deck-Condition	9	2. Stringers	N	a-Wings	7
3. Stay in Place Forms	N	3. Diaphragms	N	b-Backwall	9
4. Curbs	9	4. Girders or ~~Beams~~ Planks	9	c-Bridge Seats	9
5. Median	N	5. Floor Beams	N	d-Breastwall	7
6. Sidewalks	N	6. Trusses	N	e-Footings	7
7. Parapet	N	7. Rivets or Bolts	N	f-Piles	N
8. Railing	N	8. Welds	N	g-Erosion	7
9. Anti Missile Fence	N	9. Collision Damage	N	h-Settlement	N
10. Drains	N	10. Load Deflection	9	2. Piers or Bents	
11. Lighting Standards	N	11. Member Alignment	9	a-Caps	N
12. Utilities	N	12. Load Vibration	N	b-Column	N
13. Deck Joints	7	13. Paint-Epoxy	N	c-Web	N
14. Approach Settlement	7	14. Year Painted	N	d-Footing	N
		15. Under Clearance ____ ft ____ in		e-Piles	N
		Clearance Signs ☐ yes ☐ no		f-Scour	N
				g-Settlement	N
				3. Collision Damage	N
				4. Hydraulic-Adequacy	8

	H	3	3S2	Single
Actual Posting	☐	☐	☐	☐
Recommended Posting From Rating Book	☐	☐	☐	☐

	at bridge	advance
SIGNS IN PLACE Y or N	N	N
LEGIBILITY	-	-

Overhead Signs (attached to bridge) ☐ yes ☒ no

1. Welds	N
2. Bolts	N
3. Condition	N

Item93b U/W Inspection Date: N/A

ITEM 61-channel and channel protection: 7

1. channel scour	7	5. rip rap or slope paving	N
2. embankment erosion	7	6. effectiveness	7
3. fender system	N	7. debris	7
4. spur dikes & jetties	N	8. vegetation	7

36-Traffic Safety features

	36	condition
1. bridge railing	N	-
2. transitions	8	-
3. approach guardrail	N	-
4. guardrail terminal	N	-

Franklin Falls
Knox Brook Bridge

SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity?	Yes
2. Is streambed erodible? If so, does the structure have any vulnerable design features?	Yes
a. Piers, abutments with spread footings or short pile foundations.	Stone Abutment
b. Superstructures with simple spans or non-redundant support systems.	N
c. Inadequate waterway opening.	N
d. Designs which collect ice and debris.	N
e. All water must pass through or over structure.	Yes
f. Other.	N
3. Are any characteristics of an aggressive stream or waterway present?	
a. Active degradation or aggredation of streambed.	N
b. Significant lateral movement or erosion of streambanks.	N
c. Steep slopes.	~~Yes~~ N
d. High velocities.	N
e. Any history of highway or bridge damage during past floods.	N
f. Other.	N
4. Is bridge located on stream reach with any adverse flow characteristics?	
a. Crossing near stream confluence.	N
b. Crossing of tributary stream near confluence with larger streams.	N
c. Crossing on sharp bend in stream.	N
d. Location on alluvial fan.	N
e. Other.	N
5. Other comments or observations.	/

FRANKLIN FALLS DAM
BLAKE BROOK BRIDGE, NEW HAMPTON, NH
FY 93 ROUTINE INSPECTION REPORT

DATE OF INSPECTION: 14 July 93

DATE OF PREVIOUS INSPECTIONS: Inventory, April 85
Routine, 16 July 87
Routine, 30 May 89
Routine, 14 May 91

RATING (T=TONS)

Type	Inventory	Operating	Comments
H10	14.5T	19.4T	Load capacity has not changed since previous inspection.

EVALUATION (See attached "Structures Inspection Field Report")

A. Superstructure Above Deck

The overall condition of the superstructure is good. (condition) 7 There is some minor rutting at each of the gravel approaches. The new timber deck is in very good condition. Sand is accumulating along the brush blocks on either side of the bridge and is preventing adequate drainage of the bridge deck. The 15 ton rating signs at each bridge approach have been vandalized with graffiti and are illegible. The guardrails are in good condition. One post at the north end of the west guardrail is loose. One bolt is missing on the west guardrail at the third support from the south approach. Vegetation is encroaching upon each approach.

B. Superstructure Under Deck

The overall condition of the substructure is good (condition 7). There is minor to moderate rusting of all structural steel. The existing paint system is in poor condition. There is minor debris build-up along the flanges of the steel.

C. Substructure

The overall condition is good (condition 7). The wingwalls and abutments are in good condition with only very minor cracking and efflorescence noted. There

are no signs of settlement or scour. One weep hole in the south abutment is plugged.

RECOMMENDATIONS

Status of Previous Recommendations

1. Clean debris from deck and bottom flanges of the girders. Fill, grade and compact rutted areas of the approaches. Remove obstruction from south abutment weep hole.	Not Done
2. Clean and repaint all structural steel	Not done
3. Replace the guardrail support along the north end of the west guardrail.	Not Done

Revised Recommendations

Implement above recommendations

Total Updated Estimated Cost $15,000

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

	bridge dept. no.	8-structure no.	90-date inspected
HILL - BRISTOL FRANKLIN FALLS	COE	CENEDNH331 0007	A July 93

2-dist.	104-highway system	22-owner	27-year built	106-year rebuilt	11-milepoint
		COE	1945		

43-structure type: ROLLED BEAM BRIDGE W/ TIMBER DECK	quality control engineer: NICK FORBES
07-facility carried	team leader: JOE COLUCCI
06-features intersected: BLAKE BROOK	team members: M. DESCHENES M. WALSH L. BURKHARDT

item 58	7	item 59	7	item 60	7
DECK		SUPERSTRUCTURE		SUBSTRUCTURE	
1. Wearing Surface	NA	1. Bearing Devices	NA	1. Abutments	
2. Deck-Condition	8	2. Stringers	NA	a-Wings	7
3. Stay in Place Forms	NA	3. Diaphragms	NA	b-Backwall	7
4. Curbs	7	4. Girders or Beams	7	c-Bridge Seats	NA
5. Median	NA	5. Floor Beams	NA	d-Breastwall	NA
6. Sidewalks	NA	6. Trusses	NA	e-Footings	NA
7. Parapet	NA	7. Rivets or Bolts	NA	f-Piles	NA
8. Railing	6	8. Welds	NA	g-Erosion	NA
9. Anti Missile Fence	NA	9. Collision Damage	NA	h-Settlement	NA
10. Drains	NA	10. Load Deflection	NA	2. Piers or Bents	
11. Lighting Standards	NA	11. Member Alignment	NA	a-Caps	NA
12. Utilities	NA	12. Load Vibration	NA	b-Column	NA
13. Deck Joints	NA	13. Paint-Epoxy	6	c-Web	NA
14. Approach Settlement	NA	14. Year Painted	85-86	d-Footing	NA
		15. Under Clearance ____ ft ____ in		e-Piles	NA
		Clearance Signs ☐ yes NA no		f-Scour	NA
				g-Settlement	NA
				3. Collision Damage	NA
				4. Hydraulic-Adequacy	8

Actual Posting	H	3	3S2	Single
	NA	NA	NA	15
Recommended Posting From Rating Book	☐	☐	☐	15

SIGNS IN PLACE Y or N	at bridge	advance
	Y	☐
LEGIBILITY	5	☐

Overhead Signs (attached to bridge) ☐ yes ☒ no

1. Welds: NA
2. Bolts: NA
3. Condition: NA

Item93b U/W Inspection Date: NONE

ITEM 61-channel and channel protection: 7

1. channel scour	7	5. rip rap or slope paving	NA
2. embankment erosion	7	6. effectiveness	7
3. fender system	NA	7. debris	7
4. spur dikes & jetties	NA	8. vegetation	7

36-Traffic Safety features

	36	condition
1. bridge railing	1	6
2. transitions	1	7
3. approach guardrail	1	7
4. guardrail terminal	1	7

U-UNKNOWN NA-NOT APPLICABLE IA-INACCESSIBLE

PROJECT: FRANKLIN FALLS DAM
NAME: BLAKE BROOK BRIDGE
LOCATION: HILL, NEW HAMPSHIRE

BRIDGE INSPECTION
SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity? NO

2. Is the streambed erodible? If so, does the structure have any vulnerable design features? YES

   a. Piers, abutments with spread footings or short pile foundations. YES
   b. Superstructure with simple spans or non-redundant support systems. YES
   c. Inadequate waterway openings. NO
   d. Designs which collect ice and debris. NO
   e. All water must pass through or over structure. YES
   f. Other. —

3. Are any characteristics of an aggressive stream or waterway present? NO

   a. Active degradation or aggredation of streambed. NO
   b. Significant lateral movement or erosion of streambanks. NO
   c. Steep slopes. NO
   d. High velocities. NO
   e. Any history of highway or bridge damage during past floods. NO
   f. Other. —

4. Is the bridge located on a stream reach with any adverse flow characteristics? NO

   a. Crossing near stream confluence. NO
   b. Crossing of tributary stream near confluence with larger streams. NO
   c. Crossing on sharp bend in stream. NO
   d. Location on alluvial fan. NO
   e. Other. —

5. Other comments or observations. NONE

FRANKLIN FALLS DAM
OLD RT 3A BRIDGE, HILL/ BRISTOL,NH
FY 93 ROUTINE INSPECTION REPORT

DATE OF INSPECTION: 14 July 93

DATE OF PREVIOUS INSPECTIONS: Inventory, June 84
Routine, 16 July 87
Routine, 31 May 89
Routine, 14 May 91

RATING (T=TONS)

Type	Inventory	Operating	Comments
H15	11.3T	16.1T	It is recommended that the bridge be limited to 5 tons

EVALUATION (See attached "Structures Inspection Field Report")

A. Roadway and Railings: The overall condition is fair (rating 5). The bituminous surface coating is in poor condition with various cracking along the deck. There is vegetation growth and a buildup of debris along both gutters. There are no guardrails at either approach. A safety gate at the north approach is no longer useable. The north approach is rutted with two large potholes approximately 15 feet before the bridge. The south approach is in good condition.

B. Fascias & Curbs: The parapets on the bridge are in fair condition. There is extensive spalling along the parapet walls. The faces of the walls are covered with graffiti. The anchor bolts supporting the access gate have pulled out of the parapet, and the gate is no longer usable.

C. Underside of Deck: The overall condition is good. The northern end of the deck diaphragm measured 13" from the breast wall to the back face of the diaphragm (11" 1991 Routine inspection). This would prove that the abutments have moved since the previous inspection. There is some hairline cracking along the concrete tee beams in both transverse and longitudinal directions. The longitudinal cracking

apparent at the approximate center of the east and center tee beams may be due to insufficient cover. Some transverse cracking noted in previous inspections may be caused by excessive shear stresses. The west beam is in good condition.

D. Wingwalls/Abutments: The overall condition of the wingwalls and abutments is poor (condition 3). The crack in the north abutment appears to have worsened. The crack now measures 5" at top and 1 1/2" at the bottom. The footing is covered in this area but is suspected to be cracked as well. The west wingwall has dropped 1" lower than the breastwall. The north abutment is rotated approximately 3 to 5 degrees south and is suspected to have moved since the last inspection. The south abutment has a similar crack at the east side of the breastwall. This crack measures 2 1/4" at the top and 3/4" at the bottom and continues through the footing. The east wingwall has rotated almost 1 3/4" east from the top of the abutment. This abutment has rotated 3 to 5 degrees north. It is difficult to asses whether this wall has undergone any additional movement. The abutments appear to have rotated almost 3 inches since the 1984 in-depth inspection and almost 1 foot since construction.

E. Channel: The overall channel rating is 5. The previous inspection stated that the hydraulic adequacy of the bridge opening is poor. A scour analysis has been performed and is included in the 1992 bridge inspection report appendix A. The area of scour along the south abutment did not appear to be as deep as stated in the 1991 routine inspection.

CONDITION RATING:	1984 A/E	1987 NED	1989 NED	1990 NH DOT	1991 NED	1993 NED
Deck	6	6	6	7	6	6
Superstructure	7	6	5	7	5	5
Substructure	6	5	5	4	4	4
Channel	N/R	7	7	5	5	5
Approaches	6	6	5	4	6	5

RECOMMENDATIONS:

Status of Previous Recommendations

1. Post Bridge at 5T gross load to restrict traffic to a pickup truck or less. Not Done

2. Place guardrail and terminal at the northwest approach Not Done

3. Place a timber crib to arrest the erosion pass flow adjacent to the northwest wingwall. Not Done

4. Instrument the cracks, abutments and deck with devices to measure movement more accurately Not Done

Revised Recommendation

Due to the severity of the failure and the apparent movement of the bridge in recent years, total replacement is considered the only practical solution to the problem of the abutment failure. Replacement of the bridge will also allow for an increased load carrying capacity for the bridge. It presently functions as emergency access to the reservoir.

Estimated Cost $175,000

Interim Recommendations

1. The bridge should be posted for a 5 ton weight rating and a 10 mph speed limit in order to limit traffic to a pickup truck or light duty dump truck.

Estimated Cost $500

2. Heavy trucks such as fire apparatus emergency vehicles and light excavation equipment, (backhoe or lighter) should be limited, unloaded, driven slowly, and carefully supervised while travelling over the bridge.

3. The street gate presently lying by the bridge should be repaired so that it can be locked. Provisions should also be made so that it will allow pedestrians to cross the bridge easily.

Estimated Cost $1000

4. Set reference points and markers in order to monitor the movements of the bridge. Inspect and record movements of the bridge twice per year and include the results of these inspections in the annual bridge inspection report.

Estimated Costs $2000 initial survey
$2000 per year

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

	bridge dept. no.	8-structure no.	90-date inspected
HILL - BRISTOL FRANKLIN FALLS	COE	CENEDNH331008	15 JULY 93

2-dist.	104-highway system	22-owner	27-year built	106-year rebuilt	11-milepoint
X	NON-FED	COE	1926	N/A	2.2 MI S OF BRISTOL

43-structure type: REINFORCED CONCRETE T-BEAM	quality control engineer: NICK FORBES
07-facility carried: REC AREA ACCESS (OLD RT 3A)	team leader: JOE [illegible]
06-features intersected: SMITH RIVER	team members: M. DESCHENES / M. WALSH / L. BUCKMASTER

item 58	5	item 59	5	item 60	4
DECK		SUPERSTRUCTURE		SUBSTRUCTURE	
1. Wearing Surface	4	1. Bearing Devices	4	1. Abutments	
2. Deck-Condition	7	2. Stringers	NA	a-Wings	4
3. Stay in Place Forms	NA	3. Diaphragms	7	b-Backwall	3
4. Curbs	NA	4. Girders or Beams	6	c-Bridge Seats	4
5. Median	NA	5. Floor Beams	NA	d-Breastwall	4
6. Sidewalks	NA	6. Trusses	NA	e-Footings	6
7. Parapet	5	7. Rivets or Bolts	NA	f-Piles	NA
8. Railing	NA	8. Welds	NA	g-Erosion	5
9. Anti Missile Fence	NA	9. Collision Damage	NA	h-Settlement	3
10. Drains	NA	10. Load Deflection	NA	2. Piers or Bents	
11. Lighting Standards	NA	11. Member Alignment	5	a-Caps	NA
12. Utilities	NA	12. Load Vibration	NA	b-Column	NA
13. Deck Joints	NA	13. Paint-Epoxy	NA	c-Web	NA
14. Approach Settlement	5	14. Year Painted	NA	d-Footing	NA
		15. Under Clearance NA ft ____ in		e-Piles	NA
		Clearance Signs ☐ yes ☒ NA no		f-Scour	NA
				g-Settlement	NA
				3. Collision Damage	NA
				4. Hydraulic-Adequacy	4

Actual Posting	H	3	3S2	Single
	☐	☐	☐	10
Recommended Posting From Rating Book	☐	☐	☐	5

SIGNS IN PLACE Y or N	at bridge	advance
	N	N
LEGIBILITY	NA	NA

Overhead Signs (attached to bridge) ☐ yes ☒ no

1. Welds	NA
2. Bolts	NA
3. Condition	NA

Item93b U/W Inspection Date: NONE

ITEM 61-channel and channel protection 5

1. channel scour	6	5. rip rap or slope paving	5
2. embankment erosion	5	6. effectiveness	6
3. fender system	NA	7. debris	8
4. spur dikes & jetties	NA	8. vegetation	8

36-Traffic Safety features

	36	condition
1. bridge railing	0	NA
2. transitions	0	7
3. approach guardrail	N	NA
4. guardrail terminal	N	NA

U-UNKNOWN NA-NOT APPLICABLE IA-INACCESSIBLE

PROJECT: FRANKLIN FALLS
NAME: SMITH RIVER
LOCATION: CULVERT 3A

BRIDGE INSPECTION
SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity? YES

2. Is the streambed erodible? If so, does the structure have any vulnerable design features? Yes

   a. Piers, abutments with spread footings or short pile foundations. Yes
   b. Superstructure with simple spans or non-redundant support systems. Yes
   c. Inadequate waterway openings. Yes
   d. Designs which collect ice and debris. NO
   e. All water must pass through or over structure. Yes
   f. Other. NONE

3. Are any characteristics of an aggressive stream or waterway present? YES

   a. Active degradation or aggredation of streambed. Yes
   b. Significant lateral movement or erosion of streambanks. Yes
   c. Steep slopes. Yes
   d. High velocities. Yes
   e. Any history of highway or bridge damage during past floods. UNKNOWN
   f. Other. —

4. Is the bridge located on a stream reach with any adverse flow characteristics? —

   a. Crossing near stream confluence. NO
   b. Crossing of tributary stream near confluence with larger streams. NO
   c. Crossing on sharp bend in stream. NO
   d. Location on alluvial fan. NO
   e. Other. —

5. Other comments or observations. NONE

BIRCH HILL DAM
MIDDLE ROAD BRIDGE, WINCHENDON, MA
FY 93 ROUTINE INSPECTION REPORT

DATE OF INSPECTION: 25 June 93

DATE OF PREVIOUS INSPECTIONS: Inventory, December 84
Routine, September 87
Routine, 18 July 89
Routine, 11 July 91

RATING (T=TONS)

Type	Inventory	Operating	Comments
H15	22T	35T	Load Capacity posted
3	32T	49T	15T (to limit heavy
3S2	48T	74T	truck traffic in
3-3	61T	94T	recreation area)

EVALUATION (See attached "Structures Inspection Field Report")

A. Roadway and Railings: Overall rating is 7. Access is limited by locked gates which prohibit unauthorized access to the bridge. The buildup of pine needles continues to be a problem since there is restricted traffic over the bridge. The joint sealant at both ends of the prestressed concrete plank has deteriorated. The joint sealant has unbonded and the joint is filled with debris. The bituminous surface of the deck is uneven which may cause some minor ponding. The railings are in good condition. Approach guardrails are not present and are not warranted due to the restricted access to the bridge. One bolt on the guardrail is missing as noted in the previous inspection.

B. Fascias & Curbs: Overall rating is 7. The hairline cracks reported in previous inspections and the inventory inspection have not appeared to have worsened. Some efflorescence from the cracks was noted in this inspection.

C. Underside of Deck: Overall rating is 7. Minor seepage and efflorescence was noticed between precast concrete planks near the bearing pads. This seepage could be due to water passing through the failed joint sealer and following the joints in the planks. Alignment of the planks is good with no evidence of differential movement or deflection.

D. Wingwalls/Abutments: Overall rating is 8. The new cast concrete abutments are in good condition with no signs of distress or settlement. No erosion was noted.

E. Channel: Overall rating is 7. Debris was getting caught under the bridge causing a slight restriction in flow under the bridge.

CONDITION RATINGS

Inventory 1984:	8
Routine 1987:	8
Routine 1989:	7
Routine 1991:	7
Routine 1993:	7

RECOMMENDATIONS:

Status of Previous Recommendations

1. Schedule annual maintenance to include spot painting of posts, replacement of missing hardware, sweeping deck, and cleaning debris from bridge seat.	Some maintenance done. Must be kept up annually.
2. Reapply sealant at expansion joints	Not Done

Revised Recommendations

1. Clean expansion joints and reapply sealer to both joints. Use butyl based or polyurethane based sealant (Sikaflex-15LM or equivalent). Estimated cost $500.

2. Include in annual maintenance, cleaning the debris beneath the bridge from the brook.

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

City/Town	bridge dept. no.	8-structure no.	90-date inspected
BIRCH HILL DAM WINCHENDON, MA	COE	CEPNED MA251 00 13	6/24/91

2-dist.	104-highway system	22-owner	27-year built	106-year rebuilt	11-milepoint
111	NON-FED	COE	X	1979	.1

43-structure type: PRESTRESSED CONCRETE SLAB (601)	quality control engineer: NICK FORBES
07-facility carried: MIDDLE RD (REC AREA ACCESS, PUBLIC RESTRICTED)	team leader: JOSEPH COLUCCI
06-features intersected: PRIEST BROOK	team members: M. DESCHENES / F. FUNG

item 58	7	item 59	8	item 60	8
DECK		SUPERSTRUCTURE		SUBSTRUCTURE	
1. Wearing Surface	7	1. Bearing Devices	8	1. Abutments	
2. Deck-Condition	7	2. Stringers	NA	a-Wings	8
3. Stay in Place Forms	NA	3. Diaphragms	NA	b-Backwall	8
4. Curbs	7	4. Girders or Beams	8	c-Bridge Seats	8
5. Median	NA	5. Floor Beams	NA	d-Breastwall	8
6. Sidewalks	NA	6. Trusses	NA	e-Footings	8
7. Parapet	NA	7. Rivets or Bolts	NA	f-Piles	NA
8. Railing	8	8. Welds	NA	g-Erosion	8
9. Anti Missile Fence	NA	9. Collision Damage	NA	h-Settlement	8
10. Drains	NA	10. Load Deflection	X	2. Piers or Bents	
11. Lighting Standards	NA	11. Member Alignment	8	a-Caps	NA
12. Utilities	NA	12. Load Vibration	NA	b-Column	NA
13. Deck Joints	6	13. Paint-Epoxy	NA	c-Web	NA
14. Approach Settlement	7	14. Year Painted	NA	d-Footing	NA
		15. Under Clearance NA ft ____ in		e-Piles	NA
		Clearance Signs ☐ yes ☑ no		f-Scour	NA
				g-Settlement	NA
				3. Collision Damage	NA
				4. Hydraulic-Adequacy	7

Actual Posting	H	3	3S2	Single
	☐	☐	☐	15T
Recommended Posting From Rating Book	22	32	48	☐

SIGNS IN PLACE Y or N	at bridge	advance
	Y	N
LEGIBILITY	8	☐

Overhead Signs (attached to bridge) ☐ yes ☑ no

1. Welds	NA
2. Bolts	NA
3. Condition	NA

Item93b U/W Inspection Date: NONE

ITEM 61-channel and channel protection 8

1. channel scour	8	5. rip rap or slope paving	NA
2. embankment erosion	8	6. effectiveness	NA
3. fender system	NA	7. debris	6
4. spur dikes & jetties	NA	8. vegetation	NA

36-Traffic Safety features

	36	condition
1. bridge railing	1	8
2. transitions	N	—
3. approach guardrail	N	—
4. guardrail terminal	N	—

M-MINIMUM NA-NOT APPLICABLE I-INACCESSIBLE

PROJECT: BEECH HILL DAM
NAME: MIDDLE ROAD BRIDGE
LOCATION: WINCHENDON, MA.

BRIDGE INSPECTION
SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity? NO

2. Is the streambed erodible? If so, does the structure have any vulnerable design features? Yes

   a. Piers, abutments with spread footings or short pile foundations. Yes
   b. Superstructure with simple spans or non-redundant support systems. Yes
   c. Inadequate waterway openings. NO
   d. Designs which collect ice and debris. Yes
   e. All water must pass through or over structure. Yes
   f. Other. —

3. Are any characteristics of an aggressive stream or waterway present? NO

   a. Active degradation or aggredation of streambed. _____
   b. Significant lateral movement or erosion of streambanks. _____
   c. Steep slopes. _____
   d. High velocities. _____
   e. Any history of highway or bridge damage during past floods. _____
   f. Other. _____

4. Is the bridge located on a stream reach with any adverse flow characteristics? NO

   a. Crossing near stream confluence. _____
   b. Crossing of tributary stream near confluence with larger streams. _____
   c. Crossing on sharp bend in stream. _____
   d. Location on alluvial fan. _____
   e. Other. _____

5. Other comments or observations. NONE

BIRCH HILL DAM
NEW BOSTON ROAD BRIDGE, WINCHENDON, MA
FY 93 ROUTINE INSPECTION REPORT

DATE OF INSPECTION: 24 June 93

DATE OF PREVIOUS INSPECTIONS: Inventory, 24 September 84
Routine, September 87
Routine, 18 July 89
Routine, 11 July 91

RATING (T=TONS)

Type	Inventory	Operating	Comments
H15	19T	33T	Load Capacity posted
3	24T	40T	15T (to limit heavy
3S2	37T	62T	truck traffic in
3-3	46T	77T	recreation area)

EVALUATION (See attached "Structures Inspection Field Report")

A. Roadway and Railings: Overall rating is 8. A contract to repair the deck, approaches and railings was completed in 1992. The deck was overlaid with a new 2" bituminous paving course. The approaches were also repaired. New guardrails at each approach were installed. New elastomeric joint sealer was installed. Some minor settling and erosion was noticed around some of the new guardrail posts and gabions. There are slight depressions in the approach pavements at the expansion joints which could collect water or create a rough transition onto the bridge deck.

B. Curbs, Fascias: Overall condition is 7. The concrete in the curbs and fascias is good. The minor hairline cracking in the curbs has not appeared to have worsened since the previous inspection.

C. Underside of Deck: Overall condition is 8. The concrete in the precast planks is good. Some minor seepage and efflorescence was noticed on the underside of the deck along the longitudinal joints and around the bearings. The efflorescence may have

been from previous seepage through the expansion joints prior to replacement of the joint sealer. Alignment is good. The elastomeric bearing pads are also in good condition.

D. Wingwalls/Abutments: Overall condition is 8. The concrete cap over the original stone foundation is in good condition. The wingwalls have been protected by installing new gabions which have also helped prevent erosion from runoff from the deck. The erosion on the southwest bank has been repaired with stone protection and is functioning well.

E. Channel: The overall condition is 8. The streambed was clear of debris and shows no sign of scour.

CONDITION RATING

Inventory, 1984	8
Routine, 1987	8
Routine, 1989	7
Routine, 1991	7
Routine, 1993	8

RECOMMENDATIONS:

Status of Previous Recommendations

1. Install "Narrow Bridge" signs.	Not done
2. Install 30'± gabions.	Completed 1992
3. Install 75'± guardrail along southwest approach. Install 45'± guardrail other approaches.	Completed 1992
4. Extend transition slabs. Replace joint filler.	Completed 1992
5. Schedule maintenance including cleaning sand off bridge, debris off bridge seat, and cut back encroaching vegetation.	Ongoing maintenance

Revised Recommendations

Patch settling and eroding areas around new railing posts. Estimated cost $500.

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

City/Town: WINCHENDON, MA BIRCH HILL DAM	bridge dept. no. COE	8-structure no. CENEDMA2510014			90-date inspected 6/24/93
2-dist. 111	104-highway system NON-FED	22-owner COE	27-year built 1900	106-year rebuilt 1976	11-milepoint .5
43-structure type PRESTRESSED CONC. SLABS (501)			quality control engineer NICK FORBES		
07-facility carried NEW BOSTON ROAD (REC ACCESS)			team leader JOSEPH COLUCCI		
06-features intersected MILLER RIVER			team members M. DESCHENES / F. FUNG		

item 58	8	item 59	8	item 60	8
DECK		SUPERSTRUCTURE		SUBSTRUCTURE	
1. Wearing Surface	8	1. Bearing Devices	8	1. Abutments	
2. Deck-Condition	8	2. Stringers	NA	a-Wings	8
3. Stay in Place Forms	NA	3. Diaphragms	NA	b-Backwall	8
4. Curbs	7	4. Girders or Beams	8	c-Bridge Seats	8
5. Median	NA	5. Floor Beams	NA	d-Breastwall	8
6. Sidewalks	NA	6. Trusses	NA	e-Footings	8
7. Parapet	NA	7. Rivets or Bolts	NA	f-Piles	NA
8. Railing	8	8. Welds	NA	g-Erosion	8
9. Anti Missile Fence	NA	9. Collision Damage	NA	h-Settlement	8
10. Drains	NA	10. Load Deflection	X	2. Piers or Bents	
11. Lighting Standards	NA	11. Member Alignment	8	a-Caps	NA
12. Utilities	NA	12. Load Vibration	X	b-Column	NA
13. Deck Joints	8	13. Paint-Epoxy	NA	c-Web	NA
14. Approach Settlement	8	14. Year Painted	NA	d-Footing	NA
		15. Under Clearance NA ft ___ in		e-Piles	NA
		Clearance Signs ☐ yes NA no		f-Scour	NA
				g-Settlement	NA
				3. Collision Damage	NA
				4. Hydraulic-Adequacy	8

Actual Posting	H 3 3S2 ☐ ☐ ☐	Single 15	
Recommended Posting From Rating Book	19 24 37	☐	
SIGNS IN PLACE Y or N	at bridge N	advance N	
LEGIBILITY	—	—	

Overhead Signs (attached to bridge) ☐ yes ☒ no

1. Welds NA
2. Bolts NA
3. Condition NA

Item93b U/W Inspection Date: NONE

ITEM 61-channel and channel protection 8

1. channel scour	8	5. rip rap or slope paving	NA
2. embankment erosion	8	6. effectiveness	NA
3. fender system	NA	7. debris	8
4. spur dikes & jetties	NA	8. vegetation	NA

36-Traffic Safety features

	36	condition
1. bridge railing	1	8
2. transitions	1	8
3. approach guardrail	1	8
4. guardrail terminal	1	8

U=UNKNOWN NA=NOT APPLICABLE IA=INACCESSIBLE

PROJECT: BIRCH HILL DAM
NAME: NEW BOSTON ROAD
LOCATION: WINCHENDON, MA

BRIDGE INSPECTION
SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity? — Yes

2. Is the streambed erodible? If so, does the structure have any vulnerable design features? — Yes

   a. Piers, abutments with spread footings or short pile foundations. — Yes
   b. Superstructure with simple spans or non-redundant support systems. — Yes
   c. Inadequate waterway openings. — NO
   d. Designs which collect ice and debris. — NO
   e. All water must pass through or over structure. — Yes
   f. Other. — —

3. Are any characteristics of an aggressive stream or waterway present? — Yes

   a. Active degradation or aggredation of streambed. — NO
   b. Significant lateral movement or erosion of streambanks. — NO
   c. Steep slopes. — yes
   d. High velocities. — yes
   e. Any history of highway or bridge damage during past floods. — NO
   f. Other. — —

4. Is the bridge located on a stream reach with any adverse flow characteristics? — yes

   a. Crossing near stream confluence. — NO
   b. Crossing of tributary stream near confluence with larger streams. — NO
   c. Crossing on sharp bend in stream. — yes
   d. Location on alluvial fan. — yes
   e. Other. — —

5. Other comments or observations. — NONE

BIRCH HILL DAM
BURGESS ROAD BRIDGE, WINCHENDON, MA
FY 93 ROUTINE INSPECTION REPORT

DATE OF INSPECTION: 24 June 93

DATE OF PREVIOUS INSPECTIONS: Inventory, 24 September 84
Routine, September 87
Routine, 18 July 89
Routine, 21 September 90

RATING (T=TONS)

Type	Inventory	Operating	Comments
H15	30T	47T	Load Capacity posted
3	43T	66T	15T (to limit heavy
3S2	66T	101T	truck traffic in
3-3	84T	128T	recreation area)

EVALUATION (See attached "Structures Inspection Field Report")

A. Roadway and Railings: Overall rating is 7. There are several depressions and ruts in the deck and approach slab pavements. There is moderate vegetation growth and pine needles along both curbs. Vegetation at the southwest corner of the bridge has not been removed and is encroaching into the roadway as mentioned in previous inspections. The pavement at the expansion joints along the west approach sinks below the concrete edges Guardrails should be installed at each corner of the approaches as noted in previous inspections in order to ensure adequate safety for approaching vehicles.

B. Fascias and Curbs: Overall condition is 7. The concrete in the curbs and fascias is in good condition. The hairline cracks in the curbs show some efflorescence and do not seem to have deteriorated since the last inspection. The approach curb at the south west corner of the bridge is cracked along the top which may eventually propagate into a spall.

C. Underside of Deck: Overall condition is 7. The concrete in the precast planks is in good condition. The spall mentioned in the 1991 report could not be located, however the general area should be continually inspected in order to determine if there may be any deficiency in the concrete planks. There has been no change in the condition of the one inch differential between the precast concrete planks. Some seepage and efflorescence was noticed between the concrete planks near the bearing pads.

D. Wingwalls/Abutments: Overall condition is 7. The concrete caps over the original rubble masonry are good. The elastomeric bearing pads are also in good condition. The abutments show no signs of settlement, deterioration or scour.

E. Channel: The overall condition of the channel is 7. The brook was flowing smoothly, however, debris was building up under the bridge, creating a slight obstruction to flow.

CONDITION RATING

Inventory, 1984	8
Routine, 1987	8
Routine, 1989	7
Routine, 1991	7
Routine, 1993	7

RECOMMENDATIONS

Status of Previous Recommendations

1. Install "Narrow Bridge" warning signs.	Not done
2. Install guardrail at approaches	Not done
3. Extend transition slabs, install drainage, and seal expansion joints.	Not done

Revised Recommendations

Install 75'± of guardrail at the approach at the southwest wingwall and remove encroaching vegetation. Install 45'± of guardrail at each of the other three corners of the bridge. 3"x10" pressure treated rails with 8"x8" pressure treated posts are recommended. Replace the joint sealant in the expansion joints. Estimated cost $7500.

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

c	bridge dept. no.	8-structure no.	90-date inspected
WINCHENDON, MA BIRCH HILL DAM		CENED MA251 0015	6/24/93

2-dist.	104-highway system	22-owner	27-year built	106-year rebuilt	11-milepoint
11		COE	1979	—	—

43-structure type: PRESTRESSED CONCRETE SLAB (501)	quality control engineer: NICK FORBES
07-facility carried: BURGESS RD.	team leader: J. COLUCCI
06-features intersected: PRIEST BROOK	team members: M. DESCHENES / F. FUNG

item 58	7	item 59	8	item 60	8
DECK		SUPERSTRUCTURE		SUBSTRUCTURE	
1. Wearing Surface	7	1. Bearing Devices	8	1. Abutments	
2. Deck-Condition	7	2. Stringers	NA	a-Wings	7
3. Stay in Place Forms	NA	3. Diaphragms	NA	b-Backwall	8
4. Curbs	7	4. Girders or Beams	8	c-Bridge Seats	8
5. Median	NA	5. Floor Beams	NA	d-Breastwall	8
6. Sidewalks	NA	6. Trusses	NA	e-Footings	8
7. Parapet	NA	7. Rivets or Bolts	NA	f-Piles	NA
8. Railing	7	8. Welds	NA	g-Erosion	8
9. Anti Missile Fence	NA	9. Collision Damage	NA	h-Settlement	8
10. Drains	NA	10. Load Deflection	—	2. Piers or Bents	
11. Lighting Standards	NA	11. Member Alignment	7	a-Caps	NA
12. Utilities	NA	12. Load Vibration	—	b-Column	NA
13. Deck Joints	6	13. Paint-Epoxy	NA	c-Web	NA
14. Approach Settlement	6	14. Year Painted	NA	d-Footing	NA
		15. Under Clearance NA ft ___ in		e-Piles	NA
		Clearance Signs ☐ yes ☒ NA no		f-Scour	NA
				g-Settlement	NA
				3. Collision Damage	NA
				4. Hydraulic-Adequacy	8

Actual Posting	H	3	3S2	Single
	☐	☐	☐	15T
Recommended Posting From Rating Book	30	43	66	☐

SIGNS IN PLACE Y or N	at bridge	advance
	Y	N
LEGIBILITY	8	—

Overhead Signs (attached to bridge) ☐ yes ☒ no

1. Welds	NA
2. Bolts	NA
3. Condition	NA

Item93b U/W Inspection Date: NONE

ITEM 61-channel and channel protection: 8

1. channel scour	8	5. rip rap or slope paving	NA
2. embankment erosion	8	6. effectiveness	NA
3. fender system	NA	7. debris	7
4. spur dikes & jetties	NA	8. vegetation	NA

36-Traffic Safety features

	36	condition
1. bridge railing	1	7
2. transitions	0	—
3. approach guardrail	0	—
4. guardrail terminal	0	—

[redacted]

PROJECT: BIRCH HILL
NAME: BURGESS RD
LOCATION: WINCHENDON, MA

BRIDGE INSPECTION
SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity? NO

2. Is the streambed erodible? If so, does the structure have any vulnerable design features? YES

   a. Piers, abutments with spread footings or short pile foundations. yes
   b. Superstructure with simple spans or non-redundant support systems. yes
   c. Inadequate waterway openings. NO
   d. Designs which collect ice and debris. yes
   e. All water must pass through or over structure. yes
   f. Other. —

3. Are any characteristics of an aggressive stream or waterway present? NO

   a. Active degradation or aggredation of streambed. NO
   b. Significant lateral movement or erosion of streambanks. NO
   c. Steep slopes. yes
   d. High velocities. yes
   e. Any history of highway or bridge damage during past floods. NO
   f. Other. —

4. Is the bridge located on a stream reach with any adverse flow characteristics? NO

   a. Crossing near stream confluence. NO
   b. Crossing of tributary stream near confluence with larger streams. NO
   c. Crossing on sharp bend in stream. NO
   d. Location on alluvial fan. NO
   e. Other. NO

5. Other comments or observations. NONE

BIRCH HILL DAM
OLD ROUTE 202 BRIDGE, WINCHENDON MA.
FY 93 ROUTINE INSPECTION REPORT

DATE OF INSPECTION: 24 June 93

DATE OF PREVIOUS INSPECTIONS: Inventory, 24 May 84.
Routine, Sep 87.
Routine, 29 Jul 89.
Routine, 21 Sep 90.

RATING (T = TONS)

Type	Inventory	Operating	Comments
H15	23T	35T	Load rating
3	34T	53T	recalculated due
3S2	54T	84T	to new deck
3-3	66T	103T	concrete overlay.

EVALUATION: (See attached "Structures Inspection Field Report")

A. Roadway and Railings — Overall rating 7. The bridge west approach showed some depression but the overall transition to the concrete deck is smooth. The approach guardrail, bridge rails, concrete overlay and transition slabs are in good condition. The approach guardrail are far from the pavement but they are functional. Slight erosion is located at the southwest and northeast approach corner.

B. Fascias — Overall condition is 8. Both fascia and bridge deck are in good condition. No cracks or concrete spall were located. Bridge deck is also in excellent condition. The deck drainage and weep holes are clear.

C. Underside of Deck — Overall condition is 8. The beams and deck diaphragm do not have any sign of concrete spall. No cracks or water staining was noted. The underside of the deck is in good condition.

D. Wingwalls & Abutments	Overall condition 7. The wingwalls are in good condition. There are is erosion at the bottom of bituminous waterway behind southeast wingwall. Also minor spall on the southwest corner of abutment with moss growth was noted. There are no signs of scour at the foundation.
E. Channel	Overall condition 7. The streambed under the bridge is filled with vegetation and tree branches. The stream flow was moderate during inspection; however, no major signs of scour were noted.

CONDITION RATING		
	Inventory	6
	Routine, 1987:	6
	Routine, 1989:	5
	Routine, 1991	7
	Routine, 1993	7

RECOMMENDATIONS:

Status of Previous Recommendations

1. Modify approach guardrail at transitions to guide around brush blocks.

   Not done

2. Make miscellaneous patch repairs to abutments and wingwalls at flaws which were missed in 1990 contract or below the existing water level (contractor limit of work).

   Not done

Revised Recommendations

1. Remove all the tree branches, debris and other vegetation near and under the bridge deck. (Project Personnel)

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

WINCHENDON, MA	bridge dept. no.	8-structure no.		90-date inspected 6/24/93
2-dist.	104-highway system	22-owner COE	27-year built 1921	106-year rebuilt 1990	11-milepoint
43-structure type CONCRETE STRINGER / MULTI-BEAM OR GIRDER			quality control engineer	
07-facility carried OLD ROUTE 202			team leader J. COLUCCI	
06-features intersected WATER BEAVER BROOK			team members M. DESCHENES / F. FUNG	

item 58	8
DECK	
1. Wearing Surface	8
2. Deck-Condition	8
3. Stay in Place Forms	—
4. Curbs	8
5. Median	—
6. Sidewalks	—
7. Parapet	—
8. Railing	8
9. Anti Missile Fence	—
10. Drains	8
11. Lighting Standards	—
12. Utilities	—
13. Deck Joints	8
14. Approach Settlement	8

item 59	8
SUPERSTRUCTURE	
1. Bearing Devices	—
2. Stringers	8
3. Diaphragms	8
4. Girders or Beams	8
5. Floor Beams	—
6. Trusses	—
7. Rivets or Bolts	8
8. Welds	8
9. Collision Damage	—
10. Load Deflection	8
11. Member Alignment	8
12. Load Vibration	8
13. Paint-Epoxy	—
14. Year Painted	—
15. Under Clearance ____ ft ____ in	
Clearance Signs ☐ yes ☐ no	

item 60	7
SUBSTRUCTURE	
1. Abutments	
a-Wings	7
b-Backwall	8
c-Bridge Seats	—
d-Breastwall	8
e-Footings	8
f-Piles	—
g-Erosion	7
h-Settlement	
2. Piers or Bents	
a-Caps	—
b-Column	—
c-Web	—
d-Footing	—
e-Piles	—
f-Scour	—
g-Settlement	—
3. Collision Damage	—
4. Hydraulic-Adequacy	7

	H	3	3S2	Single
Actual Posting	46	69	72	☐
Recommended Posting From Rating Book	12	—	—	☐
SIGNS IN PLACE Y or N	at bridge: Y			advance: ☐
LEGIBILITY	Y			☐

Overhead Signs (attached to bridge) ☐ yes ☒ no

1. Welds ☐
2. Bolts ☐
3. Condition ☐

Item93b U/W Inspection Date: ____

ITEM 61-channel and channel protection 7

1. channel scour	8	5. rip rap or slope paving	—
2. embankment erosion	7	6. effectiveness	—
3. fender system	—	7. debris	6
4. spur dikes & jetties	—	8. vegetation	6

36-Traffic Safety features

	36	condition
1. bridge railing	1	8
2. transitions	0	7
3. approach guardrail	1	7
4. guardrail terminal	1	8

NA-NOT APPLICABLE IA-INACCESSIBLE

PROJECT: BIRCH HILL DAM
NAME: OLD ROUTE 202
LOCATION: WINCHENDON, MA

BRIDGE INSPECTION
SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity?	YES
2. Is the streambed erodible? If so, does the structure have any vulnerable design features?	YES
a. Piers, abutments with spread footings or short pile foundations.	YES
b. Superstructure with simple spans or non-redundant support systems.	YES
c. Inadequate waterway openings.	YES
d. Designs which collect ice and debris.	NO
e. All water must pass through or over structure.	YES
f. Other.	—
3. Are any characteristics of an aggressive stream or waterway present?	YES
a. Active degradation or aggredation of streambed.	NO
b. Significant lateral movement or erosion of streambanks.	NO
c. Steep slopes.	NO
d. High velocities.	YES
e. Any history of highway or bridge damage during past floods.	NO
f. Other. CONCRETE AT WATERLINE	YES
4. Is the bridge located on a stream reach with any adverse flow characteristics?	
a. Crossing near stream confluence.	NO
b. Crossing of tributary stream near confluence with larger streams.	NO
c. Crossing on sharp bend in stream.	NO
d. Location on alluvial fan.	YES
e. Other.	—
5. Other comments or observations.	NONE

BIRCH HILL DAM
GOODNOW ROAD BRIDGE, WINCHENDON, MA
FY 93 ROUTINE INSPECTION REPORT

DATE OF INSPECTION: 25 June 93

DATE OF PREVIOUS INSPECTIONS: Inventory, 25 September 84
Routine, 4 September 87
Deck reinforcing inspection, 4 September 87
Routine, 19 July 89
Routine, 21 September 90

RATING (T=TONS)

Type	Inventory	Operating	Comments
H15	13T	18T	No change in ratings

EVALUATION (See attached "Structures Inspection Field Report")

A. Roadway and Railings: Overall condition is good, no repairs needed (condition 8). The bituminous concrete deck overlay and transition slabs are in good condition. All deck drains are clear and functioning properly. The approach alignments are only 16 feet wide and slightly skewed. The timber approach and bridge railings are in good condition.

B. Fascias & Curbs: The fascias and curbs are in good condition.

C. Underside of Deck: The overall condition of the underside of the concrete deck is good. One spall was noted in the concrete deck at approximately the third point of the outside east beam. The spall is approximately 12" long, 4"wide, and 4" deep. This spall has been noted in previous inspections, has not continued to deteriorate, and is not a concern at this time.

D. Wingwalls/Abutments: The condition of the abutments and wingwalls is good (condition 7). There are only minor hairline cracks with efflorescence on the east face of the north abutment. All other concrete is in good condition. The gabion retaining walls are in good condition. Erosion was again noted beneath the south

abutment, and should be repaired.

E. Channel: Overall condition 7. There is an existing area of scour beneath the south abutment. The flow beneath the bridge was swift with little obstruction. Some minor rubble is deposited under the bridge.

CONDITION RATINGS:

Inventory, 1984:	7
Routine, 1987:	7
Routine, 1989:	6
Routine, 1991:	7
Routine, 1993:	7

Status of Previous Recommendations

Item	Current Status
1. Post warning signs "Narrow Bridge" on both approaches.	Not Done
2. Repair scour at abutments.	Not Done

Revised Recommendations

Repair scour at abutments.	Estimated cost $5,000.

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

	bridge dept. no.	8-structure no.	90-date inspected
BIRCH HILL DAM, WINCHENDON, NH	COE	CENEDMA2510017	6/24/93

2-dist.	104-highway system	22-owner	27-year built	106-year rebuilt	11-milepoint
111	NON-FED	COE	1937	1991	0.5

43-structure type: MULTI BEAM / CONCRETE DECK (302)	quality control engineer: NICK FORBES
07-facility carried: GOODNOW RD. (REC AREA ACCESS)	team leader: JOSEPH COLUCCI
06-features intersected: PRIEST BROOK	team members: N. DESCHENES / F. FUNG

item 58	8	item 59	8	item 60	7
DECK		SUPERSTRUCTURE		SUBSTRUCTURE	
1. Wearing Surface	8	1. Bearing Devices	8	1. Abutments	
2. Deck-Condition	8	2. Stringers	8	a-Wings	7
3. Stay in Place Forms	NA	3. Diaphragms	8	b-Backwall	8
4. Curbs	8	4. Girders or Beams	NA	c-Bridge Seats	8
5. Median	NA	5. Floor Beams	NA	d-Breastwall	8
6. Sidewalks	NA	6. Trusses	NA	e-Footings	6
7. Parapet	NA	7. Rivets or Bolts	NA	f-Piles	NA
8. Railing	8	8. Welds	NA	g-Erosion	7
9. Anti Missile Fence	NA	9. Collision Damage	NA	h-Settlement	8
10. Drains	8	10. Load Deflection	X	2. Piers or Bents	
11. Lighting Standards	NA	11. Member Alignment	8	a-Caps	NA
12. Utilities	NA	12. Load Vibration	X	b-Column	NA
13. Deck Joints	8	13. Paint-Epoxy	8	c-Web	NA
14. Approach Settlement	8	14. Year Painted 1990		d-Footing	NA
		15. Under Clearance NA ft ___ in		e-Piles	NA
		Clearance Signs NA yes ☐ no		f-Scour	NA
				g-Settlement	NA
				3. Collision Damage	X
				4. Hydraulic-Adequacy	7

Actual Posting	H	3	3S2	Single
	NA	NA	NA	12T
Recommended Posting From Rating Book	☐	☐	☐	13T

SIGNS IN PLACE Y or N	at bridge	advance
	☐	N
LEGIBILITY	☐	☐

Overhead Signs (attached to bridge) ☐ yes ☑ no

1. Welds	NA
2. Bolts	NA
3. Condition	NA

Item93b U/W Inspection Date: NONE

ITEM 61-channel and channel protection: 6

1. channel scour	6	5. rip rap or slope paving	NA
2. embankment erosion	7	6. effectiveness	NA
3. fender system	NA	7. debris	8
4. spur dikes & jetties	NA	8. vegetation	NA

36-Traffic Safety features

	36	condition
1. bridge railing	1	8
2. transitions	1	8
3. approach guardrail	1	8
4. guardrail terminal	1	5

Y-UNKNOWN NA-NOT APPLICABLE IA-INACCESSIBLE

PROJECT: BIRCH HILL DAM
NAME: GOOD NEW RD
LOCATION: WINCHENDON, MA.

BRIDGE INSPECTION
SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity? yes

2. Is the streambed erodible? If so, does the structure have any vulnerable design features? yes

   a. Piers, abutments with spread footings or short pile foundations. yes
   b. Superstructure with simple spans or non-redundant support systems. yes
   c. Inadequate waterway openings. no
   d. Designs which collect ice and debris. no
   e. All water must pass through or over structure. yes
   f. Other. —

3. Are any characteristics of an aggressive stream or waterway present? yes

   a. Active degradation or aggredation of streambed. yes
   b. Significant lateral movement or erosion of streambanks. yes
   c. Steep slopes. no
   d. High velocities. yes
   e. Any history of highway or bridge damage during past floods. no
   f. Other. SLOW UNDERMINING SOUTH ABUTMENT SLOWLY yes

4. Is the bridge located on a stream reach with any adverse flow characteristics? yes

   a. Crossing near stream confluence. no
   b. Crossing of tributary stream near confluence with larger streams. no
   c. Crossing on sharp bend in stream. yes
   d. Location on alluvial fan. yes
   e. Other. NO

5. Other comments or observations. none

WEST HILL DAM
WEST HILL ROAD BRIDGE, UXBRIDGE, MA
FY 93 ROUTINE INSPECTION REPORT

DATE OF INSPECTION: 8 September 93

DATE OF PREVIOUS INSPECTIONS: Inventory, 23 August 89
Routine, 30 July 91

RATING (T=TONS)

Type	Inventory	Operating	Comments
H15	12T	24T	No change in ratings Ratings based on satisfactory past performance without signs of distress.

EVALUATION (See attached "Structures Inspection Field Report")

A. Deck, Roadway & Railings: Overall condition is 7. The roadway over the bridge is in good condition. Slight vegetation buildup was noticed along the granite curbs. The pavement along the northeast, and southwest wingwalls is beginning to erode due to runoff from the road. Steel guardrail sections that were installed along the northwest approach in order to control erosion are performing satisfactorily. The railings along the bridge deck are in good condition, however they are also very light duty and do not comply with the current AASHTO standards. There is a poor transition between the approach guardrails and the bridge deck railings along the north approach. The cables for the north approach guardrails are loose. There are no guardrails along the south approach. The speed bumps at either end of the bridge are effective in controlling the speed of traffic. The bridge which is 18 feet wide is narrow and is currently used for two way traffic and pedestrians.

B. Superstructure/ Substructure

The overall condition is good (condition 8). The stones seem to be well bonded and aligned. There is no sign of distress of the superstructure. The mortar grout on the underside of the arch is delaminating and spalling. It appears that during the 1940 rehabilitation of the bridge, the underside of the arch was formed in order to contain the flow of grout which was pressure injected from above the arch into the joints in the stone. In this case the thin mortar layer does not provide any additional structural strength and therefore the delaminating mortar is not a concern. There is some moss and vegetation growing from the joints between the stones. Some of the joints should be cleaned and repointed. The superstructure is primarily integral with substructure. The substructure is also in good condition. Due to the depth of the water, the footings were not examined for scour potential.

C. Channel:

It was difficult to evaluate the overall condition of the channel. There was very light flow through the bridge at the time of the inspection. No erosion was noticed in the channel. The upstream channel makes a sharp turn south and another turn west before reaching the bridge.

CONDITION RATING:

1989	8
1991	8
1993	7

RECOMMENDATIONS:

Status of Previous Recommendations

1. Perform mortar joint repairs. Remove vegetation and repoint the joints over the stone arch on both sides.	Not Done
2. Control erosion and stabilize the west embankment.	Not Done
3. Install new approach and bridge guardrails.	Not Done
4. Install a pedestrian walkway.	Not Done

Revised Recommendations

A contract has been prepared during FY 93 to perform the above recommendations. No work had yet been accomplished by the time of the inspection.

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

	bridge dept. no.	8-structure no.	90-date inspected
WEST HILL DAM UXBRIDGE, MA	—	CENEDMA25100Z1	8 SEPT 93

2-dist.	104-highway system	22-owner	27-year built	106-year rebuilt	11-milepoint
	NON FED	COE	1880	1940	.5

43-structure type: SINGLE SPAN - STONE ARCH	quality control engineer: NICK FORBES
07-facility carried: WEST HILL ROAD (REC. ACCESS)	team leader: JOE COLUCCI
06-features intersected: WEST RIVER	team members: M. DESCHENES F. FUNS

item 58	7	item 59	8	item 60	8
DECK		SUPERSTRUCTURE		SUBSTRUCTURE	
1. Wearing Surface	8	1. Bearing Devices	NA	1. Abutments	
2. Deck-Condition	8	2. Stringers	NA	a-Wings	8
3. Stay in Place Forms	NA	3. Diaphragms	NA	b-Backwall	NA
4. Curbs	7	4. Girders or Beams	NA	c-Bridge Seats	NA
5. Median	NA	5. Floor Beams	NA	d-Breastwall	NA
6. Sidewalks	NA	6. Trusses	NA	e-Footings	8
7. Parapet	NA	7. Rivets or Bolts	NA	f-Piles	NA
8. Railing	5	8. Welds	NA	g-Erosion	8
9. Anti Missile Fence	NA	9. Collision Damage	NA	h-Settlement	8
10. Drains	NA	10. Load Deflection	NA	2. Piers or Bents	
11. Lighting Standards	NA	11. Member Alignment	8	a-Caps	NA
12. Utilities	NA	12. Load Vibration	NA	b-Column	NA
13. Deck Joints	NA	13. Paint-Epoxy	NA	c-Web	NA
14. Approach Settlement	7	14. Year Painted	NP	d-Footing	NA
		15. Under Clearance ____ ft NA in		e-Piles	NA
		Clearance Signs ☐ yes ☐ no		f-Scour	NA
				g-Settlement	ND
				3. Collision Damage	NA
				4. Hydraulic-Adequacy	NA

	H	3	3S2	Single
Actual Posting	☐	☐	☐	12
Recommended Posting From Rating Book	☐	☐	☐	15

	at bridge	advance
SIGNS IN PLACE Y or N	N	N
LEGIBILITY	NA	NA

Overhead Signs (attached to bridge) ☐ yes ☑ no

1. Welds	NA
2. Bolts	NA
3. Condition	NA

Item93b U/W Inspection Date: NONE

ITEM 61-channel and channel protection 5

1. channel scour	5	5. rip rap or slope paving	NA
2. embankment erosion	5	6. effectiveness	8
3. fender system	NA	7. debris	8
4. spur dikes & jetties	NA	8. vegetation	8

36-Traffic Safety features

	36	condition
1. bridge railing	0	5
2. transitions	0	7
3. approach guardrail	0	5
4. guardrail terminal	0	NA

X=UNKNOWN NA=NOT APPLICABLE IA=INACCESSIBLE

PROJECT: WEST HILL DAM
NAME: WEST HILL DAM BRIDGE
LOCATION: UXBRIDGE, MA

BRIDGE INSPECTION
SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity? — YES

2. Is the streambed erodible? If so, does the structure have any vulnerable design features? — YES

   a. Piers, abutments with spread footings or short pile foundations. — YES
   b. Superstructure with simple spans or non-redundant support systems. — YES
   c. Inadequate waterway openings. — YES
   d. Designs which collect ice and debris. — NO
   e. All water must pass through or over structure. — YES
   f. Other. — —

3. Are any characteristics of an aggressive stream or waterway present? — YES

   a. Active degradation or aggredation of streambed. — YES
   b. Significant lateral movement or erosion of streambanks. — NO
   c. Steep slopes. — NO
   d. High velocities. — YES
   e. Any history of highway or bridge damage during past floods. — UNKNOWN 1936-1940 RECORDS?
   f. Other. — —

4. Is the bridge located on a stream reach with any adverse flow characteristics? — YES

   a. Crossing near stream confluence. — NO
   b. Crossing of tributary stream near confluence with larger streams. — NO
   c. Crossing on sharp bend in stream. — YES
   d. Location on alluvial fan. — NO
   e. Other. — —

5. Other comments or observations. — NONE

THOMASTON DAM
LEADMINE BROOK ROAD BRIDGE, THOMASTON, CT
FISCAL YEAR 1993
ROUTINE INSPECTION REPORT

DATE OF ROUTINE INSPECTION: 24 August 93

DATE OF PREVIOUS INSPECTIONS: Routine Inspection, 16 June 91
Inventory Inspection, November 84

RATING (T = TONS)

Type	Inventory	Operating	Comments
H15	11T	16T	No change in ratings due to inspection findings.
Type 3	45T	69T	
Type 3S2	69T	106T	
Type 3-3	86T	132T	

EVALUATION (See attached "Structures Inspection Field Report")

A. Superstructure
-Above Deck

-Overall condition is very good.
-There are a few small potholes in the east approach pavement.
-All of the approach stone walls are in good condition, with only minor vegetation growth between the pavement and the base of the wall.
-The concrete transition slab at the east approach is in good condition.
-The expansion joint at the east approach is in good condition.
-The pavement at the west approach has a few bumps at the transition onto the deck.
-Bridge railings and posts are in good condition. There are some minor shrinkage cracks in the surface coats of the concrete posts.
-There is sand and debris accumulating on the deck near the south curb.
-There are a few patches of deterioration in the bituminous wearing surface.

B. Superstructure
-Below Deck

-Overall condition is good.
-The structural steel has recently been painted (1990), and is in good condition.
-Underside of deck is in good condition, with only minor honeycombing. There is some minor efflorescence coming from several transverse hairline cracks beneath both curbs.

C. Substructure

-Overall condition is good.
-The stone abutments are in good condition, with no signs of movement or settlement.
-All of the four stone wingwalls are in good condition, with no signs of movement.
-The east abutment is slightly undermined by scour.

D. Channel

-The channel is scouring beneath the bridge. The channel is approximately four feet deeper under the bridge than it is either upstream or downstream of the bridge.

E. Overall Numerical Condition Rating

Inventory 1985:	7
Routine 1991:	8
Routine 1993:	8

RECOMMENDATIONS

Status of Previous Recommendations

1. Inspect both abutments for scour.

2. Repair scour erosion at the south corner of the east abutment.

None of this work has been done.

Revised Recommendations

1. Complete the scour analysis of the east abutment. The west abutment is founded on rock and it is unlikely that it is susceptible to scour.

2. Post a 10 Ton load limit at the east approach.

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

City/t	bridge dept. no.	8-structure no.	90-date inspected
Thomaston, CT		CEPNEDCT0910003	8/24/93

2-dist.	104-highway system	22-owner	27-year built	106-year rebuilt	11-milepoint
	8 Non-Federal Aid	70 Corps Of Eng	1939	—	

43-structure type: 304 Single Span, Steel Wide Flange Beams, Conc. Deck

quality control engineer: Nick Forbes

07-facility carried: Leadmine Brook Road

team leader: Joe Colucci

06-features intersected: Leadmine Brook

team members: M. Walsh, M. Deschenes, E. Torio

item 58	8
DECK	
1. Wearing Surface	8
2. Deck-Condition	8
3. Stay in Place Forms	N
4. Curbs	8
5. Median	N
6. Sidewalks	N
7. Parapet	N
8. Railing	7
9. Anti Missile Fence	N
10. Drains	N
11. Lighting Standards	N
12. Utilities	N
13. Deck Joints	8
14. Approach Settlement	8

item 59	8
SUPERSTRUCTURE	
1. Bearing Devices	7
2. Stringers	N
3. Diaphragms	8
4. Girders or Beams	8
5. Floor Beams	N
6. Trusses	N
7. Rivets or Bolts	7
8. Welds	8
9. Collision Damage	N
10. Load Deflection	8
11. Member Alignment	8
12. Load Vibration	N
13. Paint-Epoxy	9
14. Year Painted	90
15. Under Clearance — ft — in	
Clearance Signs ☐ yes ☐ no	

item 60	8
SUBSTRUCTURE	
1. Abutments	
a-Wings	8
b-Backwall	8
c-Bridge Seats	8
d-Breastwall	8
e-Footings	8
f-Piles	-
g-Erosion	7
h-Settlement	-
2. Piers or Bents	
a-Caps	/
b-Column	/
c-Web	/
d-Footing	/
e-Piles	/
f-Scour	/
g-Settlement	/
3. Collision Damage	N
4. Hydraulic-Adequacy	8

Actual Posting	H	3	3S2	Single
	/	/	/	N
Recommended Posting From Rating Book	/	/	/	10
SIGNS IN PLACE Y or N	at bridge: N			advance: N
LEGIBILITY	-			-

Overhead Signs (attached to bridge) ☐ yes ☑ no

1. Welds	/
2. Bolts	/
3. Condition	/

Item93b U/W Inspection Date: N/A

'TEM 61-channel and channel protection: 7

1. channel scour	6	5. rip rap or slope paving	N
2. embankment erosion	7	6. effectiveness	7
3. fender system	N	7. debris	7
4. spur dikes & jetties	N	8. vegetation	7

36-Traffic Safety features

	36	condition
1. bridge railing	1	8
2. transitions	1	8
3. approach guardrail Wall	1	8
4. guardrail terminal	0	-

Thomaston Dam
Leadmine Brook Bridge

SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity? — Yes

2. Is streambed erodible? If so, does the structure have any vulnerable design features? — Yes

a. Piers, abutments with spread footings or short pile foundations.	Yes
b. Superstructures with simple spans or non-redundant support systems.	Yes
c. Inadequate waterway opening.	No
d. Designs which collect ice and debris.	No
e. All water must pass through or over structure.	No
f. Other.	—

3. Are any characteristics of an aggressive stream or waterway present?

a. Active degradation (Under Bridge) or aggredation of streambed.	Yes
b. Significant lateral movement or erosion of streambanks.	No
c. Steep slopes.	No
d. High velocities.	No
e. Any history of highway or bridge damage during past floods.	No
f. Other.	No

4. Is bridge located on stream reach with any adverse flow characteristics?

a. Crossing near stream confluence.	No
b. Crossing of tributary stream near confluence with larger streams.	No
c. Crossing on sharp bend in stream.	No
d. Location on alluvial fan.	No
e. Other.	No

5. Other comments or observations. —

NORTHFIELD BROOK LAKE
BRIDGE ON OLD ROUTE 254 (UPPER), THOMASTON, CT
FY 93 ROUTINE INSPECTION REPORT

DATE OF INSPECTION: 24 August 1993

DATE OF PREVIOUS INSPECTIONS:

In-depth,	Dec 84
Routine,	Aug 87
Routine,	Aug 89
Routine,	June 91

RATING (T=TONS)

Type	Inventory	Operating	Comments
H15	19T	28T	
3	34T	52T	
3S2	49T	52T	

EVALUATION (See attached "Structures Inspection Field Report")

A. Roadway & Railings

The overall condition of the deck and railings is good (condition 7). The upper cable of the north east approach is loose and tangled. The remaining cable guardrails along the roadway are in very good condition. Both bridge railings are in good condition. Most concrete spalls have been patched. One repair in the south end of the east rail has spalled due to wood forming remaining in the patch. The deck and approaches are in good condition. Various areas of the deck appear to have been filled with bituminous patching.

B. Fascias and Curbs

The condition of the fascias and curbs is good. The concrete shows evidence of abrasion typical of aged concrete. Of minor concern is the lack of joint filler between curb monoliths. There is a buildup of debris in some of these joints.

C. Underside of Deck

The underside of the deck is in very good condition (condition 8) and appears to have been recently painted. The bearings and underside of the concrete deck are

	in good condition with no signs of distress or deterioration.
D. Wingwalls and Abutments	The wingwalls and abutments are in good condition (condition 7). Moderate abrasion is typical of all walls. One minor vertical crack was noted in the south east wingwall and minor efflorescence noted on the west walls. The weep holes in the south abutment are clear and appear to be functioning properly. The weep holes in the north abutment were buried under sand deposited against the wall.
E. Channel	The channel is undergoing various amounts of erosion. Although no scour below the bridge footings was noted, moderate aggredation was present along the north abutment. Both upstream and downstream of the bridge, dense vegetation was encroaching upon the channel.

CONDITION RATING

In-depth	7
Interim 1987	7
Interim 1989	7
Routine 1991	8
Routine 1993	7

RECOMMENDATIONS

Status of Previous Recommendations

No Previous recommendations

Revised Recommendations

The deficiencies noted are not of much concern at this time. They may be combined with repairs to other local bridges in the future.

NORTHFIELD BROOK (UPPER)

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

c [redacted] THOMASTON CT.		bridge dept. no. COE.	8-structure no. CEPNEDCT0910004		90-date inspected 8/23/93
2-dist.	104-highway system LOCAL	22-owner COE.	27-year built UNKNOWN	106-year rebuilt 1955	11-milepoint
43-structure type STEEL SINGLE SPAN WIDE FLANGE BEAM			quality control engineer NICK FORBES		
07-facility carried OLD RT 254			team leader JOE COLUCCI		
06-features intersected NORTHFIELD BROOK			team members M DESCHENES, M WALSH, M JORID		

item 58	7	item 59	8	item 60	7
DECK		SUPERSTRUCTURE		SUBSTRUCTURE	
1. Wearing Surface	7	1. Bearing Devices	8	1. Abutments	
2. Deck-Condition	7	2. Stringers	–	a-Wings	7
3. Stay in Place Forms	–	3. Diaphragms	8	b-Backwall	7
4. Curbs	7	4. Girders or Beams	8	c-Bridge Seats	7
5. Median	–	5. Floor Beams	–	d-Breastwall	7
6. Sidewalks	–	6. Trusses	–	e-Footings	7
7. Parapet	7	7. Rivets or Bolts	8	f-Piles	–
8. Railing	7	8. Welds	–	g-Erosion	6
9. Anti Missile Fence	–	9. Collision Damage	–	h-Settlement	–
10. Drains	–	10. Load Deflection	–	2. Piers or Bents	
11. Lighting Standards	–	11. Member Alignment	8	a-Caps	–
12. Utilities	–	12. Load Vibration	–	b-Column	–
13. Deck Joints	–	13. Paint-Epoxy	9	c-Web	–
14. Approach Settlement	8	14. Year Painted	9	d-Footing	–
		15. Under Clearance — ft — in		e-Piles	–
		Clearance Signs ☐ yes ☒ NA no		f-Scour	–
				g-Settlement	–
				3. Collision Damage	–
				4. Hydraulic-Adequacy	7

	H	3	3S2	Single
Actual Posting	☐	☐	☐	–
Recommended Posting From Rating Book	☐	☐	☐	☐

SIGNS IN PLACE Y or N	at bridge	advance
	N	N
LEGIBILITY	N	N

Overhead Signs (attached to bridge) ☐ yes ☒ X no

1. Welds	NA
2. Bolts	NA
3. Condition	NA

Item93b U/W Inspection Date: NONE.

ITEM 61-channel and channel protection 7

[redacted]annel scour	8	5. rip rap or slope paving	–
2. embankment erosion	8	6. effectiveness	–
3. fender system	–	7. debris	6
4. spur dikes & jetties	–	8. vegetation	7

36-Traffic Safety features

	36	condition
1. bridge railing	1	7
2. transitions	1	7
3. approach guardrail	1	7
4. guardrail terminal	N	–

X=UNKNOWN NA=NOT APPLICABLE IA=INACCESSIBLE

PROJECT: NORTH FIELD BROOK LAKE
NAME: UPPER RT 254 BRIDGE
LOCATION: OLD RT 254 (UPPER)

BRIDGE INSPECTION
SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity? YES

2. Is the streambed erodible? If so, does the structure have any vulnerable design features? YES

   a. Piers, abutments with spread footings or short pile foundations. YES
   b. Superstructure with simple spans or non-redundant support systems. YES
   c. Inadequate waterway openings. NO
   d. Designs which collect ice and debris. NO
   e. All water must pass through or over structure. YES
   f. Other. —

3. Are any characteristics of an aggressive stream or waterway present? YES

   a. Active degradation or aggredation of streambed. YES
   b. Significant lateral movement or erosion of streambanks. NO
   c. Steep slopes. NO
   d. High velocities. NO
   e. Any history of highway or bridge damage during past floods. NO
   f. Other. —

4. Is the bridge located on a stream reach with any adverse flow characteristics? YES

   a. Crossing near stream confluence. NO
   b. Crossing of tributary stream near confluence with larger streams. NO
   c. Crossing on sharp bend in stream. NO
   d. Location on alluvial fan. YES
   e. Other. —

5. Other comments or observations. —

NORTHFIELD BROOK LAKE
BRIDGE ON OLD ROUTE 254, (LOWER) THOMASTON, CT
FY 93 ROUTINE INSPECTION REPORT

DATE OF INSPECTION: 24 August 1993

DATE OF PREVIOUS INSPECTIONS:

In-depth,	Dec 84
Routine,	Aug 87
Routine,	Aug 89
Routine,	Sept 91

RATING (T=TONS)

Type	Inventory	Operating	Comments
H15	16T	23T	
3	39T	55T	
3S2	62T	86T	

EVALUATION (See attached "Structures Inspection Field Report")

A. Roadway, & Railings

The overall condition of the roadway, railings and approaches is good. The wearing surface of the deck has been recently replaced. Cracks were noted across the deck at approximately 8 to 10 foot intervals. The cracking appears to be the result of improper curing. The cable roadway guardrails are in good condition. One cable along the south east approach is loose. The bituminous approaches have been repaired recently. The new approaches are slightly higher than the deck causing a slight impact when entering and exiting the bridge. The railings at each approach are in good condition. The west guardrail shows some abrasion of the concrete, typical of its age.

B. Curbs and Fascias

The curbs and fascias along both sides of the deck are in good condition with no apparent signs of distress or deterioration.

C. Underside of Deck

The overall condition of the superstructure below the deck is good. Three of the T-beams on the

	east side of the bridge have minor spalls and minor to moderate efflorescence. The two inner T-beams are in very good condition. The two west steel beams are in good condition. There is minor rusting apparent on the underside of the deck from the reinforcement chairs. The bearings for both the steel and concrete beams are in good condition.
D. Wingwalls and Abutments	The wingwalls and abutments are in good condition. Only minor cracking and efflorescence was noted along the wingwalls.
E. Channel	The bridge is located at the end of a bend in the channel. There is some aggredation of the channel along the north abutment. The downstream side of the channel is clear.

CONDITION RATING

In-depth	7
Routine 1987	7
Routine 1989	6
Routine 1991	8
Routine 1993	7

RECOMMENDATIONS

Status of Previous Recommendations

No previous recommendations.

Revised Recommendations

No new recommendations at this time.

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

	bridge dept. no.	8-structure no.	90-date inspected
THOMASTON CT.	3UE	CEPNEDCT091 0005	24 AUGUST 93

2-dist.	104-highway system	22-owner	27-year built	106-year rebuilt	11-milepoint
	NON-FEDERAL.	CDT.	1936		

43-structure type: SIMPLE SPAN CONCRETE T-BEAMS / STEEL STRINGERS	quality control engineer: NICK FORBES
07-facility carried: OLD ROUTE 254 (LOWER)	team leader: JOE COLUCCI
06-features intersected: NORTHFIELD BROOK.	team members: M. DESCHENES M. WALSH M. TORIO

item 58	7	item 59	7	item 60	7
DECK		SUPERSTRUCTURE		SUBSTRUCTURE	
1. Wearing Surface	7	1. Bearing Devices	7	1. Abutments	
2. Deck-Condition	7	2. Stringers	-	a-Wings	7
3. Stay in Place Forms	-	3. Diaphragms	7	b-Backwall	7
4. Curbs	8	4. Girders or Beams	7	c-Bridge Seats	7
5. Median	-	5. Floor Beams	-	d-Breastwall	7
6. Sidewalks	-	6. Trusses	-	e-Footings	7
7. Parapet	8	7. Rivets or Bolts	-	f-Piles	-
8. Railing	7	8. Welds	-	g-Erosion	7
9. Anti Missile Fence	-	9. Collision Damage	-	h-Settlement	-
10. Drains	-	10. Load Deflection	-	2. Piers or Bents	
11. Lighting Standards	-	11. Member Alignment	8	a-Caps	-
12. Utilities	-	12. Load Vibration	-	b-Column	-
13. Deck Joints	-	13. Paint-Epoxy	8	c-Web	-
14. Approach Settlement	7	14. Year Painted	91	d-Footing	-
		15. Under Clearance — ft — in		e-Piles	-
		Clearance Signs ☐ yes ☒ no		f-Scour	-
				g-Settlement	-
				3. Collision Damage	-
				4. Hydraulic-Adequacy	7

Actual Posting	H	3	3S2	Single
	-	-	-	-
Recommended Posting From Rating Book	☐	☐	☐	-

SIGNS IN PLACE Y or N	at bridge	advance
	N	N
LEGIBILITY	-	-

Overhead Signs (attached to bridge) ☐ yes ☑ no

1. Welds	-
2. Bolts	-
3. Condition	-

Item93b U/W Inspection Date: _____

ITEM 61-channel and channel protection: 7

1. channel scour	6	5. rip rap or slope paving	-
2. embankment erosion	8	6. effectiveness	-
3. fender system	-	7. debris	7
4. spur dikes & jetties	-	8. vegetation	7

36-Traffic Safety features

	36	condition
1. bridge railing	1	7
2. transitions	1	7
3. approach guardrail	1	7
4. guardrail terminal	0	-

X=UNKNOWN NA=NOT APPLICABLE IA=INACCESSIBLE

PROJECT: NORTH FIELD BROOK
NAME: OLD RT 25A (LOWER)
LOCATION: OLD RT 25A

BRIDGE INSPECTION
SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity? YES

2. Is the streambed erodible? If so, does the structure have any vulnerable design features? YES

   a. Piers, abutments with spread footings or short pile foundations. yes
   b. Superstructure with simple spans or non-redundant support systems. YES
   c. Inadequate waterway openings. NO
   d. Designs which collect ice and debris. NO
   e. All water must pass through or over structure. YES
   f. Other. —

3. Are any characteristics of an aggressive stream or waterway present? YES

   a. Active degradation or aggredation of streambed. YES
   b. Significant lateral movement or erosion of streambanks. NO
   c. Steep slopes. NO
   d. High velocities. NO
   e. Any history of highway or bridge damage during past floods. NO
   f. Other. —

4. Is the bridge located on a stream reach with any adverse flow characteristics? YES

   a. Crossing near stream confluence. NO
   b. Crossing of tributary stream near confluence with larger streams. NO
   c. Crossing on sharp bend in stream. YES
   d. Location on alluvial fan. NO
   e. Other. —

5. Other comments or observations. NONE

BLACK ROCK LAKE
OLD NORTHFIELD ROAD BRIDGE, THOMASTON, CT
FY 93 ROUTINE INSPECTION REPORT

DATE OF INSPECTION: 24 August 1993

DATE OF PREVIOUS INSPECTIONS:

In-depth,	Dec 84
Routine,	Aug 87
Routine,	Aug 89
Routine,	June 91

RATING (T=TONS)

Type	Inventory	Operating	Comments
H15	11T	16T	Ratings similar to
3	25T	40T	those determined in
3S2	39T	63T	the 1984 in-depth
3-3	49T	78T	report.

EVALUATION (See attached "Structures Inspection Field Report")

A. Roadway, Railings, and Deck. The general condition is good (condition 8). The bituminous wearing surface on the north approach and south approach is in good condition. The transitions to the deck from the north and south approaches are not smooth. The expansion joint is sealed and in adequately good condition. The concrete bridge deck is in good condition. The scuppers are clear. The rails on the bridge deck are in good condition. There is some minor vegetation growth at the curbs on the bridge deck. The approach guardrails are in good condition.

B. Fascia and Curbs The general condition is good (condition 8). The overall condition of the curbs is good; they have recently been painted. There is a minor crack at the northeast corner of the curb and some minor honeycombing.

C. Underside of Deck and Bearings. The overall condition is good (condition 8). The underside of the deck is in good condition. The girders are in good condition with no signs of rust. The bearings appear to be well seated and in good condition.

D. Wingwalls and Abutments	The overall condition is good (condition 7). The granite block wingwall on the southwest side has some cracked mortar with vegetation growth in the cracks. The other wingwalls are in good condition. The abutments are in good condition.
E. Channel	The channel is in good condition (condition 8). There is heavy vegetation upstream and downstream.

CONDITION RATING

Previous in-depth:	7
Interim 1987:	7
Interim 1989:	7
Routine 1991:	8
Routine 1993:	8

RECOMMENDATIONS

Status of Previous Recommendations

There were no previous recommendations.

Revised Recommendations

Repair cracked mortar on southeast wingwall.

Estimated Cost $1,000

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

	bridge dept. no.	8-structure no.	90-date inspected
THOMASTON, G		CEDNEDCTOS10006	8/24/93

2-dist.	104-highway system	22-owner	27-year built	106-year rebuilt	11-milepoint
		CENED	UKNOWN		

43-structure type: SINGLE SPAN WIDE FLANGE BEAM	quality control engineer: NICK FORBES
07-facility carried: OLD NORTHFIELD ROAD	team leader: JOSEPH COLUCCI
06-features intersected: NORTHFIELD BROOK	team members: M. IORIO, M. DESCHENES, M. WALSH

item 58	8	item 59	8	item 60	8
DECK		SUPERSTRUCTURE		SUBSTRUCTURE	
1. Wearing Surface	8	1. Bearing Devices	8	1. Abutments	
2. Deck-Condition	8	2. Stringers	8	a-Wings	7
3. Stay in Place Forms	NA	3. Diaphragms	8	b-Backwall	8
4. Curbs	8	4. Girders or Beams	8	c-Bridge Seats	8
5. Median	NA	5. Floor Beams	8	d-Breastwall	8
6. Sidewalks	NA	6. Trusses	NA	e-Footings	NA
7. Parapet	NA	7. Rivets or Bolts	8	f-Piles	NA
8. Railing	8	8. Welds	NA	g-Erosion	NA
9. Anti Missile Fence	NA	9. Collision Damage	NA	h-Settlement	8
10. Drains	8	10. Load Deflection	8	2. Piers or Bents	
11. Lighting Standards	NA	11. Member Alignment	8	a-Caps	NA
12. Utilities	NA	12. Load Vibration	8	b-Column	NA
13. Deck Joints	7	13. Paint-Epoxy	8	c-Web	NA
14. Approach Settlement	7	14. Year Painted	91	d-Footing	NA
		15. Under Clearance ____ ft ____ in		e-Piles	NA
		Clearance Signs ☐ yes ☒ no		f-Scour	NA
				g-Settlement	NA
				3. Collision Damage	NA
				4. Hydraulic-Adequacy	7

	H	3	3S2	Single
Actual Posting	NA	NA	NA	NA
Recommended Posting From Rating Book	NA	NA	NA	IIT

SIGNS IN PLACE Y or N	at bridge	advance
	N	N
LEGIBILITY	—	—

Overhead Signs (attached to bridge) ☐ yes ☒ no

1. Welds	—
2. Bolts	—
3. Condition	—

Item93b U/W Inspection Date: ____

ITEM 61-channel and channel protection: 7

1. channel scour	8	5. rip rap or slope paving	NA
2. embankment erosion	8	6. effectiveness	8
3. fender system	NA	7. debris	7
4. spur dikes & jetties	NA	8. vegetation	7

36-Traffic Safety features

	36	condition
1. bridge railing	NA	8
2. transitions	NA	8
3. approach guardrail	NA	8
4. guardrail terminal	NA	8

X–UNKNOWN NA–NOT APPLICABLE IA–INACCESSIBLE

PROJECT: BLACK ROCK LAKE
NAME: OLD NORTHFIELD RD BRIDGE
LOCATION: THOMASTON, CT

BRIDGE INSPECTION
SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity?	NO
2. Is the streambed erodible? If so, does the structure have any vulnerable design features?	YES
a. Piers, abutments with spread footings or short pile foundations.	NO
b. Superstructure with simple spans or non-redundant support systems.	YES
c. Inadequate waterway openings.	NO
d. Designs which collect ice and debris.	NO
e. All water must pass through or over structure.	YES
f. Other.	NO
3. Are any characteristics of an aggressive stream or waterway present?	YES
a. Active degradation or aggredation of streambed.	YES
b. Significant lateral movement or erosion of streambanks.	NO
c. Steep slopes.	NO
d. High velocities.	NO
e. Any history of highway or bridge damage during past floods.	NO
f. Other.	NO
4. Is the bridge located on a stream reach with any adverse flow characteristics?	NO
a. Crossing near stream confluence.	NO
b. Crossing of tributary stream near confluence with larger streams.	NO
c. Crossing on sharp bend in stream.	NO
d. Location on alluvial fan.	NO
e. Other.	NO
5. Other comments or observations.	NO

HOP BROOK LAKE
BRIDGE ON OLD ROUTE 63, MIDDLEBURY, CT
FY 93 ROUTINE INSPECTION REPORT

DATE OF INSPECTION: 24 August 1993

DATE OF PREVIOUS INSPECTIONS: In-depth, Dec 84
Routine, Sept 87
Routine, Aug 89
Routine, Sept 91

RATING (T=TONS)

Type	Inventory	Operating	Comments
H15	23T	32T	The 8 ton rating suggested in the 1984 in-depth inspection can be increased to the full inventory capacity since the deteriorated concrete of the arched section has been satisfactorally repaired.
3	38T	54T	
3S2	55T	77T	
3	61T	86T	

EVALUATION (See attached "Structures Inspection Field Report")

A. Roadway, Railings, and Deck. The general condition is good (condition 7). The bituminous wearing surface on the north approach and south approach has some minor rutting. There are slight depressions at the transitions to the deck from the north and south approaches. The wearing surfaces on the north and south approaches have some minor rutting. Small stones from a chip seal have been left along the curb. The rails on the bridge deck have been recently patched are in good condition. The approach guardrails are in good condition.

B. Fascia and Curbs The general condition is good (condition 8). The overall condition of the curbing is good. The curbs have recently been patched with concrete; however, the concrete has some minor surface deterioration. The fascias are in very good condition.

C. Underside of Deck and Bearings.	The overall condition is good (condition 7). The arched section has been recently repaired and has a new coating of "shot-crete". The coloring of the "shot-crete" is inconsistent and varies from very light gray to dark gray. The tee beams on the west side are in good condition with some minor honeycombing. The tee beams on the east side have a few spalls and minor honeycombing.
D. Wingwalls and Abutments	The overall condition is good (condition 7). The north and south abutments are in good condition. The weepholes on the south abutment are clear. The weepholes on the north abutment are buried by aggredation. The wingwalls are in good condition; however, there is miscellaneous vegetation growing in front on them.
E. Channel	The channel is in good condition (condition 7). The bridge is located on a bend in the river. This is causing aggredation along the northern abutment and creates the possibility of scour along the southern abutment. There is a confluence just west of the northern abutment.

CONDITION RATING

Previous in-depth:	7
Interim 1987:	7
Interim 1989:	5
Routine 1991:	5
Routine 1993:	7

RECOMMENDATIONS

Status of Previous Recommendations

Remove trees and vegetation in front of wingwalls.	Not done

Revised Recommendations

Implement the previous recommendation.

Total Estimated Cost	$5000

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

	bridge dept. no.	8-structure no.	90-date inspected
MIDDLEBURY, CT		CEPNEDCTO510007	8/24/93

2-dist.	104-highway system	22-owner	27-year built	106-year rebuilt	11-milepoint
		CENED	1935	1944	

43-structure type: CONCRETE ARCH & CONC. TEE	quality control engineer: NICK FORBES
07-facility carried: OLD ROUTE 63 / REC AREA ACCESS	team leader: JOSEPH COLUCCI
06-features intersected: HOP BROOK	team members: M. IORIO M. DESCHENES M. WELSH

item 58	7	item 59	7	item 60	7
DECK		SUPERSTRUCTURE		SUBSTRUCTURE	
1. Wearing Surface	7	1. Bearing Devices	NA	1. Abutments	
2. Deck-Condition	7	2. Stringers	NA	a-Wings	8
3. Stay in Place Forms	NA	3. Diaphragms	7	b-Backwall	NA
4. Curbs	7	4. Girders or Beams	7	c-Bridge Seats	8
5. Median	NA	5. Floor Beams	NA	d-Breastwall	8
6. Sidewalks	NA	6. Trusses	NA	e-Footings	IA
7. Parapet	8	7. Rivets or Bolts	NA	f-Piles	IA
8. Railing	8	8. Welds	NA	g-Erosion	7
9. Anti Missile Fence	NA	9. Collision Damage	NA	h-Settlement	8
10. Drains	7	10. Load Deflection	8	2. Piers or Bents	
11. Lighting Standards	NA	11. Member Alignment	8	a-Caps	NA
12. Utilities	NA	12. Load Vibration	8	b-Column	NA
13. Deck Joints	7	13. Paint-Epoxy	NA	c-Web	NA
14. Approach Settlement	7	14. Year Painted	NA	d-Footing	NA
		15. Under Clearance ____ ft ____ in		e-Piles	NA
		Clearance Signs ☐ yes ☑ no		f-Scour	NA
		17 ARCH	8	g-Settlement	NA
				3. Collision Damage	NA
				4. Hydraulic-Adequacy	7

Actual Posting	H	3	3S2	Single
	NA	NA	NA	NA
Recommended Posting From Rating Book	NA	NA	NA	8
SIGNS IN PLACE Y or N	at bridge: NA			advance: NA
LEGIBILITY	–			–

Overhead Signs (attached to bridge) ☐ yes ☒ no

1. Welds	–
2. Bolts	–
3. Condition	–

Item93b U/W Inspection Date: ____

ITEM 61-channel and channel protection: 7

1. channel scour	7	5. rip rap or slope paving	NA
2. embankment erosion	7	6. effectiveness	7
3. fender system	NA	7. debris	7
4. spur dikes & jetties	NA	8. vegetation	6

36-Traffic Safety features

	36	condition
1. bridge railing		
2. transitions		
3. approach guardrail		
4. guardrail terminal		

X=UNKNOWN NA=NOT APPLICABLE IA=INACCESSIBLE

PROJECT: Hop Brook Lake
NAME: Old Rt 63 Bridge
LOCATION: Middlebury CT

BRIDGE INSPECTION
SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity?	No
2. Is the streambed erodible? If so, does the structure have any vulnerable design features?	Yes
a. Piers, abutments with spread footings or short pile foundations.	No
b. Superstructure with simple spans or non-redundant support systems.	Yes
c. Inadequate waterway openings.	No
d. Designs which collect ice and debris.	No
e. All water must pass through or over structure.	~~No~~ Yes
f. Other.	No
3. Are any characteristics of an aggressive stream or waterway present?	Yes
a. Active degradation or aggredation of streambed.	Yes
b. Significant lateral movement or erosion of streambanks.	Yes
c. Steep slopes.	No
d. High velocities.	No
e. Any history of highway or bridge damage during past floods.	No
f. Other.	No
4. Is the bridge located on a stream reach with any adverse flow characteristics?	Yes
a. Crossing near stream confluence.	Yes
b. Crossing of tributary stream near confluence with larger streams.	No
c. Crossing on sharp bend in stream.	No
d. Location on alluvial fan.	No
e. Other.	No
5. Other comments or observations.	No

TULLY LAKE
DOANE HILL ROAD BRIDGE, ROYALSTON, MA
FY 93 ROUTINE INSPECTION REPORT

DATE OF INSPECTION: 24 June 93

DATE OF PREVIOUS INSPECTIONS: Inventory, 24 September 84
Routine, 15 September 87
Routine, 7 September 89
Routine, 11 July 91

RATING (T=TONS)

Type	Inventory	Operating	Comments
H15	13.5T	25.4T	No change in ratings
3	16.0T	30.1T	
3S2	24.7T	46.7T	
3-3	31.0T	57.6T	

EVALUATION (See attached "Structures Inspection Field Report")

A. Roadway and Railings: Overall condition 6. A New tar and gravel surface coat has recently been applied to the road and the bridge. When placing this coat, however, several of the vertical deck drains were covered and are now blocked. The new surface coating also continued across the joints in the deck. The new surfacing was not compacted well as it approached the openings in the curbings and therefore makes these openings ineffective for drainage. The extensive vegetation growth in the openings also creates an obstruction to the proper drainage of the deck. Weight limit signs were not present. The 3"x8" timber rails which are dried out and brittle are loose and inadequate. and are loose to the touch. The cable guard rails at the approaches to the deck are in good condition, however, they are very loose and need to be tightened and repaired.

B. Curbs & Fascias: Overall condition 6. There is extensive spalling and wear on both curbs. The drainage openings, as previously mentioned, are mostly filled with

vegetation and debris. There is extensive spalling and efflorescence along the exterior fascias of the bridge.

C. Underside of Deck: Overall condition 7. Minor spalling around deck drains was noted. Most of the structural steel exhibited moderate rusting. The exterior beams show the greatest amount of rust. The beam on the interior of the north face of the bridge which has been noted as not having enough clearance, has not yet been cut. It is recommended that this beam be cut in order to allow 2" to 2 1/2" of clearance from the face of the abutment. The bearings are in good condition with minor rust and debris buildup.

D. Wingwalls/Abutments: Overall condition 8. The wingwalls and abutments are in good condition. Bonding and alignment are good. The walls show no signs of distress.

E. Channel: The overall condition is 8. The water flows smoothly through the channel witH little or no debris buildup. Some minor abrasion was evident at the base of the abutments below the flow line.

CONDITION RATING

Inventory, 1984	7
Routine, 1987	7
Routine, 1989	7
Routine, 1991	7
Routine, 1993	7

RECOMMENDATIONS:

Status of Previous Recommendations

1. Repair loose guard rail cables on northeast approach; repair detached upper guardrail cable on southwest approach; replace timber bridge rail with steel tubular section. Estimated cost $7000. — Not done

2. Clear debris from fascia openings and patch spalled areas with polymer modified repair mortar. Estimated cost $3000. — Not done

3. Clean all debris and vegetation from gutters. Repair pavement on approaches and deck by cold — Not done

planing 1" from existing and repaving; clean deterioration from around drains; compact new material around drains prior to repaving.
Estimated cost $5000.

4. Clean and paint all structural steel and bearings. Cut or burn web and bottom flange of first interior beam (North side, east abutment) as required to re-establish a minimum clearance of two inches. Not done
Estimated cost $15000.

Revised Recommendations

1. Repair loose guardrail cables on northeast approach; repair detached upper guardrail cable on southwest approach; replace timber bridge railing with new railing.
Estimated cost $7000.

2. Clear debris from fascia openings and patch spalled areas with polymer modified repair mortar.
Estimated cost $3000.

3. Clean all debris and vegetation from gutters. Can be done by project personnel.

4. Clean and paint all structural steel and bearings. Cut or burn web and bottom flange of first interior beam (North side, east abutment) as required to re-establish a minimum clearance of two inches.
Estimated cost $15000.

Total Estimated Cost $25000.

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

	bridge dept. no.	8-structure no.	90-date inspected
ROYALSTON MA. TULLY LAKE	COE	CENERDMA251OO10	6/24/93

2-dist.	104-highway system	22-owner	27-year built	106-year rebuilt	11-milepoint
11	NON. FEDERAL	COE	1950	—	000810

43-structure type: (302) WIDE FLANGE BEAM W/ CONC. DECK	quality control engineer: NICK FORBES
07-facility carried: DOANE HILL ROAD	team leader: JOSEPH COLUCCI
06-features intersected: TULLY RIVER	team members: M. DESCHENES F. FOX

item 58	6
DECK	
1. Wearing Surface	7
2. Deck-Condition	7
3. Stay in Place Forms	NA
4. Curbs	6
5. Median	NA
6. Sidewalks	NA
7. Parapet	6
8. Railing	
9. Anti Missile Fence	NA
10. Drains	6
11. Lighting Standards	NA
12. Utilities	NA
13. Deck Joints	7
14. Approach Settlement	8

item 59	7
SUPERSTRUCTURE	
1. Bearing Devices	7
2. Stringers	NA
3. Diaphragms	7
4. Girders or Beams	7
5. Floor Beams	NA
6. Trusses	NA
7. Rivets or Bolts	7
8. Welds	NA
9. Collision Damage	X
10. Load Deflection	X
11. Member Alignment	8
12. Load Vibration	X
13. Paint-Epoxy	6
14. Year Painted	—
15. Under Clearance ____ ft NA in	
Clearance Signs ☐ yes ☒ NA no	

item 60	8
SUBSTRUCTURE	
1. Abutments	
a-Wings	8
b-Backwall	8
c-Bridge Seats	8
d-Breastwall	8
e-Footings	NA
f-Piles	NA
g-Erosion	8
h-Settlement	8
2. Piers or Bents	
a-Caps	NA
b-Column	NA
c-Web	NA
d-Footing	NA
e-Piles	NA
f-Scour	NA
g-Settlement	NA
3. Collision Damage	X
4. Hydraulic-Adequacy	8

	H	3	3S2	Single
Actual Posting	☐	☐	☐	☐
Recommended Posting From Rating Book	13	16	25	☐

SIGNS IN PLACE Y or N	at bridge	advance
	N	N
LEGIBILITY	NA	NA

Overhead Signs (attached to bridge) ☐ yes ☑ no

1. Welds	NA
2. Bolts	NA
3. Condition	NA

Item93b U/W Inspection Date: NONE

ITEM 61-channel and channel protection ☐

1. channel scour	8	5. rip rap or slope paving	NA
2. embankment erosion	8	6. effectiveness	NA
3. fender system	NA	7. debris	8
4. spur dikes & jetties	NA	8. vegetation	8

36-Traffic Safety features

	36	condition
1. bridge railing	0	6
2. transitions	1	7
3. approach guardrail	1	7
4. guardrail terminal	1	7

X=UNKNOWN NA=NOT APPLICABLE IA=INACCESSIBLE

PROJECT: TULLY LAKE
NAME: DONE HILL ROAD
LOCATION: ROYALSTON MA.

BRIDGE INSPECTION
SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity? NO

2. Is the streambed erodible? If so, does the structure have any vulnerable design features? yes

   a. Piers, abutments with spread footings or short pile foundations. yes
   b. Superstructure with simple spans or non-redundant support systems. yes
   c. Inadequate waterway openings. no
   d. Designs which collect ice and debris. no
   e. All water must pass through or over structure. no
   f. Other. —

3. Are any characteristics of an aggressive stream or waterway present? NO

   a. Active degradation or aggredation of streambed. No
   b. Significant lateral movement or erosion of streambanks. No
   c. Steep slopes. No
   d. High velocities. No
   e. Any history of highway or bridge damage during past floods. NO
   f. Other. —

4. Is the bridge located on a stream reach with any adverse flow characteristics? No

   a. Crossing near stream confluence. No
   b. Crossing of tributary stream near confluence with larger streams. no
   c. Crossing on sharp bend in stream. No
   d. Location on alluvial fan. NO
   e. Other. No

5. Other comments or observations. NONE

EVERETT LAKE
CHOATE BROOK
FY93 ROUTINE INSPECTION REPORT

DATE OF ROUTINE INSPECTION: 9 Sept 93

DATE OF PREVIOUS INSPECTIONS: 31 July 91 Routine
11 Sep 89 Routine
17 Sep 87 Routine
25 Mar 85 In-depth

RATING (T = TONS)

Type	Inventory	Operating	Comments
H	2.0 T	4.4 T	Ratings from 1985
3	3.6 T	7.9 T	in-depth.
3S2	5.7 T	12.5 T	

Note: Ratings are estimated for H-20 loading for the new concrete deck for 1993 and final calculation will be performed within FY94.

EVALUATION (see attached field report)

A. Approaches — Overall rating is 6. Guard rails are new but only 25' long on east side and no erosion control on both sides.

B. Bridge Deck — Overall rating is 7. New bridge deck with guard rails on both sides. Missing bolts were located on the middle of the south guard rails. Most of the I-beams posts do not line up their centerline axis.

C. Substructure
Overall rating is 7. At the northeast abutment corner, a one and half foot deep scour is located. There are honey comb and hairline cracks at the southeast bridge abutment. Tree branches and debris are built up on the southside of the bridge deck.

CONDITION RATING:

Previous in-depth:	6
Routine 1987:	6
Routine 1989:	5
Routine 1991:	4
Routine 1993:	7

RECOMMENDATIONS:

Recommendations

1. The length of the guardrail for the eastside approach should be increased another 25 feet due to the sharp curve and deep drop at the edge.

Estimated cost: $ 1500.00

2. There should be some erosion control on the embankments along both side approaches.

Estimated cost: $ 2000.00

3. The project personnel should remove the tree branches and debris under or near the bridge deck.

Total estimated cost: $ 3500.00

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

city	bridge dept. no.	8-structure no.	90-date inspected
WEARE, N.H			

2-dist.	104-highway system	22-owner	27-year built	106-year rebuilt	11-milepoint
		CORPS OF ENGR	1920	1993	

43-structure type: CONCRETE SLAB SINGLE SPAN	quality control engineer: NICK FORBES
07-facility carried: RECREATION AREA ACCESS Rd	team leader: JOE COLUCCI
06-features intersected: CHOATE BROOK	team members: M. DESCHENES / F. FUNG

item 58	7	item 59	7	item 60	7
DECK		SUPERSTRUCTURE		SUBSTRUCTURE	
1. Wearing Surface	8	1. Bearing Devices	7	1. Abutments	
2. Deck-Condition	8	2. Stringers	NA	a-Wings	7
3. Stay in Place Forms	NA	3. Diaphragms	NA	b-Backwall	8
4. Curbs	8	4. Girders or Beams	NA	c-Bridge Seats	8
5. Median	NA	5. Floor Beams	8	d-Breastwall	7
6. Sidewalks	NA	6. Trusses	NA	e-Footings	7
7. Parapet	NA	7. Rivets or Bolts	7	f-Piles	NA
8. Railing	7	8. Welds	NA	g-Erosion	6
9. Anti Missile Fence	NA	9. Collision Damage	NA	h-Settlement	NA
10. Drains	NA	10. Load Deflection	NA	2. Piers or Bents	
11. Lighting Standards	NA	11. Member Alignment	8	a-Caps	NA
12. Utilities	NA	12. Load Vibration	NA	b-Column	NA
13. Deck Joints	NA	13. Paint-Epoxy	NA	c-Web	NA
14. Approach Settlement	NA	14. Year Painted	NA	d-Footing	NA
		15. Under Clearance N/A ft ___ in		e-Piles	NA
		Clearance Signs ☐ yes ☐ no		f-Scour	NA
				g-Settlement	NA
				3. Collision Damage	NA
				4. Hydraulic-Adequacy	NA

	H	3	3S2		Single
Actual Posting	☐	☐	☐	N/A	☐
Recommended Posting From Rating Book	☐	☐	☐		20

SIGNS IN PLACE Y or N	at bridge	advance
	N	N
LEGIBILITY	NA	NA

Overhead Signs (attached to bridge) ☐ yes ☒ no

1. Welds	NA
2. Bolts	NA
3. Condition	NA

Item93b U/W Inspection Date: NONE

ITEM 61-channel and channel protection: 6

1. channel scour	6	5. rip rap or slope paving	6
2. embankment erosion	6	6. effectiveness	6
3. fender system	NA	7. debris	7
4. spur dikes & jetties	NA	8. vegetation	7

36-Traffic Safety features

	36	condition
1. bridge railing	0	7
2. transitions	0	7
3. approach guardrail	N	NA
4. guardrail terminal	N	NA

X=UNKNOWN NA=NOT APPLICABLE IA=INACCESSIBLE

PROJECT: EVERETT LAKE
NAME: CHOATE BROOK
LOCATION: WEARE, N.H.

BRIDGE INSPECTION
SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity?	YES
2. Is the streambed erodible? If so, does the structure have any vulnerable design features?	YES
a. Piers, abutments with spread footings or short pile foundations.	YES
b. Superstructure with simple spans or non-redundant support systems.	YES
c. Inadequate waterway openings.	YES
d. Designs which collect ice and debris.	NO
e. All water must pass through or over structure.	YES
f. Other.	NO
3. Are any characteristics of an aggressive stream or waterway present?	YES
a. Active degradation or aggredation of streambed.	YES
b. Significant lateral movement or erosion of streambanks.	NO
c. Steep slopes.	YES
d. High velocities.	YES
e. Any history of highway or bridge damage during past floods.	UNKNOWN
f. Other.	—
4. Is the bridge located on a stream reach with any adverse flow characteristics?	—
a. Crossing near stream confluence.	NO
b. Crossing of tributary stream near confluence with larger streams.	NO
c. Crossing on sharp bend in stream.	NO
d. Location on alluvial fan.	NO
e. Other.	—
5. Other comments or observations.	NONE

OTTER BROOK LAKE
EXIT BRIDGE, KEENE, N.H.
FY 93 ROUTINE INSPECTION REPORT

DATE OF INSPECTION: 18 August 1993

DATE OF PREVIOUS INSPECTIONS:

In-depth,	*.
Routine,	Sept 87
Routine,	Sept 89
Routine,	22 August 1991

RATING (T=TONS)

Type	Inventory	Operating	Comments
H15	18.0T	32.6T	Load capacities
3	22.1T	39.9T	recalculated for
3S2	34.4T	62.1T	prestressed beams

EVALUATION (See attached "Structures Inspection Field Report")

A. Roadway, Railings, and Deck. The overall condition is good (condition 7).The bituminous wearing surface onthe deck is in good condition. The south approach surface is in good condition with a minor crack at the transition to the bridge deck. The north approach has some minor rutting along wheel lines and a crack at the transition to the bridge deck. The terminal unit of the guardrail in the northwest corner is damaged. The design of the existing terminal unit in this location is poor and should be extended around the corner and buried. The southeast top railing is loose.

B. Fascia and Curbs The overall condition is good (condition 7). Both the curbs and fascias have hairline cracks approximately every two feet. There is also some spalling at the caps covering the transrverse posttensioned reinforcing. Minor debris and vegetation is collecting along the curbing.

C. Underside of Deck and Bearings. The overall condition is good (condition 7). The underside of the deck is in good condition. There is some minor leakage of water from the deck onto the south abutment. No problems were noted with the bearings.

	with the bearings.
D. Wingwalls and Abutments	The overall condition is fair (condition 6). The north abutment is in good condition. The northeast footing has a spall measuring two foot by two foot by six inches. There is also evidence of scour and erosion along the northeast wingwall.
E. Channel	The overall rating is 5. The water is deepest along the abutments. The north east abutment is scoured and deteriorated as noted on previous reports. The channel contains many rocks and has the potential to collect debris.
CONDITION RATING	Interim 1987: 7 Interim 1989: 6 Routine 1991: 6 Routine 1993: 6

RECOMMENDATIONS

Status of Previous Recommendations

		Cost Est	Status
1.	Repair erosion and deteriorated concrete at the base of the abutments.	$20,000	Not Done
2.	Provide stone apron at abutment as scour remedial action.	$15,000	Not Done
3.	Remove vegetation from wingwalls and curbs.	$500	Not Done
	Total	$35,500	

Revised Recommendations

Implement above recommendations.

Extend and bury northeast guardrail terminal unit.	$1500
Total Updated Estimated Cost	$37,000

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

c	bridge dept. no.	8-structure no.	90-date inspected
KEENE NH		CEPNEDNH3310009	8/18/93

2-dist.	104-highway system	22-owner	27-year built	106-year rebuilt	11-milepoint
		COE	1967	1987	

43-structure type: PRESTRESSED CONCRETE BRIDGE BEAMS	quality control engineer: NICK FORBES
07-facility carried: REC AREA EXIT	team leader: JOE COLUCCI
06-features intersected:	team members: ELLEN IORIO MARK DESCHENES

item 58	7	item 59	7	item 60	6
DECK		SUPERSTRUCTURE		SUBSTRUCTURE	
1. Wearing Surface	7	1. Bearing Devices	7	1. Abutments	
2. Deck-Condition	7	2. Stringers	NA	a-Wings	6
3. Stay in Place Forms	NA	3. Diaphragms	NA	b-Backwall	NA
4. Curbs	7	4. Girders or Beams	7	c-Bridge Seats	7
5. Median	NA	5. Floor Beams	NA	d-Breastwall	7
6. Sidewalks	NA	6. Trusses	NA	e-Footings	6
7. Parapet	NA	7. Rivets or Bolts	NA	f-Piles	NA
8. Railing	7	8. Welds	NA	g-Erosion	6
9. Anti Missile Fence	NA	9. Collision Damage	NA	h-Settlement	NA
10. Drains	NA	10. Load Deflection	8	2. Piers or Bents	
11. Lighting Standards	NA	11. Member Alignment	8	a-Caps	NA
12. Utilities	NA	12. Load Vibration	8	b-Column	NA
13. Deck Joints	7	13. Paint-Epoxy	NA	c-Web	NA
14. Approach Settlement	7	14. Year Painted	NA	d-Footing	NA
		15. Under Clearance ____ ft ____ in		e-Piles	NA
		Clearance Signs ☐ yes ☒ no		f-Scour	NA
				g-Settlement	NA
				3. Collision Damage	8
				4. Hydraulic-Adequacy	7

	H	3	3S2	Single
Actual Posting	15	NA	NA	NA
Recommended Posting From Rating Book	NA	NA	NA	NA

	at bridge	advance
SIGNS IN PLACE Y or N	Y	NA
LEGIBILITY	Y	NA

Overhead Signs (attached to bridge) ☐ yes ☒ no

1. Welds	NA
2. Bolts	NA
3. Condition	NA

Item93b U/W Inspection Date: NONE

ITEM 61-channel and channel protection: 6

1. channel scour	5	5. rip rap or slope paving	NA
2. embankment erosion	6	6. effectiveness	7
3. fender system	NA	7. debris	7
4. spur dikes & jetties	NA	8. vegetation	7

36-Traffic Safety features

	36	condition
1. bridge railing	NA	7
2. transitions	NA	7
3. approach guardrail	NA	7
4. guardrail terminal	NA	7

X=UNKNOWN NA=NOT APPLICABLE IA=INACCESSIBLE

PROJECT: OTTER BROOK LAKE
NAME: EXIT BRIDGE
LOCATION: KEENE NH

BRIDGE INSPECTION
SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity?	YES
2. Is the streambed erodible? If so, does the structure have any vulnerable design features?	YES
a. Piers, abutments with spread footings or short pile foundations.	N/A
b. Superstructure with simple spans or non-redundant support systems.	YES
c. Inadequate waterway openings.	NO
d. Designs which collect ice and debris.	YES
e. All water must pass through or over structure.	NO
f. Other.	N/A
3. Are any characteristics of an aggressive stream or waterway present?	YES
a. Active degradation or aggredation of streambed.	YES
b. Significant lateral movement or erosion of streambanks.	NO
c. Steep slopes.	NO
d. High velocities.	NO
e. Any history of highway or bridge damage during past floods.	NO
f. Other.	N/A
4. Is the bridge located on a stream reach with any adverse flow characteristics?	NO
a. Crossing near stream confluence.	NO
b. Crossing of tributary stream near confluence with larger streams.	NO
c. Crossing on sharp bend in stream.	NO
d. Location on alluvial fan.	NO
e. Other.	N/A
5. Other comments or observations.	NO

NED FORM 223
27 Sept 49

NEW ENGLAND DIVISION
CORPS OF ENGINEERS, U.S. ARMY

PAGE

SUBJECT RATING FOR STEEL BEAMS EXIT BRIDGE

COMPUTATION

COMPUTED BY N D CHECKED BY DATE 3/2/93

INVENTORY LOAD RATINGS

		H15	3	3S2
36x21	FLEXURE	23.0	28.2	43.9
	SHEAR	49.3	58.5	106.5
48x21	FLEXURE	18.0	22.1	34.4
	SHEAR	37.8	44.9	81.5

OPERATING LOAD RATINGS

		H15	3	3S2
36x21	FLEXURE	45.5	55.8	86.9
	SHEAR	82.1	97.6	177.5
48x21	FLEXURE	32.6	39.9	62.1
	SHEAR	63.0	74.8	136.0

OVERALL RATING

	H15	3	3S2
INVENTORY	18.0	22.1	34.4
OPERATING	32.6	39.9	62.1

SUBJECT OTTER BROOK LAKE ENTRANCE/EXIT BRIDGES
COMPUTATION CASE A 36" x 21" IN HC SLABS
COMPUTED BY MEF CHECKED BY M.D DATE 8/19/93

BRIDGE REPLACED 1987

SIMPLE SPAN, PRESTRESSED DECK BEAMS

LENGTH OF SPAN: 43 FEET

TYPE IV-36 (36" x 21" IN HC SLAB)

$A = 529.80 \text{ in}^2$

$I = 25747 \text{ in}^4$

$w = 551.9 \text{ \#/FT}$

$S_x = I/c \qquad c = 21'/2$

$= 25747 \text{ in}^2 / 21 \text{ in}/2 = 2452.1 \text{ in}^3$

INFORMATION GATHERED FROM TRANSMITTAL NO. 3230-002
RESUBMITTAL 9 OCTOBER 1985

$f_c' = 5000 \text{ PSI}$

$f_{ci}' = 4000 \text{ PSI}$

density = 150 PCF

STRANDS

12 - 1/2" ϕ 270 K SRLV STRANDS

STRAND AREA = 0.1530 in^2 / STRAND

$A_s^* = 0.1530 \times 12 = 1.8360 \text{ in}^2 \qquad A_{s_T}^* = 0.306 \text{ in}^2 \quad A_{s_B}^* = 1.53 \text{ in}^2$

CG OF STRAND = 2" FROM BOTTOM OF BEAM / 3" FROM TOP OF BEAM

$e_s = \frac{h}{2} - CG = \frac{21"}{2} - 2" = 8.5" \qquad c_T = 7.5"$

SUBJECT OTTERBROOK LAKE
COMPUTATION CASE A
COMPUTED BY MCI CHECKED BY M.D DATE 8/19/93

INITIAL TENSION ON STRAND = 28.92 KIPS = P_i

P_B = 28.92 x 10 = 289.2 KIPS (10 STRANDS)
P_T = 28.92 x 2 = 57.8 KIPS (2 STRANDS)
INITIAL STRESS ON STRAND $f_{initial} = P_i / A_s$

$f_{initial} = 28.92 / 0.1530 = 189.02$ KSI

DESIGN LOADS

DL SELF WT 551.9 #/FT

SUPPLIMENTAL DEAD LOADS

DL TBIT TOPPING = (2.5")(150 PCF/12"/1')(3') = 93.75 #/FT

LL H15 TRUCK

$M_{DL} = \frac{(0.5519\ K/FT)(43\ FT)^2}{8} = 127.56$ FT-K

$M_{SDL} = \frac{(0.09375\ K/FT)(43\ FT)^2}{8} = 21.67$ FT-K

149.23 FT-K

SUBJECT OTTM. BROOK LAKE
COMPUTATION CASE A
COMPUTED BY MEI CHECKED BY M.D DATE 8/A/93

LOSS OF PRESTRESS. AASHTO TABLE 9.16.2.2.

PRETENSIONED STRAND $f_c' = 5000$ PSI Loss: 45,000 PSI

(ESTIMATED CALCULATION)

$$f_{final} = 189 - 45 = 144 \text{ KSI}$$

$$P_{final} = 144 \text{ ksi} \left(1.836 \text{ in}^2\right) = 264.38 \text{ KIPS}$$

= effective prestress

$M_{P/S}$ = MOMENT DUE TO PRESTRESS = P_e

$$= (264.38 \text{ KIPS})(8.5 \text{ in} / 12) = 187.27 \text{ FT-KIPS}$$

CALCULATED LOSS OF PRESTRESS

f_{cir} = CONCRETE STRESS AT CG OF PRESTRESSING STEEL DUE TO PRESTRESSING FORCE AND DEAD LOAD OF BEAM IMMEDIATELY AFTER TRANSFER

f_{cds} = CONCRETE STRESS AT CG OF PRESTRESSING STEEL DUE TO ALL DEAD LOADS EXCEPT THE DEAD LOADS PRESENT AT THE TIME OF PRESTRESSING

$$f_{cir} = \frac{P_o}{A} + \left(\frac{P_o e^2}{I}\right)_b - \frac{M_g c}{I} - \left(\frac{P_o e^2}{I}\right)_T \qquad P_o = 0.9\, P_i$$

$$= \frac{0.9\,(347{,}040)}{529.8} + \frac{0.9\,(289{,}200)(8.5)^2}{25747} - \frac{0.9(57800)(13)}{25747} - \frac{(127560)(12)(8}{25747}$$

$$= 589.54 + 730.39 - 113.65 - 505.34 = 700.94$$

$$f_{cds} = \frac{(21{,}670)(12)(7.5)}{25747} = 75.75$$

USE COMPUTER GENERATED $f_{cir} = 663$

$f_{cds} = 59$

CALCULATED BY DESIGNER 5-6-85

SUBJECT OTTERBROOK LAKE
COMPUTATION CASE I
COMPUTED BY MEI CHECKED BY M.D DATE 8/19/99

Loss of Prestress

$\Delta f_s = SH + ES + CR_c + CR_s$

$SH = 17000 - 150\,RH = 17000 - 150(70) = 6500$ (6.4)

$RH = 70$ (Relative Humidity)

$ES = \frac{E_s}{E_{ci}} f_{cir} = \frac{28000}{3834}(663) = 4842$ (6-9)

$CR_c = 12(f_{cir}) - 7(f_{cds}) = 12(663) - 7(59) = 7543$ (9-9)

$CR_s = 20{,}000 - 0.4\,ES - 0.2(SH + CR_c)$

$= 20{,}000 - 0.4(4842) - 0.2(6500 + 7543) = 15{,}255$ (9-1

$f_{final} = 189.02 - 34.14 = 154.88$ ksi

$P_{final} = 154.88\ (1.836\ in^2) = 284.36$ kips

$M_{P/S}$ = Moment due to Prestress = P_e

$= (284.36\ kip)(8.5\ in / 12) = 201.42$

$P_T = (154.88\ ksi)(2)(0.1530) = 47.39$ kips

$P_B = (154.88)(10)(0.1530) = 236.97$ kips

$M_{P/S} = (47.39)(7.5)/12 = 29.62$ ft-kips Top

$M_{P/S} = (236.97)(8.5)/12 = 167.85$ ft-kips

SUBJECT OTTER BROOK LAKE
COMPUTATION CASE A
COMPUTED BY MPI CHECKED BY M.D DATE 8/19/73

STRESSES

$$f = -\frac{P}{A} \pm \frac{M_{P/S(T)}}{S} \pm \frac{M_{P/S(B)}}{S} \pm \frac{M_{DL} + M_{SDL}}{S}$$

$$= \frac{284.36}{529.8} \pm \frac{29.62(12)}{2452.1} \pm \frac{167.85(12)}{2452.1} \pm \frac{149.23(12)}{2452.1}$$

$$= -0.5367 \pm 0.1450 \pm 0.8214 \pm 0.7303$$

$f_{TOP} = -0.5367 - 0.1450 + 0.8214 - 0.7303 = -0.5906$ KSI COMPRESSION

$f_{BOT} = -0.5367 + 0.1450 - 0.8214 + 0.7303 = -0.4828$ KSI COMPRESSION

ALLOWABLE STRESSES

INVENTORY COMPRESSION $0.4 f_c' = 2.0$ KSI

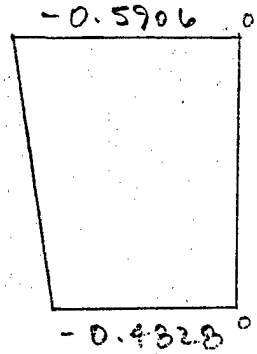
TENSION $3\sqrt{f_c'} = 0.212$ KSI

STRESS AVAILABLE FOR LIVE LOAD

TOP OF BEAM $2.0 - 0.5906 = 1.41$ KSI

BOTTOM OF BEAM $0.212 + .4828 = 0.695$ KSI (CONTROLS)

INVENTORY $M_{CAP} = (0.695)(2452.1)/12 = 141.98$ FT·K



SUBJECT OTTER BROOK GATE

COMPUTATION CASE A

COMPUTED BY ME.1 CHECKED BY M.D DATE 3/27/95

OPERATING MANUAL 5.4.6

FOR PRESTRESSED CONCRETE MEMBERS, THE REINFORCEMENT INDEX DETERMINED BY AASHTO 9.18.1 DOES NOT EXCEED 0.30, THE OPERATING RATING SHALL RESULT IN MOMENTS NOT TO EXCEED 0.75 THE ULTIMATE MOMENT CAPACITY AASHTO 9.17

$A_s^* = 10(0.1530\ in^2) = 1.530\ in^2$

d = h - cg of lower strands = 21" - 2" = 19"

$f_c' = 5.0$ KSI

$f_s' = 270$ KSI

$p^* = A_s^* / bd = 1.530 / (36)(19) = 0.0022$

p^* = RATIO OF PRESTRESSING STEEL

STEEL STRESSES (BONDED MEMBERS) AASHTO 9.17.4.1

f^*_{su} = avg stress in prestressing steel at ultimate load

$$f^*_{su} = f_s' \left(1 - 0.5 \frac{f_s' p^*}{f_c'}\right) = 270\ KSI \left[1 - 0.5 \frac{(0.0022)(270\ KSI)}{5.0\ KSI}\right]$$

$f^*_{su} = 253.69$ KSI

REINFORCEMENT INDEX (RECTANGULAR SECTIONS) AASHTO 9.18.1

$$p^* \frac{f^*_{su}}{f_c'} = 0.0022 \left(253.69\ KSI / 5\ KSI\right) = 0.1116$$

$0.1116 < 0.30$ OK

SUBJECT OTTER BROOK LOCK

COMPUTATION CASE A

COMPUTED BY MFS CHECKED BY M.D DATE 8/19/29

CHECK LOCATION OF NEUTRAL AXIS

$$a = \frac{A_s^* f_{su}^*}{0.85 f_c' b} = \frac{(1.53)(253.69)}{0.85(5.0)(36)} = 2.54 \text{ in}$$

β_1 (5000 psi) = 0.85 − 0.05 = 0.80 AASHTO 8.16.2.7

$c = a/\beta_1 = 2.54 / 0.80 = 3.17$ in

$3.17" < 4.5"$ OK TO USE RECTANGULAR AREA

FLEXURAL STRENGTH

$$M_n = A_s^* f_{su}^* d \left(1 - 0.6 p^* f_{su}^* / f_c'\right)$$

$$= (1.53)(253.69)(19/12)\left[1 - 0.6(0.1116)\right] = 573.41 \text{ FT-KIPS}$$

* NOTE: $M_U = \phi M_n$ $\phi = 1.0$ FOR ONLY FACTORY PRODUCED PRECAST PRESTRESSED - M.D

OPERATING $M_{cap} = 0.75(573.41) = 430.06$ FT-KIPS

OPERATING CAPACITY AVAILABLE FOR LIVE LOAD

$$M_{OPER} = M_{CAP} - (M_{DL} + M_{SDL})$$

$$= 430.06 - (149.23) = 280.83 \text{ FT-KIPS}$$

SUBJECT OTTER BROOK LAKE
COMPUTATION CASE I
COMPUTED BY MEI CHECKED BY M.D DATE 8/19/99

LIVE LOAD

LOAD FRACTION S/D AASHTO 3.23 4.3

S = WIDTH OF PRECAST MEMBER

$C = K(W/L)$ C = STIFFNESS PARAMETER
W = OVERALL WIDTH OF BRIDGE (FT)
L = SPAN LENGTH
K = 0.80

$C = 0.8(14\,FT/43\,FT) = 0.2605$

$C \leq 5$

$D = (5.75 - 0.5\,NL) + 0.7\,NL(1 - 0.2\,C)^{1/2}$ (3-12)

NL = NUMBER OF LANES = 1

$D = (5.75 - 0.5(1)) + 0.7(1)(1 - 0.2(0.2605))^{1/2}$

$D = 5.93$

LOAD FRACTION $\frac{S}{D} = \frac{3}{5.93} = 0.5058$

IMPACT $= \frac{50}{L + 125}$ AASHTO 3.8.2.

$= \frac{50}{43 + 125} = 0.2976$

$\therefore I = 1.2976$

LIVE LOADS FROM MANUAL PLATE 2

H20: $20/15(140.95)(1.2976)(0.5058) = 128.35$ FT-KIPS

H15: $140.95(1.2976)(0.5058) = 92.51$ FT-KIPS

3 : $191.75(1.2976)(0.5058) = 125.85$ FT-KIPS

3S2: $177.35(1.2976)(0.5058) = 116.40$ FT-KIPS

SUBJECT OTTER BROOK LAKE

COMPUTATION CASE A

COMPUTED BY MEI CHECKED BY M.D DATE 5/19/93

MOMENT RATING

TYPE	INVENTORY (TONS)	OPERATING (TONS)
H20	(141.98)(20T)/123.35 = 23.02	(280.83)(20T)/123.35 = 45.5
H15	(141.98)(15T)/92.51 = 23.02	(280.83)(15)/92.51 = 45.5
3	(141.98)(25)/125.85 = 28.20	(280.83)(25)/125.85 = 55.7
3S2	(141.98)(36)/116.40 = 43.91	(280.83)(36)/116.40 = 86.8

SUBJECT OTTER BROOK LAKE
COMPUTATION CASE A
COMPUTED BY MEI CHECKED BY M.D DATE 8/19/93

CHECK SHEAR & REINFORCEMENT

CHECK MINIMUM REINFORCEMENT

$f_r = 7.5\sqrt{f_c'} = 7.5\sqrt{5000} = 530.33$ (AASHTO 9.15.2.3)

$M_{cr} = f_r S_x = 0.53033(2452.1)/12 = 108.36$

$1.2\ M_{cr} = 1.2(108.36) = 130.04$ FT-KIPS < 573.41 = M_u

OK

AASHTO 9.18.2

CHECK SHEAR #4 (GRADE 60) @ 15" OC

USE AASHTO 9.20 - THE USE OF 1977 INTERIM METHOD IS ACCEPTABLE.

MAX SPACING = 3/4 h = .75(21) = 15.75" > 15" OK

$A_v = \dfrac{(V_u - V_c)s}{2 f_{sy} j d}$ $f_{sy} = 60{,}000$ psi

Assume $j = 0.9$

$V_u - V_c = \dfrac{2 A_v f_{sy} j d}{s} = \dfrac{2(0.20)(60)(0.9)(19)}{15} = 27.36$

$V_c = 0.06 f_c' b' j d$ } use smaller V_c
$V_c = 180\ b' j d$ }

$b' = 36 - 2(12) = 12$

$V_c = 0.06(5000)(12")(0.9)(19") = 61.56$ KIPS

$V_c = 180(12")(0.9)(19) = 36.94$ KIPS CONTROLS

$V_u - V_c = 27.36$ $V_u = 27.36 + 36.94 = 64.30$ KIPS

$\phi V_c = 0.9(64.30^K) = 57.87$ KIPS AASHTO 9.14

SUBJECT OTTERBROOK LAKE

COMPUTATION CASE A

COMPUTED BY MRI CHECKED BY M.D. DATE 8/19/93

AS PER 1979 INTERIM; CHECK SHEAR AT 1/4 PT

DL & SDL SHEAR AT 1/4 POINT

$$V_{DL+SDL} = (0.5519\ klf + 0.09375\ klf)\left(\frac{43}{2} - \frac{43}{4}\right) = 6.94\ k$$

LIVE LOAD SHEAR AT 1/4 POINT L = 43, 0.75L = 32.25, 0.25L = 10.7

IMPACT

$I = 50/(125 + 32.25) = 0.3180$ MAX 30% $\therefore I = 1.32$ → 1.30 MAX (3.8.2 M.D.) CLOSE ENOUGH

MANUAL PLATE 6 & 7

H20: $V = \frac{20(32.25 - 2.8)}{43}(1.32)(0.5058) = 9.15\ k$ 9.0

3: $V = \frac{25(32.25 - 7.44)}{43}(.52)(0.5058) = 9.63\ k$ 9.5

3S2: $V = \frac{36(32.25 - 18.61)}{43}(1.32)(0.5058) = 7.62\ k$ 7.5 CLOSE ENOUGH M.D.

USE LOAD FACTOR METHOD

$1.3(V_{DL} + 5/3\ V_{LL+I}) = \phi V_n = 57.87$ KIPS

$\therefore 5/3\ V_{LL+I} = \frac{\phi V_n}{1.3} - V_{DL} = \frac{57.87}{1.3} - 6.94 = 37.58\ k$

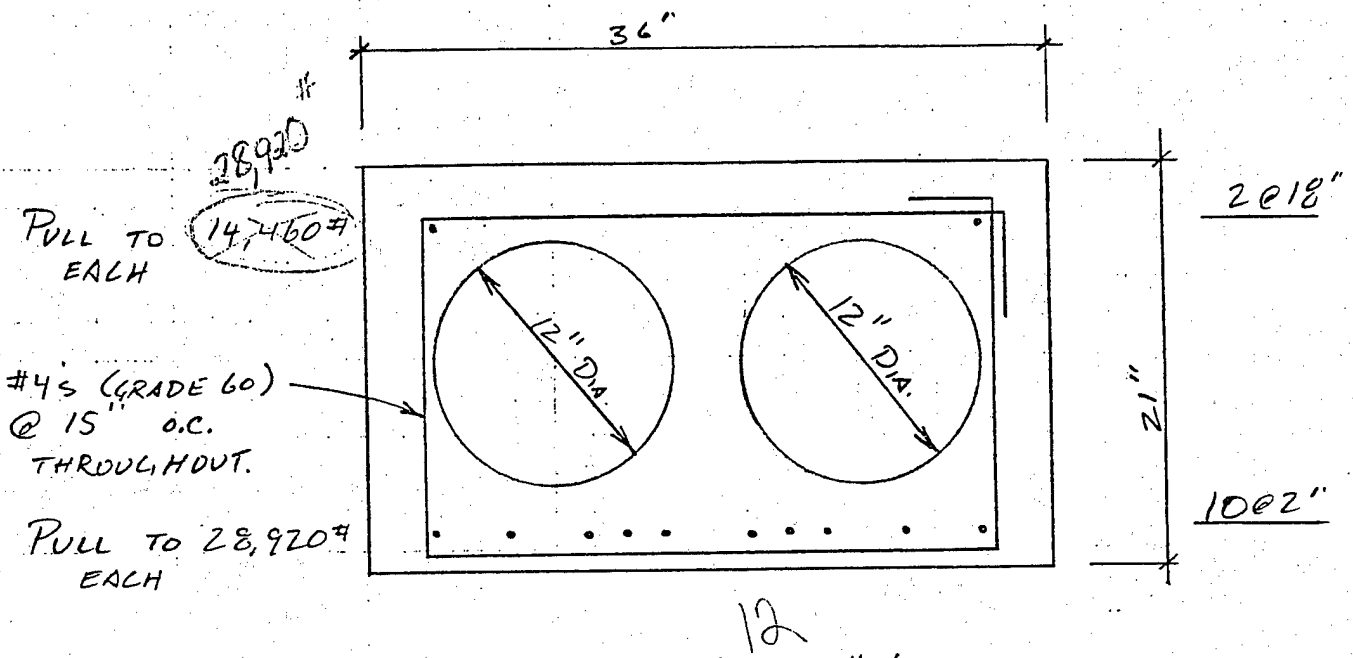
INVENTORY: $3/5\ (37.58)\ k = 22.55$ KIPS

OPERATING: 37.58

TYPE	INVENTORY (TONS)	OPERATING (TONS)
H15	$(22.55)(20)/9.15 = 49.28$	$(37.58)(20)/9.15 = 82.14$
3	$(22.55)(25)/9.63 = 58.54$	$(37.58)(25)/9.63 = 97.56$
3S2	$(22.55)(36)/7.62 = 98\ 106.54$	$(37.58)(36)/7.62 = 177.54$

DATE	DESIGN	LEAP ASSOCIATES INTERNATIONAL INC.	SHEET
8-6-85	KLT		2
REVISED	CHECK	JOB / FOR	JOB NO. PRC 513

CASE "A" 36" x 21" HC SLAB



12

f'_c = 5000 PSI
f'_{ci} = 4000 PSI
DEN = 150 PCF

USE 70-½" ϕ 270K SRLV STRANDS

SUBJECT OTTERBROOK LAKE ENTRANCE/EXIT BRIDGES

COMPUTATION CASE "B" 48 x 21" IN HC SLAB

COMPUTED BY MEI CHECKED BY M.D DATE 5/27/93

BRIDGE REPLACED 1987

SIMPLE SPAN, PRESTRESSED DECK BEAMS

LENGTH OF SPAN: 43 FT

TYPE IV-48 (36" x 21" IN HC SLABS)

$A = 703.26\ in^2$ $f_c' = 5000\ psi$

$I = 34517\ in^4$ $f_{ci}' = 4000\ psi$

$w = 732.6\ plf$ density = 150 pcf

$S_x = 34517\ in^4 / 21\frac{1}{2}" = 3287.33\ in^3$

FROM TRANSMITTAL NO 3230-002 9 OCTOBER 1993

STRANDS

12 - ½" ϕ 270 k SR LV STRANDS

$A_s^* = 0.1530 \times 12 = 1.8360\ in^2$

$A_s^*{}_T = 0.306\ in^2$

$A_s^*{}_B = 1.530\ in^2$

Cg OF STRAND: 2" FROM BOTTOM OF BEAM
3" FROM TOP OF BEAM

$e_B = \frac{h}{2} - cg = \frac{21"}{2} - 2" = 8.5"$

$e_T = 7.5"$

SUBJECT OTTER BROOK LAKE

COMPUTATION CASE B
M.E.I

COMPUTED BY _____ CHECKED BY M.D DATE 5/27/93

INITIAL TENSION ON STRAND = P_i

P_i = 28.92 KIPS

P_B = 28.92 x 10 = 289.2 KIPS (10 STRANDS)

P_T = 28.92 x 2 = 57.8 KIPS (2 STRAND)

INITIAL STRESS ON EA. STRAND

28.92 / 0.1530 = 189.02

DESIGN LOADS

DEAD LOADS

DL self wt 732.6 plf

SUPPLEMENTAL DEAD LOADS

DL BITUMINOUS SURFACE (2.5")(150 plf)/12 in/ft (3') = 93.75 plf

CURB (132 in²)/144 in²/ft² (150 plf) = 137.5 plf

231.25

LIVE LOAD

LL H15 TRUCK

M_{DL} = (0.7326)(43)²/8 = 169.32 FT-KIPS

$M_{SDL①}$ = (0.09375)(43²)/8 = 21.67 FT-KIPS

$M_{SDL②}$ (0.1375)(43)²/8 = 31.78 FT-KIPS

SUBJECT Otter Brook Dam
COMPUTATION CASE B
COMPUTED BY MEI CHECKED BY M.D. DATE 8/27/85

LOSS OF PRESTRESS AASHTO TABLE 9.16.2.2

PRETENSIONED STRAND $f_c' = 5000$ psi

$f_{cir} = 415$ (from design calculation 8/6/85)

$f_{cds} = 108$ (" " " ")

$\Delta f_s = SH + ES + CR_c + CR_s$

$SH = 17000 - 150\,RH = 17000 - 150(70) = 6500$ (6-4)

$RH = 70$

$ES = \left(\frac{E_s}{E_{ci}}\right) f_{cir} = \left(\frac{28000}{3834}\right) 415 =$ 303.1 (6-9)

$CR_c = 12(f_{cir}) - 7(f_{cds}) = 12(415) - 7(108) = 4224$ (9-9)

$CR_s = 20000 - 0.4\,ES - 0.2(SH + CR_c)$

$= 20000 - 0.4(3031) - 0.2(6500 + 4224) =$ 16,643 (9-10)

30,398

$f_{final} = 189.02 - 30.40 = 158.62$ KSI

$P_{final} = 158.62\,(1.836) = 291.23$ KIPS

$M_{I/S}$ = MOMENT DUE TO PRESTRESS = P_e

$= 291.23\,(8.5/12) = 206.28$ FT-KIPS

$P_T = (158.62)(2)(.1530) = 48.54$ KIPS

$P_B = (158.62)(10)(0.1530) = 242.69$ KIPS

$M_{I/S_T} = (48.54)(7.5/12) = 30.34$ FT-KIPS

$M_{I/S_B} = 242.62\,(8.5/12) = 171.90$ FT-KIPS

SUBJECT OTTER BROOK GATE

COMPUTATION CASE B

COMPUTED BY MEI CHECKED BY M.D DATE 8/28/97

STRESSES

$$f = -\frac{P}{A} \pm \frac{M_{P/S(T)}}{S} \pm \frac{M_{P/S(B)}}{S} \pm \frac{M_{DL} + M_{SDL}}{S}$$

$$= -\frac{291.23}{703.26} \pm \frac{30.34\,(12)}{3287.33} \pm \frac{171.90\,(12)}{3287.33} \pm \frac{(169.32 + 21.67 + 31.78)(12)}{3287.33}$$

$$= -0.4141 \pm 0.1108 \pm 0.6275 \pm 0.8132$$

$$f_{TOP} = -0.4141 - 0.1108 + 0.6275 - 0.8132 = -0.7106$$

$$f_{BOT} = -0.4141 + 0.1108 - 0.6275 + 0.8132 = -0.1176$$

ALLOWABLE STRESSES

INVENTORY COMPRESSION $0.4 f_c' = 2.0$ KSI

TENSION $6\sqrt{f_c'} = 0.424$

$6\sqrt{f_c'}$ IS REQ'D FOR CAPACITY SEE AASHTO 9.15.2.2

STRESS AVAILABLE FOR LIVE LOADS

TOP OF BEAM $2.0 - 0.7106 = 1.2894$

BOT OF BEAM $0.424 + 0.1176 = 0.5419$ (CONTROLS)

INVENTORY

$$M_{CAP} = (0.5419)(3287.33)/12 = 148.45$$

SUBJECT OTTER BROOK LAKE
COMPUTATION CASE B
COMPUTED BY MEI CHECKED BY DATE 5/23/95

OPERATING MANUAL 5.4.6

FOL PRESTRESSED CONCRETE MEMBERS, THE REINFORCEMENT INDEX DETERMINED BY AASHTO 9.18.1 DOES NOT EXCEED 0.30, THE OPERATING RATING SHALL RESULT IN MOMENTS NOT TO EXCEED 0.75 THE ULTIMATE MOMENT CAPACITY AASHTO 9.17.

$A_s^* = 1.530 \text{ in}^2$

$d =$ h - cg of lower strands $= 21" - 2" = 19"$

$f_c' = 5.0$ ksi

$f_s' = 270$ ksi

$p^* = A_s^* / bd = 1.53 / (48)(19) = 0.0017$

p^* = RATIO OF PRESTRESSING STEEL

STEEL STRESSES (BONDED MEMBERS) AASHTO 9.17.4.1

f_{su}^* = avg stress in prestressing steel at ult. load

$$f_{su}^* = f_s' \left(1 - 0.5 \frac{f_s' p^*}{f_c'} \right) = 270 \left[1 - 0.5 \frac{(0.0017)(270)}{5 \text{ ksi}} \right]$$

$= 257.61$ ksi

REINFORCEMENT INDEX (RECTANGULAR SECTIONS) AASHTO 9.18.1

$$p^* \frac{f_{su}^*}{f_c'} = 0.0017 \left(253.69 \text{ ksi} / 5 \text{ ksi} \right) = 0.0863$$

$0.0863 < 0.30$ OK

SUBJECT OTTER BROOK CAGE

COMPUTATION CASE B

COMPUTED BY MRI CHECKED BY M.D. DATE 8/23/93

CHECK LOCATION OF NEUTRAL AXIS

$$a = \frac{A_s^* f_{su}^*}{0.85 f_c' b} = \frac{(1.53)(253.67)}{0.85(5.0)(88)} = 1.90 \text{ in}$$

$\beta_1 = 0.80$ AASHTO 8.16.2.7

$c = a/\beta_1 = 1.90/0.8 = 2.375$

$2.375 < 4.5$ OK TO USE RECTANGULAR AREA

FLEXURAL STRENGTH

$$M_u = A_s^* f_{su}^* d \left(1 - 0.6 \rho^* f_{su}^*/f_c'\right)$$

$$= (1.53)(257.61)(21)/12 \left[1 - 0.6(0.0363)\right]$$

$$= 654.03$$

* NOTE: $M_u = \phi M_n \Rightarrow \phi = 1.0$ ONLY FOR FACTORY PRODUCED PRECAST PRESTRESSED — M.D
AASHTO 9.14.

OPERATING: $M_{CAP} = 0.75(M_u) = 0.75(654.03) = 490.53$ FT.

OPERATING CAPACITY AVAILABLE FOR LIVE LOAD

$M_{oper} = M_{cap} - (M_{DL} + M_{SDL})$

$= 490.53 - (222.77) = 267.76$

SUBJECT OTTER BROOK LAKE
COMPUTATION CASE B
COMPUTED BY JAE CHECKED BY M.D. DATE 9/28/93

LIVE LOAD

S/D = LOAD FRACTION S = WIDTH OF PRECAST MEMBER

C = STIFFNESS PARAMETER W = OVERALL BRIDGE WIDTH
L = SPAN LENGTH
K = 0.8

C = K (W/L)

C = 0.8 (14/43) = 0.2605 C ≤ 5

∴ D = (5.75 − 0.5 NL) + 0.7 NL(1 − 0.2 C)^½ (3-12) NL = # OF LANES = 1

D = (5.75 − 0.5) + 0.7[1 − 0.2(0.2605)] = 5.93

S/D = 4/5.93 = 0.6745

IMPACT

IMPACT = 50 / (L + 125) = 50 / (45 + 125) = 0.2976

∴ I 1.2976

LIVE LOADS FROM MANUAL PLATE 2

H20: 20/15 (140.95)(1.2976)(0.6745) = 164.48 FT-KIPS

H15: (140.95)(1.2976)(0.6745) = 123.36 FT-KIPS

3: (141.75)(1.2976)(0.6745) = 167.82 FT-KIPS

3S2: (177.35)(1.2976)(0.6745) = 155.22 FT-KIPS

SUBJECT ~~TITE BRIDGE LAKE~~

COMPUTATION CASE B

COMPUTED BY ME I CHECKED BY M.D. DATE 3/28/43

MOMENT RATING

TYPE	INVENTORY (TONS)	OPERATING (TONS)
H20	(148.45)(20T)/164.48 = 18.05	(267.76)(20T)/164.48 = 32.56
H15	(148.45)(15T)/123.36 = 18.05	(267.76)(15T)/(123.36) = 32.56
3	(148.45)(25T)/167.83 = 22.11	(267.76)(25T)/167.83 = 39.89
3S2	(148.45)(36T)/155.22 = 34.43	(267.76 MD)(36T)/155.22 = 34.43

48" PLANK CONTROLS RATING — M.D.

SUBJECT OTTER POND LAKE

COMPUTATION CASE B

COMPUTED BY MEI CHECKED BY M.D. DATE 8 FEB 94

CHECK SHEAR & REINFORCEMENT

$f_r = 7.5\sqrt{f_c'} = 7.5\sqrt{5000} = 530.33$ (AASHTO 9.15.2.3)

$M_{cr} = f_r S_x = 0.53033(3287.33)/12 = 145.28$ FT-KIPS

$1.2\,M_{cr} = 1.2(145.28) = 174.34$ FT-KIPS $<$ 654.03 OK

AASHTO 9.18.2

CHECK SHEAR #4 (GR 60) @ 15" OC

USE AASHTO 9.20, 1979 INTERIM METHOD IS ACCEPTABLE

MAX SPACING = 3/4 h = 0.75 (21) = 15.75 > 15 OK

$A_v = \dfrac{(V_u - V_c)s}{2 f_{sy} j d}$ f_{sy} = 60,000 PSI Assume j = 0.9

$V_u - V_c = \dfrac{2 A_v f_{sy} j d}{s} = \dfrac{2(0.20)(60)(0.9)(19)}{15} = 27.36$

$V_c = 0.06 f_c' b' j d$ } use smaller V_c
$V_c = 180 b' j d$ }

$b' = 48 - 2(12) - 10 = 14$

$V_c = 0.06(5000)(14")(0.9)(19) = 71.82$ KIPS

$V_c = 180(14)(0.9)(19) = 43.09$ KIPS

$V_{cl} = V_c = 27.36$ KIPS $V_u = 27.36 + 43.09 = 70.45$ KIPS

$\phi V_c = 0.9(70.45^k) = 63.41$ KIPS AASHTO 9.14

SUBJECT Otter Bridge Case B

COMPUTATION CASE B

COMPUTED BY MCI CHECKED BY M.D. DATE 8/28/79

AS PER 1979 INTERIM ; CHECK SHEAR AT 1/4 PT

DL + SDL ~~SHEAR~~ AT 1/4 PT

$V_{DL+SDL} = (0.732.6 + .231.25)\left(\frac{43}{2} - \frac{43}{4}\right) = 10.36$ KIPS

LIVE LOAD SHEAR AT 1/4 POINT

L = 43
0.75 L = 32.25
0.25 L = 10.75

IMPACT = 50 / 125 + 32.25 = 0.3.30 ∴ I = 1.32
NOT TO EXCEED 1.30 ML

MARGINAL PLATE 6 & 7

H20: $V = .20\left(\frac{32.25 - 7.5}{\text{1/2}}\right)(1.32)(0.6745) = 12.20$ K

$V = 25\left(\frac{32.25 - 7.44}{\text{1/2}}\right)(1.32)(0.6745) = 12.84$ K

$V = 36\left(\frac{32.25 - 18.16}{\text{1/2}}\right)(1.32)(0.6745) = 10.17$ K

USE LOAD FACTOR METHOD

$.3\left(V_{DL} + 5/3\ V_{LL+I}\right) = \phi V_u = 63.41$ KIPS

$\therefore 5/3\ V_{LL+I} = \frac{\phi V_u}{1.3} - V_{DL} = \frac{63.41}{1.3} - 10.36 = 38.42$ KIPS

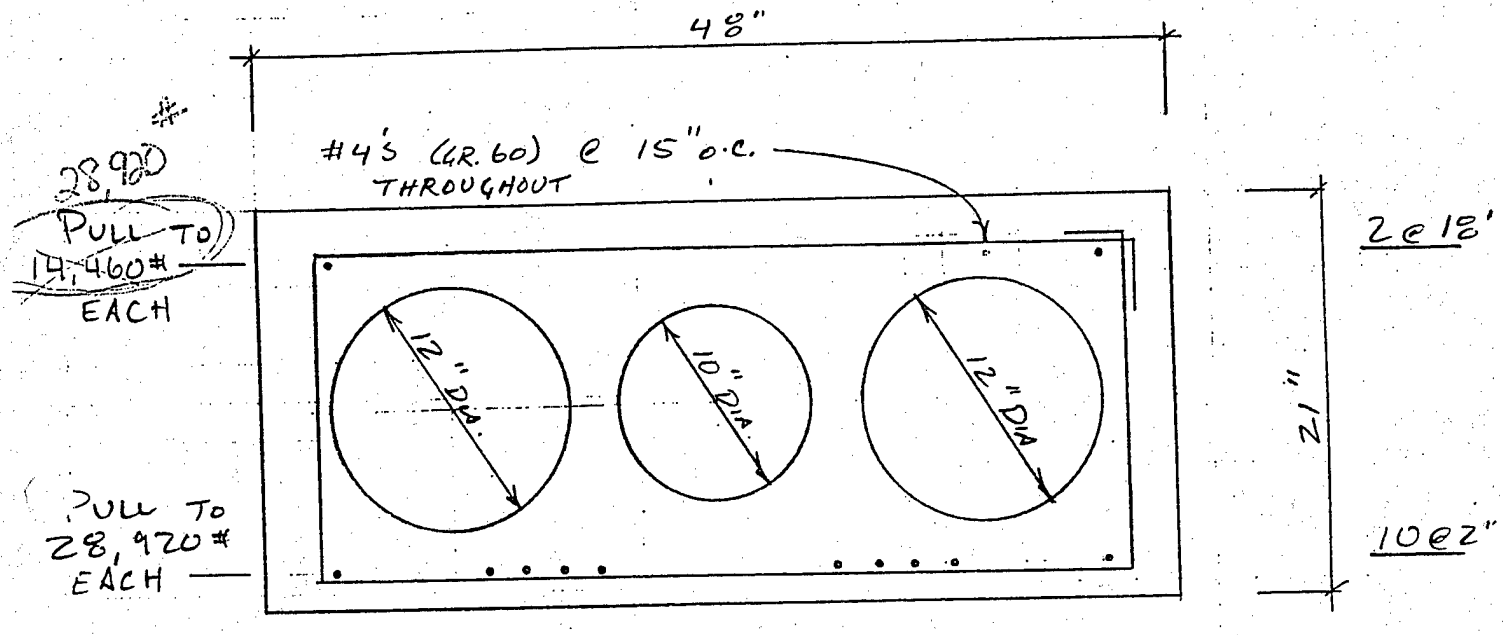
INVENTORY : $3/5\ (38.42) = 23.05$

OPERATING : 38.43

TYPE	INVENTORY	OPERATING
H 20	$(23.05)(20)/12.20 = 37.79$	$(38.42)(20)/12.20 = 62.98$
3	$(23.05)(25)/12.84 = 44.83$	$(38.42)(25)/12.84 = 74.81$
3-S2	$(23.05)(36)/10.17 = 81.54$	$(38.42)(36)/10.17 = 136.00$

DATE	DESIGN	LEAP ASSOCIATES INTERNATIONAL INC.	SHEET
8-7-85	KLT		3
CHECKED	CHECK	JOB / FOR	JOB NO. PRC 513

CASE "B" 48" x 21" HC SLAB



f'_c = 5000 PSI
f'_{ci} = 4000 PSI

USE 12- ½" ϕ 270 K SRLV STRANDS

OTTER BROOK LAKE
ENTRANCE BRIDGE, KEENE, N.H.
FY 93 ROUTINE INSPECTION REPORT

DATE OF INSPECTION: 18 August 1993

DATE OF PREVIOUS INSPECTIONS:

In-depth,	*.
Routine,	Sept 87
Routine,	Sept 89
Routine,	22 August 1991

RATING (T=TONS)

Type	Inventory	Operating	Comments
H15	18.0T	32.6T	Load rating were
3	22.1T	39.9T	recalculated for
3S2	34.4T	62.1T	prestressed beams.

EVALUATION (See attached "Structures Inspection Field Report")

A. Roadway, Railings, and Deck. The overall condition is good. (condition) 7
The bituminous wearing surface on the deck is in good condition with minor rutting along the wheel lines. There is some minor rutting at the gravel approach on the south side. The bituminous concrete road on the north side has a four inch pothole and some minor rutting along wheel lines. The pavement is also cracked along the slab transition due to one-half inch settlement. The approach guardrails are in very good condition with the exception of a slightly bent end rail on the southeast corner.

B. Fascia and Curbs The overall condition is good (condition 7). Both the curbs and fascias have hairline cracks approximately every two feet. Minor debris and vegetation along the curbing.

C. Underside of Deck and Bearings. The overall condition is good (condition 7). The underside of the deck is in good condition. No problems were observed with the bearings.

D. Wingwalls and Abutments The overall condition is fair (condition 6). In general, the cementitious coating is delaminating and in poor condition.

	The abutments appear to be stable. Spalling has occurred on the southeastern wingwall. On the north abutment there is an eight foot by two foot by six inch spall on the northeast corner and a four foot by two foot by six inch spall on the northwest corner. There is also evidence of scour and undermining on the north abutment.
E. Channel	Scour is occurring from four foot deep to the top of the water line on the north abutment with some undermining taking place.
CONDITION RATING	Interim 1987: 7 Interim 1989: 6 Routine 1991: 7 Routine 1993: 7

RECOMMENDATIONS

Status of Previous Recommendations

		Cost Est	Status
1.	Repair erosion and deteriorated concrete at the base of the abutments and wingwalls.	$15,000	Not Done
2.	Replace bituminous pavement at north approach.	$3,500	Not Done
3.	Remove all deteriorated concrete repair mortar in wingwalls and abutments and replace with new to give uniform surface.	$12,500	Not Done
4.	Replace nuts on railing post cap.	Maint.	Not Done
5.	Remove vegetation from wingwalls and curbs.	$1000	Not Done
	Total	$32,000	

Revised Recommendations

Implement above recommendations.

Total Updated Estimated Cost $32,000

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

city/	bridge dept. no.	8-structure no.	90-date inspected
KEENE, NH	COE	CERGEDN#331 0010	8/18/93

2-dist.	104-highway system	22-owner	27-year built	106-year rebuilt	11-milepoint
				1987	

43-structure type: PRESTRESSED CONCRETE BRIDGE BEAMS	quality control engineer: NICK FORBES
07-facility carried: REC AREA ENTRANCE	team leader: JOE COUCCI
06-features intersected: OTTER BROOK	team members: ELLEN IORIO MARK DESCHENES

item 58	7	item 59	7	item 60	6
DECK		SUPERSTRUCTURE		SUBSTRUCTURE	
1. Wearing Surface	7	1. Bearing Devices	8	1. Abutments	
2. Deck-Condition	7	2. Stringers	NA	a-Wings	7
3. Stay in Place Forms	NA	3. Diaphragms	NA	b-Backwall	6
4. Curbs	7	4. Girders or Beams	7	c-Bridge Seats	7
5. Median	NA	5. Floor Beams	NA	d-Breastwall	7
6. Sidewalks	NA	6. Trusses	NA	e-Footings	NA
7. Parapet	NA	7. Rivets or Bolts	NA	f-Piles	NA
8. Railing	7	8. Welds	NA	g-Erosion	5
9. Anti Missile Fence	NA	9. Collision Damage	NA	h-Settlement	NA
10. Drains	NA	10. Load Deflection	8	2. Piers or Bents	
11. Lighting Standards	NA	11. Member Alignment	8	a-Caps	NA
12. Utilities	NA	12. Load Vibration	8	b-Column	NA
13. Deck Joints	7	13. Paint-Epoxy	NA	c-Web	NA
14. Approach Settlement	7	14. Year Painted	NA	d-Footing	NA
		15. Under Clearance ____ ft ____ in		e-Piles	NA
		Clearance Signs ☐ yes ☐ no		f-Scour	NA
				g-Settlement	NA
				3. Collision Damage	8
				4. Hydraulic-Adequacy	7

Actual Posting	H	3	3S2	Single
	15	NA	NA	NA
Recommended Posting From Rating Book	NA	NA	NA	NA

SIGNS IN PLACE Y or N	at bridge	advance
	Y	NA
LEGIBILITY	Y	NA

Overhead Signs (attached to bridge) ☐ yes ☒ no

1. Welds	NA
2. Bolts	NA
3. Condition	NA

Item93b U/W Inspection Date: ____

ITEM 61-channel and channel protection: 6

1. channel scour	5	5. rip rap or slope paving	NA
2. embankment erosion	7	6. effectiveness	7
3. fender system	NA	7. debris	7
4. spur dikes & jetties	NA	8. vegetation	7

36-Traffic Safety features

	36	condition
1. bridge railing	NA	8
2. transitions	NA	8
3. approach guardrail	NA	8
4. guardrail terminal	NA	8

X=UNKNOWN NA=NOT APPLICABLE IA=INACCESSIBLE

PROJECT: OTTER BROOK
NAME: ENTRANCE BRIDGE
LOCATION: KEENE, NH

BRIDGE INSPECTION
SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity?	YES
2. Is the streambed erodible? If so, does the structure have any vulnerable design features?	YES
a. Piers, abutments with spread footings or short pile foundations.	N/A
b. Superstructure with simple spans or non-redundant support systems.	YES
c. Inadequate waterway openings.	NO
d. Designs which collect ice and debris.	YES
e. All water must pass through or over structure.	NO
f. Other.	N/A
3. Are any characteristics of an aggressive stream or waterway present?	YES
a. Active degradation or aggredation of streambed.	YES
b. Significant lateral movement or erosion of streambanks.	NO
c. Steep slopes.	NO
d. High velocities.	NO
e. Any history of highway or bridge damage during past floods.	NO
f. Other.	N/A
4. Is the bridge located on a stream reach with any adverse flow characteristics?	NO
a. Crossing near stream confluence.	NO
b. Crossing of tributary stream near confluence with larger streams.	NO
c. Crossing on sharp bend in stream.	NO
d. Location on alluvial fan.	NO
e. Other.	N/A
5. Other comments or observations.	NA

NED FORM 223
27 Sept 49

NEW ENGLAND DIVISION
CORPS OF ENGINEERS, U.S. ARMY

PAGE

SUBJECT RATING FOR STEEL SPANS ENTRANCE BRIDGE

COMPUTATION

COMPUTED BY MJD CHECKED BY DATE 5/21/93

INVENTORY LOAD RATINGS

		HS	3	352
36 x 21.	FLEXURE	23.0	28.2	43.9
	SHEAR	49.3	58.5	106.5
48 x 21	FLEXURE	18.0	22.1	34.4
	SHEAR	37.8	44.9	81.5

OPERATING LOAD RATING

36 x 21	FLEXURE	45.5	55.8	86.9
	SHEAR	82.1	97.6	177.5
48 x 21	FLEXURE	32.6	39.9	62.1
	SHEAR	63.0	74.8	136.0

OVERALL RATING

	HS	3	352
INVENTORY	18.0	22.1	34.4
OPERATING	32.6	39.9	62.1

NOTE: FOR CALCULATIONS, SEE EXIT BRIDGE

COLEBROOK LAKE
BRIDGE ON OLD ROUTE 8 SANDISFIELD, MA
FY 93 ROUTINE INSPECTION REPORT

DATE OF INSPECTION: 25 August 1993

DATE OF PREVIOUS INSPECTIONS: In-depth, Dec 84
Routine, Sept 87
Routine, Sept 89
Routine, June 91

RATING (T=TONS)

Type	Inventory	Operating	Comments
H15	24T	33T	
3	34T	52T	
3S2	52T	82T	
3-3	60T	98T	

EVALUATION (See attached "Structures Inspection Field Report")

A. Roadway, & Railings

The bridge deck, approaches, guardrails, and railings are in very good condition (condition 8). The new deck surface and approaches are still in good condition. There are no visible joints at either end of the bridge. Some of the aggregate from the chip seal surfacing has accumulated along the gutters on the bridge. The cable guardrails along the north approach are both loose. The guardrails along the bridge deck have recently been painted as part of the contract to paint the bridge.

B. Superstructure

The trusses and bracing are in good condition. The entire superstructure has been recently painted. The paint is in good condition, however, the contractor was limited to the amount of scraping that was allowed due to the use of lead in previous coats of paint. This may tend to lead to accelerated degradation of the new finish. All joints, welds, and connections are in good condition. Most deteriorated rivets have been replaced with high strength bolts.

C. Underside of Deck

The superstructure under the deck is in good condition. The floor beam connections at the bearings at the ends of the trusses on the inside of the skew angle are filled with sand and painted. Attention will have to be paid to this area in future inspections since it is a likely spot for corrosion. Otherwise they should be cleaned out, filled with concrete, and capped. There is some honeycombing along the underside of the deck. Some remaining burlap was noticed between the floor beams and stringers. The bearings are in good condition.

D. Wingwalls and Abutments

The wingwalls and abutments are in good condition. Most vertical cracking has been sealed as recommended in previous inspections. Some horizontal cracking along cold joints in both wingwalls and abutments have not been repaired. Some minor efflorescence was noted along both north and south wingwalls.

E. Channel

The channel is in good condition and flowing smoothly. There is a moderate amount of rubble built up in the north side of the channel. The sheetpile and concrete toe protection along the south abutment is in good condition.

CONDITION RATING

In-depth	7
Interim 1987	7
Interim 1989	6
Routine 1991	7
Routine 1993	8

RECOMMENDATIONS

Status of Previous Inspections

Item	Status
1. Remove vegetation from southeast wingwall	Not Done
2. Remove vegetation from curb edge.	Recurring
3. Paint structural steel	Complete

Revised Recommendations

Keep the curb edge free of vegetation.
No additional recommendations

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

city	bridge dept. no.	8-structure no.	90-date inspected
COLEBROOK LAKE SANDISFIELD NA	COE	CFPNGCMA2510019	25 AUG 92

2-dist.	104-highway system	22-owner	27-year built	106-year rebuilt	11-milepoint

43-structure type: STEEL TRUSS	quality control engineer: NICK FORBES
07-facility carried: OLD ROUTE 8	team leader: JOSEPH COLUCCI
06-features intersected: FARMINGTON RIVER	team members: M. DESCHENES. M. WALSH M. IORIO

item 58	8
DECK	
1. Wearing Surface	8
2. Deck-Condition	8
3. Stay in Place Forms	—
4. Curbs	7
5. Median	—
6. Sidewalks	—
7. Parapet	5
8. Railing	7
9. Anti Missile Fence	-
10. Drains	8
11. Lighting Standards	—
12. Utilities	—
13. Deck Joints	—
14. Approach Settlement	8

item 59	7
SUPERSTRUCTURE	
1. Bearing Devices	7
2. Stringers	7
3. Diaphragms	7
4. Girders or Beams	—
5. Floor Beams	7
6. Trusses	7
7. Rivets or Bolts	7
8. Welds	7
9. Collision Damage	-
10. Load Deflection	-
11. Member Alignment	7
12. Load Vibration	-
13. Paint-Epoxy	8
14. Year Painted	91
15. Under Clearance ____ ft ____ in	
Clearance Signs ☐ yes ☒ no	

item 60	7
SUBSTRUCTURE	
1. Abutments	
a-Wings	7
b-Backwall	7
c-Bridge Seats	7
d-Breastwall	7
e-Footings	7
f-Piles	—
g-Erosion	7
h-Settlement	—
2. Piers or Bents	
a-Caps	—
b-Column	—
c-Web	—
d-Footing	—
e-Piles	-
f-Scour	—
g-Settlement	—
3. Collision Damage	—
4. Hydraulic-Adequacy	5

Actual Posting	H	3	3S2	Single
	—	—	-	☐
Recommended Posting From Rating Book	—	—	-	☐

SIGNS IN PLACE Y or N	at bridge	advance
	N	N
LEGIBILITY	—	—

Overhead Signs (attached to bridge) ☐ yes ☒ NA no

1. Welds	—
2. Bolts	—
3. Condition	—

Item93b U/W Inspection Date: NONE

ITEM 61-channel and channel protection: 7

1. channel scour	7	5. rip rap or slope paving	—
2. embankment erosion	7	6. effectiveness	7
3. fender system	-	7. debris	6
4. spur dikes & jetties	—	8. vegetation	6

36-Traffic Safety features

	36	condition
1. bridge railing	0	5
2. transitions	0	6
3. approach guardrail	0	7
4. guardrail terminal	N	—

X=UNKNOWN NA=NOT APPLICABLE IA=INACCESSIBLE

PROJECT: COLEBROOK LAKE
NAME: OLD ROUTE 8 BRIDGE
LOCATION: SANDY FIELD LN.

BRIDGE INSPECTION
SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity? NO

2. Is the streambed erodible? If so, does the structure have any vulnerable design features? YES

   a. Piers, abutments with spread footings or short pile foundations. NO
   b. Superstructure with simple spans or non-redundant support systems. YES
   c. Inadequate waterway openings. NO
   d. Designs which collect ice and debris. NO
   e. All water must pass through or over structure. NO
   f. Other. —

3. Are any characteristics of an aggressive stream or waterway present? NO

   a. Active degradation or aggredation of streambed. NO
   b. Significant lateral movement or erosion of streambanks. NO
   c. Steep slopes. NO
   d. High velocities. NO
   e. Any history of highway or bridge damage during past floods. NO
   f. Other. —

4. Is the bridge located on a stream reach with any adverse flow characteristics? NO

   a. Crossing near stream confluence. NO
   b. Crossing of tributary stream near confluence with larger streams. NO
   c. Crossing on sharp bend in stream. NO
   d. Location on alluvial fan. NO
   e. Other. —

5. Other comments or observations. —

KNIGHTVILLE DAM
INDIAN HOLLOW ROAD BRIDGE, HUNTINGTON, MA
FISCAL YEAR 1993
ROUTINE INSPECTION REPORT

DATE OF ROUTINE INSPECTION: 25 August 93

DATE OF PREVIOUS INSPECTIONS: Routine Inspection, 13 May 91
Inventory Inspection, March 85

RATING (T = TONS)

Type	Inventory	Operating	Comments
H	17T	40T	No change in ratings due to inspection findings.
Type 3	20T	47T	
Type 3S2	29T	67T	

EVALUATION (See attached "Structures Inspection Field Report")

A. Superstructure -Above Deck
- -Overall condition is good.
- -Both east and west approaches are in fair to good condition. The bituminous pavement at the west approach is unravelling.
- -There are no bridge railings or approach guardrails.
- -The wearing surface on the deck is in good condition, with a small amount of sand debris collecting at the curbs.

B. Superstructure -Below Deck
- -Overall condition is good.
- -The underside of the prestressed concrete planks is in good condition. There are signs of water leakage between the planks near the west abutment.

C. Substructure
- -Overall condition is good.
- -Both east and west abutments are in good condition. Both have numerous hairline cracks with efflorescence, but this condition is not considered serious.

D. Channel
- -The channel under the bridge is in fair condition, with overgrowth of vegetation, but no signs of scour.

E. Overall Numerical Condition Rating

Inventory 1985:	7
Routine 1991:	7
Routine 1993:	7

RECOMMENDATIONS

Status of Previous Recommendations

1. Construct a 10' long by 12' wide bituminous approach slab at both approaches.

   A contract is currently underway.

2. Construct 25' of approach guardrail at each of the four corners of the bridge.

   $5,000 Not Done

3. Seal cracks in abutments.

   A contract is currently underway.

Revised Recommendations

1. Due to the low ADT on Indian Hollow Road, and the low vehicle speeds, it is not recommended to provide approach guardrails. There are no further recommendations at this time.

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

city/[redacted]	bridge dept. no.	8-structure no.	90-date inspected
Huntington MA		CEPNEDMA2510020	8/25/93

2-dist.	104-highway system	22-owner	27-year built	106-year rebuilt	11-milepoint
		Corps of Eng.	1979	-	

43-structure type: Prestressed Conc. Slab, Simple Span	quality control engineer: Nick Forbes
07-facility carried: Indian Hollow Road	team leader: Joseph Colucci
06-features intersected: Little River	team members: Mike Walsh, Mark Deschenes

item 58	7	item 59	7	item 60	7
DECK		SUPERSTRUCTURE		SUBSTRUCTURE	
1. Wearing Surface	8	1. Bearing Devices	8	1. Abutments	
2. Deck-Condition	7	2. Stringers	N	a-Wings	7
3. Stay in Place Forms	N	3. Diaphragms	N	b-Backwall	N
4. Curbs	7	4. Girders or ~~Beams~~ Planks	7	c-Bridge Seats	7
5. Median	N	5. Floor Beams	N	d-Breastwall	7
6. Sidewalks	N	6. Trusses	N	e-Footings	?
7. Parapet	N	7. Rivets or Bolts	N	f-Piles	N
8. Railing	N	8. Welds	N	g-Erosion	7
9. Anti Missile Fence	N	9. Collision Damage	N	h-Settlement	7
10. Drains	N	10. Load Deflection	N	2. Piers or Bents	
11. Lighting Standards	N	11. Member Alignment	8	a-Caps	N
12. Utilities	N	12. Load Vibration	N	b-Column	N
13. Deck Joints	7	13. Paint-Epoxy	N	c-Web	N
14. Approach Settlement	6	14. Year Painted	N	d-Footing	N
		15. Under Clearance ____ ft ____ in		e-Piles	N
		Clearance Signs ☐ yes ☐ no		f-Scour	N
				g-Settlement	N
				3. Collision Damage	N
				4. Hydraulic-Adequacy	7

Actual Posting	H	3	3S2	Single
	-	-	-	-
Recommended Posting From Rating Book	17	20	29	17

SIGNS IN PLACE Y or N	at bridge	advance
	N	N
LEGIBILITY	-	-

Overhead Signs (attached to bridge) ~~yes~~ ☐ N no

1. Welds	-
2. Bolts	-
3. Condition	-

Item93b U/W Inspection Date: 8/25/93

ITEM 61-channel and channel protection: 7

1. [redacted]annel scour	8	5. rip rap or slope paving	N
2. embankment erosion	8	6. effectiveness	7
3. fender system	N	7. debris	8
4. spur dikes & jetties	N	8. vegetation	6

36-Traffic Safety features

	36	condition
1. bridge railing	0	-
2. transitions	0	-
3. approach guardrail	0	-
4. guardrail terminal	0	-

X=UNKNOWN NA=NOT APPLICABLE IA=INACCESSIBLE

Knightville Dam
Indian Hollow Bridge

SCOUR CHECKLIST

1. Is the bridge currently experiencing, or does it have a history of, scour activity? — No

2. Is streambed erodible? If so, does the structure have any vulnerable design features? — Yes

a. Piers, abutments with spread footings or short pile foundations.	Yes
b. Superstructures with simple spans or non-redundant support systems.	Yes
c. Inadequate waterway opening.	No
d. Designs which collect ice and debris.	No
e. All water must pass through or over structure.	No
f. Other.	

3. Are any characteristics of an aggressive stream or waterway present?

a. Active degradation or aggredation of streambed.	No
b. Significant lateral movement or erosion of streambanks.	No
c. Steep slopes.	No
d. High velocities.	No
e. Any history of highway or bridge damage during past floods.	No
f. Other.	

4. Is bridge located on stream reach with any adverse flow characteristics?

a. Crossing near stream confluence.	No
b. Crossing of tributary stream near confluence with larger streams.	No
c. Crossing on sharp bend in stream.	No
d. Location on alluvial fan.	No
e. Other.	

5. Other comments or observations.

Appendix A

Visual Assessment for Scour Potential

Everett Lake ---- Choate Brook
Birch Hill ------ Goodnow Road
Old Route 202
Middle Road

GEOTECHNICAL ASSESSMENT

FOR

BRIDGE SCOUR STUDY

AT

CHOATE BROOK BRIDGE

EVERETT RESERVOIR

WEARE, NEW HAMPSHIRE

SEPTEMBER 1993

GEOTECHNICAL ASSESSMENT

FOR

BRIDGE SCOUR STUDY

AT

CHOATE BROOK BRIDGE

EVERETT RESERVOIR

WEARE, NEW HAMPSHIRE

TABLE OF CONTENTS

I. INTRODUCTION

1.1 General

This report presents a visual assessment of scour potential at Choate Brook Bridge which is situated in the reservoir area of Everett Dam. The work was done by Geotechnical Engineering Division as part of the NED Bridge inspection program.

1.2 Purpose and Scope

The purpose of the assessment was to obtain information on subsurface and streambed conditions at Choate Brook Bridge and visually evaluate whether there is a potential for scour around the footings and abutments. The scope of work included:

a. Field reconnaissance of the site during September 1993.

b. Research of available geological and geotechnical information.

c. Laboratory testing of streambed samples collected during the September 1993 field reconnaissance of the site.

d. Report to include locus plan, gradation curve, site description, subsurface and streambed conditions, and assessment.

II. SITE CONDITIONS

2.1 Site Location and Description

Everett Dam and reservoir are located along the Piscataquog River, a tributary of the Merrimack River, in south central New Hampshire. Choate Brook is a tributary of the southeasterly flowing Piscataquog River, as shown on the Locus Plan in the Appendix. The bridge is in the northern portion of Everett Lake (recreational pool level) and within one-quarter mile of the normal Piscataquog River channel. Choate Brook has a fairly flat slope in the vicinity of the bridge. It cuts through a relatively flat floodplain. A moderate sloping hill ascends to the west of the bridge. A rough sketch (plan view) of the bridge and adjacent areas is included in the Appendix.

2.2 Bridge Description

Choate Brook Bridge has a concrete slab deck which bears on rubble masonry abutments and footings. A smooth concrete surface has been cast against the west abutment. The abutments and footings appear to be in fair to good condition. Stone revetments protect the corners of the bridge. The outer layer of the revetments are in good condition. However, there does not appear to be filter layers between the outer layer and the subgrade.

The footings of the bridge are founded on sand and gravel. It appears high water velocities have eroded (scoured) the sand and gravel below the south end of the west abutment footing. The void is approximately five feet wide by two feet high and is up to two feet deep. Distress cracks were not noted in the abutment area above the void.

Recently several small repairs have been made to the footings, revetments, and abutments. An apparent void under the north end of the west abutment footing was filled with concrete. Voids between the stones in the top two feet of the east abutment were filled with grout. Voids in the stone revetments at the north end of the bridge were filled with grout. Generally the work looks good except that an area up to three feet wide was not grouted at the junction of the stone revetment and northeast corner of the bridge.

2.3 Site Geology

Choate Brook flows through a low, flat and relatively wide area in the pre-glacial Piscataquog River valley. The valley has been filled with deep glacial outwash deposits and till. The brook has eroded a narrow valley in the outwash deposits and the till. Till and till covered bedrock hills which rise above the lowlands form the perimeter of the brook's drainage area.

2.4 Streambeds and Streambanks

The streambed is slightly meandering. It consists of clean, fine to coarse, sands and gravels with rounded to subangular cobbles and boulders. Gradations for the matrix portion of the streambed are included in the appendix. The cobbles and boulders in the streambed are typically 0.25 to 0.75 feet diameter with a maximum diameter of 1 foot. A beaver dam were observed at the north end of the bridge in the streambed. Water flowed through the dam rather than over the top during the inspection. It is approximately five feet high and 12 feet wide at the base. The water level was approximately 4.5 feet deep upstream of the dam and 2.5 feet deep downstream.

The streambanks are typically fairly low (ten feet or less high) and flat (1 vertical on 3 horizontal to 1 vertical on 10 horizontal). Due to the width of the channel in the vicinity of the bridge, the slopes are not critical. Medium to dense vegetation grows on the banks.

III. ASSESSMENT

3.1 Streambed and Streambank Material Characteristics

The streambed materials are deep deposits of hard, durable, rounded to subangular, sands, gravels, cobbles and boulders. The mean diameter, by weight, of the sand to boulder sized materials was visually estimated to be 0.25 to 0.5 feet at Choate Brook Bridge. Laboratory gradation tests (Complete gradation test results are in Appendix.) were performed on samples of the sand and gravel matrix materials that exist between the cobbles and boulders. The results indicate that the mean diameter, by weight, of the streambed matrix materials sampled is 1.5 millimeters (0.06 inches). The mean diameters of the streambed materials could be used in theoretical hydraulic studies to estimate the scour potential around the abutment footings.

3.2 Streambank Materials Characteristics

The streambank matrix material characteristics did not appear to be significantly different than the streambed matrix materials. However, the number and sizes of cobbles and boulders in the streambank materials appeared to be lower than in the streambed materials.

3.3 Scour Potential

High water velocities have scoured the material below the footings at the bridge as described in paragraph 2.2. It appears that high water velocities that occur during future flood events will continue to erode the foundation and the bottom of footing materials. Continued erosion will reduce the bearing capacity of the footings and cause subsequent damage to the superstructure of the bridges at a faster rate than normal weathering.

3.4 Proposed Remedial Work at Choate Brook Bridge

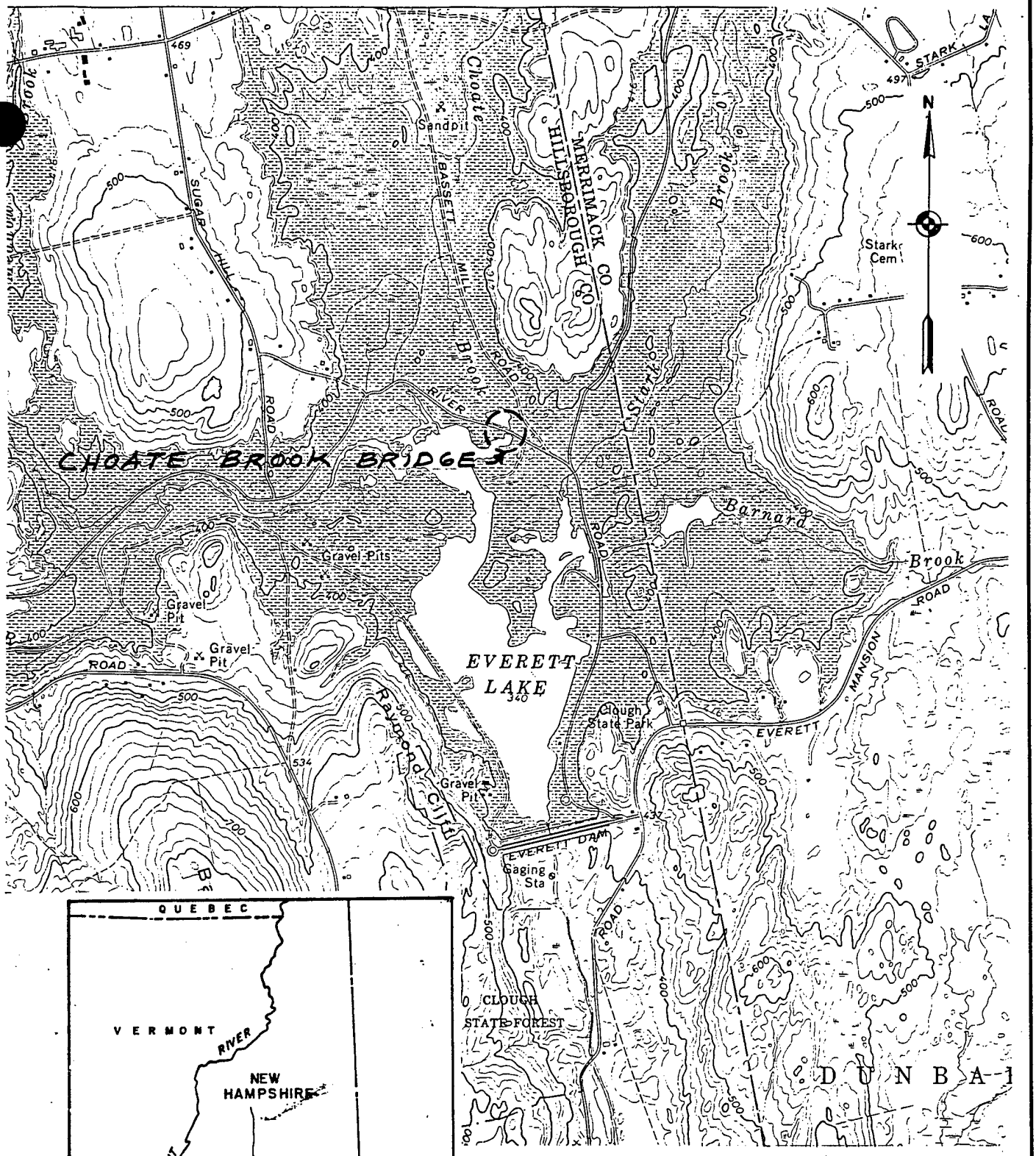
The most pressing need is to fill the void below the west abutment footing. It appears further erosion could damage the abutment. A possible method for repairing the footings is to place concrete forms around the outside edges and then pump concrete into the eroded voids and the space between the footings and forms. Then the entire channel (from approximately 15 feet upstream to 15 feet downstream of the bridge) should be lined with a stone blanket (estimated thickness of 2 feet) underlain by a bedding layer (estimated thickness of 1 foot). The stone blanket and bedding should extend to the top of the banks upstream and downstream of the bridge.

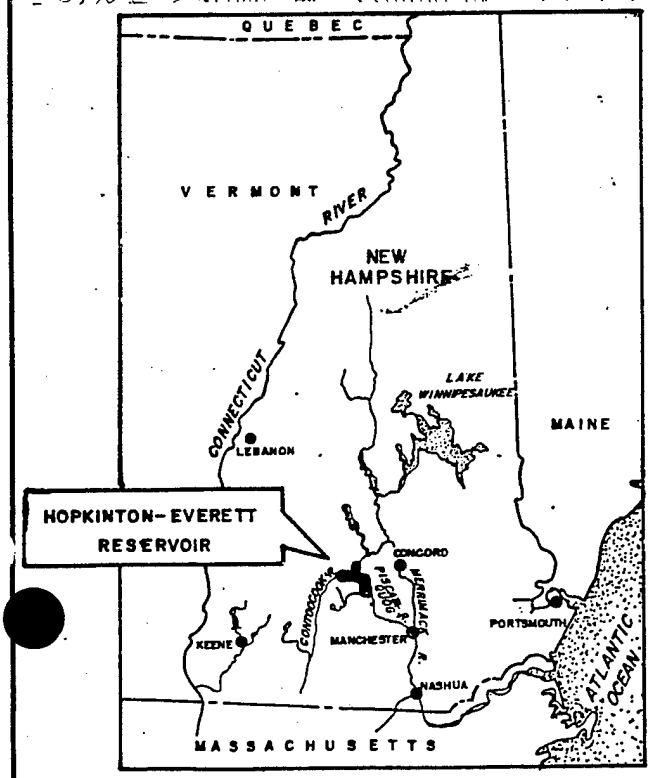
Grout should be placed in the voids of the stone revetment at the junction of the stone revetment and the northeast corner of the bridge. The junction is area of potential future scour because it

is weaker than the bridge abutment and grouted stone revetment on either side of it. Approximately one cubic yard of grout and a few hours of hand labor would be required to place the grout.

It is recommended that the beaver dam that was observed upstream of Choate Brook Bridge be removed. It appears that the dam might slightly alter the hydraulic characteristics of the stream and cause eddy currents which could lead to additional scour near the bridge. Rental of a small truck and a few hours of hand labor would be needed to remove the debris.

IV. APPENDIX

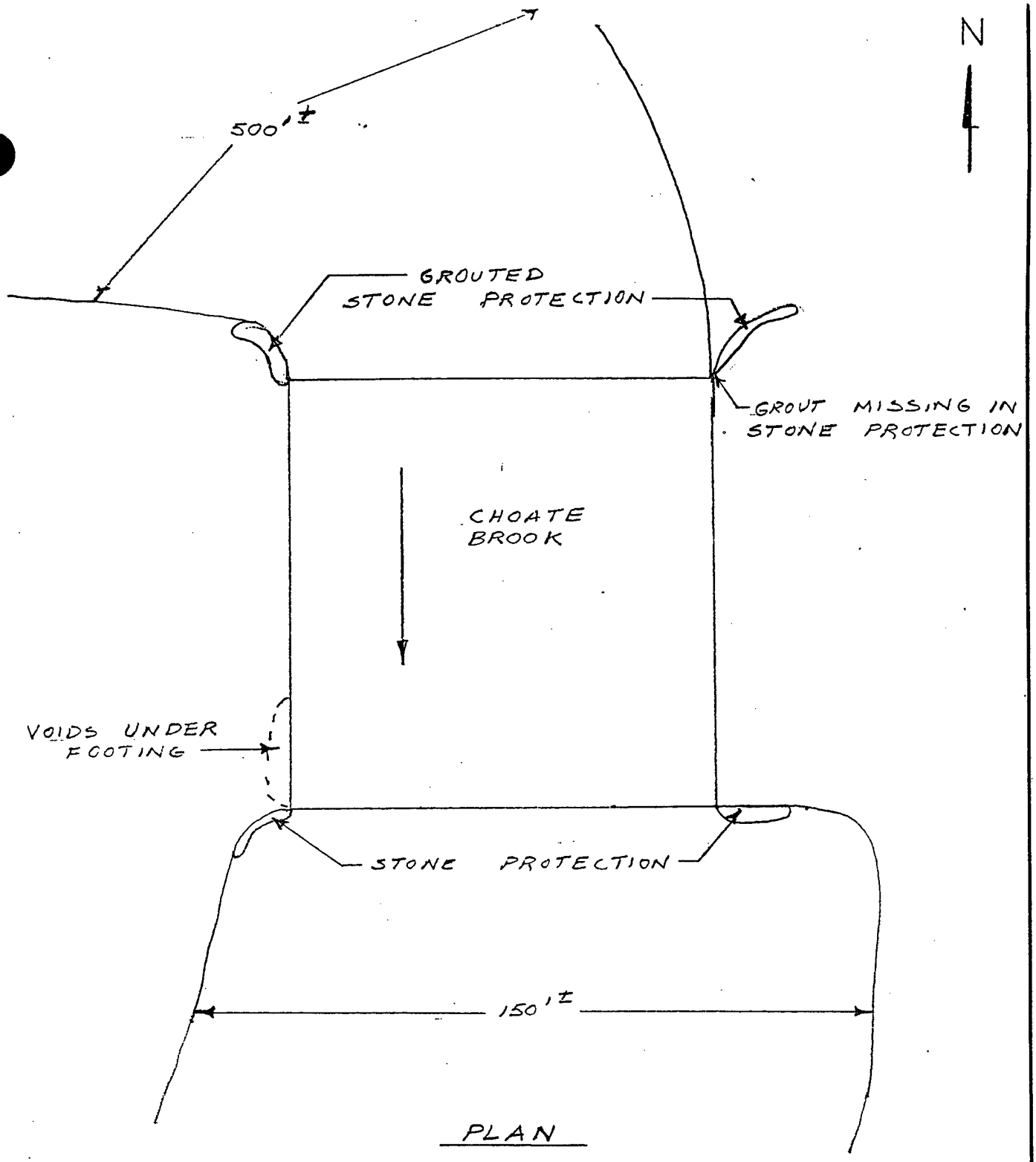




DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY PS	LOCUS PLAN
DR. BY PS	BRIDGE SCOUR STUDY
CK. BY	HOPKINTON-EVERETT LAKES

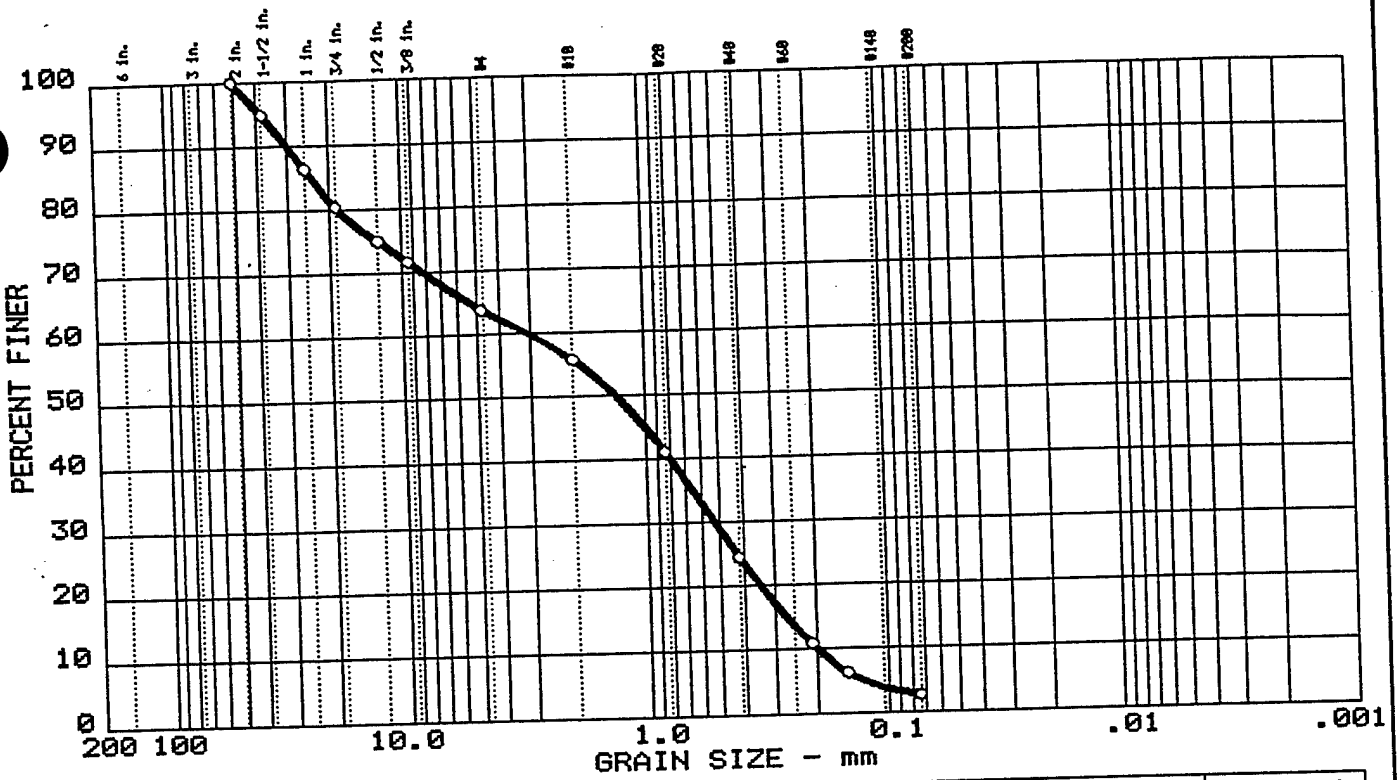
GEOTECH. ENG. BR. SCALE: 1:24,000
SK. NO. 1 DATE: 7 SEPT. 93



PLAN

DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION CORPS OF ENGINEERS WALTHAM, MASS.	
PS DES. BY	CHOATE BROOK BRIDGE SKETCH
PS DR. BY	BRIDGE SCOUR STUDY
CK. BY	HOPKINTON-EVERETT LAKES
GEOTECH. ENG. BR. SK. NO. 2	SCALE: NTS DATE: 7 SEPT 93

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	1	0.0	36.2	61.1	2.7	

	LL	PI	D_{75}	D_{60}	D_{50}	D_{30}	D_{25}	D_{10}	C_c	C_u
○			12.59	3.09	1.32	0.525	0.4266	0.1972	0.45	15.7

MATERIAL DESCRIPTION	USCS	AASHTO
○ POORLY GRADED SAND WITH GRAVEL	SP	

Project No.: 124-1-1
Project: CHOATE BROOK BRIDGE (EVERETT DAM) , N.H.
○ Location: SAMPLE TAKEN FROM ON-SITE

Date: 9-3-93

GRAIN SIZE DISTRIBUTION TEST REPORT
CORPS OF ENGINEERS - NEW ENGLAND

Remarks:
SAMPLE FOR SCOUR STUDY
COLOR: MEDIUM BROWN
TRACES OF BITUMINOUS
MATERIAL FOUND IN SAMPLE

Fig. No. 1

GEOTECHNICAL ASSESSMENT

FOR

BRIDGE SCOUR STUDY

AT

THREE BRIDGES

BIRCH HILL RESERVOIR

WINCHENDON, MASSACHUSETTS

AUGUST 1993

GEOTECHNICAL ASSESSMENT

FOR

BRIDGE SCOUR STUDY

AT

THREE BRIDGES

BIRCH HILL RESERVOIR

WINCHENDON, MASSACHUSETTS

TABLE OF CONTENTS

I. INTRODUCTION

1.1 General

This report presents a visual assessment of scour potential at three bridges situated in the reservoir area of Birch Hill dam. The work was done by Geotechnical Engineering Division as part of the NED Bridge inspection program.

1.2 Purpose and Scope

The purpose of the assessment was to obtain information on subsurface and streambed conditions at the three bridges and visually evaluate whether there is a potential for scour around their footings and abutments. The scope of work included:

a. Field reconnaissances of the sites July 1993.

b. Research of available geological and geotechnical information.

c. Laboratory testing of streambed samples collected during a July 1993 field reconnaissance of the sites.

d. Report to include locus plan, gradation curves, site description, subsurface and streambed conditions, and assessment.

II. SITE CONDITIONS

2.1 Site Location and Description

Birch Hill dam and reservoir are located along the Millers River, a tributary of the Connecticut River, in central Massachusetts. Priest Brook and Beaver Brook are tributaries of the southerly flowing Millers River, as shown on the Locus Plan in the Appendix. The Goodnow Road and Middle Road bridges cross Priest Brook. The Old Route 202 bridge crosses Beaver Brook. The three bridges are within one-half mile of the normal Millers River channel. The tributaries have fairly flat slopes in the vicinity of the three bridges and cut through a relatively flat floodplain. A moderate sloping hill ascends to the north of Old Route 202 bridge. Sketches (plan views) of the bridges and adjacent areas are included in the Appendix.

2.2 Bridge Descriptions

The three bridges have steel girder and concrete decks which bear on concrete abutments and footings except for the Middle Road bridge where the deck bears on chinked stone and mortar abutments and footings. Concrete wingwalls (at each corner) protect Goodnow Road and Old Route 202 bridges while chinked stone and mortar wingwalls (at each corner) protect Middle Road bridge. Gabion extensions have been added to the concrete wingwalls at Goodnow Road bridge.

It appears that the footings for all the bridges are founded on sand and gravel. The footings are in good condition except for the ones at Goodnow Road bridge which have been undermined. It appears high water velocities have eroded (scoured) the sand and gravel below the concrete footings at Goodnow bridge. A steel bar could be pushed from 0.5 to 3.5 feet into nine voids under the south abutment footing and 0.5 to 1 feet into six voids under the north abutment footing. Although voids were observed under the footings at Goodnow Road bridge, no distress cracks other than normal weathering were noted in the abutments.

2.3 Site Geology

The Millers River flows through a wide pre-glacial bedrock valley in the vicinity of the three bridges. The valley has been filled with deep glacial outwash deposits of sands and gravels. The river has eroded a narrow inner valley in the sands and gravels which is flanked by sand and gravel terraces. Priest and Beaver Brooks are tributaries that have cut narrow channels through the terraces to the river.

2.4 Streambeds and Streambanks

The streambeds of the two tributaries are slightly meandering.

They consist of clean, fine to coarse, sands and gravels with rounded to subangular cobbles and boulders. Gradations for the matrix portion of the streambed are included in the appendix. The cobbles and boulders in the streambed are typically 1 to 3 feet in diameter with a maximum diameter of 8 feet at the Goodnow Road bridge, typically 0.5 to 1.5 feet in diameter with a maximum diameter of 2 feet at Middle Road bridge and typically 0.25 to 0.75 feet diameter with a maximum diameter of 1 foot at Old Route 202 bridge. Two large boulders (6 to 8 feet in diameter) were observed in the streambed under Goodnow Road bridge. Also a pile (10 by 20 feet) of branches was observed upstream of Goodnow Road bridge. Beaver dams were observed Under Middle Road bridge and approximately 100 feet upstream of the bridge. They were approximately two and three feet high respectively..

The streambanks are typically fairly low (five feet or less high) and steep (1 vertical on 1 horizontal to 1 vertical on 3 horizontal). Medium to dense vegetation grows on the banks. A small amount of erosion of the bank materials at Middle Road bridge was observed. It has occurred 5 to 10 feet upstream of the chinked stone wingwalls. The two eroded areas (scour holes) are 20 to 25 feet long and up to 7 feet wide. It does not appear that the erosion is endangering the wingwalls or the bridge.

III. ASSESSMENT

3.1 Streambed and Streambank Material Characteristics

The streambed materials are deep deposits of hard, durable, rounded to subangular, sands, gravels, cobbles and boulders. The mean diameter, by weight, of the sand to boulder sized materials was visually estimated to be 1 to 1.5 feet at the Goodnow Road bridge, 0.5 to 1 feet at the Middle Road bridge and 0.25 to 0.5 feet at the Old Route 202 bridge. Laboratory gradation tests (Complete gradation test results are in Appendix.) were performed on samples of the sand and gravel matrix materials that exist between the cobbles and boulders. The results indicate that the mean diameter, by weight, of the streambed materials sampled is 1.5 millimeters (0.06 inches) at the Goodnow Road bridge, 0.63 millimeters (0.025 inches) at the Middle Road bridge and 10.1 millimeters (0.40 inches) at the Old Route 202 bridge. The mean diameters could be used in theoretical hydraulic studies to estimate the scour potential around the abutment footings.

3.2 Streambank Materials Characteristics

The streambank matrix material characteristics did not appear to be significantly different than the streambed matrix materials. However, the number and sizes of cobbles and boulders in the streambank materials appeared to be lower than the streambed materials.

3.3 Scour Potential

High water velocities have scoured material below the footings at Goodnow Road bridge as described in paragraph 2.2. It Appears high water velocities that have occurred during past flood events have not been a problem at Middle Road and Old Route 202 bridges. Field observations and measurements indicate that the top of the streambed is higher adjacent to the abutment footings than at the center of the stream channels at the Middle Road and Old Route 202 bridges. However, high water velocities have eroded streambank materials upstream of Middle Road bridge as described in paragraph 2.4. It appears the erosion of the streambanks near Middle Road bridge is due to the fact that there are fewer and smaller cobbles and boulders in the streambanks as noted in paragraph 3.2.

3.4 Remedial and Maintenance Work at Goodnow Road Bridge

The most pressing need is to fill the voids below Goodnow Road bridge footings. It appears further erosion could damage the abutments. A possible method for repairing the footings is to place concrete forms around the outside edges and then pump concrete into the eroded voids and the space between the footings and forms. Then the entire channel (from approximately 15 feet

upstream to 15 feet downstream of the bridge) should be lined with a stone blanket (estimated thickness of 2 to 3) underlain by a bedding layer (estimated thicknes of 1 to 1.5 feet). The stone blanket and bedding should extend to the top of the banks upstream and downstream of the bridge.

It recommended that the tree debris that was observed upstream of Goodnow bridge be removed. It appears that the debris might slightly alter the hydrologic characteristics of the stream and cause eddy currents which could lead to additional scour near the bridge. Rental of a small truck and a few hours of hand labor would be needed to remove the debris.

3.5 Maintenance Work at Middle Road Bridge

It recommended that the Beaver dam that was observed under Middle Road bridge be removed. It appears that the dam alters the hydrologic characteristics of the stream and causes eddy currents which could lead to scour near the bridge. Rental of a small truck and a few hours of hand labor would be needed to remove the dam.

It is recommended that the erosion upstream of Middle Road bridge be monitored during future bridge inspections. If it appears that the erosion is beginning to endanger the wingwalls, properly designed stone revetments should be constructed to reduce the erosion. They should extend from the streambed to the top of the streambank. The stone revetments are not expected to be major remedial items.

3.6 Old Route 202 Bridge

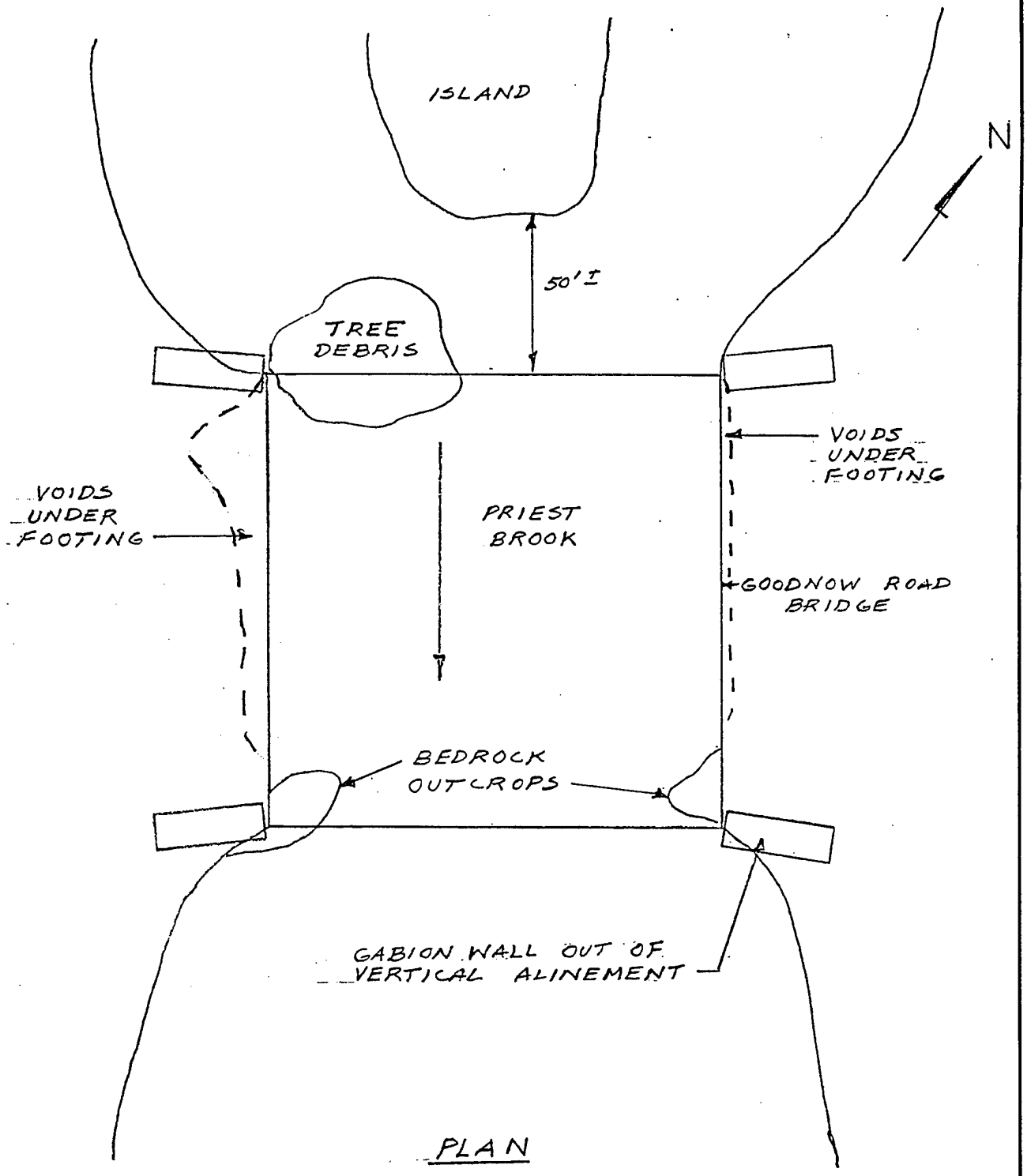
Substantial scour problems were not observed near the Old Route 202 bridge. No remedial or maintenance measures are recommended now at the Old Route 202 bridge.

IV. APPENDIX

USGS QUADRANGLE MAP
OF
WINCHENDON, MASS - NH
SCALE 1:25,000

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY: PS	LOCUS PLAN
DR. BY: PS	BRIDGE SCOUR STUDY
CK. BY:	BIRCH HILL DAM RESERVOIR
GEOTECH. ENG. BR.	SCALE: 1:25000
SK. NO. 1	DATE: 11 AUG. 93

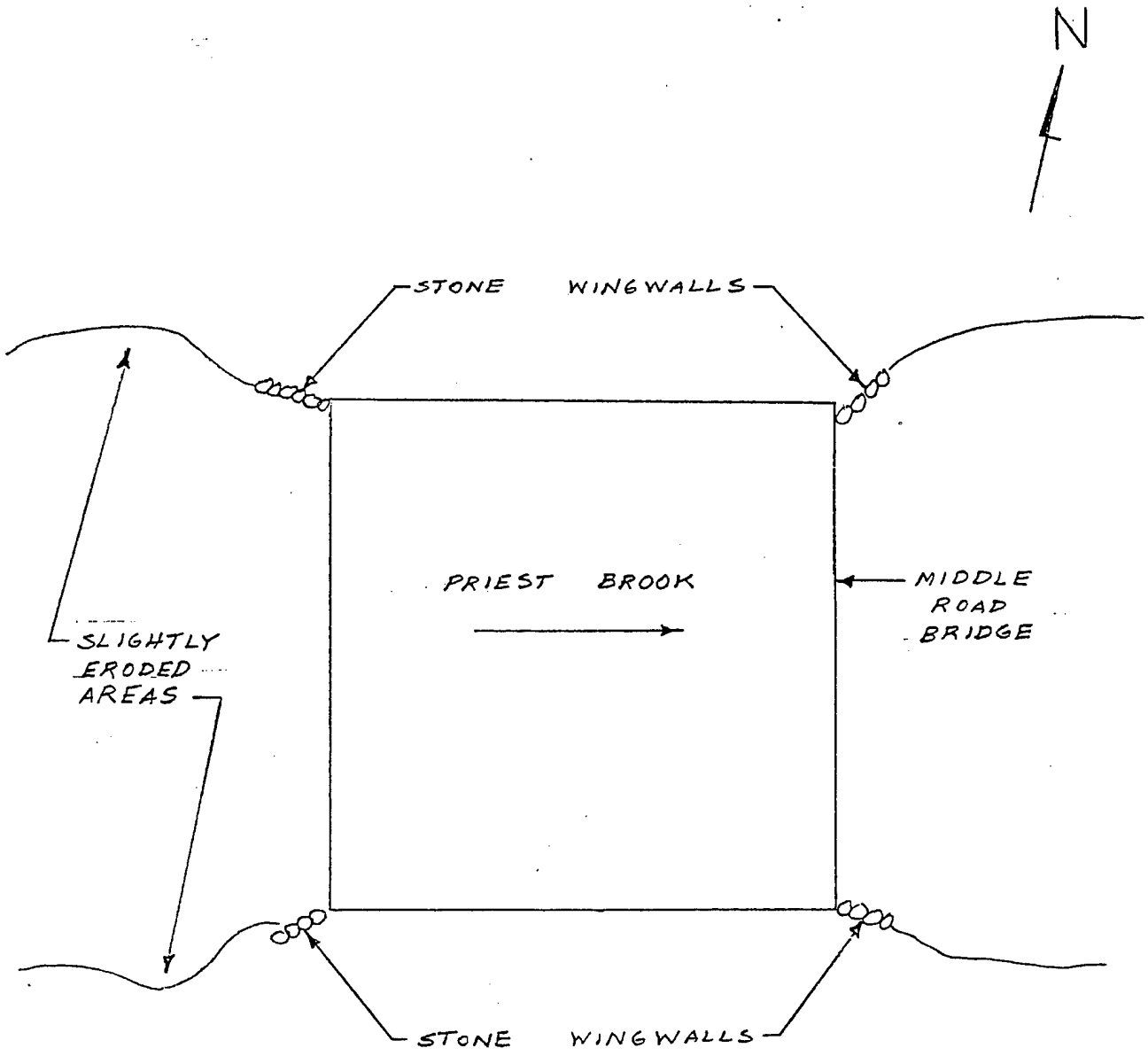


PLAN

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

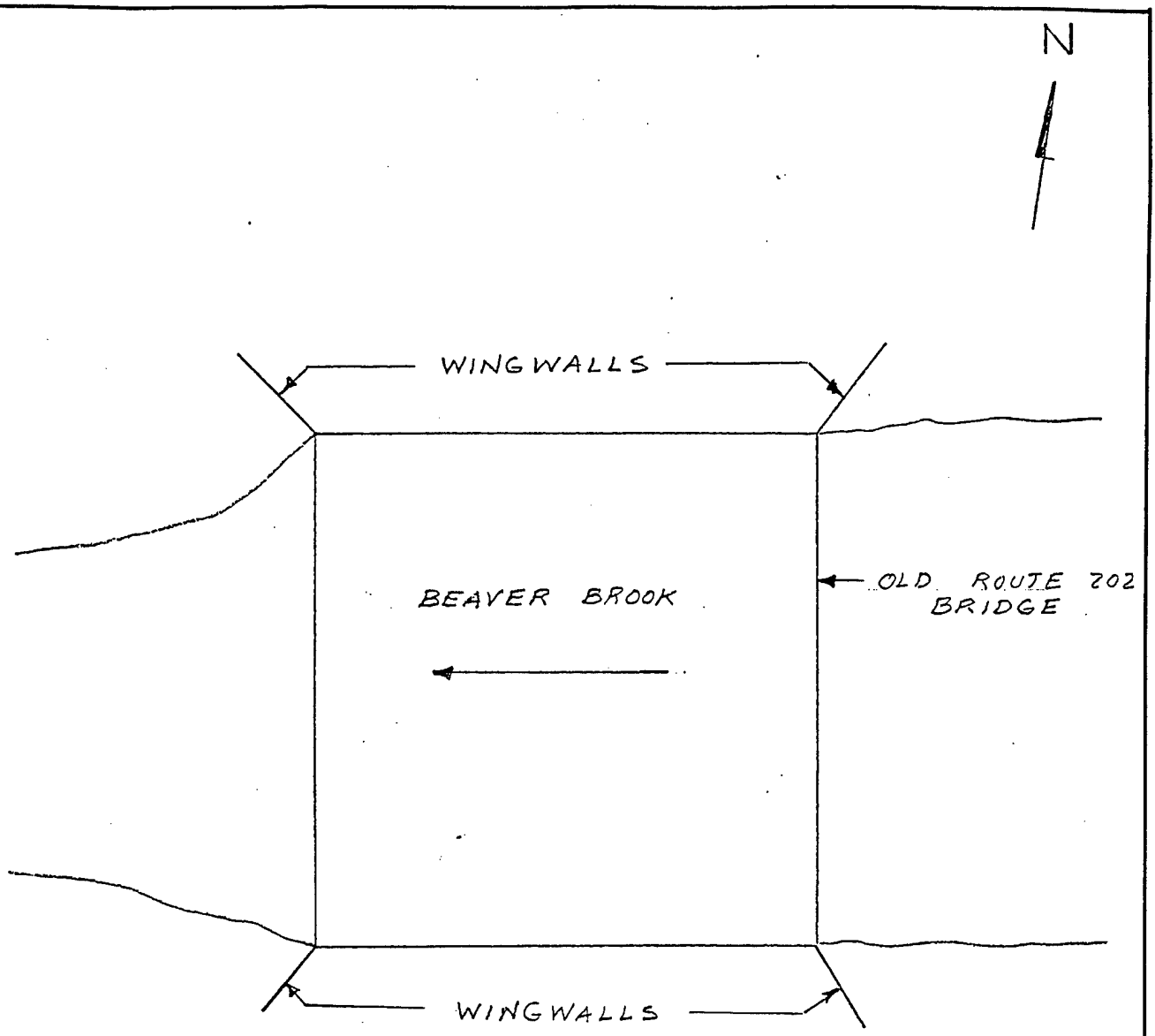
PS DES. BY	GOODNOW ROAD BRIDGE SKETCH
PS DR. BY	BRIDGE SCOUR STUDY
CK. BY	BIRCH HILL DAM RESERVOIR

GEOTECH. ENG. BR. SCALE: NTS
SK. NO. 2 DATE: 12 AUG. 93



PLAN

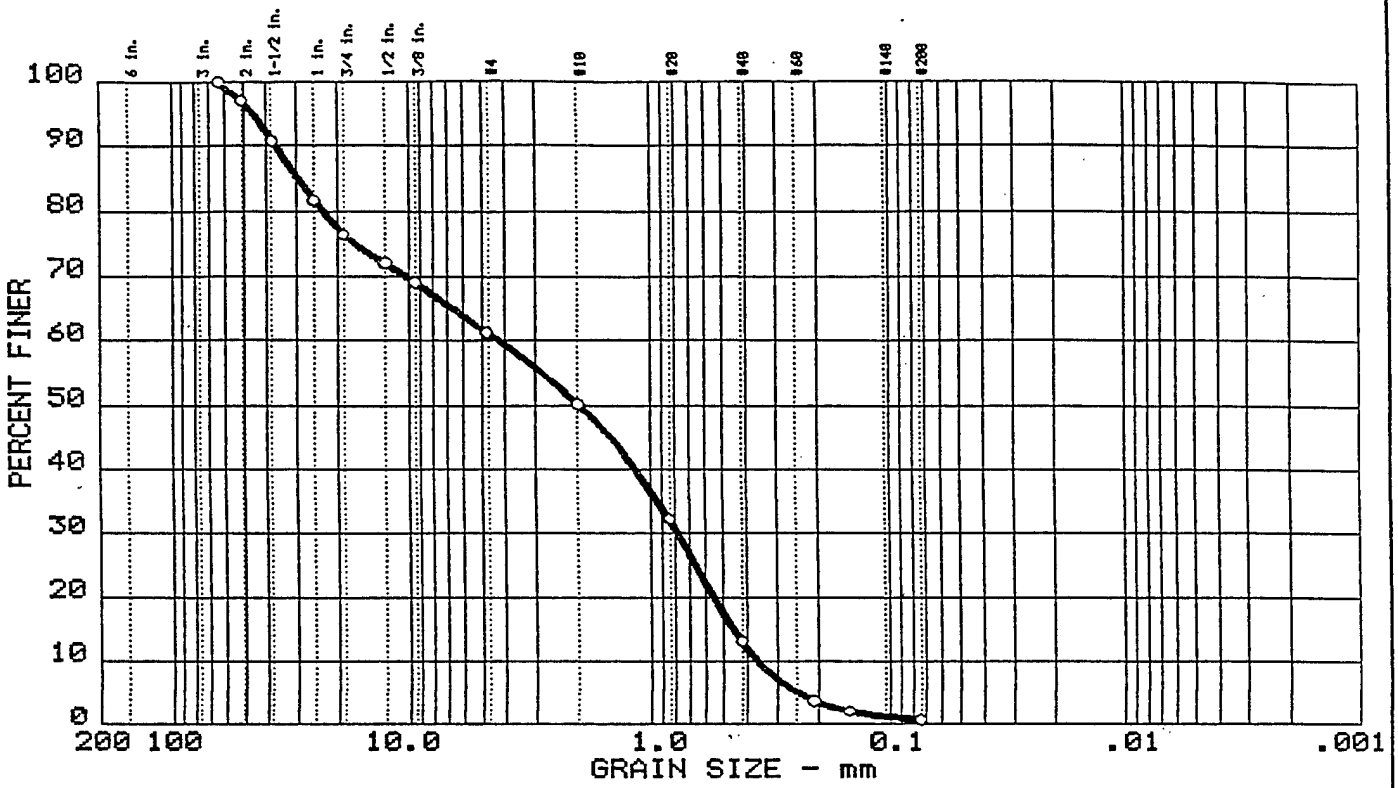
DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION CORPS OF ENGINEERS WALTHAM, MASS.	
PS DES. BY	MIDDLE ROAD BRIDGE SKETCH
PS DR. BY	BRIDGE SCOUR STUDY
CK. BY	BIRCH HILL DAM RESERVOIR
GEOTECH. ENG. BR. SK. NO. 3	SCALE: NTS DATE: 12 AUG. 93



PLAN

DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION CORPS OF ENGINEERS WALTHAM, MASS.	
PS DES. BY	OLD ROUTE 202 BRIDGE SKETCH
PS DR. BY	BRIDGE SCOUR STUDY
CK. BY	BIRCH HILL DAM RESERVOIR
GEOTECH. ENG. BR. SK. NO. 4	SCALE: NTS DATE: 12 AUG 93

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	1	0.0	38.7	60.6	0.7	

	LL	PI	D_{75}	D_{60}	D_{50}	D_{30}	D_{25}	D_{10}	C_c	C_u
○			17.18	4.22	1.95	0.773	0.6501	0.3573	0.40	11.8

MATERIAL DESCRIPTION	USCS	AASHTO
○ POORLY GRADED SAND WITH GRAVEL	SP	

Project No.: 33-17-1
Project: BIRCH HILL DAM (WINCHENDON, MASS)
○ Location: GOODNOW BRIDGE STREAMBED

Date: 7-16-93

Remarks:

SAMPLE TAKEN FROM THE STREAMBED MATERIAL.

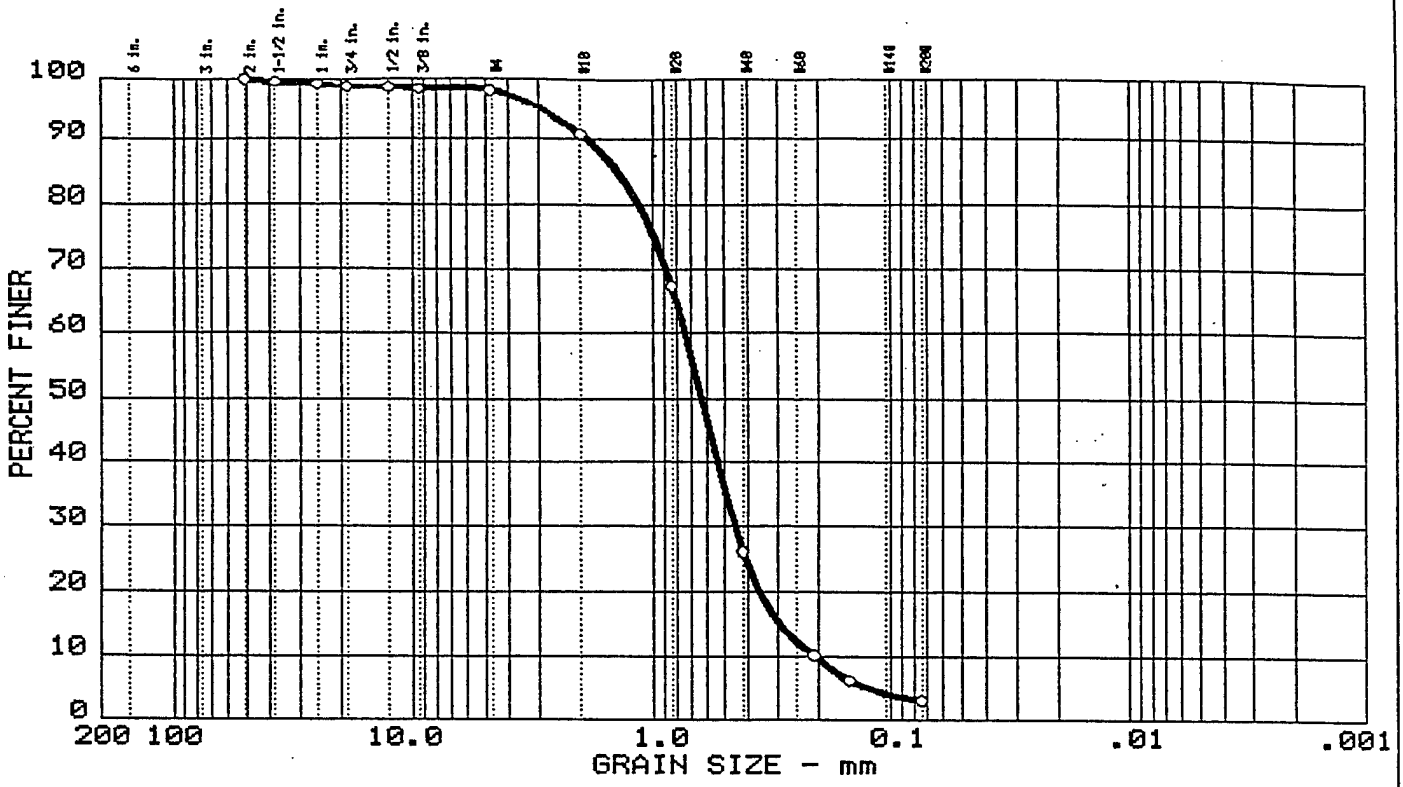
COLOR: MEDIUM BROWN

GRAIN SIZE DISTRIBUTION TEST REPORT

CORPS OF ENGINEERS - NEW ENGLAND

Fig. No. 1

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	2	0.0	2.0	94.8	3.1	

	LL	PI	D_{75}	D_{60}	D_{50}	D_{30}	D_{25}	D_{10}	C_c	C_u
○			0.99	0.74	0.63	0.454	0.4093	0.2051	1.36	3.6

MATERIAL DESCRIPTION	USCS	AASHTO
○ POORLY GRADED SAND	SP	

Project No.: 33-17-2
Project: BIRCH HILL DAM (WINCHENDON, MASS)
○ Location: MIDDLE BRIDGE STREAMBED

Date: 7-16-93

Remarks:

SAMPLE TAKEN FROM THE STREAMBED ~~STOCK-PILED~~ MATERIAL.

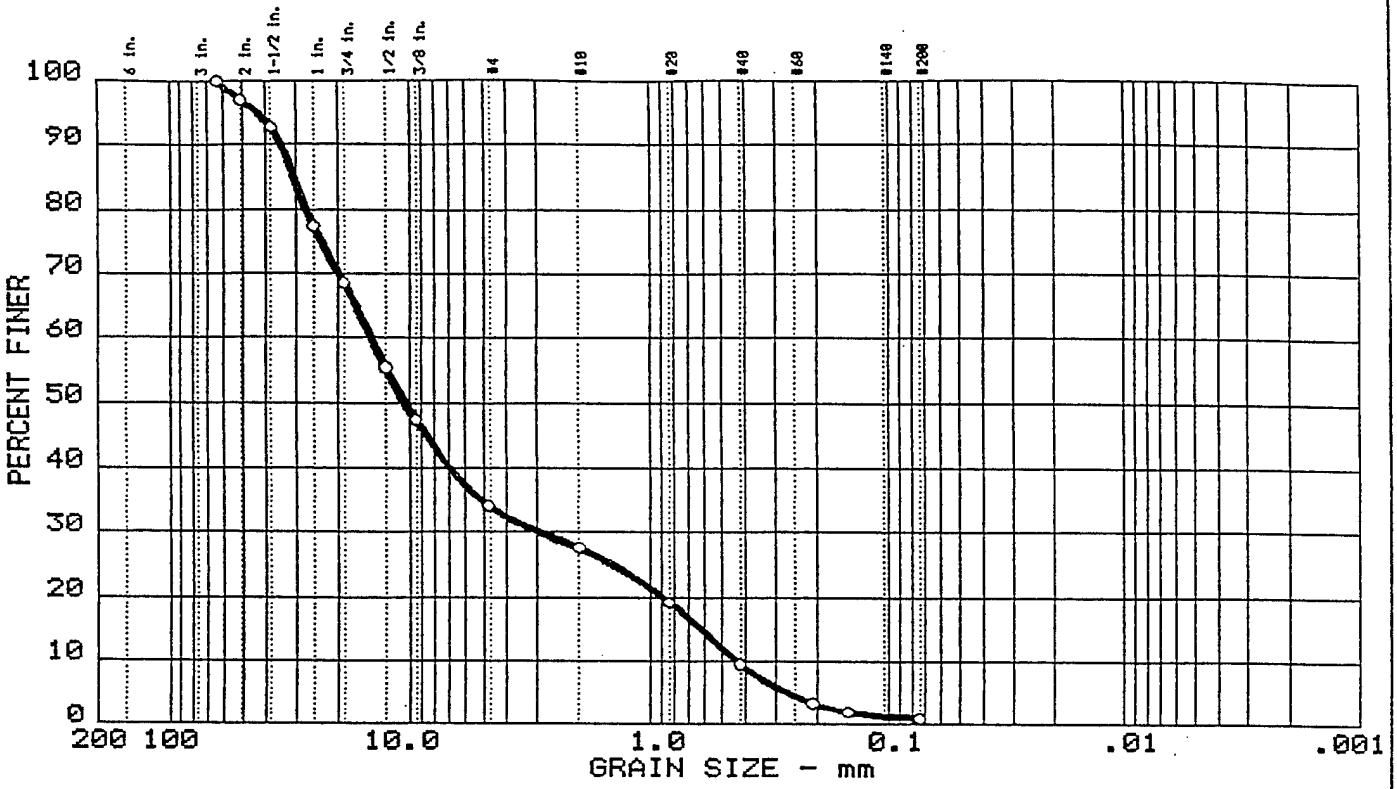
COLOR: LIGHT BROWN

GRAIN SIZE DISTRIBUTION TEST REPORT

CORPS OF ENGINEERS - NEW ENGLAND

Fig. No. 2

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	3	0.0	65.8	33.2	0.9	

	LL	PI	D_{75}	D_{60}	D_{50}	D_{30}	D_{25}	D_{10}	C_c	C_u
○			23.63	14.57	10.56	2.941	1.4077	0.4300	1.38	33.9

MATERIAL DESCRIPTION	USCS	AASHTO
○ WELL-GRADED GRAVEL WITH SAND	GW	

Project No.: 33-17-3
Project: BIRCH HILL DAM (WINCHENDON, MASS)
○ Location: OLD RT. 202 BRIDGE STREAMBED

Date: 7-16-93

Remarks:

SAMPLE TAKEN FROM THE STREAMBED MATERIAL.

COLOR: MEDIUM BROWN

GRAIN SIZE DISTRIBUTION TEST REPORT

CORPS OF ENGINEERS - NEW ENGLAND

Fig. No. 3