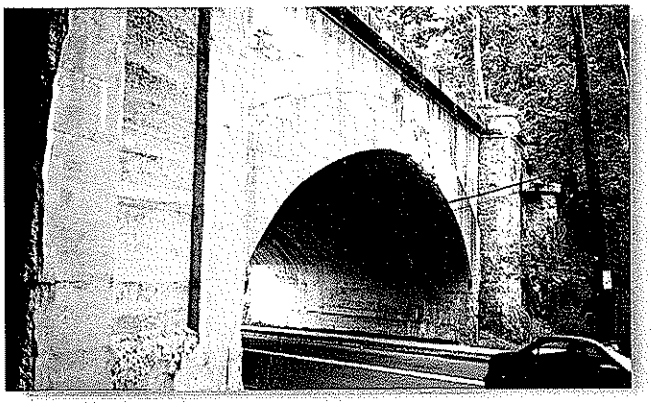
Village of Pelham

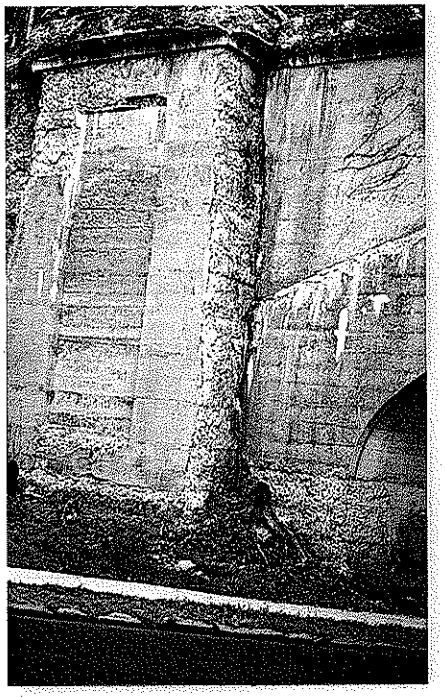
Harry Pallett

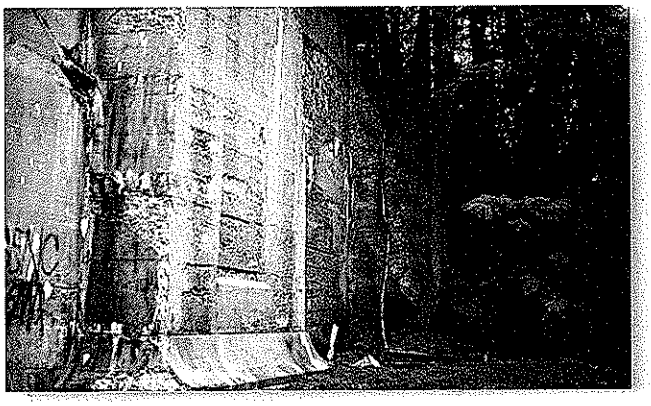
195 Sparks Avenue, Pelham, New York 10803



WESTCHESTER COUNTY

INSPECTION, TESTING AND ASSESSMENT OF THE HIGHBROOK AVENUE NEW YORK, WESTCHESTER AND BOSTON RAILWAY BRIDGE





BERGER, LEHMAN Associates, P.C.

Consulting Engineers
Transportation Planners

February, 2001

411 Theodore Fremd Avenue, Rye, New York 10580 (914) 967-5800 www.bergerlehman.com

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INTRODUCTION:

Berger, Lehman Associates, P.C. has been retained by the Village of Pelham to assess the stability of the New York, Boston and Westchester Railroad Bridge over Highbrook Avenue and to provide recommendations for corrective actions including cost estimates for both restoration and demolition.

The bridge was constructed in approximately 1910 as part of the New York, Westchester, & Boston Railway, a subsidiary of the New York, New Haven and Hartford Railroad. The bridge over Highbrook Avenue carried two electrified tracks that connected New Rochelle and Mt. Vernon. The New York, Westchester & Boston Railway declared bankruptcy in 1937 and stopped service. The last train to be carried by the Highbrook Avenue Bridge was reportedly in 1942 when a work train was used to remove the rails.

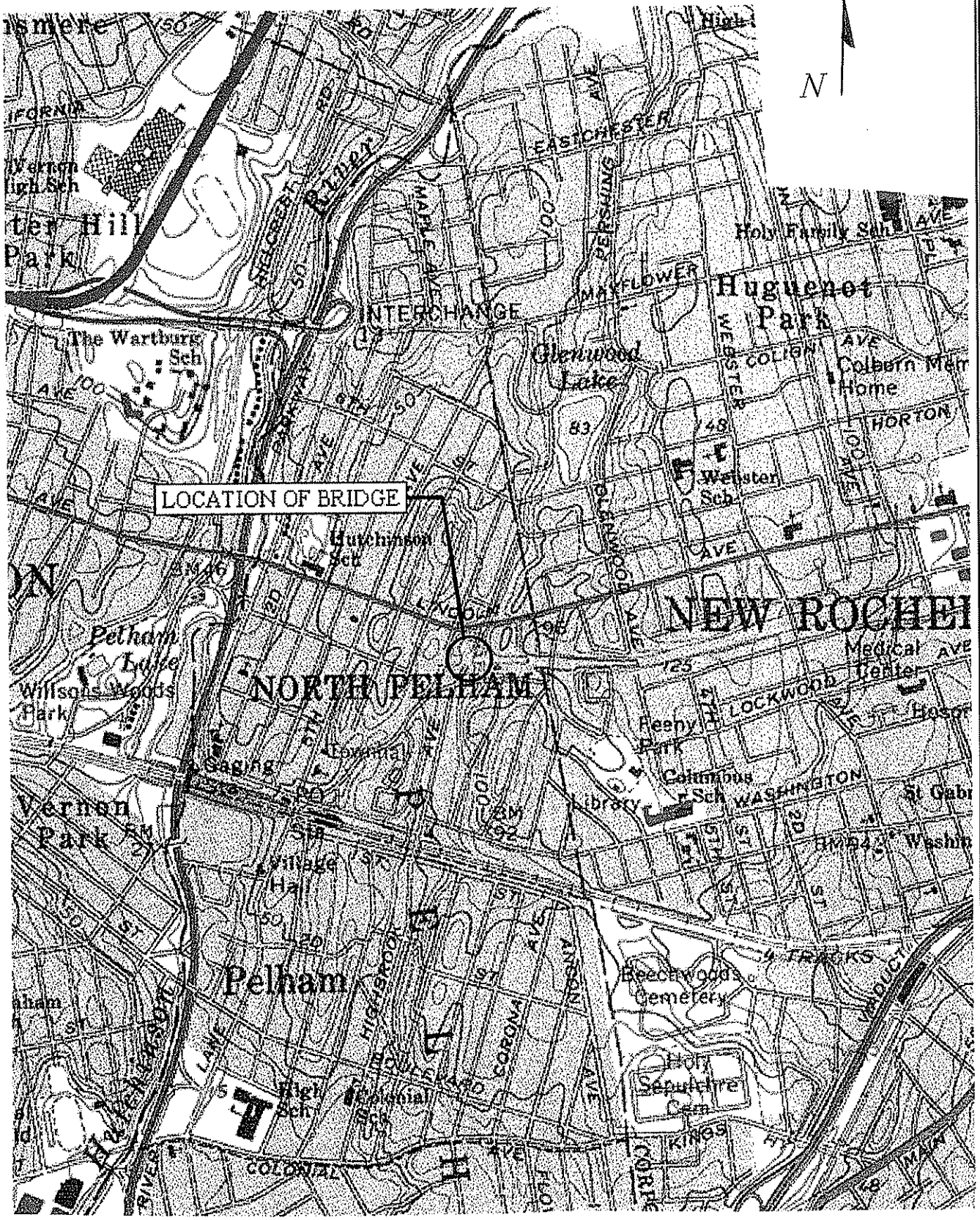
The bridge spans Highbrook Avenue which runs approximately North-South between Lincoln Avenue and Harmon Avenue. Highbrook Avenue is two lanes with a measured curb to curb width of 28 feet 4 inches and four foot wide sidewalks on each side. The vertical faces of the arch are set back approximately eleven feet six inches from the curb line on each side. At the curblines there is a minimum under clearance of 15 feet 4 inches. The under clearance at the centerline of Highbrook Avenue measured 17 feet at the north fascia and 17 feet 8 inches at the south fascia. Above the west curbline there are 6 wires which appear to be the following: 2 large diameter electrical cables, 1 span wire, and 3 smaller diameter wires carrying telephone and cable television.

The bridge is on a skew of approximately 18.5 degrees with a span length of 54 feet. The width of the bridge measured 46 feet. The vertical depth of the arch measured approximately thirteen feet at the legs and three feet eight inches at the crown. From spalled areas on the underside of the arch it was ascertained that the intrados was reinforced with one inch diameter steel bars at twelve to fourteen inches spacing. At the crown of the arch the earth and ballast is retained with five foot high spandrel walls. The spandrel walls were measured to be approximately fourteen feet at the ends of the arch. At the center of the span on each fascia is a decorative three foot by five foot high concrete emblem.

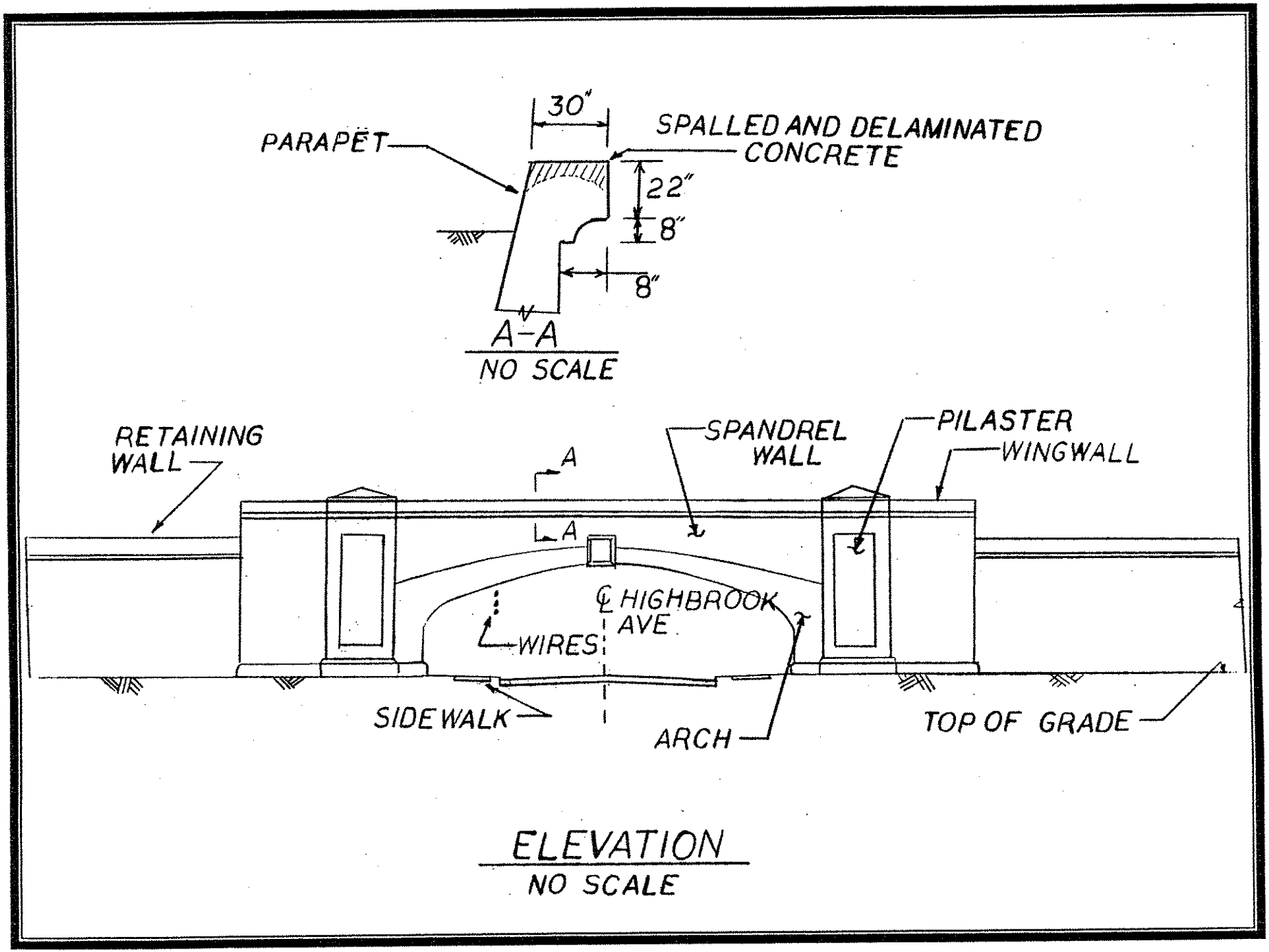
On top of the structure the spandrel walls protrude approximately two feet above the fill. The measured width of the top of the fill was 35 feet from inside of spandrel wall to inside of spandrel wall. The width of the top of the spandrel wall measured 30 inches which includes a coping of eight inches located 22 inches from the top. Access to the top of the structure is restricted by fences on both approaches.

Wingwalls are located at each corner of the arch and were measured to be 29.5 feet long and 24 feet high from the existing ground line. Each wingwall has a decorative pilaster fourteen feet wide, topped with a concrete pyramid, which protrudes two feet two inches out from the wall. Within the pilaster there is a 15.5 foot by 6 foot decorative inset.

Retaining walls extend beyond the wingwalls until the railroad fill meets the surrounding



LOCATION PLAN


30"
PARAPET
SPALLED AND DELAMINATED CONCRETE
22"
8"
8"
A-A
NO SCALE
RETAINING WALL
A
SPANDREL WALL
PILASTER
WINGWALL
A
℄ HIGHBROOK AVE
WIRES
SIDEWALK
ARCH
TOP OF GRADE
ELEVATION
NO SCALE

grade. The retaining walls are approximately five feet shorter in height than the wingwalls and4 protrude out from the wingwall face by four feet six inches. At the west approach the wingwalls which are 152 feet long on the north side and 175 feet long on the south side extend to Pell Place. The east approach wingwalls extend 64 feet on the north side and 95 feet on the south side.

Approximately forty feet west of the span are concrete foundations on both sides of the approach; these are assumed to be for a steel catenary support previously removed.

The structure has a plate bearing the New York State BIN (Bridge Identification Number) 7712879, indicating that the bridge is in New York State Department of Transportation's Bridge Inventory System. A record search at NYSDOT Region 8 office in Poughkeepsie indicated that the bridge was last inspected in 1979, but the inspection report could not be found.

There are no plans available for the structure. There is narrative and pictorial information about the New York, Westchester and Boston Railway at the website www.nycsubway.org and in several books available at local libraries:

1. "Westchester County's Million-Dollar-A-Mile Railroad"
   Robert A Beng

2. "Westchester's Forgotten Railway"
   Roger Arcara

3. "The New Haven Railroad"
   John L. Weller

These include some photographs and references to the Highbrook Avenue bridge.

INSPECTION:

An inspection was conducted on the structure on December 18 and 21 of 2000. Hands on access to the underside of the arch, spandrel walls and the wingwalls was facilitated with the use of a bucket truck. Village of Pelham personnel closed off half of Highbrook Avenue at a time while the arch and spandrel walls were inspected. Exposed concrete in the arch and spandrel walls was sounded with a hammer to determine areas of hollow and delaminating concrete. Loose concrete was removed by inspection forces to the extent possible. Other areas of loose concrete that posed a safety hazard was marked with orange paint for further removal by Village forces. The Village of Pelham was notified of this need for removal by letter dated December 19, 2000. Areas of deterioration were documented and photographed.

Arch: The arch appeared to be constructed as five separate longitudinal sections with joints between the different sections. In addition each longitudinal section appeared to be constructed

in segments. The underside of the arch was found to be in fair condition. Spalling was found at the apex of the arch at both fascia lines. The spalling revealed steel reinforcing bars. The spalls are adjacent to a transverse joint on the south fascia and encompasses the transverse joint on the north fascia. The spalling at the north side extends along the fascia approximately four to five feet. Two spalls with exposed rusted steel bar were noted on the east side of the underside of the arch at the longitudinal joint between the first and second section and the second and third section from the north. Large areas of patch material were found approximately at the crown of both the second and third section from the north. Adjacent to the patch material is a spalled area. Patch material with adjacent spalling was also noted on the south section on the east side adjacent to the fascia. A small spall was noted on the south section adjacent to the fascia on the west side. A hollow area of approximately two square feet was sounded on the underside of the arch between the third and forth section towards the west side. Efflorescence, indicating leakage through the joint, was noted between the first and second section at the west side. A small transverse crack with efflorescence was noticed starting at the fourth longitudinal joint extending to the south for approximately two feet.

On both legs of the arch, the concrete has been painted to a height of approximately ten feet. The B.I.N. plate (7712870) is attached to the east leg. On the east leg a large spall of approximately forty square feet was noted. Other smaller spalls were noted at the ends of both legs and scattered within the leg. A large area of scaling was noted on the south side of the east leg. Minor scaling was noted in the center of the west leg.

The north face of the arch was noted to be in poor condition. While sounding, this face, a large quantity of concrete which posed a hazard was removed. The area of spalling, delaminations and cracking extended from the emblem at the crown to approximately 20 feet to the west. This area was marked in orange paint for additional removal by Village personnel. Large spalls were noted at the top and the bottom of the north face adjacent to both the east and west wingwall.

Large areas of spalling were noted on the south face of both the east and west leg of the arch. At the top of the south face of the arch adjacent to the east wingwall is a spall of approximately three square feet. There are two spalls noted at the bottom of the south face of the arch of approximately two square feet each; one located directly to the east of the emblem and the other located directly above the west sidewalk.

Spandrel Walls: The spandrel walls are supported on top of the arch and serve to retain the fill and ballast. They measured five feet high at the crown of the arch and approximately fourteen feet at the ends adjacent to the wingwalls. Included in those measurements are the 22 inch high parapets, with an additional eight inch coping, which protrudes out from the fascia walls by eight inches. The top of the parapets measured thirty inches. They were found to be extensively spalled and delaminated. A sounding of the top found the concrete to be extremely soft with the aggregate loose enough to be removed by hand. The south side of the south parapet was spalled for the length of the arch and was marked in orange to indicate the need for additional removal of concrete to address the hazardous condition. The north side of the north parapet was found to be spalled on the eastern third. At the crown a spall of approximately three square feet was

marked in orange indicating that additional removal of concrete is required. Adjacent to the spall is an area of cracking, delamination and efflorescence.

A sounding of the north spandrel wall revealed a section of approximately 15 square feet of hollow concrete with accompanying cracks and efflorescence. This area was marked in orange paint for removal. Three other horizontal cracks with efflorescence were noted on the western half of the north spandrel wall. Vines were found on the eastern half of the wall.

An inspection of the south spandrel wall revealed a ten inch wide hollow area extending the full height of the wall with a vertical crack and efflorescence in the center. This hollow area is located above the west sidewalk. Directly west of the crown on the south fascia wall is a two square feet area of scaling. On the eastern end of the south spandrel wall are two small spalls adjacent to the wing walls and two small horizontal cracks.

Wingwalls: The wingwalls appear to have been constructed with a thin layer of parging placed over layered mass concrete. The parging was found to be extensively compromised with large areas of it either spalled off, delaminated, or scaled. The underlaying concrete appeared to be of much poorer quality than that of the arch. Some of the aggregate in the concrete was noted to be rounded river rocks and mica; both which provide a poor bond to the surrounding cement matrix. There were no indications of reinforcing steel in the wingwall concrete. Where the parging has spalled the underlaying concrete was noted to be undergoing extensive deterioration. The concrete is delaminating throughout the exposed areas. A sounding with the hammer found a very soft matrix and easily removed aggregate. The north east wingwall exhibited the greatest deterioration with the loss of concrete estimated to be one foot deep at the top of the wingwall. The parapets, on top of all four wingwalls, were noted to be spalled for the complete length of the wingwalls. The decorative concrete pyramids that top the pilasters were found to be extensively spalled.

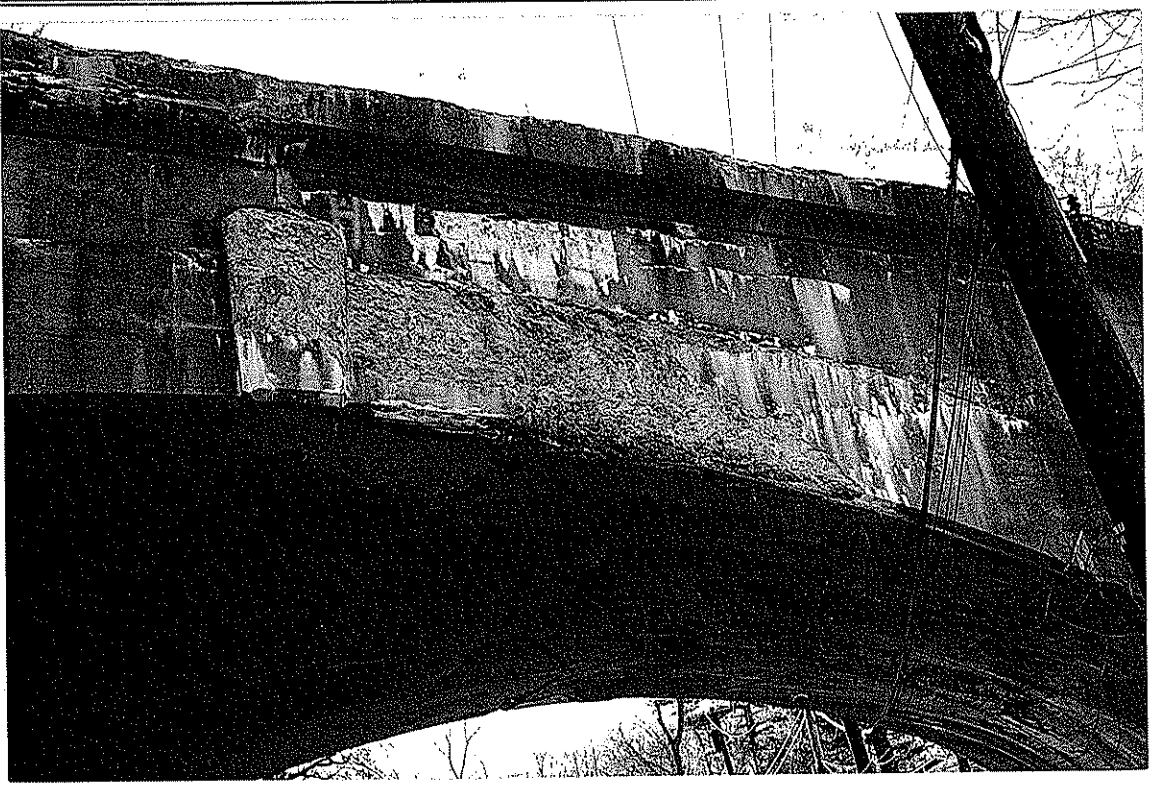
Retaining Walls: The top of the retaining walls were constructed to the top of railway grade and are currently covered with soil and vegetation. There is no fencing or other protection to prevent an accidental fall from the top. Nor is there any delineation visible. This is a potentially hazardous situation. Drainage from the upper grade at the juncture of the retaining walls with the wingwalls is causing extensive deterioration of the wingwalls. Since the retaining walls are built lower that the wingwalls it appears that surface water is being channeled to this juncture and eroding the concrete. At the beginning of both south wingwalls the concrete has been so eroded that the coping (originally on top of the wingwalls) have already fallen. On the northeast side the coping overhangs the eroded concrete by approximately three feet. In addition it is being dislocated by the root of a tree. This coping is in imminent danger of falling and it is recommended that it be removed in a controlled manner. The coping at the start of the northwest retaining wall overhangs the eroded concrete up to an estimated four feet. It is currently being supported by a column of extensively spalled concrete. While the area below this overhanging coping is fenced it is still recommended that it be removed in a controlled manner.

The retaining walls, similar to the wingwalls, appeared to be constructed of a thin layer of

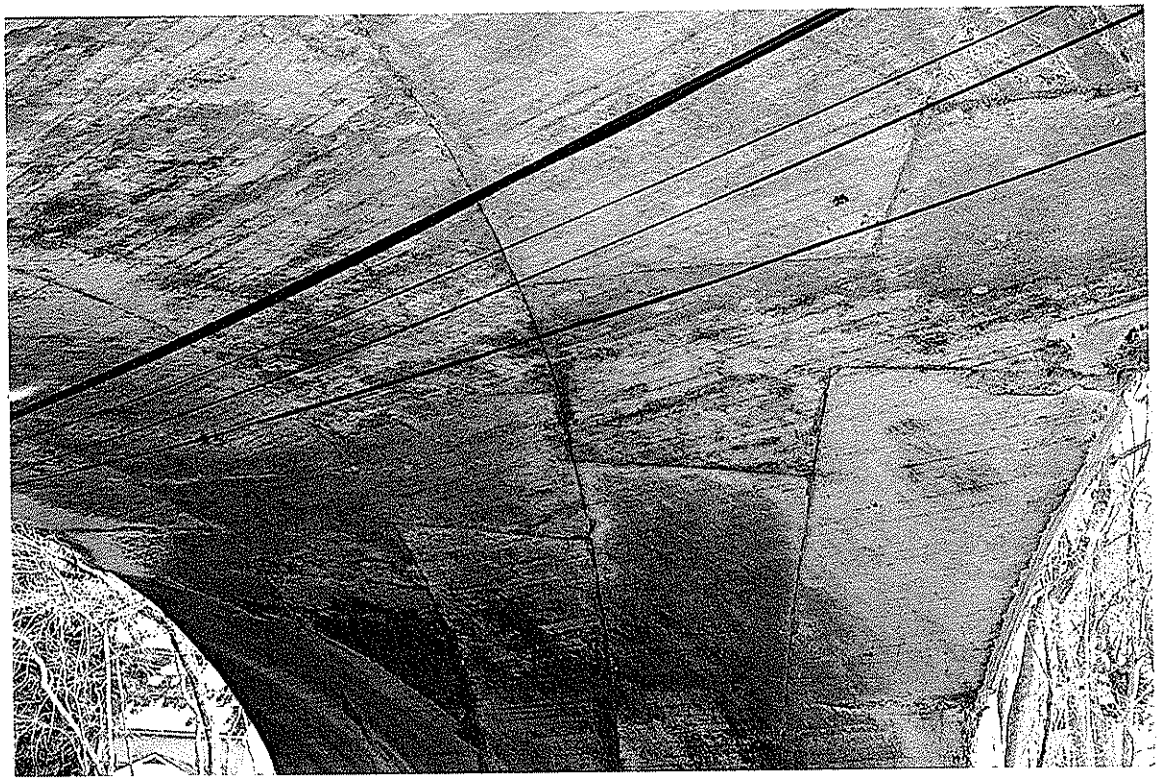
parging placed over mass concrete. The parging was found to be extensively compromised with large areas of it either spalled off, delaminated, or scaled. Other areas where the parging is intact found it cracked with efflorescence or with hollow areas. The underlaying concrete appeared to be of much poorer quality than that of the arch. There were no indications of reinforcing steel in the retaining wall concrete. Where the parging has spalled the underlying concrete was noted to be undergoing extensive deterioration. The concrete is delaminating throughout the exposed areas. A sounding with the hammer found a very soft matrix and easily removed aggregate. The northwest retaining wall exhibited the greatest deterioration. The last two sections of wall (approximately 90 feet in length) are covered with ivy and the concrete is delaminating with large areas hollow sounding. There is an area of approximately 2 feet by 10 feet of severely eroded concrete at the ground line. Losses were estimated to be up to 2 feet deep into the wall in this area. The beginning of the southeast retaining wall was found to be extensively spalled with large loss in the concrete. The large losses in the wall may be caused by surface water flowing down the wall during heavy rains. The large concrete losses in the walls will eventually compromise the earth retaining capability of the walls.

View of Structure from the South

B.I.N. Plate on East Leg of Arch



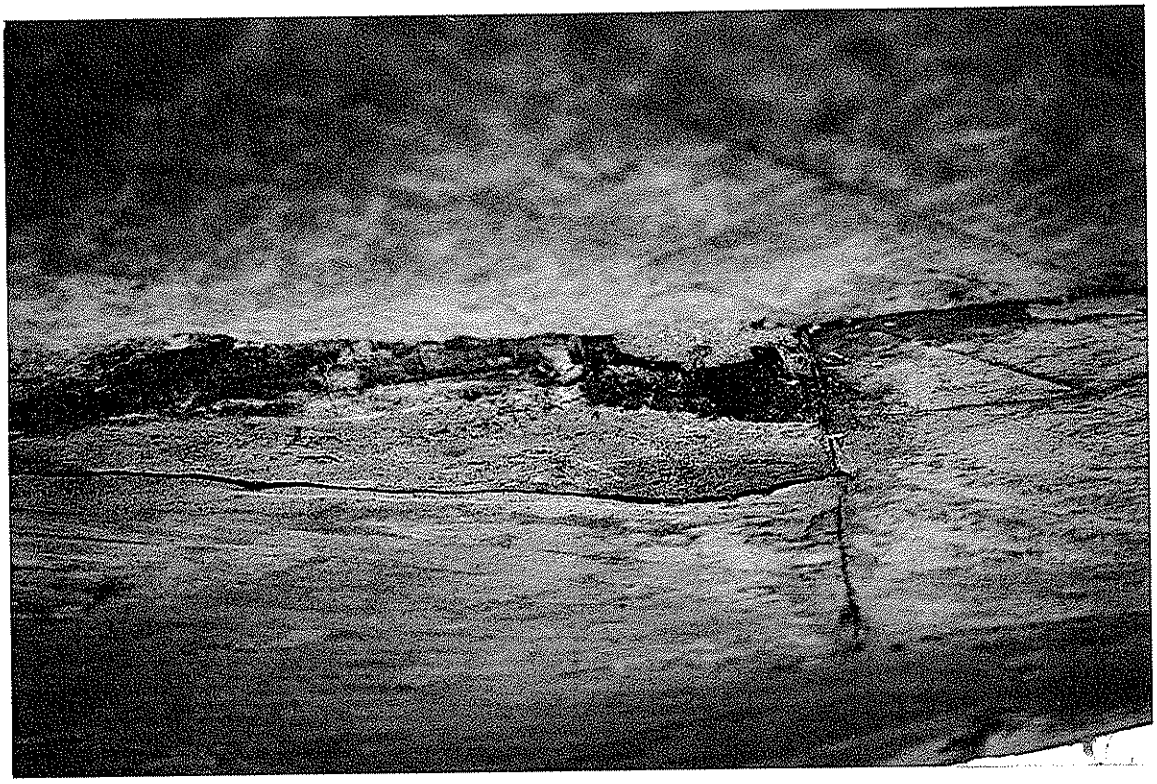
North Fascia
Note Delaminating Concrete on North Face of Arch
Note Hollow Areas, Cracks, & Efflorescence on Fascia Wall
Note Orange Paint Indicating Area Recommended for Further Concrete Removal



Underside of Arch Looking East
Note Longitudinal and Transverse Construction Joints

Underside of Arch at South Fascia
Note Exposed & Rusting Steel Bars

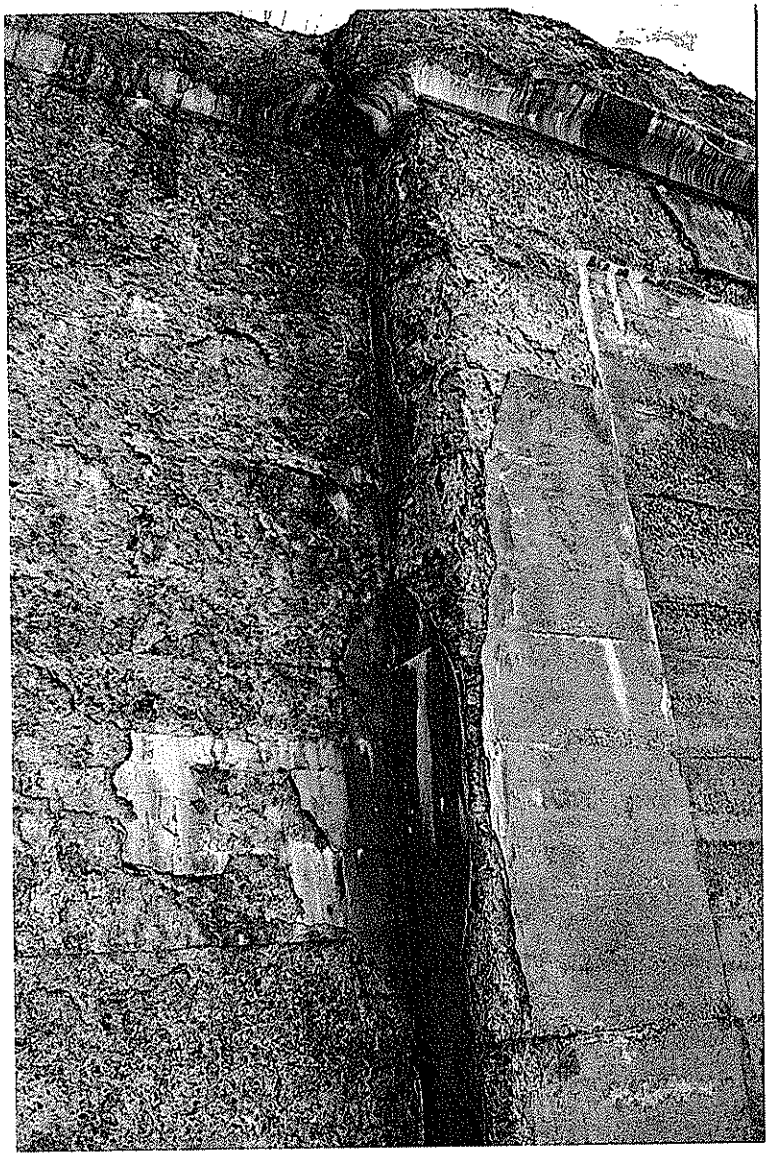
Spall on Underside of Arch with Exposed Steel Bars



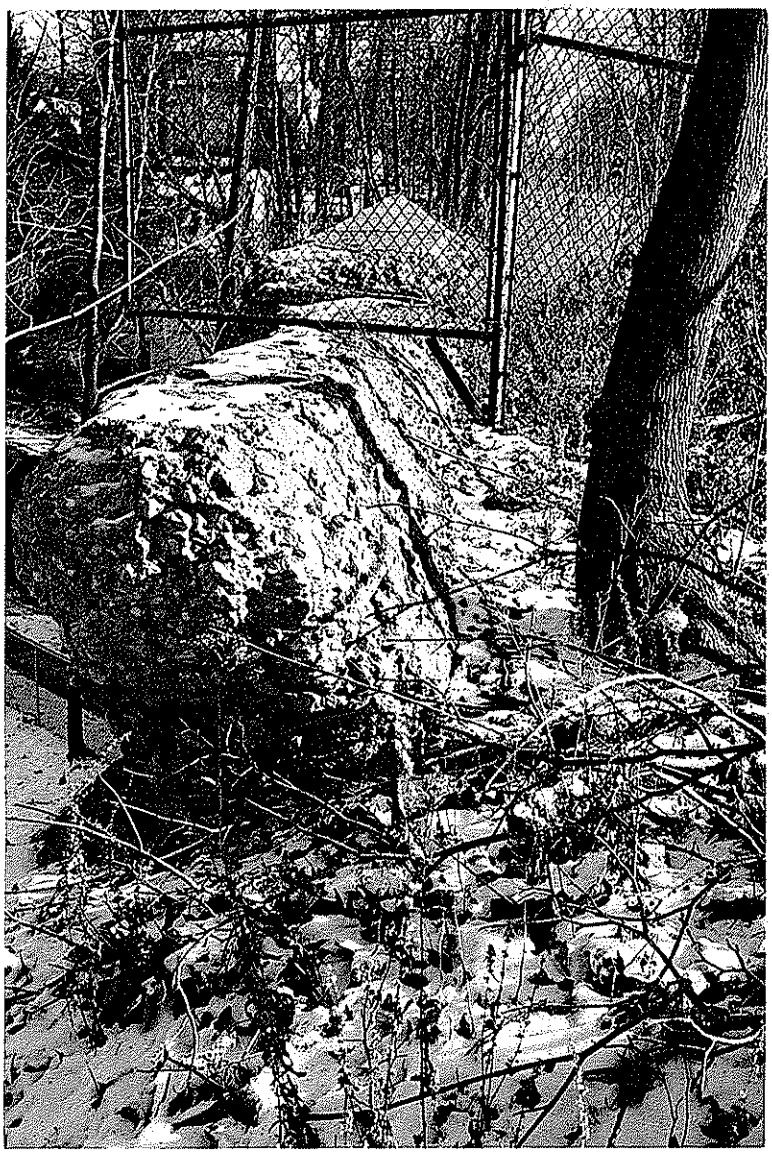
Underside of Arch
Note Separating Concrete
Note Orange Paint Indicating Area Recommended for Further Concrete Removal

Close-up of Typical Wingwall Concrete
Note Delaminating Concrete

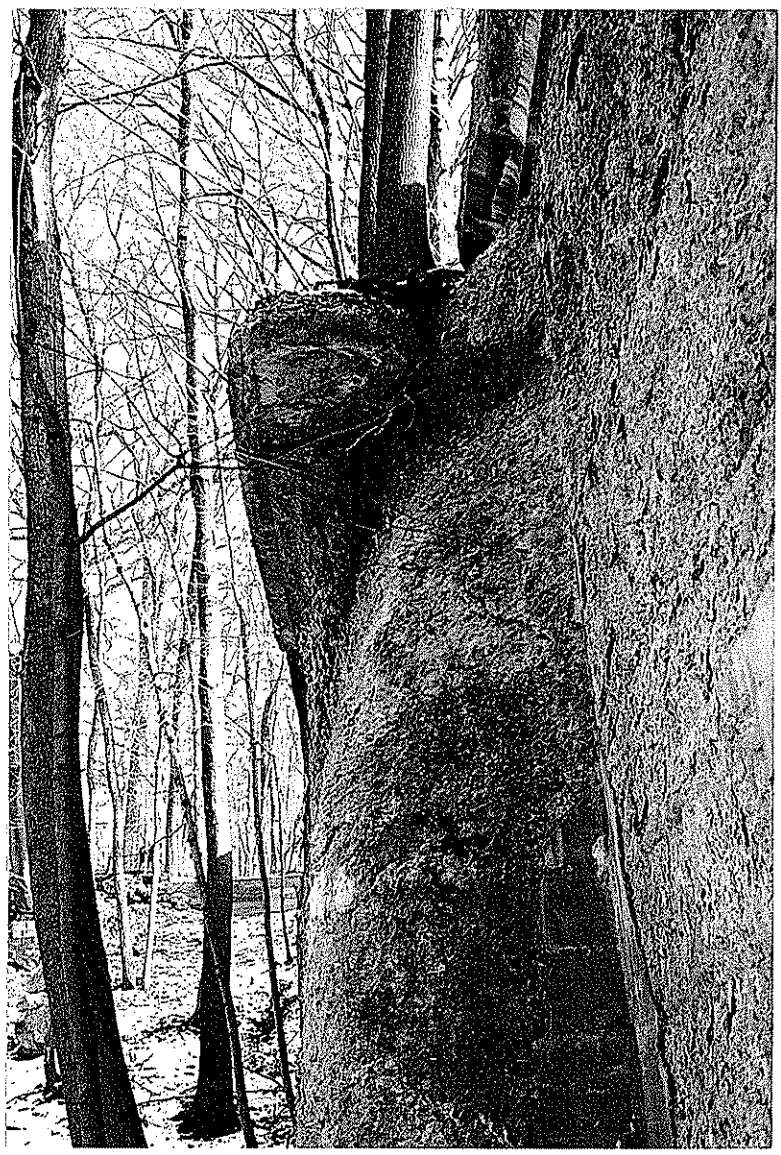
Northwest Wingwall Pilaster- Typical Condition
Note Severely Eroded Concrete



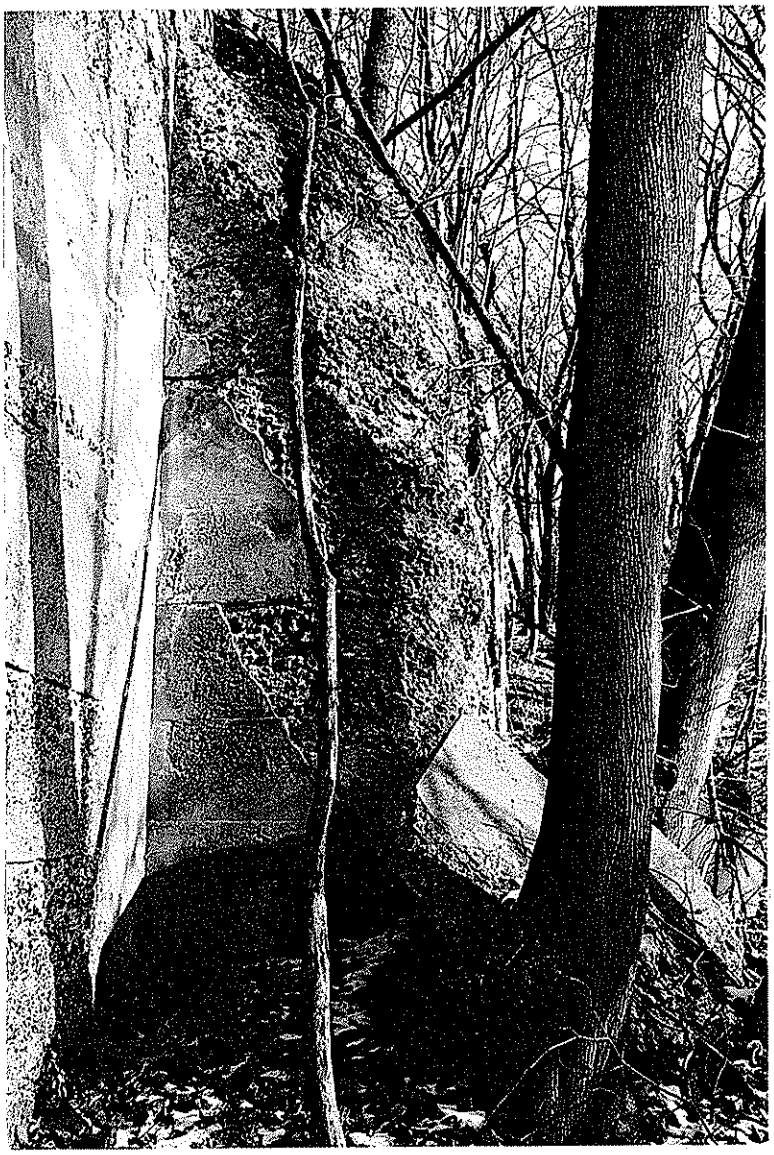
Northeast Wingwall
Note Delaminated Parging and Spalling Concrete



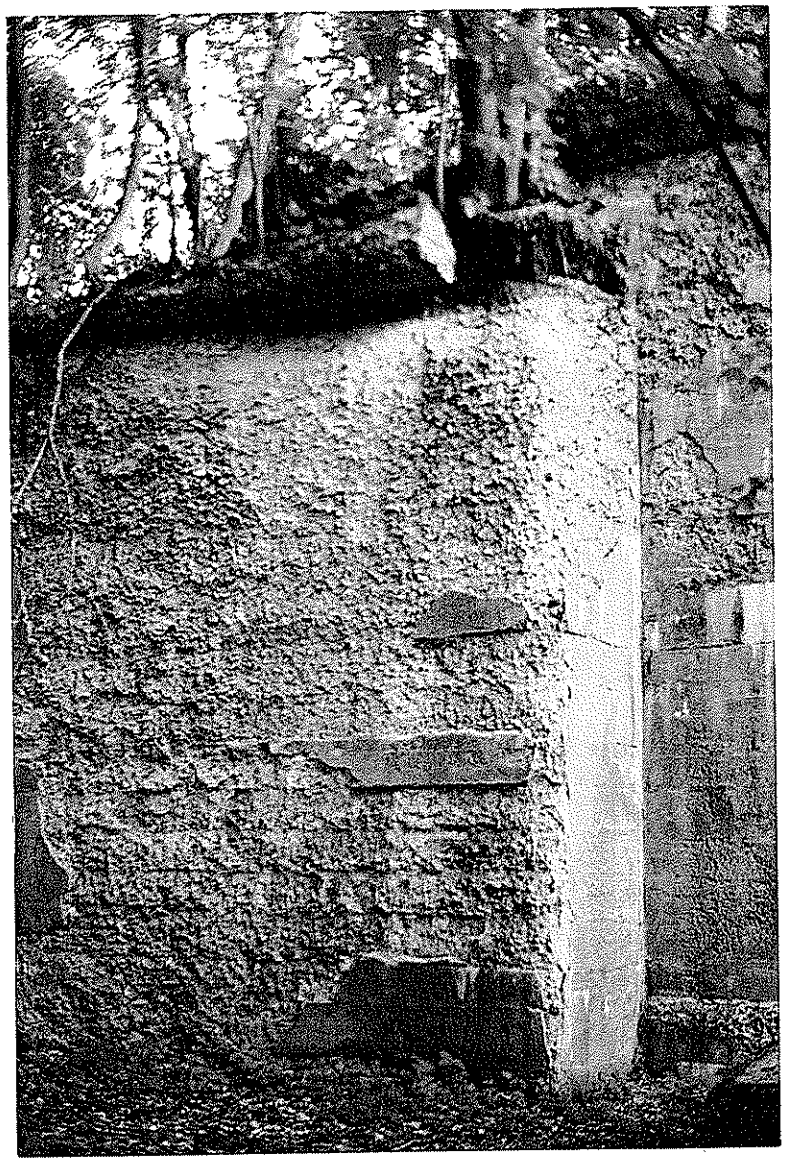
End of Northwest Wingwall with Exposed Parapet
Looking East



Northeast Retaining Wall
Note Tree Dislocating Coping and Erosion of Concrete

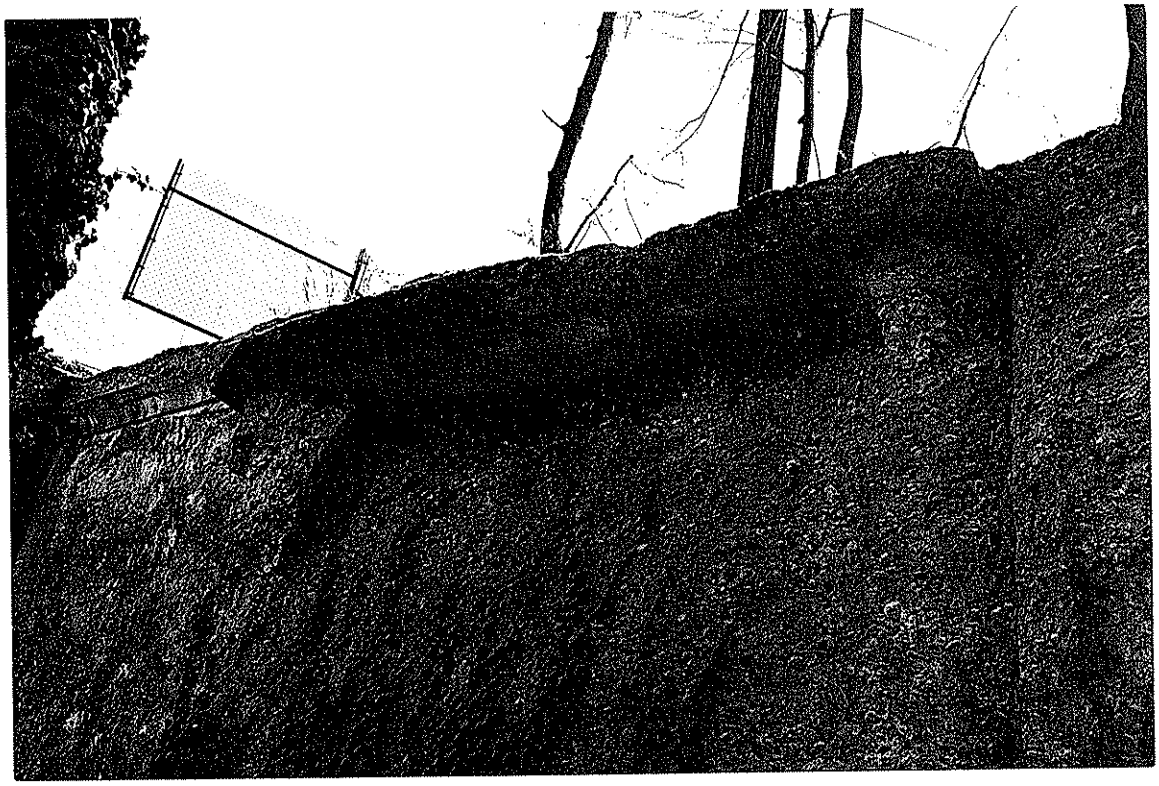


Southeast Retaining Wall
Note Coping on Ground, Loss of Concrete, and Erosion of Backfill

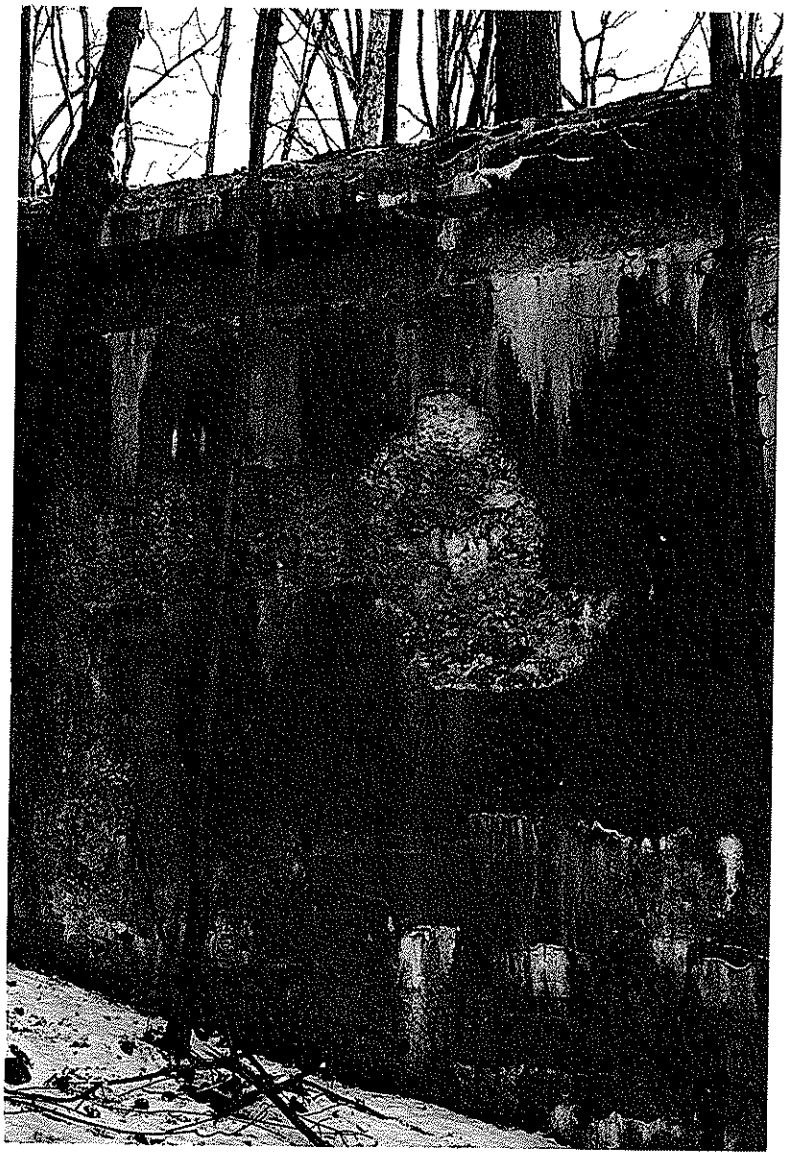


Southwest Retaining Wall
Note Concrete Coping being Dislodged

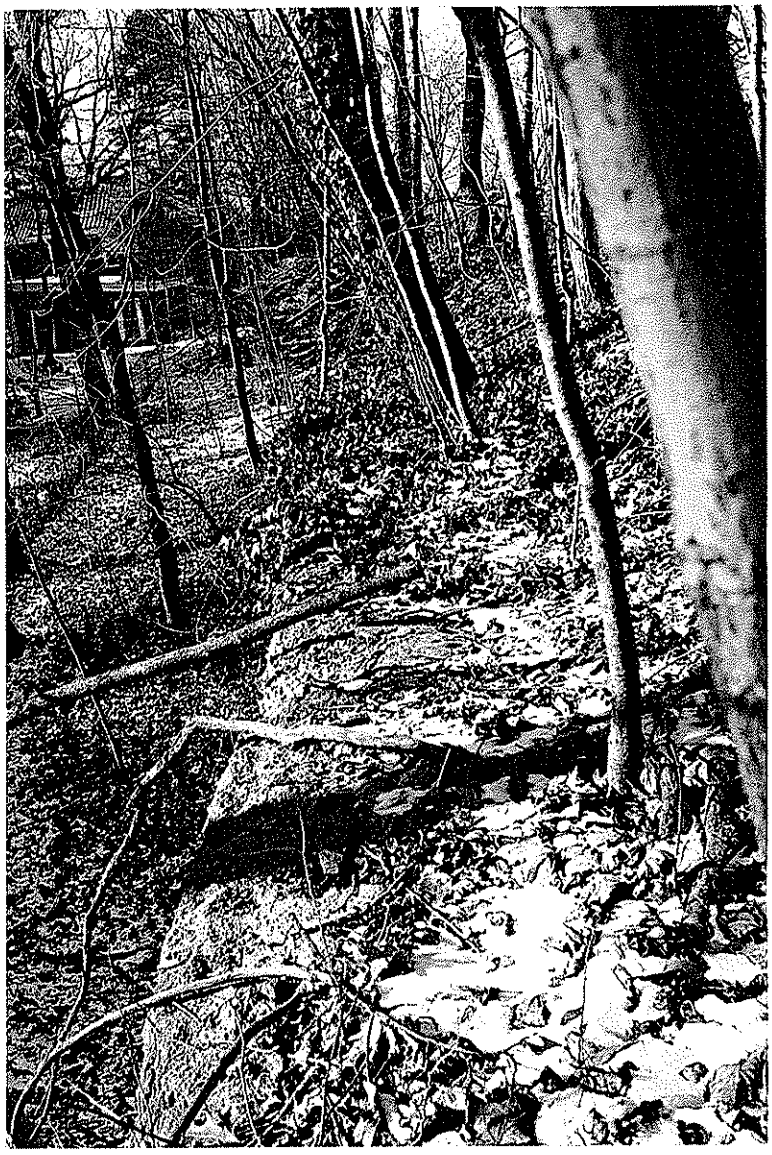
Northwest Retaining Wall- Looking Northwest
Note Compromised Coping and Concrete Loss Estimated at Four Feet



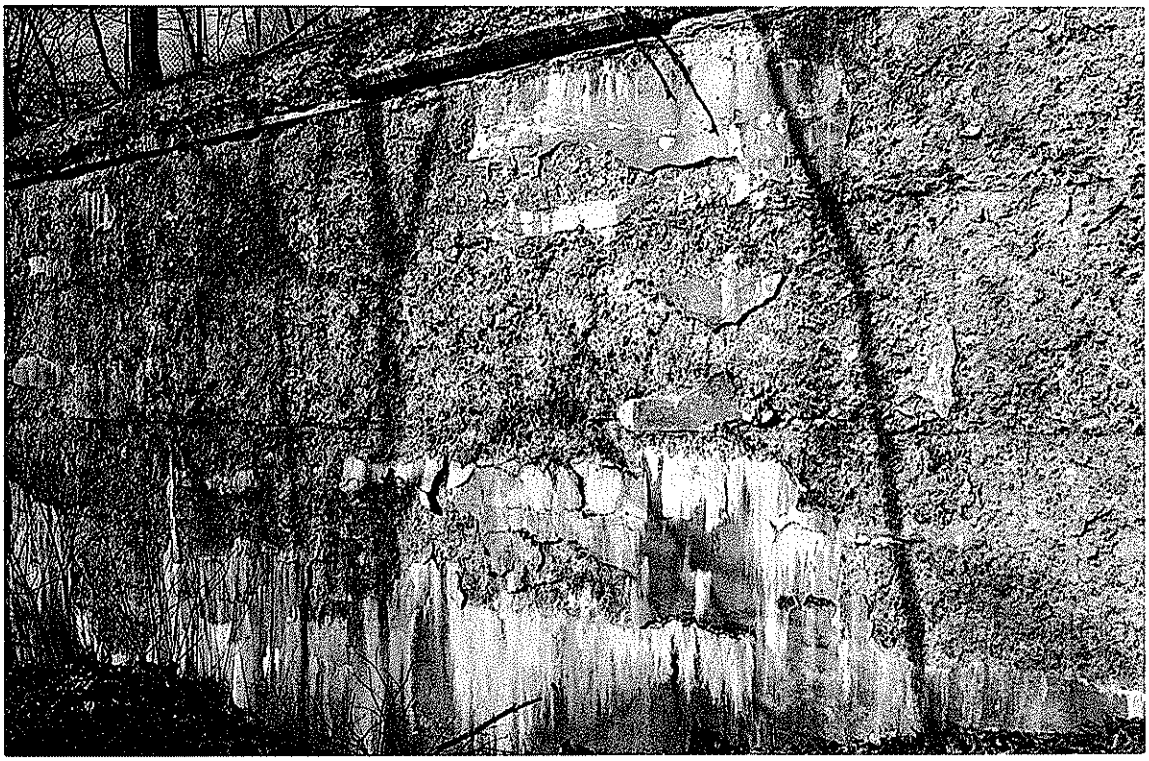
Northwest Retaining Wall- Looking Northeast



Northeast Retaining Wall
Typical Condition



Southwest Retaining Wall - On Top Looking West
Note - No Delineation, Fencing or Other Fall Protection



Southwest Retaining Wall- Typical Condition
Note Delaminated Parging, Efflorescence, and Spalling Concrete

Northwest Retaining Wall- Ivy Covered
Note Up to Two Foot Loss of Concrete at Groundline
Note Continuing Delamination of Concrete

CONCRETE TEST RESULTS

Four inch diameter and twelve inch long concrete cores were taken at six locations in the structure. Two were drilled in the underside of the arch, one in each leg. These two samples are from concrete that has not been exposed to the elements. One core was taken in the south face of the east leg of the arch. The other three samples were taken in the northeast, southeast, and southwest wingwalls. All the cores were removed intact except for the one taken from the south face of the east leg of the arch(SEL-3). The SEL-3 concrete disintegrated at approximately two inches from the face for a depth of around one inch. Steel reinforcing was noted in the sample taken from the east leg of the arch (EL-1). The drilling reportedly went easily, indicating soft concrete. Four different type tests were conducted on the six samples. Four of the samples were tested for compressive strength, a visual petrograph test was conducted on four of the concrete cores, two samples were tested for aggregate reactivity and tests on two samples determined percentage of voids and specific gravity. The results of the testing can be found in the appendix.

The compressive strength of concrete is an indication of the current structural integrity of the in-place concrete. The test can only be conducted on samples that have no cracks and were retrieved in an intact state. The results of the test varied widely from 2650 pounds per square inch for the sample that was taken from the west leg of the arch to 7250 pounds per square inch for the sample from the inside of the east leg. Both samples that were cored from the wingwalls tested above 3000 pounds per square inch. Currently 3000 pounds per square inch is the minimum design value for many applications. While the sample taken from the west leg falls below this there is no sign of distress in the arch and it is possible that the design value at the time of construction was below the tested value.

A visual petrograph is the observation and scientific description of samples as seen under magnification. The only property found that could be considered unusual is the large size of the aggregate used. The 2.5 inch diameter stone aggregate is over three times the size of aggregate that would currently be used. Since the structural elements of the bridge contained widely spaced reinforcing (in the arch) or no reinforcing (in the walls) the large sized aggregate is not a detriment to the integrity of the bridge. No entrained air was noted which is not unusual for concrete of this age as air entraining additives were not widely used until the 1940's to 1950's. Entrained air aids in the ability of the concrete to resist the multiple freeze-thaw cycles that it is subject to.

Two samples were tested for an alkali-silica reaction. One sample was taken from the arch and the other sample was taken from a wingwall. Only trace amounts of an alkali-silica reaction were found. The trace amounts of the reaction would not be considered to contribute to the deterioration of the concrete.

The specific gravity of the two concrete samples tested is within or close to the range of normal weight concrete which varies from 2.2 to 2.4. The percent of air voids of 10.7 and 11.7 can be attributed to entrapped air. Normally entrapped air can be expected to constitute approximately two percent of the resultant concrete. This large percent of air voids may be a contributing factor in the deterioration of the wingwalls and retaining walls.

In conclusion the testing found that, except for the large percentage of entrapped air, no internal factors were found in the concrete that would contribute to its deterioration. It appears that external weathering is the major factor causing deterioration of the concrete.

HISTORIC CLASSIFICATION

The New York State Department of Transportation, Environmental Analysis Bureau and the Office of the Commissioner of Parks, Recreation, and Historic Preservation have been contacted to ascertain the historic classification of the structure. Since the structure was constructed over fifty years ago it has been inventoried to see if it would be eligible for inclusion in the National Register of Historic Places. The inventory conducted in 1984 classified the bridge as "Not Eligible for Inclusion in National Register" A new inventory is currently being conducted. Prior to any work being done on the structure it is recommended that a letter (with photographs) be sent to the Office of the Commissioner of Parks, Recreation, and Historic Preservation to confirm that it is not listed and that they have no interest in any work proposed. In the unlikely case that the structure will have been reclassified, historic documentation would be required prior to removal or rehabilitation. This is a fairly routine procedure involving archiving of photographs and development of record plans. The cost of such documentation is included in the cost estimates.

COST ESTIMATE

Rehabilitation: Due to the advanced state of deterioration of the concrete, measures to restore the structure to its original configuration would be very extensive. Approximately 15 % of the surface of the arch underside, 35 % of the spandrel wall and arch faces, 75 % of the wingwall faces and 95 % of the retaining wall faces would require reconstruction. The measures would involve removing all loose and soft concrete until good concrete is reached, drilling anchors and placing reinforcing mesh, and placing shotcrete. In addition the coping would be rebuilt with either precast or cast-in-place concrete. The resultant surfaces would be coated with a protective compound to help preserve the concrete. The estimated costs for this rehabilitation are as follows:

1. Remove deteriorated concrete, place anchors and mesh, and shotcrete.

Arch Faces	**$ 100,000**
Spandrel walls	**200,000**
Retaining walls	**1,000,000**
Wingwalls	**500,000**
Subtotal	**$1,800,000**
2. Rebuild coping	**$20,000**
3. Architectural Restoration (optional)	**$50,000**
4. Protective coating	**$30,000**
5. Road closure and detour signing	**$ 2,000**
Subtotal Construction Cost	**$1,902,000**
6. State Historic Preservation documentation*	**$15,000**
7. Engineering & Inspection	**$250,000**
TOTAL	**= $2,167,000**

Say $2.2 million (2001 dollars)

*if required

Removal: The cost estimate for complete removal of the structure including foundations and fill is as follows. The resultant area would be graded and landscaped to match the surrounding property. Due to the absence of plan information the volumes of concrete removal and resultant costs were estimated based on engineering experience and are approximate.

1. Removal and disposal of unreinforced concrete:

Spandrel walls	**$ 17,000**
Wingwalls	**$ 73,000**
Retaining walls	**$152,000**
Subtotal	**$242,000**
2. Removal and disposal of reinforced arch	**$175,000**
3. Removal and disposal of fill	**$100,000**
4. Road closure and detour signing	**$ 2,000**
5. Relocation and/or protection of wires	**$ 10,000**
6. Removal and modification of drainage(east approach)	**$ 1,000**
7. Erosion control	**$ 1,000**
8. Landscaping	**$10,000**
9. Tree removal	**$10,000**
Subtotal Construction Cost	**$551,000**
10. State Historic Preservation documentation*	**$15,000**
11. Engineering and Inspection	**$110,000**
TOTAL=	**$676,000**

Say $700,000 (2001 dollars)

*if required

ANALYSIS

Since the initial cost of rehabilitation exceeds the cost of removal, a life cycle cost analysis comparing the alternative of rehabilitating the structure versus removal of the structure clearly favors removing the structure. It is estimated that every 20 years approximately twenty percent of the surface area of the structure would require resurfacing. For analysis purposes it is assumed that the structure will finally be removed 100 years after the rehabilitation. Currently there is no offsetting utility of the structure nor is any anticipated.

Total estimated life cycle costs in 2001 dollars (utilizing an interest rate 3% higher than the inflation rate) for rehabilitating the structure is as follows:

2001 rehabilitation	**$2,200,000 x 1.0 =**	**2,200,000**
2020 rehabilitation	**450,000 x 0.5537 =**	**249,165**
2040 rehabilitation	**450,000 x 0.3066 =**	**137,970**
2060 rehabilitation	**450,000 x 0.1697 =**	**76,365**
2080 rehabilitation	**450,000 x 0.0940 =**	**42,300**
2100 removal	**700,000 x 0.0520 =**	**36,400**
		$2,742,200**

**does not include any maintenance of the property or structure by Village forces.

This figure compares very unfavorably to the $700,000 estimated to remove the structure. In addition the reclaimed property resulting from complete removal could be utilized to benefit the community.

CONCLUSION AND RECOMMENDATIONS:

Based on the inspection of the accessible elements of the structure and the results of the concrete core testing it is concluded that, while the structure does not pose a danger of a catastrophic collapse, the continuing deterioration of certain elements poses a hazard to the public. The on-going deterioration of the concrete on the spandrel walls, including the parapets, and the face of the arch poses a hazard to traffic and pedestrians below. Until the structure is removed or rehabilitated it is recommended that loose concrete be removed on a regular schedule. The deterioration of the concrete of the wingwalls and retaining walls is more advanced than that of the arch and fascia walls. The delaminating concrete poses a danger to people adjacent to the structure. The coping on the wingwalls is greatly compromised and is a danger to people below or on top of the coping. It is recommended that the compromised coping be either removed or that access below and on top be restricted with the use of fencing. In addition it is recommended that trees that have taken root at the coping be removed. There are no indications that the structural integrity of the wingwalls and retaining walls has been compromised to an extent that there may be a collapse, but the earth retaining capability of the retaining walls is gradually being eroded. There is evidence that at the start of the wingwalls the concrete is being eroded by surface water draining over the side. At the northeast retaining wall soil is also being eroded over the side and the continuing deterioration of the concrete will accelerate that erosion.

Based on the advanced state of deterioration of the wingwalls and retaining walls and the continuing maintenance requirements of the arch and spandrel walls Berger, Lehman Associates, P.C. recommends that the structure be completely removed. Given the indefinite quantities involved, it would be advisable to contract such work on a lump sum basis. Prior to the process of arranging the removal of the structure, it is recommended that a program be immediately initiated to remove loose concrete from the arch and spandrel walls and to secure the area around the wingwalls and retaining walls and that such procedures continue until removal is complete.

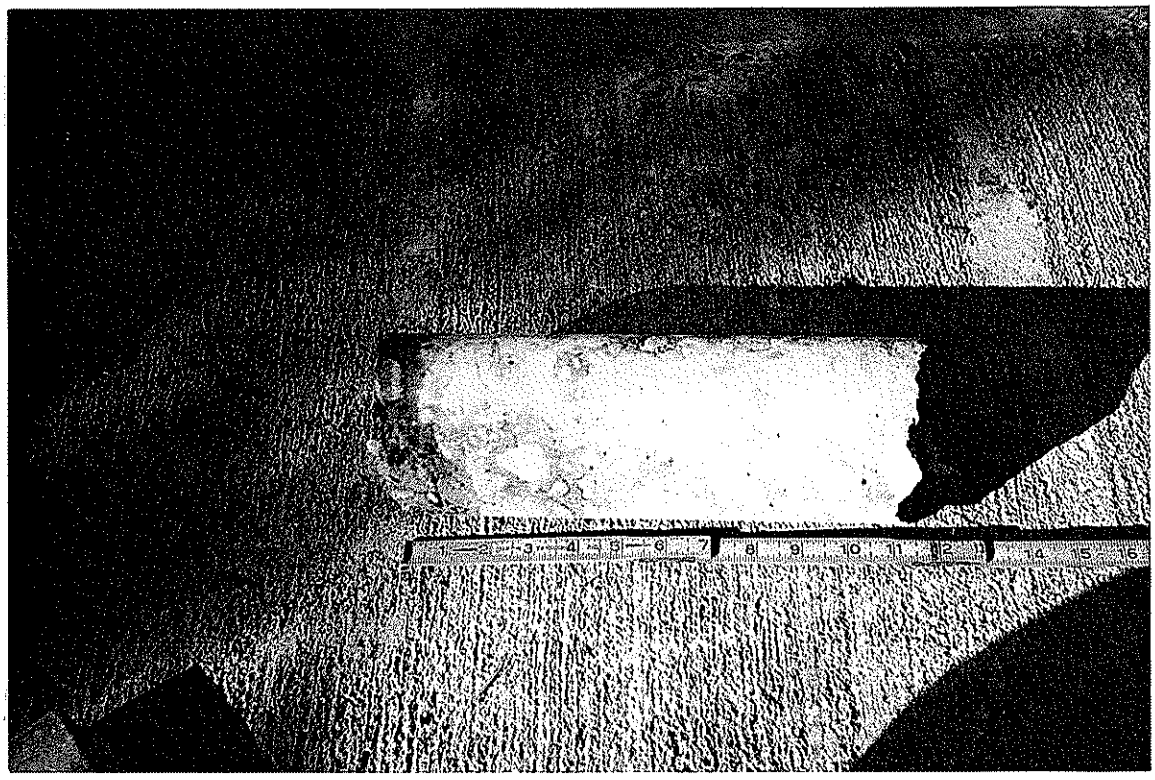
APPENDIX

Concrete Core Photographs and Test Reports

Core # EL -1
Located in East Leg of Arch

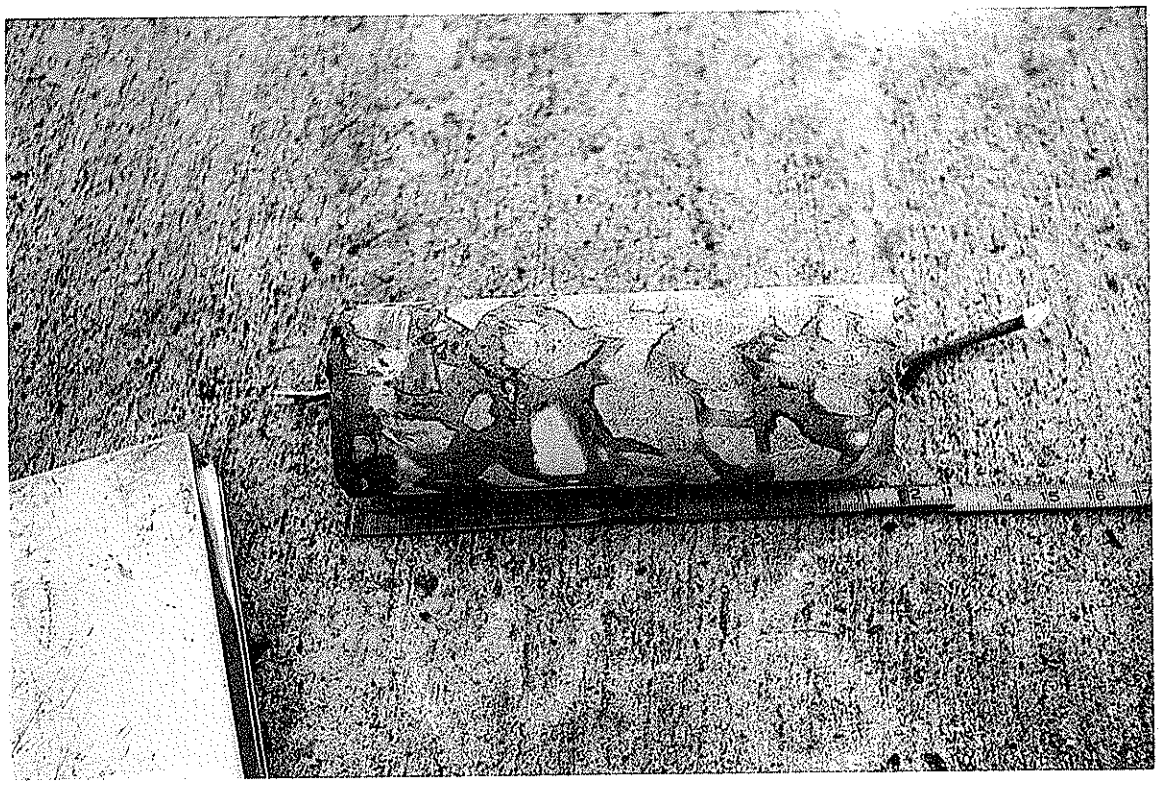
Core # NE -2
Located in Pilaster of Northeast Wingwall

Core # SEL -3
Located in South Face of East Leg of Arch



Core #SE -4
Located in Pilaster of Southeast Wingwall

Core # SW -5
Located in Pilaster of Southwest Wingwall



Core # W-6
Located West Leg of Arch

1-11-01

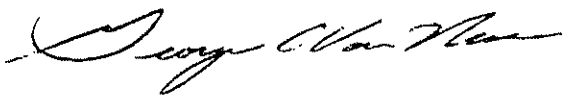
CLIENT: Berger, Lehman Associates, P.C.
PROJECT: Highbrook Avenue Bridge, Village of Pelham, NY
SUBJECT: Compression Tests of Concrete Cores
REPORTED TO: Berger, Lehman Assoicates, P.C.

We submit herewith a report of compression tests conducted on concrete cores from the above mentioned project:

Lab. Number	01M002	01M003	01M004	01M006
Core ID	W-6	SE-4	NE-2*	EL-3
COMPRESSION TESTS				
Diameter (in.)	4.00	4.00	4.00	4.00
Length of Core Prepared (in.)	6.75	7.125	7.00	3.80
Capped Height (in.)	6.875	7.250	7.125	7.125
Area (sq. inches)	12.57	12.57	12.57	12.57
Total Load - lbs.	34,000	39,500	56,500	105,000
Ratio H to D	1.72	1.81	1.78	1.00
Correction Factor	0.978	0.985	0.982	0.870
Corrected Load (lbs.)	33,252	38,907	55,483	91,350
Unit Load - PSI	2,650	3,100	4,400	7,250

* A large void on surface.

Respectfully submitted,



CLIENT: Berger, Lehman Associates, P.C. 1-11-01
PROJECT: Highbrook Avenue Bridge, Village of Pelham, NY

Laboratory Number	01M006
Core Number	EL-1

VISUAL PETROGRAPHIC EXAMINATION

Diameter	4"
Depth of Core	10 1/2"
Condition of Concrete	Good
Disintegration	None
Entrapped Air	Yes
Entrained Air	Minimal
Largest Size Aggregate	2" stone and 2" gravel
Thickness of Overlay	None
Rebars	Yes, one #8 rebar, 3 1/2" from top, horizontal
Horizontal Cracking	None
Concrete Bond to Reinforcement	Good
Remarks	Core has very thin layer of coating on top surface of core.

CLIENT: Berger, Lehman Associates, P.C. 1-11-01
PROJECT: Highbrook Avenue Bridge, Village of Pelham, NY

Laboratory Number	01M003
Core Number	SE-4

VISUAL PETROGRAPHIC EXAMINATION

Diameter	4"
Depth of Core	12 1/2"
Condition of Concrete	Good
Disintegration	None
Entrapped Air	Yes
Entrained Air	Minimal
Largest Size Aggregate	2 1/4" stone
Thickness of Overlay	None
Rebars	None
Horizontal Cracking	None
Concrete Bond to Reinforcement	N/A
Remarks	Concrete core has evidence of voids on surface at top of core.

JERSEY BORING AND DRILLING CO., INC.
150-152 WRIGHT STREET, NEWARK, N.J. 07114
TELEPHONE (973) 242-3800 • FAX (973) 802-1272

CLIENT: Berger, Lehman Associates, P.C. 1-11-01
PROJECT: Highbrook Avenue Bridge, Village of Pelham. NY
SUBJECT: Testing of Concrete Cores

Laboratory Number	01M001
Core Number	SW-5

VISUAL PETROGRAPHIC EXAMINATION

Diameter	4"
Depth of Core	12"
Condition of Concrete	Good
Disintegration	None
Entrapped Air	Yes
Entrained Air	Minimal
Largest Size Aggregate	2 1/2" stone
Thickness of Overlay	N/A
Rebars	None
Horizontal Cracking	None
Concrete Bond to Reinforcement	N/A
Remarks	Core has circumferencial multiple cracks at 1" from top

CLIENT: Berger, Lehman Associates, P.C. 1-11-01
PROJECT: Highbrook Avenue Bridge, Village of Pelham, NY

Laboratory Number	01M002
Core Number	W-6

VISUAL PETROGRAPHIC EXAMINATION

Diameter	4"
Depth of Core	11 1/2"
Condition of Concrete	Good
Disintegration	None
Entrapped Air	Yes
Entrained Air	Minimal
Largest Size Aggregate	2 1/2" stone
Thickness of Overlay	None
Rebars	None
Horizontal Cracking	None
Concrete Bond to Reinforcement	N/A
Remarks	Concrete core has very thin layer of protective coating on top surface.

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TELEPHONE (973) 242-3800 • FAX (973) 802-1272

1-17-01

CLIENT: Berger, Lehman Associates, P.C.
PROJECT: Highbrook Avenue Bridge, Village of Pelham, NY
SUBJECT: Alkali - Silica Reaction Test of Two Concrete Cores
REPORTED TO: Berger, Lehman Associates, P.C.

We submit herewith a report of laboratory test results of two concrete samples from the above mentioned project. The samples were tested for Alkali-Silica Reactivity as per ASTM C-856:

TEST RESULTS

Property	Core SW-5	Core SEL-3
Coarse Aggregate	Trap Rock (Diabase)	Trap Rock (Diabase)
Fine Aggregate	Natural Sand (Predominantly quartz)	Natural Sand (Predominantly quartz)
Alkali-Silica Reaction	Very Slight or Trace (*)	Very Slight or Trace (*)

(*) In both samples, alkali-silica reaction found was in trace amounts and it is not expected to have any adverse effects on the concrete quality.

Very truly yours,

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JERSEY BORING AND DRILLING CO., INC.
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1-16-01

CLIENT: Berger, Lehman Associates, P.C.
PROJECT: Highbrook Avenue Bridge, Village of Pelham, NY
SUBJECT: Testing of Concrete Cores
REPORTED TO: Berger, Lehman Associates, P.C.

We submit herewith a report of tests conducted on concrete cores from the above mentioned project:

Lab. Number	01M004	01M005
Core ID	NE-2	EL-1
TESTS		
Absorption after immersion (%)	4.1	4.7
Absorption after immersion and boiling (%)	4.3	5.0
Bulk Specific Gravity (dry)	2.474	2.355
Bulk Specific Gravity after immersion and boiling	2.581	2.472
Bulk Specific Gravity after immersion	2.575	2.466
Apparent Specific Gravity	2.771	2.667
% Air Voids	10.7	11.7

Respectfully submitted,