

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DATA SHEET

FOR NPS USE ONLY

RECEIVED NOV 1 1976

DATE ENTERED APR 13 1977

NATIONAL REGISTER OF HISTORIC PLACES
INVENTORY -- NOMINATION FORMSEE INSTRUCTIONS IN *HOW TO COMPLETE NATIONAL REGISTER FORMS*
TYPE ALL ENTRIES -- COMPLETE APPLICABLE SECTIONS**1 NAME**

HISTORIC Great Stone Dam

AND/OR COMMON

Essex Company Dam

2 LOCATION

STREET & NUMBER Merrimack River, just west of the Mass. Route 28 crossing

___ NOT FOR PUBLICATION

CITY, TOWN

Lawrence

___ VICINITY OF

CONGRESSIONAL DISTRICT

5th Massachusetts

STATE

Massachusetts

CODE

025

COUNTY

Essex

CODE

009

3 CLASSIFICATION

CATEGORY

___ DISTRICT

___ BUILDING(S)

☒ STRUCTURE

___ SITE

___ OBJECT

OWNERSHIP

___ PUBLIC

☒ PRIVATE

___ BOTH

PUBLIC ACQUISITION

___ IN PROCESS

___ BEING CONSIDERED

STATUS

☒ OCCUPIED

___ UNOCCUPIED

___ WORK IN PROGRESS

ACCESSIBLE

___ YES: RESTRICTED

___ YES: UNRESTRICTED

___ NO

PRESENT USE

___ AGRICULTURE

___ MUSEUM

___ COMMERCIAL

___ PARK

___ EDUCATIONAL

___ PRIVATE RESIDENCE

___ ENTERTAINMENT

___ RELIGIOUS

___ GOVERNMENT

___ SCIENTIFIC

☒ INDUSTRIAL

___ TRANSPORTATION

___ MILITARY

___ OTHER:

4 OWNER OF PROPERTY

NAME Essex Company

STREET & NUMBER

6 Essex Street

CITY, TOWN

Lawrence

___ VICINITY OF

STATE

Massachusetts 01840

5 LOCATION OF LEGAL DESCRIPTION

COURTHOUSE.

REGISTRY OF DEEDS, ETC.

Essex Company

STREET & NUMBER

6 Essex Street

CITY, TOWN

Lawrence

STATE

Massachusetts

6 REPRESENTATION IN EXISTING SURVEYSTITLE Historic American Engineering Record
Inventory of the Historic Assets of the Commonwealth

DATE 1975, 1976

☒ FEDERAL ☒ STATE ___ COUNTY ___ LOCAL

DEPOSITORY FOR

SURVEY RECORDS Library of Congress, Massachusetts Historical Commission

CITY, TOWN

Washington, Boston

STATE

D.C., Mass.

7 DESCRIPTION

CONDITION

☒ EXCELLENT
☐ GOOD
☐ FAIR

☐ DETERIORATED
☐ RUINS
☐ UNEXPOSED

CHECK ONE

☐ UNALTERED
☒ ALTERED

CHECK ONE

☒ ORIGINAL SITE
☐ MOVED DATE _____

DESCRIBE THE PRESENT AND ORIGINAL (IF KNOWN) PHYSICAL APPEARANCE

The Great Stone Dam crosses the Merrimack River in Lawrence, Massachusetts. It is located west of the center of the city at the point where State Highway 28 crosses the Merrimack River.

The Essex Company Dam is an overflow weir the purpose of which is to impound the flow of the Merrimack River and to raise its water to a head sufficient for the generation of power. The dam is 900 feet in length and is gently curved upstream, with a center ordinate of 14.97 feet. The dam is skewed across the river, its southern end being about 200 feet further upstream than the northern end. The dam is anchored to the north and south mill islands by wing walls of random coursed, rough cut granite blocks, bricks and large pieces of granite rubble. The northern wing wall is 405 feet long and the southern wing wall is 324 feet. Thus the entire length of the dam is 1,629 feet. The overflow section of the dam varies in height from thirty to forty feet, with its average height being thirty-four feet. The dam is trapezoidal in profile, with a base of thirty-five feet and a top width of twelve and a half feet. The accompanying sketch provides additional information. The downstream side of the dam slopes at a rate of one foot in twelve, thus allowing the water to fall freely onto the blue quartzite ledge of the river bottom. The downstream face of the dam is of ashlar construction, consisting of quarry faced hammered granite headers and stretchers, set in hydraulic cement. The bottom row of headers was doweled to the bed of the river and set in a trench, eight feet wide and four feet deep, which was blasted for the entire overflow length of the weir. The crest stones of the dam are hammered granite blocks, all headers, which slope upstream at a grade of one foot in three for twelve feet. The upstream face of the dam slopes at a rate of forty-five degrees for twenty-two and a half feet, at which point the face drops vertically for ten feet to the bed of the river. All of the dam except for the crest stones and downstream face is constructed of large blocks of granite rubble, set in concrete and hydraulic cement. The entire upstream side of the dam is covered with a five foot layer of gravel and an earthen embankment, which slopes at a rate of one foot in six for one hundred and sixty feet upstream of the crest of the weir. The crest stones were initially drilled to accommodate about 250 wrought iron bars upon which flash boards were secured. Around 1865 the number of holes was doubled. The dam has nowasteways beyond the two canals which it supplies and its own spillway. The wing walls of the dam, on either side of the river, are fifteen feet higher than the crest. To comply with state law, the Essex Company originally constructed a wooden fishway at the south end of the dam. This fishway washed out periodically and was replaced with a concrete fishway in 1918. This fishway is still in place. Around 1914 the crest stones were reinforced by almost five hundred additional dowels as a precaution against the loss of crest stones which had occurred at the Pawtucket Dam in Lowell, a structure with a similar profile to the Essex Dam. At this time two crest stones were found to be cracked, and the cracks were spanned with steel plates. The dam has not been modified in any other way. The dam was begun in August of 1845 and the structure was completed in September of 1848. Its designer was Charles S. Storrow, the Treasurer and Chief Engineer of the Essex Company. The Construction Engineer was Charles Bigelow of the Essex Company.

8 SIGNIFICANCE

PERIOD	AREAS OF SIGNIFICANCE -- CHECK AND JUSTIFY BELOW			
☐ PREHISTORIC	☐ ARCHEOLOGY-PREHISTORIC	☐ COMMUNITY PLANNING	☐ LANDSCAPE ARCHITECTURE	☐ RELIGION
☐ 1400-1499	☐ ARCHEOLOGY-HISTORIC	☐ CONSERVATION	☐ LAW	☐ SCIENCE
☐ 1500-1599	☐ AGRICULTURE	☐ ECONOMICS	☐ LITERATURE	☐ SCULPTURE
☐ 1600-1699	☐ ARCHITECTURE	☐ EDUCATION	☐ MILITARY	☐ SOCIAL/HUMANITARIAN
☐ 1700-1799	☐ ART	☒ ENGINEERING	☐ MUSIC	☐ THEATER
☒ 1800-1899	☐ COMMERCE	☐ EXPLORATION/SETTLEMENT	☐ PHILOSOPHY	☐ TRANSPORTATION
☐ 1900-	☐ COMMUNICATIONS	☐ INDUSTRY	☐ POLITICS/GOVERNMENT	☐ OTHER (SPECIFY)
		☐ INVENTION		

SPECIFIC DATES 1845-48

BUILDER/ARCHITECT Charles S. Storrow

STATEMENT OF SIGNIFICANCE

The Essex Company Dam was the first weir to cross a large American river with a height that exceeded ten feet. Since the overturning movement exerted upon a dam increases as the cube of its height, it required great engineering skill to design and construct such a structure. Moreover, the dam had to be constructed to resist the huge freshets which periodically occurred on the Merrimack River. The average flow of the Merrimack is less than six thousand cubic feet per second. In the freshet of 1936 over two hundred thousand cubic feet per second were flowing over the dam's crest. Charles Storrow, a graduate of Harvard (number one in the Class of 1829) and the Ecole Nationale de Ponts et Chaussées (1833), had studied in the offices of Loammi Baldwin, Jr., and had toured the major engineering sites of France and Great Britain during the years 1830-1834. Storrow was the author of the first American treatise on hydraulic engineering (1835), and was a prominent railroad engineer (Boston and Lowell Railroad), and hydraulic engineer (Proprietors of Locks and Canals at Lowell). Storrow employed design principles which were followed by other dam builders for the remainder of the nineteenth century. Such renowned engineers as James Francis, Ezra Worthen, and Joseph Freeman modeled their own dams upon that of Storrow. Dam designers of more recent years have employed different techniques based upon the empirical data accumulated in the years since 1845. To this day the design of overflow weirs is largely a matter of good judgment upon the part of the engineer rather than such hard and fast rules as apply to the design of reservoir dams. The Essex Company Dam is of great significance because it embodies every known principle of weir design that was followed in the early nineteenth century in a state that has remained virtually unchanged since 1848. These design principles are its skewed, slightly curved form (to minimize overflow and to concentrate eddies in the center of the dam), its crest design (to facilitate the flow of chunks of ice), the massive earthen embankment (to prevent undermining of the dam), and the flush, uncurved spillway (to avoid the very considerable expense of building a curved spillway with ashlar masonry). A resultant force diagram of the dam shows that in every case from an empty mill pond to a water level of over 25 feet, the resultant force falls within the middle third of the profile, thus accounting for the dam's survival of floods and ice without the need for repair over the past 130 years. The use of hydraulic cement and concrete, each barrel of which was tested by an Essex Company Engineer, is also noteworthy. Only two other overflow weirs in the United States are older. The oldest is the Ascutney Dam at Windsor, Vermont (1836), which spans a very small stream, and which has been significantly modified. The second is the Old Croton Dam (1844), which was submerged in 1890 by the reservoir of its replacement, the New Croton River Dam.

9 MAJOR BIBLIOGRAPHICAL REFERENCES

Tenth Census of the United States, 1880, Vol. XVI, p.25.

Frizell, Joseph; Water Power, New York: 1890.

Wegmann, J.; Design of Dams, New York: 1908.

MSS.; Essex Company Records, Archives of the Merrimack Valley Textile Museum.

Essex Company; Plans and Drawings.

10 GEOGRAPHICAL DATA

ACREAGE OF NOMINATED PROPERTY 2 acres

UTM REFERENCES

A 19 322540 4729660
ZONE EASTING NORTHING

B
ZONE EASTING NORTHING

C
D
VERBAL BOUNDARY DESCRIPTION

LIST ALL STATES AND COUNTIES FOR PROPERTIES OVERLAPPING STATE OR COUNTY BOUNDARIES

STATE	CODE	COUNTY	CODE
STATE	CODE	COUNTY	CODE

11 FORM PREPARED BY

NAME / TITLE

Peter M. Molloy Merrimack Valley Textile Museum & Joseph R. Orfant, National Register

ORGANIZATION

DATE

Editor

Massachusetts Historical Commission

25 October 1976

STREET & NUMBER

TELEPHONE

294 Washington Street

617-727-8470

CITY OR TOWN

STATE

Boston

Massachusetts

12 STATE HISTORIC PRESERVATION OFFICER CERTIFICATION

THE EVALUATED SIGNIFICANCE OF THIS PROPERTY WITHIN THE STATE IS:

NATIONAL

STATE X

LOCAL

As the designated State Historic Preservation Officer for the National Historic Preservation Act of 1966 (Public Law 89-665), I hereby nominate this property for inclusion in the National Register and certify that it has been evaluated according to the criteria and procedures set forth by the National Park Service.

STATE HISTORIC PRESERVATION OFFICER SIGNATURE

Elizabeth Reed Arneson

TITLE Executive Director, Massachusetts Historical Commission

DATE 10/26/76

FOR NPS USE ONLY

I HEREBY CERTIFY THAT THIS PROPERTY IS INCLUDED IN THE NATIONAL REGISTER

CHIEF

DIRECTOR, OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION

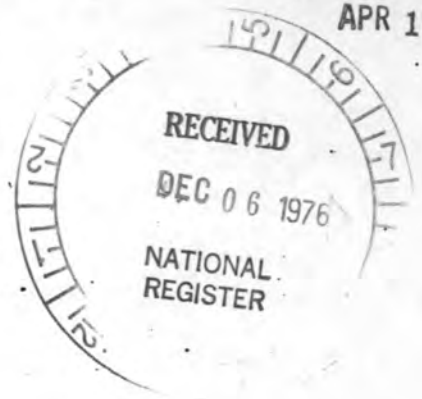
DATE 4/13/97

ATTEST:

KEEPER OF THE NATIONAL REGISTER

DATE 3.18.97

APR 13 1977



Great River Dam
Lawrence, Massachusetts
Sketch of Section

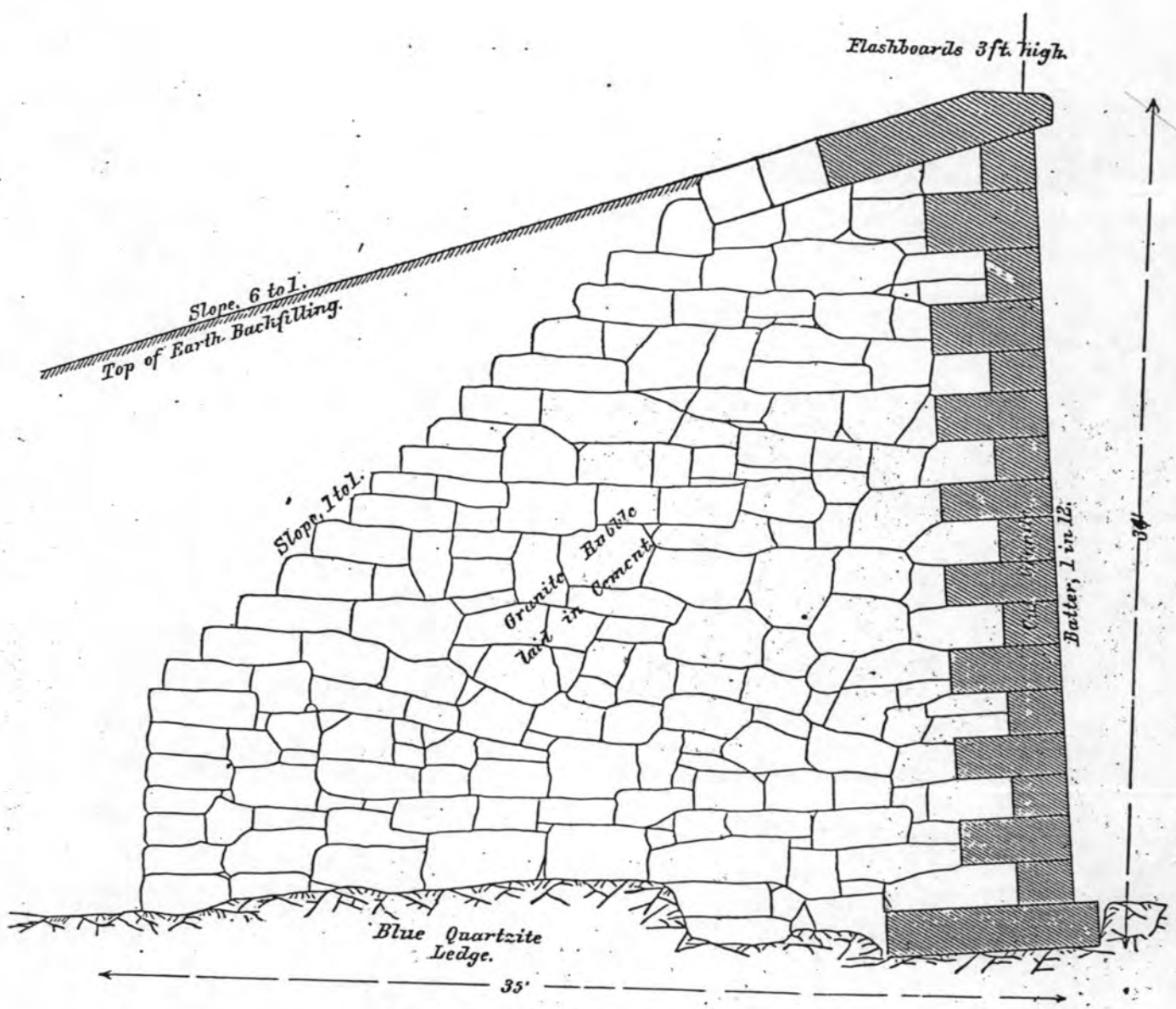


Fig. 5. SECTION OF DAM AT LAWRENCE, MASS.

FROM 1880 CENSUS, 'WATER POWER', VOL XVI.

Property Great Stone Dam

State Mass. Working Number 11.1.76.4417

Essex

TECHNICAL

Photos 1
Maps 1

CONTROL

KP

OK 11.1.76

What accompanying sketch?
Rec'd 6 D 76

HISTORIAN

ACCEPT
L. W. Good
26 N 76

ARCHITECTURAL HISTORIAN

Accept
M. J. W. G.
12-9-76

ARCHEOLOGIST

OTHER

HAER

Well written & researched nomination!

Inventory Sub 16 X 1.76

Review Accept Endy
11/17

REVIEW UNIT CHIEF

accept
Cole

2/21/77

BRANCH CHIEF

KEEPER

for Mustang
31.18.77

National Register Write-up

Send-back

Entered APR 13 1977

Federal Register Entry 5-3-77

Re-submit

INT:2106-74



Great Stone Dam
Lawrence, MA.
1975

Peter M. Molloy
Merrimack Valley Textile Museum
North Andover, Massachusetts

Photograph #1 of 1
Looking south across the Merrimack River
showing the front of the dam and flash-
boards.

NOV 1 1976

DOE APR 13 1977

OR ESSEX CO DAM

O'NEAL BRIDGE.

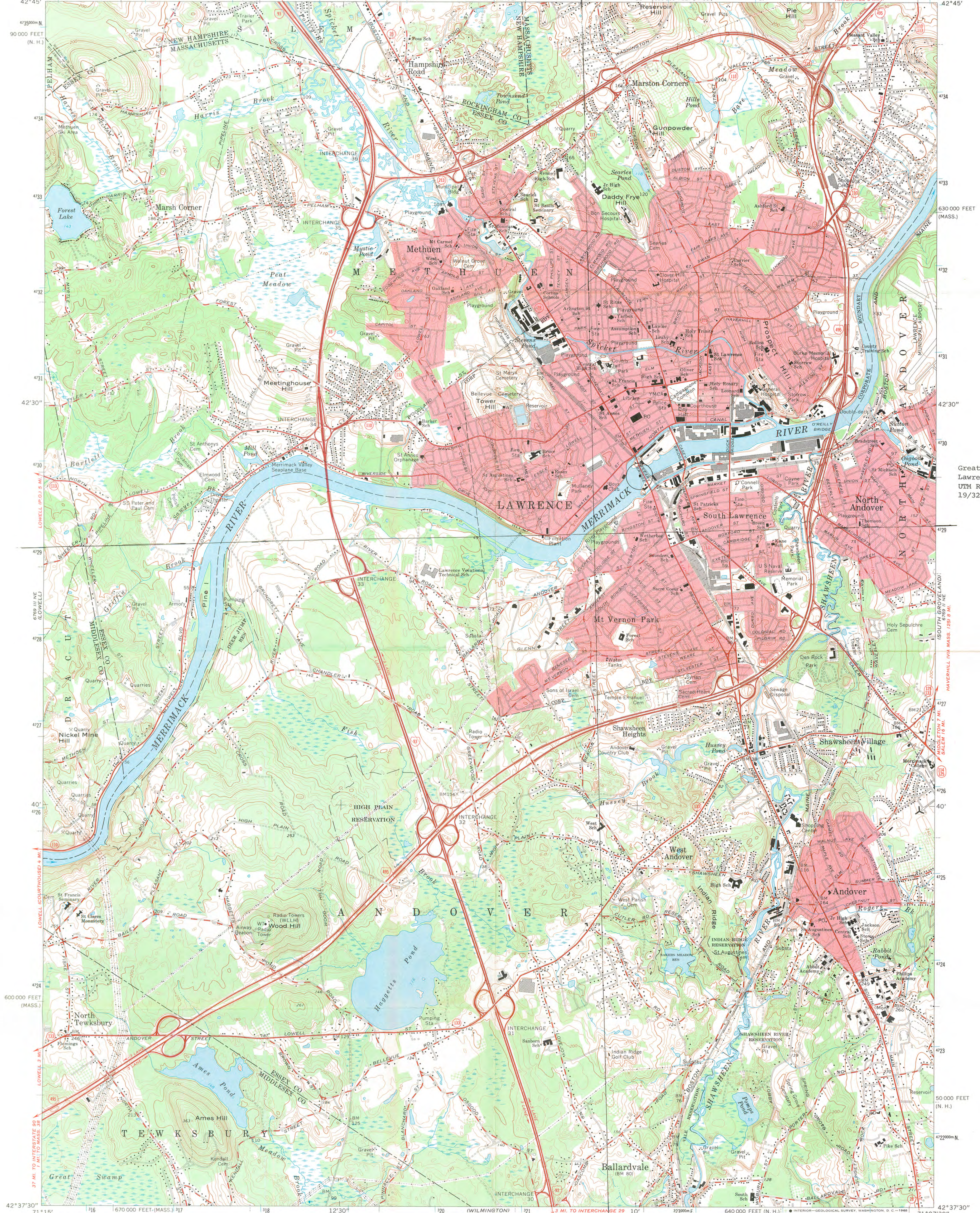
E - SOME OF THE BARS

THE FLOW OF THE

MOLLOY IN AUGUST 1975

MERRIMACK VALLEY TEXTILE MUSEUM

PROPERTY OF THE NATIONAL REGISTER





The Commonwealth of Massachusetts

Office of the Secretary

Massachusetts Historical Commission

*Secretary of the
Commonwealth*

*294 Washington Street Boston, Massachusetts 02108
(617) 727-8470*

November 30, 1976

The National Register of Historic Places
Office of Archeology and Historic Preservation
National Park Service
U.S. Department of the Interior
Washington, D.C. 20240

Attn: Stephen Livengood

Dear Steve:

Enclosed please find a copy of the sketch that is referred to in the nomination form for the Great River Dam in Lawrence, Massachusetts. It is a section through the dam and is from the 1880 U.S. Census. Its exclusion was an oversight on my part.

Sincerely,

Joseph R. Orfant
National Register Editor
Massachusetts Historical Commission

JRO/edh
enc.



ENTRIES IN THE NATIONAL REGISTER

STATE MASSACHUSETTS

Date Entered APR 13 1977

Name

Location

Great Stone Dam

Lawrence vicinity
Essex County

Holy Trinity Greek Orthodox Church

Lowell
Middlesex County

Chandler, General Samuel, House

Lexington
Middlesex County

Also Notified

Hon. Edward M. Kennedy
Hon. Edward W. Brooke
Hon. Paul Tsongas

Regional Director, North Atlantic
Region

State Historic Preservation Officer
Mrs. Elizabeth R. Amadon
Executive Director, Massachusetts
Historical Commission
294 Washington Street
Boston, Massachusetts 02108

NR Data Sheet

DATE: 26 Apr 76
Reviewer INITIALS: S
NR DOE APR 13 1977

NAME AS IT APPEARS IN FEDERAL REGISTER: Great Stone Dam

OTHER NAMES: Essex Company Dam

LOCATION:

STREET & NUMBER Merrimack River at MA 28

CITY, TOWN Lawrence

CONGRESSIONAL DISTRICT 5th

STATE Massachusetts

VICINITY OF 25

COUNTY code
Essex 009

OWNER OF PROPERTY: (Circle) PRIVATE STATE LOCAL GOV'T MUNICIPAL COUNTY OTHER

ADMINISTRATOR (underline)

FEDERAL (AGENCY NAME):

NPS REGION: (CIRCLE) N. ATLANTIC MID ATLANTIC SOUTHEAST MIDWEST

SOUTHWEST ROCKY MOUNTAIN WEST PACIFIC NORTHWEST

FEATURES:

INTERIOR	EXTERIOR	ENVIRONS
☐ Substantially intact-1	☐ Substantially intact-2	☒ Substantially intact-3
☐ unknown - 4	☐ unknown - 5	☐ unknown - 6
☒ not applicable - 7	☒ not applicable - 8	☐ Not applicable - 9

☐ Interior, exterior, environs not intact-0

CONDITION - ☒ EXCELLENT
☐ GOOD
☐ FAIR

☐ DETERIORATED
☐ RUINS
☐ UNEXPOSED
☐ Unexcavated

☐ UNALTERED
☒ ALTERED
☐ Reconstructed
☐ Excavated
☒ ORIGINAL SITE
☐ MOVED
☐ Unknown

ACCESS - Yes-restricted Yes-unrestricted No access Unknown

historic district? YES NO

WITHIN NATIONAL REGISTER HISTORIC DISTRICT? YES NO
IF YES, NAME:

WITHIN NATIONAL HISTORIC LANDMARK? YES NO
IF YES, NAME:

ADAPTIVE USE: YES NO Saved? YES NO

FUNCTION(S): (use vocabulary words)

then- dam

now- dam

SIGNIFICANCE:

☐ ARCHEOLOGY-PREHISTORIC	☐ CONSERVATION	☐ LANDSCAPE ARCHITECTURE	☐ RELIGION	☐ entertainment
☐ ARCHEOLOGY-HISTORIC	☐ ECONOMICS	☐ LAW/Gov't/politics	☐ SCIENCE	☐ health
☐ AGRICULTURE	☐ EDUCATION	☐ LITERATURE	☐ SOCIAL/HUMANITARIAN	☐ recreation
☐ ARCHITECTURE	☒ ENGINEERING	☐ MILITARY	☐ TRANSPORTATION	☐ settlement
☐ ART	☐ EXPLORATION	☐ MUSIC	☐ OTHER (SPECIFY)	☐ socio/cultural
☐ COMMERCE	☐ INDUSTRY	☐ PHILOSOPHY		☐ urban & commun
☐ COMMUNICATIONS	☐ INVENTION	☐ POLITICS/GOV'T. MENT		planning

Claims

"first" YES NO "oldest" YES NO "only" YES NO

ARCHITECTURAL STYLE:

architect/m.builder:

landscape/garden designer:

interior decorator:

engineer: Charles J. Starrow

artist/artisan:

builder/contractor: Charles Bigelow
construction
engineer

ETHNIC GROUP:

NAMES:

personal

(label role
&
appropriate date)

events

institutional

DATES:

DATE OF CONSTRUCTION (Specific date or 1/4 of century):

1845-48

DATE(S) OF "MAJOR" ALTERATIONS:

HISTORICALLY SIGNIFICANT DATE(S):

SOURCE:

(OF NOMINATION)

PRIVATE

STATE

LOCAL GOV'T

MUNICIPAL

COUNTY

OTHER

FEDERAL AGENCY:

ACREAGE:

(to nearest tenth of an acre)

2

COMMENTS: (include architectural information here)

HAER

Dam of

Granite rubble set in concrete and hydraulic concrete, 900' long dam with side wings of 405' and 394', 30'-40' overflow section, concrete highway: erect stone reinforced, 1914. First weir to cross a large American river with a height over 10'

SIGNIFICANCE: (maximum two sentences)

One of the oldest overflow weirs in America, the Esser Company Dam is an excellent example of dam design with mid 19th century technology.