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## PLEASE Support the Talbot Mills Dam Removal

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From Kirk DOGGETT <kdoggett@verizon.net>

Date Wed 11/26/2025 4:48 PM

To Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Jennifer Raitt,

Thank you for the opportunity to comment on the Appeal of Billerica Historic District Commission Denial of Application for Talbot Dam Removal. I support the removal of the Talbot Mills Dam and the restoration of this culturally significant section of the Concord River.

As someone who has lived in Acton for the past 20 years, and has kayaked on the Concord River, I believe this is a critical opportunity to restore the river to a more historically accurate state and reconnect it to its deeper history that long predates the dam.

For thousands of years, the river sustained Indigenous communities whose presence and stewardship shaped this region. Restoring natural river flow is not just an ecological repair; it is also a step toward preserving, honoring, and acknowledging this deeper legacy.

### **I support the appeal for the following reasons:**

#### **River Ecology**

Removing the dam will help to restore access to spawning grounds for several anadromous fish such as herring and the American Eel. You can learn more here: <https://newildernesstrust.org/american-eel-rewilding/>

#### **Respect for historic and cultural resources**

I urge the reviewing bodies to consider the full scope of the river's history—not just the industrial-era history of the past few hundred years, but the longstanding and ongoing presence of Indigenous peoples and the ecological history of the river itself, which has been in existence for thousands of years. This project offers an opportunity to recognize and protect those historic and cultural values while restoring the natural landscape.

#### **The project was incorrectly reviewed**

While the project team provided significant evidence for why the project should be approved either by a Certificate of Hardship or Certificate of Non-Applicability, the Billerica Historic Districts Commission denied the project with little to no explanation. One member even acknowledged that economic hardship exists, but disregarded it. I expect our regulatory authorities and commissions to make

decisions based on facts, regulations, and review standards, not based on personal opinions.

### **The project provides an opportunity to tell the full history of the site**

The purpose of the Historic Preservation Act is to "promote the educational, cultural, economic and general welfare of the public through the preservation and protection of the distinctive characteristics of ... places significant in the history of the commonwealth..." and the dam removal project achieves exactly that. The project will add educational signage and other aspects of historic preservation to the site to tell not only the short industrial history of the dam, but also the indigenous history of the area. It provides an opportunity to uncover artifacts currently buried under the impoundment, including an older version of the dam. The project is an opportunity to promote the educational and cultural welfare of the public beyond and including the dam's short industrial history.

Please support the dam's removal and be a part of showcasing the full history of the Concord River. Thank you.

Sincerely,

Kirk Doggett  
Acton

W. Kirk Doggett

=====

mailto: kdoggett@verizon.net

m: (978) 394-2534



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## Talbot Mills Dam

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**From** Michael Mcinnis <mjmpatch@gmail.com>

**Date** Wed 11/26/2025 5:34 PM

**To** Jennifer Raitt <jraitt@nmcog.org>

 1 attachment (336 KB)

MCCLettertoNMCOGforDec12025HearingNov262025FINAL.pdf;

Caution: This email originated from outside of the organization. Do not reply, click links, or open attachments unless you can confirm the sender and know the content is safe.

Sent from my iPhone



THE COMMONWEALTH OF MASSACHUSETTS  
**Middlesex Canal Commission**



November 26, 2025

Ms., Jennifer Raitt, Executive Director  
Northern Middlesex Council of Governments  
672 Suffolk Street, Suite 100  
Lowell, MA 01854

**RE: Appeal Hearing – December 1, 2025 - Concerning Billerica Historic Districts  
Commission Ruling – Talbot Mills Dam**

Dear Ms. Raitt:

The appeal of the June 4, 2025 decision of the Billerica Historic Districts Commission (BHDC) concerning the proposed removal of the Dam and Summit Pond in North Billerica has been scheduled, pursuant to a continuance, for a Hearing on December 1, 2025. We will have representation at that time, but wish to have this letter entered into the record of the Hearing.

We want to be firmly on the record as opposing any reversal of the BHDC's decision to forbid removal of this important historic resource. The Middlesex Canal is a National Register Historic District, and the Dam and Summit Pond fall squarely within the North Billerica Mills District.

In its July 2, 2025 Appeal document, CRT Development Realty makes several claims as to why NMCOG should reverse BHDC's decision. The document first includes an elaborate recitation of "Background facts," designed to bootstrap the dam removal project into a foregone conclusion. The document then lays out several arguments for NMCOG to reverse the BHDC's decision. Stripped of their elaborate legalese, these assert the following: 1) The Talbot Mills Dam is not a structure and thus not subject to the jurisdiction of the BHDC; 2) CRT has demonstrated a hardship that should allow them to remove the Dam.

These arguments are patently deficient. First, common sense shows that the Dam meets all the logical definitions of a historic "structure." It's made of solid materials. It has a documented historical role. And, it has been a structure for over two centuries. It is hard to imagine anything more obvious. Moreover, the Dam is a nationally recognized historic resource that is central to the history and importance of the Middlesex Canal.

Second, there is the hardship argument; this is based on Gomez and Sullivan's elaborate and entirely speculative presentation at the BHDC earlier this year. Let's just say the numbers were designed to reach a foregone conclusion. More importantly, it is clear the CRT is perfectly capable of funding ongoing maintenance of the Dam. The dam's owner noted that he has spent more than \$60,000 on those costs. Furthermore, CRT had the resources to recently pay \$400,000 for two acres of land on Old Elm Street. These are clearly not the actions of an entity that needs to plead poverty or hardship.

The facts are clear. The BHDC has clear and untrammelled jurisdiction over the Talbot Mills Dam. The Dam is a structure. CRT is in no way a hardship case.

J. Raitt, NMCOG  
November 26, 2025  
page 2

Finally, we remind NMCOG and your retained expert of what is at stake here. The Talbot Mills Dam is a nationally recognized historic resource that is absolutely central to the history and importance of the Middlesex Canal. The Canal itself is an integral part of the history of Northern Middlesex, Billerica, Chelmsford and Lowell, not to mention the other Canal communities further South. Removal of the Dam would destroy the Summit Pond on the Concord River, the central feature of the entire Middlesex Canal. It would also completely destroy the core mission of the new Middlesex Canal Museum; no more physical resources/structures, no more Museum.

The only goal of the Middlesex Canal Commission is to protect and celebrate the Middlesex Canal. As you know, we and others proposed a sensible compromise that would preserve history, help the fish and the environment and advance the public interest in the fullest sense. Unfortunately, this idea has been summarily dismissed by NOAA, the Division of Ecological Resources and OARS.

Removal of the Talbot Mills Dam would make a complete mockery of historic preservation, undermine the will of the people of Billerica, and damage the relationship of NMCOG to its constituents. We trust that NMCOG will deny this appeal.

Thank you for your kind attention.

Sincerely,

Michael McInnis, Chair

cc: BHDC; MCC; MCA



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## Talbot Mills Dam

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**From** Al Peirce <trashpaddler@gmail.com>

**Date** Fri 11/28/2025 8:39 AM

**To** Jennifer Raitt <jrait@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Jennifer Raitt,

I often paddle on the Concord River and want to convey my support for the removal of the Talbot Mills Dam. The dam no longer serves its intended purpose and is an unnecessary hindrance to navigation by humans and migratory fish. The dam also allows nutrients to accumulate upstream which results in oxygen depletion.

Thank you for providing me this opportunity to comment on the appeal of Billerica Historic District Commission Denial of Application for Talbot Dam Removal.

Sincerely,  
Al Peirce  
Acton, MA



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## Support for the Talbot Mills Dam Removal

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**From** Ken Reeves <ken\_reeves@hotmail.com>

**Date** Fri 11/28/2025 11:18 AM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Jennifer Raitt,

Thank you for the opportunity to comment on the Appeal of Billerica Historic District Commission Denial of Application for Talbot Dam Removal. I support the removal of the Talbot Mills Dam and the restoration of the ecology of the Concord River.

Dam removal restores natural river flows, which improves water quality. Freely flowing rivers improve habitats for fish and wildlife.

Sincerely,

Ken Reeves  
Concord, MA



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## Comments on Talbot Mills Dam Removal

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**From** Richard Pitkin <richardpitkin69@gmail.com>

**Date** Fri 11/28/2025 5:06 PM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Jennifer Raitt,

Thank you for the opportunity to comment on the Appeal of Billerica Historic District Commission Denial of Application for Talbot Dam Removal. I support the removal of the Talbot Mills Dam and the restoration of this culturally significant section of the Concord River.

As someone who lives near and cares for the Concord River, I believe this is a critical opportunity to restore the river to a more historically accurate state and reconnect it to its deeper history that long predates the dam.

A history professor told me once that there is no history, only histories. As we have seen this month with Ken Burns, American Revolution, there are multiple stories that make up what we need to know in living in the future.

I find the decision to made trying to keep the dam in place, quite selfish, when I look at the 10,000 years plus that the Concord river has run free. The geological history we should respect is the free movement of the waters and wildlife.

The history of the indigenous people who lived, with the bounty of the river that was taken away when the dam was install some 200+ years ago, is another place that I wish would be restored. I am saddened that future generations of citizens will never see what those past peoples experienced.

In looking at this decision to keep the dam, I am saddened. The history shown in Robert M. Thorson's, "The Boatman", where the political class was lobbied to change the law. The moned class wanted to defy the court's ruling that the dam should come down because of the harm facing farmers in the upper river basin. That harm to farmers was never resolved.

I am further saddened that information seen in the 2025 Report Card for America's Infrastructure from the American Society of Civil Engineers, where dams in this country receive an overall have a D rating is thwarted, with a grasping of a history that has passed by. History needs, should not put citizens in danger when a dam could fail in the floods that will happen in the future.

Another element of sadness in the decision to try and hold the dam by historical proclamation, is the burden on the dam owner. The owner does not want the burden of financial cost in dam inspections and future cost. I see this decision to burden the owner as government overreach.

So while I may not be administratively accurate in my comments, I do want to express my view that the other histories that intersect this dam, should inform the historical choice that goes forward, and in this case, I feel the choice of keeping the dam, is not the best for the current and future citizens of the state.

I hope this appeal will allow the dam to be taken down and future generations will see the Concord river as a vital wildlife habitat.

Regards,

Richard Pitkin

26 Waverly Ave.

Lowell, Mass.



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## Support for the Talbot Mills Dam Removal

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From Danise <danise.cavallaro@gmail.com>

Date Sat 11/29/2025 3:21 PM

To Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Jennifer,

Thank you for the opportunity to comment on the Appeal of Billerica Historic District Commission Denial of Application for Talbot Dam Removal. I support the removal of the Talbot Mills Dam and the restoration of this culturally significant section of the Concord River.

As someone who lives near and paddles on the Concord River, I believe this is a critical opportunity to restore the river to a more historically accurate state and reconnect it to its deeper history that long predates the dam.

For thousands of years, the river sustained Indigenous communities whose presence and stewardship shaped this region. Restoring natural river flow is not just an ecological repair; it is also a step toward preserving, honoring, and acknowledging this deeper legacy.

I support the appeal for the following reasons:

### **Respect for historic and cultural Resources**

I urge the reviewing bodies to consider the full scope of the river's history—not just the industrial-era history of the past few hundred years, but the longstanding and ongoing presence of Indigenous peoples and the ecological history of the river itself, which has been in existence for thousands of years. This project offers an opportunity to recognize and protect those historic and cultural values while restoring the natural landscape.

### **The project was incorrectly reviewed**

While the project team provided significant evidence for why the project should be approved either by a Certificate of Hardship or Certificate of Non-Applicability, the Billerica Historic Districts Commission denied the project with little to no explanation. One member even acknowledged that economic hardship exists, but disregarded it. I expect our regulatory authorities and commissions to make decisions based on facts, regulations, and review standards, not based on personal opinions.

### **The project provides an opportunity to tell the full history of the site**

The purpose of the Historic Preservation Act is to “promote the educational, cultural, economic and general welfare of the public through the preservation and protection of the distinctive characteristics of ... places significant in the history of the commonwealth...” and the dam removal project achieves exactly that. The project will add educational signage and other aspects of historic preservation to the site to tell not only the short industrial history of the dam, but also the indigenous history of the area. It provides an opportunity to uncover artifacts currently buried under the impoundment, including an older version of the dam. The project is

an opportunity to promote the educational and cultural welfare of the public beyond and including the dam's short industrial history.

Please support the dam's removal and be a part of showcasing the full history of the Concord River.

Sincerely,  
Danise Cavallaro  
Maynard, MA



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## Support for the Talbot Mills Dam Removal

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**From** Marshall, Bridget <Bridget\_Marshall@uml.edu>

**Date** Sun 11/30/2025 6:47 PM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Jennifer Raitt,

I'm writing to share my support for the removal of the Talbot Mills Dam and the restoration of this area of the Concord River.

For the past six years, I have been volunteering with Lowell Parks and Conservation Trust as a part of their fish monitoring program, working to document and hopefully eventually increase the number of migratory fish in this Concord, restoring the ecosystem that affects us all. I believe this is a critical opportunity to restore the river to a more historically accurate state and reconnect it to its deeper history that long predates the dam.

I understand some folks think that this dam needs to be preserved, but there is a much more important form of preservation at stake. This river has sustained Indigenous communities for thousands of years prior to the arrival of white settlers. Restoring natural river flow is not just an ecological repair; it is also a step toward preserving, honoring, and acknowledging this deeper legacy.

I urge the reviewing bodies to consider the full scope of the river's history—not just the industrial-era history of the past few hundred years, but the longstanding and ongoing presence of Indigenous peoples and the ecological history of the river itself, which has been in existence for thousands of years. This project offers an opportunity to recognize and protect those historic and cultural values while restoring the natural landscape.

I urge our regulatory authorities and commissions to make decisions based on facts, regulations, and review standards, not based on personal opinions.

Please support the dam's removal and be a part of showcasing the full history of the Concord River.

Thank you for your time and energy to work to improve our community and our world.

Sincerely,  
Bridget Marshall  
Resident of Lowell

Dr. Bridget M. Marshall (she/her)  
Professor

Department of English  
University of Massachusetts, Lowell  
E-mail: [bridget\\_marshall@uml.edu](mailto:bridget_marshall@uml.edu)  
[@factorygothic.bsky.social](https://www.factorgothic.bsky.social)

New Book: [Mary Elizabeth Braddon: The Factory Girl \(1863\)](#) (University of Wales Press, 2025)

[Industrial Gothic: Workers, Exploitation and Urbanization in Transatlantic Nineteenth-Century Literature](#) (University of Wales Press, 2021)



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## In support of removing the Talbot Mills Dam Removal

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**From** Jake Bridge <bridge.jake@gmail.com>

**Date** Mon 12/1/2025 11:07 AM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Jennifer Raitt,

I am writing in support the removal of the Talbot Mills Dam to restore this section of the Concord River.

Any dam is a tool, with upsides and downsides. The upsides might include power, irrigation, or downstream flood control. The downsides are habitat destruction, upstream flooding, and maintenance requirements. At this point in its history, the Talbot Mills dam is a tool without a job, no longer providing power or water. The only remaining upside is as a reminder of the brief time when it had a job to do.

I live downstream of the dam, in Lowell where the Concord meets the Merrimack. I believe this is a critical opportunity to restore the river to a more historically accurate state and reconnect it to its deeper history that long predates the dam.

For thousands of years, the river sustained Indigenous communities whose presence and stewardship shaped this region. Restoring natural river flow is not just an ecological repair; it is also a step toward preserving, honoring, and acknowledging this deeper legacy.

I support the appeal for the following reasons:

Respect for historic and cultural Resources

I urge the reviewing bodies to consider the full scope of the river's history—not just the industrial-era history of the past few hundred years, but the longstanding and ongoing presence of Indigenous peoples and the ecological history of the river itself, which has been in existence for thousands of years. This project offers an opportunity to recognize and protect those historic and cultural values while restoring the natural landscape.

The project was incorrectly reviewed

While the project team provided significant evidence for why the project should be approved either by a Certificate of Hardship or Certificate of Non-Applicability, the Billerica Historic Districts Commission denied the project with little to no explanation. One member even acknowledged that economic hardship exists, but disregarded it. I expect our regulatory authorities and commissions to make decisions based on facts, regulations, and review standards, not based on personal opinions.

The project provides an opportunity to tell the full history of the site

The purpose of the Historic Preservation Act is to “promote the educational, cultural, economic and general welfare of the public through the preservation and protection of the distinctive characteristics of ... places significant in the history of the commonwealth...” and the dam removal project achieves exactly that. The project will add educational signage and other aspects of historic preservation to the site to tell not only the short industrial history of the dam, but also the indigenous history of the area. It provides an opportunity to uncover artifacts currently buried under the impoundment, including an older version of the dam. The project is an opportunity to promote the educational and cultural welfare of the public beyond and including the dam’s short industrial history.

Please support the dam’s removal and be a part of showcasing the full history of the Concord River.

Sincerely,

Jacob Bridge  
Lowell, MA



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## Support for the Talbot Mills Dam Removal

---

From Patricia Sawyer <m spat284@yahoo.com>

Date Mon 12/1/2025 12:52 PM

To Jennifer Raitt <jrait@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Jennifer Raitt, Thank you for the opportunity to comment on the Appeal of Billerica Historic District Commission Denial of Application for Talbot Dam Removal. I support the removal of the Talbot Mills Dam and the restoration of this culturally significant section of the Concord River. As someone who [lives near / paddles on / cares deeply about] the Concord River, I believe this is a critical opportunity to restore the river to a more historically accurate state and reconnect it to its deeper history that long predates the dam. For thousands of years, the river sustained Indigenous communities whose presence and stewardship shaped this region. Restoring natural river flow is not just an ecological repair; it is also a step toward preserving, honoring, and acknowledging this deeper legacy. I support the appeal for the following reasons: Respect for historic and cultural Resources I urge the reviewing bodies to consider the full scope of the river's history—not just the industrial-era history of the past few hundred years, but the longstanding and ongoing presence of Indigenous peoples and the ecological history of the river itself, which has been in existence for thousands of years. This project offers an opportunity to recognize and protect those historic and cultural values while restoring the natural landscape. The project was incorrectly reviewed While the project team provided significant evidence for why the project should be approved either by a Certificate of Hardship or Certificate of Non-Applicability, the Billerica Historic Districts Commission denied the project with little to no explanation. One member even acknowledged that economic hardship exists, but disregarded it. I expect our regulatory authorities and commissions to make decisions based on facts, regulations, and review standards, not based on personal opinions. The project provides an opportunity to tell the full history of the site The purpose of the Historic Preservation Act is to “promote the educational, cultural, economic and general welfare of the public through the preservation and protection of the distinctive characteristics of ... places significant in the history of the commonwealth...” and the dam removal project achieves exactly that. The project will add educational signage and other aspects of historic preservation to the site to tell not only the short industrial history of the dam, but also the indigenous history of the area. It provides an opportunity to uncover artifacts currently buried under the impoundment, including an older version of the dam. The project is an opportunity to promote the educational and cultural welfare of the public beyond and including the dam's short industrial history. Please support the dam's removal and be a part of showcasing the full history of the Concord River.

Sincerely, Patricia A. Sawyer, Lowell MA 01851



---

## Support for the Talbot Mills Dam Removal

---

**From** Patricia Sawyer <m spat284@yahoo.com>

**Date** Mon 12/1/2025 12:52 PM

**To** Jennifer Raitt <jrait@nmcog.org>

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Sincerely, Patricia A. Sawyer, Lowell MA 01851

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## Support for the Talbot Mills Dam Removal

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From Patricia Sawyer <m spat284@yahoo.com>

Date Mon 12/1/2025 12:52 PM

To Jennifer Raitt <jrait@nmcog.org>

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Sincerely, Patricia A. Sawyer, Lowell MA 01851

## BHDC 6/4 ppt pdf

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From Marlies Henderson <marlies.henderson@gmail.com>

Date Mon 12/1/2025 1:47 PM

To Jennifer Raitt <jraitt@nmcog.org>

Cc Kelly Lynema <klynema@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Hi Jenny,

This evening, given the opportunity, I aim to deliver a 3 minute statement which addresses what I believe to be the failure of the BHDC to consider hardship, yet refuse to issue a Certificate Of Hardship.

The 6/4 BHDC meeting minutes summarily mention that [Ms. Bresney \(DER\) presents a ppt. No word is included on the spectacularly elucidating content in the 61 slides](#). This hyperlinked masterful step-by-step legal approach clarifies non-applicability and - should authority be misinterpreted as applicable - applicability of hardship.

As for the BHDC on 6/4, the presentation was stonewalled; no discussion ensued, no votes, no action, so the recording secretary is not at fault. The BHDC however, failed to engage. This wrongful omission must be addressed.

The hyperlinked document is evidence that the applicant provided ample proof, but commissioners ignored it, and the denial is arbitrary.

Please include this email comment and the ppt pdf to the records of the Public Hearing. The ppt pdf totally clarifies all things murky in this dam removal process.

Best regards,  
Marlies

--

Marlies Henderson, CIG  
[marliesoutdoors.com](http://marliesoutdoors.com)

*"People protect what they love" (Jacques Yves Cousteau)*

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## Support for the Talbot Mills Dam Removal

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From Ginny & Chris Sargent <chrisgins79@yahoo.com>

Date Mon 12/1/2025 2:24 PM

To Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Jennifer Raitt,

Thank you for the opportunity to comment on the Appeal of Billerica Historic District Commission Denial of Application for Talbot Dam Removal. I support the removal of the Talbot Mills Dam and the restoration of this culturally significant section of the Concord River.

As someone who **cares deeply about** the Concord River, I believe this is a critical opportunity to restore the river to a more historically accurate state and reconnect it to its deeper history that long predates the dam.

For thousands of years, the river sustained Indigenous communities whose presence and stewardship shaped this region. Restoring natural river flow is not just an ecological repair; it is also a step toward preserving, honoring, and acknowledging this deeper legacy.

I support the appeal for the following reasons:

### **The project was incorrectly reviewed**

While the project team provided significant evidence for why the project should be approved either by a Certificate of Hardship or Certificate of Non-Applicability, the Billerica Historic Districts Commission denied the project with little to no explanation. One member even acknowledged that economic hardship exists, but disregarded it. I expect our regulatory authorities and commissions to make decisions based on facts, regulations, and review standards, not based on personal opinions.

### **The project provides an opportunity to tell the full history of the site**

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Removing the dam will open up 119 miles of river habitat, the largest in Massachusetts!

Please support the dam’s removal and be a part of showcasing the full history of the Concord River.

Sincerely,

Chris Sargent

Lowell, MA

Chris

Public Comment re Talbot Dam Removal

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From Tom Sciacca <tom\_sciacca@hotmail.com>  
Date Mon 12/1/2025 3:41 PM  
To Jennifer Raitt <jraitt@nmcog.org>  
Cc SuAsCo RSC <suasco-rsc@googlegroups.com>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

# Comment re Talbot Dam Removal

Ms. Raitt:

I write to comment on the removal of the Talbot Mills dam in North Billerica, relevant to your hearing scheduled for 12/1/2025.

I am the Wayland representative to the Sudbury, Assabet, and Concord Wild and Scenic River Stewardship Council. The Town of Wayland, via its Town Manager, is already on record as supporting

the removal of the dam; the letter so stating as part of the MEPA process is attached.

However, as the spouse of a published historian (her latest book, “Enslavement in the Puritan Village”, was published by the History Press in January), I am sensitive to the historical values at issue here. I submit, however, that the larger historical values are served by the removal of the dam.

History is one of the five “outstandingly remarkable values” cited by Congress to be protected by the Wild and Scenic designation of our rivers in 1999. That is because the entire extent of our rivers is historic, not any one site. The history of our rivers stretches back 10,000 years, when the first Native Americans arrived. They did not just exploit our rivers, but actively managed them by use of fire to alter the flood plain and weirs to manage the aquatic wildlife. The first European colonists actively managed our rivers as well, with drainage swales

and grazing of the marshes. For most of this time the migration of fish sustained hundreds of generations of humans and was very much a part of their history until the construction of the first dams in Billerica in the 18th century disrupted that migration.

Historically, our rivers have been central to human life for 10,000 years. Individual houses, farms, bridges, and dams have come and gone, but the rivers remain. The best way to honor that deep history is to restore our rivers as much as possible to their natural state. Individual sites should be marked and celebrated, but as a part of the entity that is the river, which extends far beyond Billerica.

Tom Sciacca

Wayland



MICHAEL F. MCCALL  
TOWN MANAGER  
TEL. (508) 358-3620  
[www.wayland.ma.us](http://www.wayland.ma.us)

## TOWN OF WAYLAND

41 COCHITUATE ROAD  
WAYLAND, MASSACHUSETTS 01778

### SELECT BOARD

ANNE BRENSLEY  
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March 19, 2024

Nicholas Moreno, MEPA Analyst  
Massachusetts Executive Office of Energy and Environmental Affairs  
MEPA Office  
100 Cambridge Street, 9<sup>th</sup> Floor  
Boston, MA 02114

Re: Talbot Mills Dam Removal, Billerica MA MEPA # 16731

Dear Mr. Moreno,

I write on behalf of the Town of Wayland to express our firm support for the Talbot Mills Dam Removal project outlined under MEPA #16731. As the Wayland Town Manager, I fully endorse this proposal.

The removal of the dam holds significant benefits for Wayland's river ecosystem. Since its construction in 1710, the dam has obstructed diadromous species, impeding their migration upstream. By removing this barrier, we anticipate a restoration and enrichment of our river ecosystem, extending to Hop (Wash) Brook, Mill Brook, and potentially even Cochituate Brook in Framingham. Removal of the dam stands to enhance local ecosystems and expand spawning territories, ultimately benefiting the entire Gulf of Maine region, as highlighted in the MEPA filing.

Moreover, removal of the dam addresses a crucial concern: flooding. Historical records indicate that the dam has contributed to flooding issues since its inception, impacting Wayland's River marshes and causing disruptions to our community. While the MEPA filing suggests a modest reduction of 3.6 to 5 inches in flood levels under extreme conditions, we remain optimistic due to the complexity of our river system. Our river's intricate hydrological network, coupled with various constrictions and flood plain sections, may have led to underestimations of the dam's impact. Regardless, even a slight decrease in peak flood levels would bring significant advantages to the safety of our residents and the economic vitality of Wayland. By safeguarding essential infrastructure such as roads, bridges, and utilities, our residents would see reduced repair costs and fewer disruptions to their daily lives.

Wayland has experienced numerous flood events, including seven since 1933, each causing considerable disruption, damage, and inconvenience. By alleviating flood risks, the removal of the dam promises tangible benefits, including shorter periods of impassable roads and improved commuting conditions for residents and surrounding communities. It's imperative to acknowledge these benefits, which, regrettably, appear to have been overlooked in the MEPA filing.

In summary, the removal of the Talbot Mills Dam is long overdue and represents a positive step towards mitigating over 300 years of adverse impacts. We believe this project will deliver substantial environmental, ecological, and safety benefits to Wayland, and we wholeheartedly support its implementation.

Sincerely,

A handwritten signature in black ink that reads 'Michael McCall'.

Michael McCall  
Town Manager

Sent from my iPad

## Support for Talbot Mill Dam Removal

---

**From** Laura Mattei <lmattei@svtweb.org>

**Date** Mon 12/1/2025 3:57 PM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Cc** SuAsCo River Stewardship <suascoriverfestparty@gmail.com>

 1 attachment (56 KB)

Talbot Mill Dam Removal NMCG.docx;

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Ms. Raitt,

Sudbury Valley Trustees (SVT) supports the removal of the Talbot Mill Dam.

Please see our attached letter.

Thank you for your consideration.

Laura Mattei

--

Laura Mattei, Director of Conservation

978-443-5588, ext. 134



18 Wolbach Rd. Sudbury MA 01776

## Support for the Talbot Mills Dam Removal

---

From carla bucklies.com <carla@bucklies.com>

Date Mon 12/1/2025 5:14 PM

To Jennifer Raitt <jraitt@nmcog.org>

Cc carla bucklies.com <carla@bucklies.com>; paul bucklies.com <paul@bucklies.com>

Caution: This email originated from outside of the organization. Do not reply, click links, or open attachments unless you can confirm the sender and know the content is safe.

Dear Jennifer Raitt,

Thank you for the opportunity to comment on the Appeal of Billerica Historic District Commission Denial of Application for Talbot Dam Removal. I support the removal of the Talbot Mills Dam and the restoration of this culturally significant section of the Concord River.

As someone who paddles on and cares deeply about the Concord River, I believe this is a critical opportunity to restore the river to a more historically accurate state and reconnect it to its deeper history that long predates the dam.

For thousands of years, the river sustained Indigenous communities whose presence and stewardship shaped this region. Restoring natural river flow is not just an ecological repair; it is also a step toward preserving, honoring, and acknowledging this deeper legacy.

I support the appeal for the following reasons:

### Respect for historic and cultural Resources

I urge the reviewing bodies to consider the full scope of the river's history—not just the industrial-era history of the past few hundred years, but the longstanding and ongoing presence of Indigenous peoples and the ecological history of the river itself, which has been in existence for thousands of years. This project offers an opportunity to recognize and protect those historic and cultural values while restoring the natural landscape.

### The project was incorrectly reviewed

While the project team provided significant evidence for why the project should be approved either by a Certificate of Hardship or Certificate of Non-Applicability, the Billerica Historic Districts Commission denied the project with little to no explanation. One member even acknowledged that economic hardship exists, but disregarded it. I expect our regulatory authorities and commissions to make decisions based on facts, regulations, and review standards, not based on personal opinions.

The project provides an opportunity to tell the full history of the site

The purpose of the Historic Preservation Act is to "promote the educational, cultural, economic and general welfare of the public through the preservation and protection of the distinctive characteristics of ... places significant in the history of the commonwealth..." and the dam removal project achieves exactly that. The project will add educational signage and other aspects of historic preservation to the site to tell not only the short industrial history of the dam, but also the indigenous history of the area. It provides an opportunity to uncover artifacts currently buried under the impoundment, including an older version of the dam. The project is an opportunity to promote the educational and cultural welfare of the public beyond and including the dam's short industrial history.

Please support the dam's removal and be a part of showcasing the full history of the Concord River.

Sincerely,  
Carla Corey  
Paul Buckley  
Billerica, Massachusetts

Sent from my iPhone

## Support the Talbot Mills Dam Removal

---

**From** Laura DaCruz <lauradacruz722@gmail.com>

**Date** Mon 12/1/2025 6:22 PM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Jennifer Raitt,

My name is Laura DaCruz, and my husband and I live less than half a mile from the Talbot Mills Dam. As avid birdwatchers, recreationalists, and nature lovers, we support the removal of the Talbot Mills Dam. I know we speak for many Billerica residents, including our friends and neighbors, when I say that removing the dam and restoring this section of the Concord River would be very exciting for our town. Please support the dam's removal and the ecological flourishing that would succeed it.

Best regards,

Laura and Jeremy DaCruz

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## Support for the Talbot Mills Dam Removal

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**From** Pam Rockwell <pam@tiac.net>  
**Date** Mon 12/1/2025 9:08 PM  
**To** Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Ms. Raitt,

I am sorry that I could not attend the appeal of the Billerica Historic District Commission denial of application for Talbot Mill dam removal this evening in person. I hope you can accept these written comments. I live along the Assabet River in West Concord, upstream of the confluence of the Assabet and Sudbury Rivers into the Concord River. I support the removal of the Talbot Mills Dam and the restoration of a free-flowing Concord River in Billerica, because I know that this will improve the health and resilience of the river behind my house more than a dozen miles away.

My fellow Concordian, naturalist Henry David Thoreau supported the removal of the predecessor of this dam, recognizing that blocking flow and fish passage in the Concord River had already severely changed the lifestyle and culture of the people who depended on the fish to feed their families in the 19<sup>th</sup> century. I know that he worked hard to have this dam removed, and his plans were only abandoned because the Army Corps of Engineers were needed to build bridges for the Civil War. He died before he could finish his fight to restore the natural flow of the Concord River.

The dam exists because the historic need to use the Middlesex Canal for transportation in the 19<sup>th</sup> century was a more immediate concern than the food supply that fish, ducks, and marsh hay provided *for more than a millennium* before the dam was constructed. Perhaps at the time, devastating the fish populations that indigenous cultures built their lives around was considered a valid trade for the businesses connecting Massachusetts to the ports effectively. But the Middlesex Canal no longer exists as a transportation medium. It makes no sense to choose to preserve this harmful, obsolete dam, rather than to restore the river to its historic, pre-industrial state. It is like preserving a bridge that is no longer connected to the roads on either side.

My love of the river that flows behind my house connected me to OARS, and I have been a member of OARS board and a water quality monitoring volunteer for almost 30 years. I am proud to be part of an organization that is following in Thoreau's footsteps advocating for the restoration of flow in the Concord river. I was sorry to see that the Billerica Historic Districts Commission denied the permit for the Talbot Mill dam removal with little to no explanation, when it is clear that there is a great economic and environmental cost to maintaining this obsolete dam. I am not a lawyer, but I find it surprising that an Historic District Commission would even have any jurisdiction on structures in the footprint of the river at all.

I encourage the Northern Middlesex Council of Governments to support the removal of Talbot Mill dam and the restoration of the Concord River to its pre-industrial state: free-flowing and healthy.

Thank you for reading my comments,  
Pam Rockwell

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*Pam Rockwell*  
*OARS Board of Directors*

**1810 Main St., Concord MA, 01742**  
**(Route 62 at Harrington Avenue)**  
**home: 978-369-8512**  
**.....cell: 978-808-9609**

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## Comments on the Talbot Mill Dam Removal - Opportunity of a Lifetime

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**From** Dan Cook <dcook@conservationsolutions.com>

**Date** Tue 12/2/2025 1:39 AM

**To** Jennifer Raitt <jraitt@nmcog.org>

 5 attachments (6 MB)

Talbot Mill Dam NMCOG Hearing Comments 12-1-25.pdf; ESC Talbot dam removal letter of support 1 copy.pdf; Dam Removal Support- signed 1 copy.pdf; Talbot Mill Dam - An Opportunity of a Lifetime!.pdf; Susie Blesney 2025-06-04\_Talbot Mills BHDC Hardship Presentation 1.pdf;

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Ms. Raitt,

Enclosed please find my comments about the Talbot Mill Dam removal. I am a strong supporter of removing the Talbot Mill Dam. The Carlisle Conservation Commission and the Carlisle Environmental Sustainability both unanimously voted to support the removal of the dam. Enclosed are copies of their letters of support. Finally, I have enclosed an article about the Talbott Mill Dam that will appear in the widely read Carlisle Mosquito on Thursday.

Thank you so much for running a great meeting to address the appeal process for the Talbot Mill Dam.

All the Best

**Dan**

Daniel Cook

Carlisle Board Member

***Sudbury Assabet Concord Wild & Scenic River Stewardship Council***

508-878-9005 cell

[Dcook@conservationsolutions.com](mailto:Dcook@conservationsolutions.com)

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## Talbot Mill Dam Comments

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From Douglas Meagher <dougmeag@gmail.com>

Date Tue 12/2/2025 10:13 AM

To Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Ms. Raitt,

I write as a lifelong Billerica resident with the understanding that you are accepting comments in your role in the review process for the Billerica HDC's decision on the Talbot Mill Dam removal application that was before them.

I respectfully request that you **AFFIRM** the Historic District's Commission's decision in this matter. To do otherwise would have a chilling effect on Billerica's historic preservation that would extend far beyond this one instance.

As a resident of the Billerica Center Historic District since its formation, I certainly respect the perspective of any responsible property owner who is required to bring forward an application for HDC approval. For the property owner, there is usually a personal interest that is first and foremost in their minds. For the HDC members, there is a significant responsibility to work collaboratively with the property owner while also fulfilling Billerica's By-law requirements "to promote the educational, cultural, economic and general welfare of the public through the preservation and protection of the distinctive characteristics of buildings and places significant in the history and architectural heritage of the Town."

When our HDC has fulfilled its obligations in working collaboratively, deliberating carefully, and diligently outlining its decision - as it has in this matter - only to be confronted by an obstinate property owner who is intent on removing or inappropriately altering a historic resource, it would cause irreparable harm to side with property owner intent on destruction. Billerica has seen more than its fair share of lost historic resources (for example, "demolition by neglect") in recent years as other Town treasures were lost to competing personal interests. In that vein, it's not clear what the fate of this historic dam will be in future years, but I sincerely hope that NMCOG will see its role in the current matter as REAFFIRMING a fair and just HDC decision which fulfills the HDC's responsibilities to our Town as a whole.

Sincerely,

Douglas Meagher  
51 Concord Road  
Billerica, MA 01821

## Strong Support for Talbot Mill Dam Removal – Public Comment

---

**From** James Sibley <james@sibleys.net>

**Date** Tue 12/2/2025 10:26 AM

**To** Jennifer Raitt <jraitt@nmcog.org>; cdillon@billerica.gov <cdillon@billerica.gov>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Ms. Raitt and Mr. Dillon,

I'm writing in strong support of removing the Talbot Mill Dam. I grew up just next door in Carlisle, and today I work professionally in the global seafood and aquaculture space, telling science-based stories about healthy rivers, fisheries, and responsible practices around the world. Because of that background—and because this watershed shaped my childhood—I care deeply about seeing the Concord River restored to its full ecological potential.

As someone who grew up along these rivers and now works full-time in the maritimes, I see this as an extraordinary opportunity for Billerica to lead with science and stewardship.

Thank you for considering my comments.

Sincerely,  
James Sibley

**James Sibley**



**E:** james@sibleys.net

**T:** +1 (978) 201-0680

**A:** Boston, MA, USA

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[LinkedIn](#) • [TikTok](#)  
[Instagram](#) • [YouTube](#)

**DAM**

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**From** John Lee <john.allandalefarm@gmail.com>  
**Date** Tue 12/2/2025 1:58 PM  
**To** Jennifer Raitt <jrait@nmcog.org>  
**Cc** Dan Cook <dcook@conservationsolutions.com>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Rather than rant about the inappropriate finding of the Billerica Historic Districts Commission, let me just add that dams should not be considered historic in the sense that they are a testament to good design, judgement, cultural quality or anything valuable today. This dam, in particular, is not a qualified landmark, a venerable specimen of architectural design. It would speak better to our history to be able to restore the historic habitats of native fish which once swarmed the Merrimac River to the benefit of native and non-native peoples living in that drainage and sustained by its bounty.

John Lee  
65 Lowell Street  
Carlisle, MA 01741

--

John D. Lee  
617/650-2965

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## Historic Dam Removal Issue

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**From** Neil Devins - Membership Director <mca\_membership@middlesexcanal.org>

**Date** Tue 12/2/2025 5:06 PM

**To** Jennifer Raitt <jrait@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Hello Ms. Raitt:

While I attended the meeting last night, I couldn't figure out how to raise my hand. I am on the Board of Directors of the Middlesex Canal Association and I am a commissioner of the Middlesex Canal Commission. More importantly, I docent at our Museum nearly every Saturday. I give guided tours to a hundred people a year. Many of these people see the dam and waterfall after parking and are universally moved. After I tell them of the history of the Summit Pond and the dam; and they then hear that there are people who want the dam torn down, they are universally perplexed as they feel that just seeing the waterfall takes them back to what was going on there since 1804. When people were using words like Historical and Esthetic, they were almost dismissive in its use. A scene that moves people is more than either of those words. After the world's worst Art Theft at the Gardener, when seven Old Masters' paintings were stolen, it mattered not that Gardener had no insurance because what was lost could never be replaced, and their emotions about the loss had nothing to do with money and everything to do with how each of the Masters's stolen works evoked a deep, deep emotion about being transported into the paintings. Removing this dam strips our Middlesex Canal Story of one of its richest reminders and its historical space. The Museum visitors feel lucky to witness the pond and the waterfall. So, in many ways this art can never be replaced and so much of the canal in this state had been brazenly paved over by the time the MCA was formed in 1964. (as opposed to NY State, which has made many, many locks into historic sites of the Erie canal, and the relics of the canal have been superbly preserved.) Thus I'm pleading with the cold, legal toned individuals who want to take the dam down.

P.S.: Have you been to the confluence of the Assabet, Sudbury, and Concord rivers? This is where they want to send the herrings to. Well there are multiple signs there that say POISON: DO NOT EAT ANY FISH CAUGHT HERE. So I can't imagine, one proponent said, that people up the river are losing their source of meals, which sounds absurd given the conditions. Yes, maybe before 1661 when the first dam was built there, the indigenous people ate from the waters. Is this guilt over our genocide of the indigenous peoples, not an attempt to improve the ecological biome of the region. The Great Meadows wouldn't be so great without the water feeding it.

Thank you so much for listening, Sincerely, Neil P Devins, Ph.D.

## SUPPORT FOR THE TALBOT MILLS DAM REMOVAL

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**From** Greg Little <gslittleus@gmail.com>

**Date** Tue 11/25/2025 11:25 AM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Ms. Raitt,

I'm writing about the Appeal of Billerica Historic District Commission's denial of the application for the removal of the Talbot Dam. I **SUPPORT THE REMOVAL** of the Talbot Mills Dam and the restoration of this section of the Concord River to its TRUE historic state.

As someone who paddles on the Concord River, I believe this is a critical opportunity to restore the river to a more historically accurate state and reconnect it to its deeper history that long predates the dam. For thousands of years, the river sustained Indigenous communities whose presence and stewardship shaped this region. Restoring natural river flow is not just an ecological repair, it is also a step toward preserving, honoring, and acknowledging this deeper legacy. **I urge the reviewing bodies to consider the full scope of the river's history**—not just the industrial-era history of the past few hundred years.

**The project was incorrectly reviewed.** While the project team provided significant evidence for why the project should be approved either by a Certificate of Hardship or Certificate of Non-Applicability, the Billerica Historic Districts Commission denied the project with little to no explanation. One member even acknowledged that economic hardship exists, but disregarded it. I expect our regulatory authorities and commissions to make decisions based on facts, regulations, and review standards, not based on personal opinions.

Sincerely,

- Greg Little  
Stow, MA



---

## Talbot Mills Dam

---

**From** Michael Mcinnis <mjmpatch@gmail.com>

**Date** Wed 11/26/2025 5:34 PM

**To** Jennifer Raitt <jraitt@nmcog.org>

 1 attachment (336 KB)

MCCLettertoNMCOGforDec12025HearingNov262025FINAL.pdf;

Caution: This email originated from outside of the organization. Do not reply, click links, or open attachments unless you can confirm the sender and know the content is safe.

Sent from my iPhone



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## Talbot Mills Dam

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**From** Al Peirce <trashpaddler@gmail.com>

**Date** Fri 11/28/2025 8:39 AM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Jennifer Raitt,

I often paddle on the Concord River and want to convey my support for the removal of the Talbot Mills Dam. The dam no longer serves its intended purpose and is an unnecessary hindrance to navigation by humans and migratory fish. The dam also allows nutrients to accumulate upstream which results in oxygen depletion.

Thank you for providing me this opportunity to comment on the appeal of Billerica Historic District Commission Denial of Application for Talbot Dam Removal.

Sincerely,  
Al Peirce  
Acton, MA



---

## Support for the Talbot Mills Dam Removal

---

**From** Ken Reeves <ken\_reeves@hotmail.com>

**Date** Fri 11/28/2025 11:18 AM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Jennifer Raitt,

Thank you for the opportunity to comment on the Appeal of Billerica Historic District Commission Denial of Application for Talbot Dam Removal. I support the removal of the Talbot Mills Dam and the restoration of the ecology of the Concord River.

Dam removal restores natural river flows, which improves water quality. Freely flowing rivers improve habitats for fish and wildlife.

Sincerely,

Ken Reeves  
Concord, MA



---

## Comments on Talbot Mills Dam Removal

---

**From** Richard Pitkin <richardpitkin69@gmail.com>

**Date** Fri 11/28/2025 5:06 PM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Jennifer Raitt,

Thank you for the opportunity to comment on the Appeal of Billerica Historic District Commission Denial of Application for Talbot Dam Removal. I support the removal of the Talbot Mills Dam and the restoration of this culturally significant section of the Concord River.

As someone who lives near and cares for the Concord River, I believe this is a critical opportunity to restore the river to a more historically accurate state and reconnect it to its deeper history that long predates the dam.

A history professor told me once that there is no history, only histories. As we have seen this month with Ken Burns, American Revolution, there are multiple stories that make up what we need to know in living in the future.

I find the decision to made trying to keep the dam in place, quite selfish, when I look at the 10,000 years plus that the Concord river has run free. The geological history we should respect is the free movement of the waters and wildlife.

The history of the indigenous people who lived, with the bounty of the river that was taken away when the dam was install some 200+ years ago, is another place that I wish would be restored. I am saddened that future generations of citizens will never see what those past peoples experienced.

In looking at this decision to keep the dam, I am saddened. The history shown in Robert M. Thorson's, "The Boatman", where the political class was lobbied to change the law. The moned class wanted to defy the court's ruling that the dam should come down because of the harm facing farmers in the upper river basin. That harm to farmers was never resolved.

I am further saddened that information seen in the 2025 Report Card for America's Infrastructure from the American Society of Civil Engineers, where dams in this country receive an overall have a D rating is thwarted, with a grasping of a history that has passed by. History needs, should not put citizens in danger when a dam could fail in the floods that will happen in the future.

Another element of sadness in the decision to try and hold the dam by historical proclamation, is the burden on the dam owner. The owner does not want the burden of financial cost in dam inspections and future cost. I see this decision to burden the owner as government overreach.

So while I may not be administratively accurate in my comments, I do want to express my view that the other histories that intersect this dam, should inform the historical choice that goes forward, and in this case, I feel the choice of keeping the dam, is not the best for the current and future citizens of the state.

I hope this appeal will allow the dam to be taken down and future generations will see the Concord river as a vital wildlife habitat.

Regards,

Richard Pitkin

26 Waverly Ave.

Lowell, Mass.



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## Support for the Talbot Mills Dam Removal

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From Danise <danise.cavallaro@gmail.com>

Date Sat 11/29/2025 3:21 PM

To Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Jennifer,

Thank you for the opportunity to comment on the Appeal of Billerica Historic District Commission Denial of Application for Talbot Dam Removal. I support the removal of the Talbot Mills Dam and the restoration of this culturally significant section of the Concord River.

As someone who lives near and paddles on the Concord River, I believe this is a critical opportunity to restore the river to a more historically accurate state and reconnect it to its deeper history that long predates the dam.

For thousands of years, the river sustained Indigenous communities whose presence and stewardship shaped this region. Restoring natural river flow is not just an ecological repair; it is also a step toward preserving, honoring, and acknowledging this deeper legacy.

I support the appeal for the following reasons:

### **Respect for historic and cultural Resources**

I urge the reviewing bodies to consider the full scope of the river's history—not just the industrial-era history of the past few hundred years, but the longstanding and ongoing presence of Indigenous peoples and the ecological history of the river itself, which has been in existence for thousands of years. This project offers an opportunity to recognize and protect those historic and cultural values while restoring the natural landscape.

### **The project was incorrectly reviewed**

While the project team provided significant evidence for why the project should be approved either by a Certificate of Hardship or Certificate of Non-Applicability, the Billerica Historic Districts Commission denied the project with little to no explanation. One member even acknowledged that economic hardship exists, but disregarded it. I expect our regulatory authorities and commissions to make decisions based on facts, regulations, and review standards, not based on personal opinions.

### **The project provides an opportunity to tell the full history of the site**

The purpose of the Historic Preservation Act is to “promote the educational, cultural, economic and general welfare of the public through the preservation and protection of the distinctive characteristics of ... places significant in the history of the commonwealth...” and the dam removal project achieves exactly that. The project will add educational signage and other aspects of historic preservation to the site to tell not only the short industrial history of the dam, but also the indigenous history of the area. It provides an opportunity to uncover artifacts currently buried under the impoundment, including an older version of the dam. The project is

an opportunity to promote the educational and cultural welfare of the public beyond and including the dam's short industrial history.

Please support the dam's removal and be a part of showcasing the full history of the Concord River.

Sincerely,  
Danise Cavallaro  
Maynard, MA



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## Support for the Talbot Mills Dam Removal

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**From** Marshall, Bridget <Bridget\_Marshall@uml.edu>

**Date** Sun 11/30/2025 6:47 PM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Jennifer Raitt,

I'm writing to share my support for the removal of the Talbot Mills Dam and the restoration of this area of the Concord River.

For the past six years, I have been volunteering with Lowell Parks and Conservation Trust as a part of their fish monitoring program, working to document and hopefully eventually increase the number of migratory fish in this Concord, restoring the ecosystem that affects us all. I believe this is a critical opportunity to restore the river to a more historically accurate state and reconnect it to its deeper history that long predates the dam.

I understand some folks think that this dam needs to be preserved, but there is a much more important form of preservation at stake. This river has sustained Indigenous communities for thousands of years prior to the arrival of white settlers. Restoring natural river flow is not just an ecological repair; it is also a step toward preserving, honoring, and acknowledging this deeper legacy.

I urge the reviewing bodies to consider the full scope of the river's history—not just the industrial-era history of the past few hundred years, but the longstanding and ongoing presence of Indigenous peoples and the ecological history of the river itself, which has been in existence for thousands of years. This project offers an opportunity to recognize and protect those historic and cultural values while restoring the natural landscape.

I urge our regulatory authorities and commissions to make decisions based on facts, regulations, and review standards, not based on personal opinions.

Please support the dam's removal and be a part of showcasing the full history of the Concord River.

Thank you for your time and energy to work to improve our community and our world.

Sincerely,  
Bridget Marshall  
Resident of Lowell

Dr. Bridget M. Marshall (she/her)  
Professor

Department of English  
University of Massachusetts, Lowell  
E-mail: [bridget\\_marshall@uml.edu](mailto:bridget_marshall@uml.edu)  
[@factorygothic.bsky.social](https://www.factorgothic.bsky.social)

New Book: [Mary Elizabeth Braddon: The Factory Girl \(1863\)](#) (University of Wales Press, 2025)

[Industrial Gothic: Workers, Exploitation and Urbanization in Transatlantic Nineteenth-Century Literature](#) (University of Wales Press, 2021)



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## In support of removing the Talbot Mills Dam Removal

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**From** Jake Bridge <bridge.jake@gmail.com>

**Date** Mon 12/1/2025 11:07 AM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Jennifer Raitt,

I am writing in support the removal of the Talbot Mills Dam to restore this section of the Concord River.

Any dam is a tool, with upsides and downsides. The upsides might include power, irrigation, or downstream flood control. The downsides are habitat destruction, upstream flooding, and maintenance requirements. At this point in its history, the Talbot Mills dam is a tool without a job, no longer providing power or water. The only remaining upside is as a reminder of the brief time when it had a job to do.

I live downstream of the dam, in Lowell where the Concord meets the Merrimack. I believe this is a critical opportunity to restore the river to a more historically accurate state and reconnect it to its deeper history that long predates the dam.

For thousands of years, the river sustained Indigenous communities whose presence and stewardship shaped this region. Restoring natural river flow is not just an ecological repair; it is also a step toward preserving, honoring, and acknowledging this deeper legacy.

I support the appeal for the following reasons:

Respect for historic and cultural Resources

I urge the reviewing bodies to consider the full scope of the river's history—not just the industrial-era history of the past few hundred years, but the longstanding and ongoing presence of Indigenous peoples and the ecological history of the river itself, which has been in existence for thousands of years. This project offers an opportunity to recognize and protect those historic and cultural values while restoring the natural landscape.

The project was incorrectly reviewed

While the project team provided significant evidence for why the project should be approved either by a Certificate of Hardship or Certificate of Non-Applicability, the Billerica Historic Districts Commission denied the project with little to no explanation. One member even acknowledged that economic hardship exists, but disregarded it. I expect our regulatory authorities and commissions to make decisions based on facts, regulations, and review standards, not based on personal opinions.

The project provides an opportunity to tell the full history of the site

The purpose of the Historic Preservation Act is to “promote the educational, cultural, economic and general welfare of the public through the preservation and protection of the distinctive characteristics of ... places significant in the history of the commonwealth...” and the dam removal project achieves exactly that. The project will add educational signage and other aspects of historic preservation to the site to tell not only the short industrial history of the dam, but also the indigenous history of the area. It provides an opportunity to uncover artifacts currently buried under the impoundment, including an older version of the dam. The project is an opportunity to promote the educational and cultural welfare of the public beyond and including the dam’s short industrial history.

Please support the dam’s removal and be a part of showcasing the full history of the Concord River.

Sincerely,

Jacob Bridge  
Lowell, MA

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## Talbot Mills Dam removal comments

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From Alison Field-Juma <fieldjuma@gmail.com>

Date Wed 12/3/2025 11:44 AM

To Jennifer Raitt <jraitt@nmcog.org>

Cc Matt Brown <mbrown@oars3rivers.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

To: Jennifer Raitt, NMCOG Executive Director

Re: Public Hearing: Appeal of Billerica Historic District Commission Denial of Application for Talbot Dam Removal

Date: Dec. 3, 2025

Dear Ms. Raitt,

Thank you for the opportunity to comment on the above referenced Appeal.

There are many reasons to remove the Talbot Mills dam—ecological, climate resilience, public safety, and historic. Due to the dam's presence in recent history, it provides an attractive feature and is part of the story of the many uses of the Concord River. Naturally this is valued by some of those who live or work there. It is plain to see. However, the extreme eutrophication of the millpond created behind the dam during the summer is also plain to see, evidence of an unhealthy ecosystem and degraded public space. Less visible is the continued obstruction of the migratory fish that were critical to the long history of indigenous settlements along the river and to the colonists as they built their communities along the free-flowing river. Without the dams, it was an essential part of the regional transportation network to and from the sea. Restoration of the fish runs, which is part of a major regional effort, would restore a key feature of local history including the waterfall upon which the dam was built. Also less visible is the threat of flooding due to more intense storms that is exacerbated by the dam and its constrained spillway. Dam removal would create a large floodplain that would safely absorb floodwaters. All these aspects are in the interest of public welfare.

There is no mechanism whereby this dam could be “protected and preserved” as the Denial states. This is simply a desire with no practical means of implementation. The dam is a large financial liability and is under an order to be repaired/modified due to the threat of flooding—a very expensive project with no funding. There is no party interested or able to take over the ownership from the current owner to relieve him of this substantial financial hardship—or to insure and maintain the dam in the decades to come. Hence denying the dam removal and river restoration would result in a detriment to the public interest, resulting in either a dam that is out of compliance and a danger to public health and welfare, or a dam for which a public body would have to assume this substantial liability.

As the Executive Director for OARS until my retirement in 2024, I have worked with the owner of the dam for several years and can state unequivocally that he has made every effort to find solutions to this problem but has reached an impasse at every turn. He is a person of goodwill and genuinely interested in the welfare of the public and the town, and in the long history of the dam and the associated buildings. However, the continued ownership of the dam and the associated major liabilities, both financial and legal, are not hardships that he or his family should be forced to bear.

There are clear legal problems with the decision to deny the application that are laid out in detail in the Appeal as well as a clear case for corrective action. I trust that MCOG will annul the Hardship Decision because it is not warranted by the evidence, and issue a Certificate of Appropriateness, Non-applicability, or Hardship as appropriate to allow the project to proceed without further delay.

Thank you for your work for our local governments and for considering these comments.

Sincerely,

Alison Field-Juma

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*Alison Field-Juma*  
617-388-1366

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## Talbot Mill Dam Appeal

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From Elissa Brown <ebrown1027@gmail.com>

Date Wed 12/3/2025 2:01 PM

To Jennifer Raitt <jrait@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

How long does it take to remove a dam?

There have been efforts to remove dams at Talbot Mills since 1710 when residents of Concord complained that the timber crib dam built on the river was negatively impacting flooding and fishing. Although that dam was torn down in 1721, another was constructed shortly thereafter. Fights over the role of the dam in flooding and fishing continued well into the 1800's when the current dam was constructed. In all, at least eight major lawsuits and multiple countersuits have been filed over the issues of flooding and fish passage.

The history of Concord is inextricably linked to the Concord River. The reason why the colonists established a settlement here was the presence of the natural hay meadows lining the river and the abundance of fish and other wildlife that lived in or near the river. There is no doubt that the current dam blocks the river that once sustained Native American populations and our colonial ancestors with plentiful supplies of river herring and shad, preventing fish and other wildlife from migrating between the upper sections of the SuAsCo watershed and the ocean. If our concern was to celebrate our history, we should be more concerned with recognition of centuries of indigenous and early colonial history, not the limited industrial period that was responsible for so much environmental damage to our region.

I'm a passionate supporter of our rivers, currently serving as River Ambassador to the SuAsCo Wild & Scenic River Stewardship Council. In this comment letter, however, I am speaking not as Ambassador but as a long-time resident of Concord; former member of the Natural Resources Commission, Planning Board, and Public Works Commission; and a certified Concord Guide. If we are being true to the unique history of settlement along the Concord River, I ask why can't we remove a dam and restore the river to its natural and true historic state.?

Elissa Brown

5 Concord Greene, #1

Concord, MA 01742

781 801-3704

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## Support for removal of Billerica Dam

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**From** Melissa Blum <martin\_melissa@ymail.com>  
**Date** Wed 12/3/2025 8:17 PM  
**To** Jennifer Raitt <jraitt@nmcog.org>  
**Cc** Morgan Asher Blum <blumroe@gmail.com>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Hi Jennifer,

I'm writing to express my strong support for removing the Billerica dam.

The community input shared during the recent NEMCOG meeting made it clear that a large majority of residents and stakeholders—both within and outside of Billerica—see dam removal as the most beneficial long-term path forward. Opening the river would improve ecological health, reduce public-safety risks, and provide meaningful community and recreational benefits.

From an environmental standpoint, removing the dam would restore natural flow, expand spawning access for migratory fish, and strengthen the broader river ecosystem from Massachusetts all the way through the watershed. This aligns directly with the guidance provided by the State Department of Fisheries and represents a rare opportunity to meaningfully improve habitat and biodiversity.

There are also real public-safety considerations. Aging infrastructure, flood-risk concerns, and ongoing maintenance pressures only increase over time. Removal addresses those risks at the root, rather than delaying a problem that will inevitably resurface.

Finally, opening the river enhances public access—creating opportunities for kayaking, canoeing, and other low-impact recreation that connect residents to the waterway and strengthen community engagement.

For these reasons, I strongly encourage NEMCOG to support the dam-removal proposal.

Thank you for your time and consideration.

Best regards,  
Melissa Blum

## Support for the Talbot Mills Dam Removal

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**From** Carol Kyte <ckyte@verizon.net>  
**Date** Thu 12/4/2025 2:43 AM  
**To** Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Jennifer Raitt,

I am writing you to let you know I strongly support the removal of the Talbot Mills Dam and the restoration of this section of the Concord River.

Therefore, I would like to register my comment on the "Appeal of the Billerica Historical Commission Denial of Application for the Talbot Mills Removal".

Dams are being removed around the world and it is high time Billerica does the right thing for the health of this river.

Since 2014, The Merrimack Watershed Council has done studies and provided ample reasons why it's time for the dam to be removed.

I have supported the hard work of our important watersheds, and like to see environmental concerns addressed.

As an avid reader of local history, I know our early ancestors have been on these lands for a relatively short time.

The indigenous communities had lived here thousands of years and the river had provided them sustenance. In its natural state, the river would flow smoothly.

Many of the issues of eutrophication would be alleviated if there was not an unnatural impediment to the flow.

What I find particularly egregious, is the fact that the project was incorrectly reviewed and the Billerica Historic Districts Commission denied the project with little to no explanation.

In fact, one member had even acknowledged that economic hardship exists, but disregarded it. Our regulatory authorities and commissions should be making decisions based on facts,

regulations, and review standards, not based on personal opinions.

Please support the dam's removal and be on the right side of history for our beloved and historic Concord River.

Sincerely,

Carol Kyte

Maynard, MA

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**Fwd: Removal of the Talbot Mills Dam in Billerica**

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**From** Ralph DiPisa <rdipisa26@gmail.com>

**Date** Thu 12/4/2025 7:42 AM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Ms. Raitt,

I am writing to express my strong support for the removal of the Talbot Mills Dam in Billerica, Massachusetts. This action represents a rare opportunity to restore the health of the Concord River, improve public safety and create long-term ecological and economic benefits for the region. The Dam is an aging structure that no longer serves the industrial purpose for which it was built. Instead, it now contributes to degraded water quality, impaired fish passage and elevated flooding risks for surrounding neighborhoods.

Numerous studies have shown that obsolete dams like this one restrict the natural flow of rivers, warm the water to unhealthy levels, and prevent migratory species from reaching critical upstream habitat.

Removing the dam would meaningfully reverse these effects.

For these reasons, I support the removal of the Talbot Mills Dam and encourage state and local decision makers to move forward with this project. This is a forward looking investment in the health and safety of the region, and I urge you to give it your full consideration.

Thanks for your attention to this matter.

Sincerely,

Ralph DiPisa

## Talbot Mills Dam Removal - Carlisle MA

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**From** Scott Triola <striola@carlislema.gov>

**Date** Thu 12/4/2025 9:11 AM

**To** Jennifer Raitt <jraitt@nmcog.org>

 1 attachment (235 KB)

Carlisle - Talbot Mills Dam.pdf;

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Hi Jennifer,

Please see the attached PDF which includes letters of support for the removal of the Talbot Mills Dam from the **Carlisle Conservation Commission** and **Carlisle Environmental Sustainability Committee**.

Regards,  
Scott Triola

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Scott Triola  
Chair - Carlisle Select Board  
striola@carlislema.gov

*Note: All email correspondence to and from this address is subject to public review under the MA Public Records Law. As a result all messages may be monitored by and disclosed to third parties.*

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## Billerica Dam

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From reacol@aol.com <reacol@aol.com>

Date Thu 12/4/2025 10:29 AM

To Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

December 3, 2025

Jennifer Raitt  
NMCOG

Dear Jennifer,

My name is Michael Rea and I am a long time resident of Billerica, having arrived here as a child in 1949. I have been active in Billerica Government in many capacities over the years including, Planning board member, Selectman, State Representative, Billerica NMAC representative two time chair and currently I am on the Billerica Historic Districts Commission.

The Commission members agreed to have one spokesperson at the recent Zoom hearing about the dam removal. That was to eliminate repetitive comments and stick to the facts of the matter. With that said, much of the commentary at that meeting by others was repetitive, opinionated, and erroneous information. Our concerns are only with the historical aspect of the site.

Those advocating dam removal for the restoration of some fish species in the Concord seem to ignore the two dams downstream of this dam. The same applies to the people wishing to paddle through this location hoping to reach the Merrimack River.

The Concord River is Billerica's only source of drinking water and some recent water levels have been dangerously low at the intake location up river from the dam. The experts tell us removal of the dam will probably have little impact on our water supply. Probably is not good enough for me,

The thought of the Mill Pond becoming a mud flat or a swamp and all that entails, coupled with concerns about municipal water shortages, seem reason enough to leave this splendid vista as it is.

Thank you for any consideration given to my comments and I wish you well in your deliberations.

Michael Rea  
[reacol@aol.com](mailto:reacol@aol.com)  
978 621 7183



THE COMMONWEALTH OF MASSACHUSETTS  
**Middlesex Canal Commission**



November 26, 2025

Ms., Jennifer Raitt, Executive Director  
Northern Middlesex Council of Governments  
672 Suffolk Street, Suite 100  
Lowell, MA 01854

**RE: Appeal Hearing – December 1, 2025 - Concerning Billerica Historic Districts  
Commission Ruling – Talbot Mills Dam**

Dear Ms. Raitt:

The appeal of the June 4, 2025 decision of the Billerica Historic Districts Commission (BHDC) concerning the proposed removal of the Dam and Summit Pond in North Billerica has been scheduled, pursuant to a continuance, for a Hearing on December 1, 2025. We will have representation at that time, but wish to have this letter entered into the record of the Hearing.

We want to be firmly on the record as opposing any reversal of the BHDC's decision to forbid removal of this important historic resource. The Middlesex Canal is a National Register Historic District, and the Dam and Summit Pond fall squarely within the North Billerica Mills District.

In its July 2, 2025 Appeal document, CRT Development Realty makes several claims as to why NMCOG should reverse BHDC's decision. The document first includes an elaborate recitation of "Background facts," designed to bootstrap the dam removal project into a foregone conclusion. The document then lays out several arguments for NMCOG to reverse the BHDC's decision. Stripped of their elaborate legalese, these assert the following: 1) The Talbot Mills Dam is not a structure and thus not subject to the jurisdiction of the BHDC; 2) CRT has demonstrated a hardship that should allow them to remove the Dam.

These arguments are patently deficient. First, common sense shows that the Dam meets all the logical definitions of a historic "structure." It's made of solid materials. It has a documented historical role. And, it has been a structure for over two centuries. It is hard to imagine anything more obvious. Moreover, the Dam is a nationally recognized historic resource that is central to the history and importance of the Middlesex Canal.

Second, there is the hardship argument; this is based on Gomez and Sullivan's elaborate and entirely speculative presentation at the BHDC earlier this year. Let's just say the numbers were designed to reach a foregone conclusion. More importantly, it is clear the CRT is perfectly capable of funding ongoing maintenance of the Dam. The dam's owner noted that he has spent more than \$60,000 on those costs. Furthermore, CRT had the resources to recently pay \$400,000 for two acres of land on Old Elm Street. These are clearly not the actions of an entity that needs to plead poverty or hardship.

The facts are clear. The BHDC has clear and untrammelled jurisdiction over the Talbot Mills Dam. The Dam is a structure. CRT is in no way a hardship case.

J. Raitt, NMCOG  
November 26, 2025  
page 2

Finally, we remind NMCOG and your retained expert of what is at stake here. The Talbot Mills Dam is a nationally recognized historic resource that is absolutely central to the history and importance of the Middlesex Canal. The Canal itself is an integral part of the history of Northern Middlesex, Billerica, Chelmsford and Lowell, not to mention the other Canal communities further South. Removal of the Dam would destroy the Summit Pond on the Concord River, the central feature of the entire Middlesex Canal. It would also completely destroy the core mission of the new Middlesex Canal Museum; no more physical resources/structures, no more Museum.

The only goal of the Middlesex Canal Commission is to protect and celebrate the Middlesex Canal. As you know, we and others proposed a sensible compromise that would preserve history, help the fish and the environment and advance the public interest in the fullest sense. Unfortunately, this idea has been summarily dismissed by NOAA, the Division of Ecological Resources and OARS.

Removal of the Talbot Mills Dam would make a complete mockery of historic preservation, undermine the will of the people of Billerica, and damage the relationship of NMCOG to its constituents. We trust that NMCOG will deny this appeal.

Thank you for your kind attention.

Sincerely,

Michael McInnis, Chair

cc: BHDC; MCC; MCA

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## Support for the Talbot Mills Dam Removal

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From hoagdj@aol.com <hoagdj@aol.com>

Date Mon 11/24/2025 4:41 PM

To Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Jennifer Raitt, Thank you for the opportunity to comment on the Appeal of Billerica Historic District Commission Denial of Application for Talbot Dam Removal. I support the removal of the Talbot Mills Dam and the restoration of this culturally significant section of the Concord River. As someone who [lives near / paddles on / cares deeply about] the Concord River, I believe this is a critical opportunity to restore the river to a more historically accurate state and reconnect it to its deeper history that long predates the dam. For thousands of years, the river sustained Indigenous communities whose presence and stewardship shaped this region. Restoring natural river flow is not just an ecological repair; it is also a step toward preserving, honoring, and acknowledging this deeper legacy. I support the appeal for the following reasons: Respect for historic and cultural Resources I urge the reviewing bodies to consider the full scope of the river's history—not just the industrial-era history of the past few hundred years, but the longstanding and ongoing presence of Indigenous peoples and the ecological history of the river itself, which has been in existence for thousands of years. This project offers an opportunity to recognize and protect those historic and cultural values while restoring the natural landscape. The project was incorrectly reviewed While the project team provided significant evidence for why the project should be approved either by a Certificate of Hardship or Certificate of Non-Applicability, the Billerica Historic Districts Commission denied the project with little to no explanation. One member even acknowledged that economic hardship exists, but disregarded it. I expect our regulatory authorities and commissions to make decisions based on facts, regulations, and review standards, not based on personal opinions. The project provides an opportunity to tell the full history of the site The purpose of the Historic Preservation Act is to “promote the educational, cultural, economic and general welfare of the public through the preservation and protection of the distinctive characteristics of ... places significant in the history of the commonwealth...” and the dam removal project achieves exactly that. The project will add educational signage and other aspects of historic preservation to the site to tell not only the short industrial history of the dam, but also the indigenous history of the area. It provides an opportunity to uncover artifacts currently buried under the impoundment, including an older version of the dam. The project is an opportunity to promote the educational and cultural welfare of the public beyond and including the dam's short industrial history. Please support the dam's removal and be a part of showcasing the full history of the Concord River. Sincerely, Dianne Hoaglin, Lexington, MA

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## Support for the Talbot Mills Dam Removal

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From Meghan Sullivan <msullivan@carlislema.gov>

Date Wed 12/3/2025 9:46 AM

To Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Jennifer Raitt,

Thank you for the opportunity to comment on the Appeal of Billerica Historic District Commission Denial of Application for Talbot Dam Removal. I support the removal of the Talbot Mills Dam and the restoration of this culturally significant section of the Concord River.

As someone who [lives near / paddles on / cares deeply about] the Concord River, I believe this is a critical opportunity to restore the river to a more historically accurate state and reconnect it to its deeper history that long predates the dam.

For thousands of years, the river sustained Indigenous communities whose presence and stewardship shaped this region. Restoring natural river flow is not just an ecological repair; it is also a step toward preserving, honoring, and acknowledging this deeper legacy.

I support the appeal for the following reasons:

Respect for historic and cultural Resources

I urge the reviewing bodies to consider the full scope of the river's history—not just the industrial-era history of the past few hundred years, but the longstanding and ongoing presence of Indigenous peoples and the ecological history of the river itself, which has been in existence for thousands of years. This project offers an opportunity to recognize and protect those historic and cultural values while restoring the natural landscape.

The project was incorrectly reviewed

While the project team provided significant evidence for why the project should be approved either by a Certificate of Hardship or Certificate of Non-Applicability, the Billerica Historic Districts Commission denied the project with little to no explanation. One member even acknowledged that economic hardship exists, but disregarded it. I expect our regulatory authorities and commissions to make decisions based on facts, regulations, and review standards, not based on personal opinions.

The project provides an opportunity to tell the full history of the site

The purpose of the Historic Preservation Act is to "promote the educational, cultural, economic and general welfare of the public through the preservation and protection of the distinctive characteristics

of ... places significant in the history of the commonwealth..." and the dam removal project achieves exactly that. The project will add educational signage and other aspects of historic preservation to the site to tell not only the short industrial history of the dam, but also the indigenous history of the area. It provides an opportunity to uncover artifacts currently buried under the impoundment, including an older version of the dam. The project is an opportunity to promote the educational and cultural welfare of the public beyond and including the dam's short industrial history.

Please support the dam's removal and be a part of showcasing the full history of the Concord River.

Sincerely,

Meghan Sullivan  
Conservation Administrator  
Town of Carlisle  
66 Westford Street, Carlisle, MA 01741  
(978) 369-0336

## Talbot Mills Dam removal comments

---

**From** Barton Koslow <[bkoslow10@gmail.com](mailto:bkoslow10@gmail.com)>

**Date** Thu 12/4/2025 12:18 PM

**To** Jennifer Raitt <[jraitt@nmcog.org](mailto:jraitt@nmcog.org)>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Please tear down this environmentally unfriendly dam which serves no valid purpose. It would enable the river to be open for recreational purposes and for a huge increase in fish all the way up to Canada. It will create a much cleaner river for all of us to enjoy.

--

Bart Koslow

reply to [bkoslow10@gmail.com](mailto:bkoslow10@gmail.com) or [bart@koslow.net](mailto:bart@koslow.net)

805-501-2127

## Supporting Approval of Talbot Mills Dam removal

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**From** Ryan Martin <caymen77@yahoo.com>  
**Date** Thu 12/4/2025 12:53 PM  
**To** Jennifer Raitt <jraitt@nmcog.org>  
**Cc** Robert Martin <martinr181@gmail.com>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Ms. Raitt,

I am writing in support of the Talbot Mills Dam Removal project. The ecological benefits of removing the dam—particularly the positive impact on wildlife and the restoration of a free-flowing river—are among the most compelling reasons for moving forward. Re-establishing natural river flow will provide environmental benefits that extend for thousands of miles throughout the connected watershed.

The public-safety considerations are equally significant. The frequency and intensity of severe storms have increased markedly over the past decade, and climate change is expected to continue driving more extreme weather events. These storms result in higher rainfall and greater flood risk, which is exacerbated by infrastructure that restricts natural water flow. Removing the dam will help reduce this risk and improve resilience for the surrounding communities.

Thank you for your time and consideration.

Sincerely,  
Ryan

## My Comments on Appeal re: Talbot Mills Dam

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**From** Allan Fierce <allan.fierce@gmail.com>

**Date** Fri 12/5/2025 12:52 PM

**To** Jennifer Raitt <jraitt@nmcog.org>

 1 attachment (283 KB)

Allan Fierce - Comments to NMCOG re Talbot Mills dam.pdf;

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

TO: Jennifer Raitt, Executive Director, NMCOG

Attached are my Comments on the Appeal of the Billerica Historic District Commission's denial of the Application for Talbot Mills Dam removal.

Thank you for this opportunity to submit comments.

Regards,

Allan Fierce  
Stow, Mass.  
978-621-9518  
[allan.fierce@gmail.com](mailto:allan.fierce@gmail.com)

**TO: North Middlesex Council of Governments  
Attn: Jennifer Raitt, Executive Director**

**FROM: Allan Fierce**

**RE: My Comments on Appeal of Billerica Historic District Commission's Denial of Application for Talbot Mills Dam Removal**

**DATE: Dec. 5, 2025**

## **I. Introduction**

My name is Allan Fierce, and I reside in Stow, Massachusetts, near the Assabet River. I am an avid paddler on the Assabet, Sudbury, and Concord rivers. I am also a retired environmental lawyer who worked in the Mass AG's Environmental Protection Division and also in private practice. Near the end of my career I served as a senior manager at the Massachusetts Department of Environmental Protection.

During the course of my career I was involved in many administrative appeals and other cases that involved interpreting state law as it applied to various state and local environmental agencies. The comments I am offering here are my own.

## **II. My Comments -- Summary**

The applicant here filed with the Billerica Historic District Commission ("BHDC") an Application seeking, among other options, a determination of Non-Applicability. For the reasons described below, pursuant to the governing statute, G.L. c. 40C, the BHDC has no legal authority to regulate dams. Therefore, the BHDC's only lawful option was to issue the applicant a Certificate of Non-Applicability. Instead it denied the Application. For the reasons stated below, that decision must be reversed. If NMCOG deems it necessary to remand this matter to the BHDC, it should only be for the purpose of having it issue a Certificate of Non-Applicability.

## **III. The Governing Statute, G.L. c. 40C, does not permit Historic District Commissions to regulate dams**

### **A. Background law**

The law governing Historic District Commissions ("HDCs) is Mass. General Laws chapter 40C, which is known as the "Historic Districts Act." Section 3 of the Act authorizes a city or town, by ordinance or by-law adopted by two-thirds vote of a town meeting, to establish "historic districts." If that happens, Section 4 of the Act requires that the city or town establish "an historic district commission" consisting of not less than three nor more than seven members."

Section 6 of the Act states its key operational provision: “[n]o **building or structure** within an historic district shall be constructed or altered in any way that affects exterior architectural features unless the commission shall first have issued a certificate of appropriateness, a certificate of non-applicability or a certificate of hardship with respect to such construction or alteration.” [Emphasis added.]

Importantly, the Act provides a Definitions section, Section 5, which specifies the definitions of “building” and “structure.” More on this below.

Pursuant to the state enabling act, in 1990 Billerica adopted a “BY-LAW TO ESTABLISH BILLERICA HISTORIC DISTRICTS COMMISSION.” Section 1 of the By-Law states: “Therefore, there is hereby established under Chapter 40C of the General Laws of the Commonwealth of Massachusetts a Billerica Historic Districts Commission.” There can be no question that the Billerica Historic Districts Commission (“BHDC”) operates under the mandates of the state Act.

The Billerica By-Law established three historic districts, one of which is the Billerica Mills Historic District, which is the district in which the Talbot Mills dam is located.

When the applicant in this case filed an application for a certificate of appropriateness, a certificate of non-applicability or a certificate of hardship for the removal of the Talbot Mills dam, the key issue in this case presented itself: Does the BHDC have the legal authority to regulate dams? The only authority it had been given under the state enabling act was to regulate “buildings” and “structures.”

## **B. Analysis of this case**

The BHDC found that it had the authority to regulate dams because they were “structures.” However, it failed to address the very real issue whether the word “structure” as defined in the state enabling act, G.L. c. 40C, § 5, includes dams. The applicant contends that it does not. The BHDC simply assumes that it does. But a close look at the language of the enabling act, G.L. c. 40C, § 5, suggests strongly that it is wrong to assume this. Indeed, the best interpretation of the legislative intent is that this statute, which governs the activities of all Historic District Commissions, does not authorize any Historic District Commissions to regulate dams as “structures.”

Section 5 of G.L. c. 40C is the section that provides “Definitions” for all of G.L. c. 40C. Here is that section in its entirety:

Section 5. As used in this chapter the word "altered" includes the words "rebuilt", "reconstructed", "restored", "removed" and "demolished" and the phrase "changed in exterior color"; the word "building" means a combination of materials forming a shelter for persons, animals or property; the word "commission" means the commission acting as the historic district commission; the word "constructed" includes the words "built", "erected", "installed", "enlarged", and "moved"; the words "exterior architectural feature" means such portion of the exterior of a building or structure as is open to view from a public street, public way, public park or public body of water, including but not limited to the architectural style and general arrangement and setting thereof, the kind, color and texture

of exterior building materials, the color of paint or other materials applied to exterior surfaces and the type and style of windows, doors, lights, signs and other appurtenant exterior fixtures; the words "person aggrieved" mean the applicant, an owner of adjoining property, an owner of property within the same historic district as property within one hundred feet of said property lines and any charitable corporation in which one of its purposes is the preservation of historic structures or districts; the words "solar energy system" shall mean a device or structural design feature, a substantial purpose of which is to provide for the collection, storage and distribution of solar energy for space heating or cooling, electricity generation or water heating; and **the word "structure" means a combination of materials other than a building, including a sign, fence, wall, terrace, walk or driveway.** [Emphasis added.]

The crucial issue of legislative interpretation here is whether the word “including” in the definition of “structure” is followed by an **exclusive** list of categories or simply a **non-exclusive** list of examples that includes other similar categories. If it is an exclusive list, then **only** signs, fences, walls, terraces, walks, and driveways constitute “structures.” If the word “including” here was meant by the legislature to be non-exclusive, then there are other categories that could be deemed to be “structures.”

In examining legislative intent of the word “including” here in the definition of “structure,” one looks to the standard principles of legislative interpretation. One very important consideration is whether the legislature used the word consistently throughout the same statutory provision. Here the legislature did not. Above in the text of § 5 you will see that I have underlined the words “including but not limited to” in the definition of “exterior architectural feature.” Clearly, in that case, the drafters intended the following listed categories to be **non-exclusive**. That’s what the phrase “including but not limited to” means. Yet, the legislature did not use these words (“including but not limited to”) with respect to the categories listed as “structures.” Since the legislature is presumed to know what they are doing, this is a strong indication that, by not using the phrase “including but not limited to,” they meant the listed categories of “structure” to be **exclusive**, i.e., it’s an exhaustive list. And if that is the case, then pursuant to the governing statute, dams are not to be treated as “structures” under this enabling legislation. There are also no other provisions in G.L. c. 40C that would enable an HDC to regulate dams. This results in the conclusion that the BHDC had no jurisdiction over dams.

Now let’s take a look at the BHDC By-law. Here is its definition of “structure.”

*Structure: Combination of materials other than a building, including but not limited to a sign, fence, wall, terrace, walk or driveway.*

Here Billerica, on its own, inserted the words “including but not limited to” into its definition of “structure.” We don’t know whether this was done inadvertently or was an attempt to give the BHDC more authority over “structures” than provided by state law. Either way, adding these additional words appears to make the **exclusive** state statutory definition of “structure” into a **non-exclusive** one for use by the BHDC. However, since the definitions in the statute always

take precedence over Billerica's local By-law, the BHDC cannot exercise authority over a broader list of "structures" than it was given by the legislature in its enabling act, G.L. c. 40C.

There is no other provision in the state enabling act that would allow HDCs to regulate dams.

The upshot is that the BHDC has no authority to regulate dams as structures. The definition of "structure" that governs BHDC, as a matter of law, is the one in the enabling Act, i.e., the one that offers an exclusive list of "structures" that does not include dams.

This is not a surprising conclusion – that the legislature would not permit dams to be regulated by HDCs – given how thoroughly regulated dams are by numerous other state and federal governmental entities, as amply described in the applicant's materials. Indeed, there is the very real possibility that whatever requirements HDCs might seek to impose on dams could interfere or overly complicate the ability of state and federal agencies to effectively regulate dams.

#### **IV. CONCLUSION**

Since HDC's have no legal authority to regulate dams, the applicant here was entitled to receive a "Non-Applicability" determination from the BHDC. The BHDC's decision should be reversed for this reason. If NMCOG deems a remand to be necessary, it should be only for the purpose of having the BHDC issue a Certificate of Non-Applicability, allowing this project to proceed.

Respectfully submitted,

Allan Fierce  
Stow, Mass.

## Concord River Dam Removal

---

**From** Bill <martinw@rcn.com>  
**Date** Thu 12/4/2025 2:11 PM  
**To** Jennifer Raitt <jraitt@nmcog.org>

Caution: This email originated from outside of the organization. Do not reply, click links, or open attachments unless you can confirm the sender and know the content is safe.

Jennifer

I am writing to support the removal of the Concord River Dam.

It has long out lived it useful life and no longer serves any useful purpose

There are many other reasons why it should be removed as outlined by others.

The Town of Billerica does not want to take ownership nor do other agencies in the Town.

Let's not forget the positives for removing the Dam, fish and wild life and the possibility of a park with greatly improve the area and benefit many people for both people living in Billerica and many living outside of Billerica.

This has been a 20 year journey and it should end with the removal.

There have been many dams that have already been removed and in all cases has worked out very well and residents are all happy.

Thank you for approving this project.

Bill (Lexington)

Sent from my iPad

## Supporting Approval of Talbot Mills Dam removal

---

**From** Ryan Martin <caymen77@yahoo.com>

**Date** Thu 12/4/2025 12:53 PM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Cc** Robert Martin <martinr181@gmail.com>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Ms. Raitt,

I am writing in support of the Talbot Mills Dam Removal project. The ecological benefits of removing the dam—particularly the positive impact on wildlife and the restoration of a free-flowing river—are among the most compelling reasons for moving forward. Re-establishing natural river flow will provide environmental benefits that extend for thousands of miles throughout the connected watershed.

The public-safety considerations are equally significant. The frequency and intensity of severe storms have increased markedly over the past decade, and climate change is expected to continue driving more extreme weather events. These storms result in higher rainfall and greater flood risk, which is exacerbated by infrastructure that restricts natural water flow. Removing the dam will help reduce this risk and improve resilience for the surrounding communities.

Thank you for your time and consideration.

Sincerely,  
Ryan

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## Talbot Mills Dam removal

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From Cara Martin <caralmartin@icloud.com>

Date Thu 12/4/2025 3:21 PM

To Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Dear Ms. Raitt,

I am writing to express my strong support for the removal of the Talbot Mills Dam in Billerica, Massachusetts.

The Talbot Mills Dam is an aging structure that no longer serves the purpose for which it was originally built. Maintaining an obsolete dam poses ongoing safety risks and continues to negatively impact the natural river system. Its presence disrupts the normal movement of water along the Concord River and contributes to ongoing environmental degradation.

Removing the dam would allow for better and more natural water flow, helping to restore the river to a healthier condition. Improved flow would also benefit local ecosystems by lowering water temperatures and increasing oxygen levels. Just as importantly, it would allow fish to swim upstream to reach critical habitats for spawning, which is essential for the recovery of native fish populations and the overall biodiversity of the river.

As for historical value, there is a long history of a flowing river before this dam was ever built. That history is much more significant than the small window of time during which the structure existed for industrial purposes only, and this further supports removal of the dam for true historical worth.

For these reasons, I strongly encourage the appropriate officials to move forward with plans to remove the Talbot Mills Dam. This is an important step toward restoring the river, improving safety, and protecting the long-term environmental health of the region.

Thank you for your time and consideration.

Take down the dam!!

Sincerely,

Cara Martin

Sent from my iPhone



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**Attached are my expanded comments**

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**From** Andrew Jennings <aajennings@aol.com>

**Date** Thu 12/4/2025 4:34 PM

**To** Jennifer Raitt <jrait@nmcog.org>

 1 attachment (43 KB)

Dam removal - written statement - final.docx;

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

On the appeal of the Billerica Historic District Commission's Denial of Application for Talbot Mills Dam Removal. I appreciate the opportunity to have my opinions considered in the decision.

Thank you.

Andrew Jennings  
29 Talbot Avenue  
North Billerica, MA 01862

# **It's not another mill dam**

Comments submitted for consideration  
on the Appeal of Billerica Historic District Commission's  
Denial of Application for Talbot Dam Removal

Submitted by:  
Andrew Jennings  
29 Talbot Avenue  
North Billerica, MA 01862  
December 4, 2025

I live a short walk from the dam. I moved to Billerica in the fall of 1977. It took me many years to understand that the dam was not built for providing water-power to the mills. It certainly looks like one of the hundreds of mill dams built in New England. But this dam was built for the operation of the Middlesex Canal. It was a replacement for a 1798 dam which had become leaky. Indeed the Talbot brothers purchased land and water rights from the Middlesex Canal as the Canal was liquidating assets.

Personally, I am conflicted about whether the dam should be removed. I recognize the benefits that the proponents of removal cite. But I see that associated with removal comes huge intangible costs that the proponents have not considered. Those intangible costs can be partially mitigated, but as I write this the proposed mitigations required by Section 106 of the National Historic Preservation Act have yet to be presented.

I am not particularly troubled by the loss of this dam. After all, this dam is at least the fourth dam at this location, and the second to be built for water supply for the Middlesex Canal

What I am most concerned about is the loss of one of the last, highly visible remnants of the Middlesex Canal. About two-thirds of the Middlesex Canal has been built over, erasing it from sight. Most of the remaining remnants are hidden in wetlands on or surrounded by or on private property. Access is limited to the remaining remnants, either because parking is unavailable or no public transit is nearby. The North Billerica site is one of the few accessible and visible remnants of the Canal existing today. Removing the dam which contains the Canal's summit pond would create a huge cultural and educational void which would be difficult to fill without substantial mitigation.

Engineering history is an often-overlooked field as the impact of technological change on history is often not considered. And within engineering history the Middlesex Canal is also overlooked, overshadowed by the economic impact of the opening of the Erie Canal over two decades later.<sup>1</sup>

The proponents and their allies have failed to acknowledge that this is not another mill dam. The Middlesex Canal and its summit pond contained by this dam is a unique site of national historic importance. The canal even has international recognition.

Here are a few ways that the Middlesex Canal and the impacted summit pond are unique in history:

- **Involvement of Revolutionary War Heroes:** John Hancock, John Adams, John Quincy Adams and Loammi Baldwin were all involved with the Canal. Hancock, as Governor of Massachusetts, signed the charter for the Middlesex Canal Corporation. Hancock and the two Adams were shareholders. Baldwin was the Chief Engineer and oversaw construction of the Canal.

<sup>1</sup> The American Canal Society has an interesting discussion of this at <https://americancanalsociety.org/the-middlesex-canal-as-a-model/>

- **It was recognized after it was built as a great engineering achievement.** In 1808, Albert Gallatin, Secretary of the Treasury, transmitted a report, Roads and Canals, to the U. S. Senate stating, *“The Middlesex canal, uniting the waters of that river with the harbor of Boston, is, however, the greatest work of the kind which has been completed in the United States.”* This report urged investment in roads and canals along the Atlantic Coast, east – west roads and canals between the Atlantic and western rivers, and canals linking the Atlantic Coast with the Great Lakes.
- **The Middlesex Canal was the occasion where transference of key European engineering technology to the Americas occurred.** European canals were in service long before they were built in the Americas. The Briare Canal, connecting the Loire and Seine rivers in France was completed in 1642, about 150 years before the Middlesex Canal was chartered. The Canal du Midi, linking the Atlantic Ocean with the Mediterranean, was opened in 1681.

The first survey for the Middlesex Canal was inadequate, so Loammi Baldwin sought help. He convinced William Weston, an English canal engineer to take a leave of absence from the projects he was working on in Pennsylvania to review the Middlesex canal. Weston brought his telescopic leveling device with him and used it for an updated survey of two routes, one of which became the route of the Middlesex Canal. Weston’s transfer of information and technology in turn was used in subsequent canal projects throughout the US.

- **The Middlesex Canal was a project that helped move the engineering field from military engineering to civil engineering.** The first formal academic instruction in what is now known as civil engineering was established at the U.S. Military Academy at West Point in 1802. The focus of that instruction was on military fortifications. William Wisely, Executive Secretary of the American Society of Civil Engineers noted in 1967, *“The Middlesex Canal was one of the early projects that marked the transition from military engineering to civil engineering as we know it today.”*
- **The Middlesex Canal demonstrated to those advocating for more canals that investment in low-cost, reliable transportation leads to economic development. Some examples of that development include:**
  - **City of Lowell** - The Boston Associates would likely not have developed Lowell, despite its excellent waterpower, without the transport availability provided by the Middlesex Canal. Initial discussions of the National Park in Lowell included the Middlesex Canal in that National Park, so close is that relationship.<sup>2</sup>
  - **Medford, MA** - The first keel of the first vessel of the first shipyard in Medford was laid in 1803, the year the Middlesex Canal was opened. The Canal provided

<sup>2</sup> According to an April 8, 1972 edition of the Boston Globe, “US Rep. F. Bradford Morse announced that he would propose legislation this week to establish “the first urban national park in this country” to be centered in Lowell and to include a 30-mile recreational corridor along the route of the canal to Boston.”

access to lumber in New Hampshire along the Merrimack River that prior to the canal had little value.

- **Woburn, MA** – The small tanning and shoe making industry in Woburn boomed when the Middlesex Canal opened and provided tanners with a more economic means of obtaining tanbark.
- **Billerica, MA** – Beginning in 1811, the Falkner Mill used secondary water rights purchased from the Canal to operate
- **The Middlesex Canal was one of the earliest major American engineering projects to use eminent domain to acquire private land for its construction.** Although few parcels were acquired by eminent domain, the cases set precedents in law.
- **The Middlesex Canal served as a model for the Erie Canal.** Ronald Shaw, author of the book, *“Canals for a Nation”* stated this quite succinctly on p.20 of that book, “Just as it took the pioneer Middlesex Canal in Massachusetts for its model, the Erie Canal became the model for most of the subsequent canals in America.” Erie Canal Commissioners visited the Middlesex Canal in 1816, and *“and carefully examined that canal, throughout its whole extent, and committed to writing, on the spot, the results of their own observations, as well as the answers to all their inquiries, which were obligingly given, by the very intelligent agent (Mr. Sullivan) of the canal company.”* Mr. Sullivan also visited Albany in 1817.
- **The Middlesex Canal is designated as a Civil Engineering Landmark by the American Society of Civil Engineers.** It was one of the first four landmarks so designated. The designation does not provide additional legal protection, but does indicate that the Canal and the summit pond that would be drained by the dam removal is of national importance.
- **The Middlesex Canal is mentioned in The International Canal Monuments List.** That 1994 document, prepared under the auspices of The International Committee for the Conservation of the Industrial Heritage to provide the World Heritage Committee with a list of "waterways" sites recommended as being of international significance. Although the Middlesex Canal did not formally make the list, the document noted how European engineering did transfer to the US in the surveys that William Weston ran for the Middlesex Canal and stated that the Middlesex Canal “became a field-study project for many of the engineers on the Erie Canal and facilitated the development of the great textile centre at Lowell.”

Clearly, this dam is not just another mill dam. It is one component of a unique site of national significance. That significance has not been recognized by the proponents or their allies.

The lack of recognition of the historical importance of the site that this dam creates calls into question a key argument that the proponent uses to support dam removal. On the first page of the transmittal letter for the May 28, 2025 Supplemental Information the proponents state, “Other options, such as dam repair and fish ladder construction have been explored, but would

not be funded by grants, would cost over a million dollars and more than the proposed dam removal project, and would not remove the liability of the dam.” This statement implicitly places a value of around \$1 million for the loss of a historic landmark. One million dollars is not much. A single family home not too far from the dam (20 Pollard Street) is on the market for over \$1 million. The conditions of the grant should not dictate the solution. The best solution should be determined and the appropriate grants should be found to fund that solution. **Lack of budget does not mean “infeasible”.**

We know that fish ladders are an alternative to dam removal in certain cases. I am not qualified to judge whether a fish ladder would work here. But to reject that alternative because the grant applied for was one that only covers dam removal does not make sense.

**I support relieving the proponent of the burden of dam ownership.** This site has significant historical value. Although it may not be possible for a private owner to monetize that value, but the huge historic value of this site are better recognized in the public or non-profit sectors than it is in the private sector.

**I am puzzled why the dam was not offered to the obvious buyer, the Commonwealth’s Department of Conservation and Recreation [DCR].** DCR is the largest owner of dams in the Commonwealth and has the expertise to manage this dam. DCR’s mission is “to protect, promote and enhance our common wealth of natural, cultural and recreational resources for the well-being of all.” Protecting and promoting this historic site is clearly within their purview. I cannot predict if DCR would remove the dam. But if they did, I am confident that they would mitigate the historic loss in a way that would reflect the historic value of this national treasure.

I do not ask that you rule on this appeal one way or the other. Instead, I ask that you set conditions on your ruling so that the historic value of this site is reflected.

If you reverse the Billerica Historic Districts Commission’s decision, I ask that you require that any steps to remove the dam be delayed until all the historic mitigations are fully permitted, and the funding for those mitigations is in place. It would be a tragedy if the dam were removed and mitigations were blocked by permitting problems or funding issues.

If you deny the appeal, I ask that you call for a task force composed of the applicant, water resource advocates, DCR, MassDOT, and canal historians to develop a plan for the future of this site. If that plan includes dam removal, the process of review of the plan by the Billerica Historic District should be restarted.

I believe in communication and mitigation before litigation. I am hopeful that your decision will be structured in a way that recognizes the unique historic value of the Middlesex Canal remnant that would be impacted by dam removal. And I hope that your ruling can foster communication among the parties rather than maintaining or increasing the current level of polarization.

Thank you.

## Talbot Mills Dam Hearing: Billerica HDC's Respondent Brief

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**From** Dan P. Valentine <dvalentine@sgh.com>

**Date** Fri 12/5/2025 11:36 AM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Cc** Dave Gagliardi <mdx254@hotmail.com>; Katherine Malgieri <kmalgieri@billerica.gov>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

*Attach2Cloud has uploaded the following files to OneDrive:  
HDC's Respondent Brief.pdf, HDC's Respondent Brief Footnotes.pdf*

*The following files have expiration dates:  
HDC's Respondent Brief Footnotes.pdf and HDC's Respondent Brief.pdf  
They will be available until March 5, 2026.*

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Ms. Raitt,

Attached are two files:

- Respondent Brief – This is the document that I presented on behalf of the HDC. It includes footnotes to references, some of which I quoted during the hearing. Each footnote identifies which page of the footnotes file contains the cited language.
- Respondent Brief Footnotes – This has all the references cited in the footnotes of the brief.

Please confirm receipt and let me know if you have any difficulty with these documents. If needed, I can send individual files for the footnotes.

Respectfully submitted on behalf of the Billerica HDC,

Dan

**Dan P. Valentine, Esq., P.E. (NH, NC)**

**D:** 781.907.9295 **C:** 617.347.4681

**SIMPSON GUMPERTZ & HEGER**

[sgh.com](http://sgh.com)

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# NMCOG Public Hearing

December 1, 2025, 6:30 pm

## Appeal of Billerica Historic Districts Commission Denial of Application for Talbot Dam Removal

The Billerica Historic Districts Commission respectfully submits this brief, which reiterates the HDC's position, as presented by Mr. Dan Valentine at the hearing. Note that this brief includes the citations (footnotes) that support various points from the HDC's position but that intentionally were not identified by Mr. Valentine to the hearing's audience given the format of the hearing.

CRT makes a number of claims in its appeal that need to be addressed. Specifically, CRT claims that

- “the dam poses significant public safety concerns,”
- “the Project should not fall within the jurisdiction of the Commission,”
- “the Project should qualify for a Certificate of Hardship,”
- the HDC's decision “fails to address a Certificate of Non-Applicability as specifically requested by CRT,” and
- “the Decision on its face is insufficient in law ... and should be annulled.”

Speaking on behalf of the HDC, we believe that each of these claims is without merit.

### **Regarding CRT's claim that the dam poses significant public safety concerns**

CRT has presented no evidence quantifying the risk to public safety and instead merely uses the words to get people to subjectively imagine what would happen if the dam were to fail. Similarly frightening wording has also been used by the Merrimack River Watershed Council (MRWC), when it stated that removing the dam would “remove the risk of a catastrophic failure of the dam, which would release a significant amount of water at once, potentially flooding downstream properties.”<sup>1</sup>

Rather than speculating about what might happen, a proper risk analysis requires assessing 1) the likelihood of the event occurring and 2) the consequences of the event if it occurs. Yet various documents provided by CRT and others actually minimize both aspects of a risk assessment.

Regarding the likelihood of failure:

- In 1999, the Commonwealth inspected the dam and stated that “the dam abutments and the spillway show no sign of misalignment, movement, or vertical settlement.”<sup>2</sup>
- Ten years later, in 2009, the dam was evaluated by Geotechnical Consultants Inc. for the dam's

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<sup>1</sup> MRWC Talbot Mills Dam webpage (<https://merrimack.org/talbotmills/>). See page 7 of the PDF file.

<sup>2</sup> 1999 Inspection for MA, “Dept. of Environmental Management Office of Dam Safety, Owned Dam Inspection/Evaluation Report,” Weston & Sampson Engineers, Inc., May 20, 1999. See § 3.1 of the evaluation (page 27 of the PDF file).

owner, CRT. They stated that they “found no indications of instability or seepage which compromise the integrity of the dam,”<sup>3</sup> that they “observed no structural defects or concerns,”<sup>4</sup> that “based on [their] inspection and review, as well as historical evidence, the dam is stable,”<sup>5</sup> declaring that “there is little risk of overtopping during the Spillway Design Flood.”<sup>6</sup> They also noted that historical reports provided in a FEMA study suggest the dam has never been over-topped in its nearly 200-year existence.<sup>7</sup> Although the consultants characterized the dam as merely being in fair condition, they noted this was due to CRT’s “lack of routine maintenance and operational procedures.” This is consistent with the Commonwealth’s inspection guidelines for dams, which state that a “fair” rating means that “significant operational and maintenance deficiencies [exist, but] no structural deficiencies.”<sup>8</sup>

- Fast forward another 6 years to 2015, CRT’s consultant again inspected the dam. Their observations and conclusions on the dam’s condition remained unchanged from 2009, again stating that they found no indications of instability or seepage which compromise the dam’s integrity.<sup>9</sup>
- Yet in spite of these facts, the MRWC’s website has a story map that misleads the public by falsely stating that the “Talbot Mills Dam is aging and in poor condition” and that “removing the dam eliminates the risk of a catastrophic failure.”<sup>10</sup> This is nothing more than fearmongering.

Regarding the consequence of failure:

- In 2009, CRT’s consultant also performed a dam failure analysis, which can fairly be characterized as meeting the 2<sup>nd</sup> part of a valid risk analysis – that is, a quantitative analysis of the consequences of failure. This analysis concluded that if the dam failed, then “the increase in flood elevation is approximately 0.2 feet,” which is “considerably less than the 2.0 foot incremental rise of flood water offered as guidance regarding hazard potential”<sup>11</sup> per the Commonwealth’s dam safety regulations. For reference, the 0.2 ft predicted rise is less than the diameter of a soda can.

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<sup>3</sup> 2009 Inspection for CRT, “*Talbot Mills Dam – Phase I – Inspection/Evaluation Report*,” Geotechnical Consultants, Inc., May 22, 2009, Executive Summary. See page 55 of the PDF file.

<sup>4</sup> *Id.* at § 2.1.1 – General Findings. See page 69 of the PDF file.

<sup>5</sup> *Id.* at § 2.6.1 – Embankment Structural Stability. See page 73 of the PDF file.

<sup>6</sup> *Id.* at § 2.6.2 – Overtopping Potential. See page 73 of the PDF file.

<sup>7</sup> *Id.* See pages 73-74 of the PDF file.

<sup>8</sup> Dam Safety Inspection Report Template. Link to the “Phase I Formal Dam Safety Inspection Report Template and Instructions – Updated June 2021”, available at <https://www.mass.gov/info-details/dam-safety-inspection-requirements>. See definition of “fair” condition on page 140 of the PDF file.

<sup>9</sup> 2015 Inspection, “*Talbot Mills Dam – Phase I – Inspection/Evaluation Report*,” Geotechnical Consultants, Inc., November 6, 2015, Executive Summary. See page 142 of the PDF file.

<sup>10</sup> MRWC Story Map (<https://storymaps.arcgis.com/stories/17ef93aeba194b1a84fbf0fef86b19f9>). See page 633 of the PDF file. Note that during the public statements portion of the hearing, Matthew Cranney of MRWC claimed that the “poor condition” statement related to the sluice gates. This is false, as evidenced by this citation.

<sup>11</sup> 2009 Dam Failure Analysis, “*Application to Change Hazard Classification – Talbot Mills Dam*,” Geotechnical Consultants, Inc., June 2, 2009. See page 643 of the PDF file.

- That consultant's 2015 report also states that 1) "a failure of the dam at maximum pool will not result in significant damage to the bridge or other downstream structures" and 2) "the potential damage to habitable structures will be minor since no structures are in the [water's] direct path."<sup>12</sup>

Together, these studies suggest a low chance of failure and little impact if a failure occurs.

## **Regarding CRT's claim that the Project is not within the HDC's jurisdiction**

Although CRT correctly observes that the dam is not a building, it then misleadingly conflates being a structure with then also having to have exterior architectural features. The latter is not a prerequisite for a structure to be within the HDC's jurisdiction. As stated in Billerica's by-laws, a structure is "a combination of materials or part thereof other than a building including but not limited to a sign, fence, wall, statue, mechanical device, bridge, walk, driveway or road."<sup>13</sup> There is no architectural feature requirement to this definition. However, the HDC notes that even if there were such a requirement, the definition of an architectural feature in the enabling statute (M.G.L. Chapter 40C § 5) expressly defines an "exterior architectural feature" as "such portion of the exterior of a building or structure as is open to view from a public street, public way, public park or public body of water."<sup>14</sup> The bottom line is that any part of the dam that is visible to the public from public property is an architectural feature as defined by the legislature.

Additionally, the By-Law's definition expressly states that structures are not limited to the examples given. The list merely presents structures that are likely to be assessed by the HDC; it is not an exhaustive list. But in terms of similarity to the listed examples, the dam can be fairly characterized as a stone wall – albeit one that happens to hold back water. The dam is, in fact, a combination of materials other than a building and is therefore a structure within the HDC's jurisdiction. But in an effort to extricate the dam from the definition of a structure, CRT had to go 45 miles away to the Town of Marshfield to find a by-law that lists dams separately from structures. We're not in Marshfield, and its by-laws can't be used to overrule the clearly worded definition in the by-laws of Billerica. There is no ambiguity in the By-Law's language, notwithstanding CRT's assertion that one exists.

Regarding the idea that there must be architectural features (and assuming one ignores the definition provided by the legislature), the closest wording in the Billerica by-laws is where they define the intent and purpose of the town's Demolition By-Law. Specifically, that by-law states that it is "for the purpose of preserving and protecting significant buildings or structures" that "reflect distinctive features of the architectural, cultural, political, economic or social history of the Town."<sup>15</sup> Rather than being a list of exemplars, this is an exclusive listing of 5 features that can be considered by the HDC, of which architectural features is just one. The HDC correctly determined that the dam has local and national historical significance warranting protection and preservation.

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<sup>12</sup> *Supra* note 9 at § 1.2.7. See page 153 of the PDF file.

<sup>13</sup> By-Law to Establish the Billerica HDC, § 2. See page 699 of the PDF file.

<sup>14</sup> Massachusetts General Laws, Part I, Title VII, Chapter 40C, Section 5 (available at <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleVII/Chapter40C/Section5>). See page 708 of the PDF file.

<sup>15</sup> Demolition Review By-Law, at § 1. See page 710 of the PDF file.

In a further attempt to avoid the HDC's jurisdiction, CRT submitted supplemental information in which it pointed to Section 9 of the By-Law that created the Billerica HDC. In doing so, it focused on wording stating that the by-law cannot be construed to prevent meeting "requirements certified by a duly authorized public officer to be necessary for public safety because of an unsafe or dangerous condition."<sup>16</sup> First, it should be noted that Section 9 of the By-Law is titled *Ordinary Maintenance Exemption*, so it relates to the maintenance of a structure, not the destruction of one, and it merely establishes that the HDC cannot prevent an owner from maintaining its structure (a responsibility that CRT has demonstrably failed to uphold). Additionally, the wording talks about public safety due to an unsafe or hazardous condition. Yet the evaluations of the dam by CRT's own consultant establish that the dam is not unsafe; rather, its condition is characterized as fair with no structural issues noted. With regard to being hazardous, the dam's Hazard Potential Classification, as defined by the Department of Conservation and Recreation's Dam Safety regulations (302 CMR 10), is based on the potential consequences of failure and "has no relationship to the current structural integrity, operational status, flood routing capability, or safety condition of the dam."<sup>17</sup> Recall that CRT's consultant found the flood rise due to a failure is less than the diameter of a soda can.

## **Regarding CRT's claim that the Project qualifies for a Certificate of Hardship**

The HCD's by-laws state that two requirements must be met to grant a Certificate of Hardship.

The first requirement is that failure to approve an application will result in substantial hardship, whether financial or otherwise, to the applicant.<sup>18</sup> Neither "substantial" nor "hardship" are defined in the by-laws, so it is left to NMCOG's discretion on what constitutes a hardship and whether that hardship is then a substantial one. Per CRT's appeal, it states that it has expended about \$67,000 since 1997; this equates to about \$200/month. Yet CRT's claim of financial hardship is belied by the fact that CRT just paid over \$400,000 to purchase property adjacent to the dam to facilitate the dam's demolition.<sup>19</sup> And in an effort to expand the scope of persons experiencing a hardship, CRT's Supplemental Information pulls in the upstream and downstream abutters – alleging that they are experiencing a hardship merely due to the dam's existence. This is pure speculation and ignores the fact that a Certificate of Hardship applies only to the applicant/owner of the structure at issue. The supplemental information also notes that "as the dam deteriorates, the owner's risk for liability for dam failure increases," but such deterioration only results from the owner's ongoing failure to properly maintain the dam. This aspect of CRT's claimed hardship would be of its own making.

Importantly the second requirement for granting a Certificate of Hardship is that the HDC must "make specific factual findings demonstrating that ... granting the application will not involve substantial detriment to the public welfare or substantial derogation from the intent and purpose of the Historic Districts

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<sup>16</sup> By-Law to Establish the Billerica HDC, at § 9. See page 702 of the PDF file.

<sup>17</sup> 302 Code of Massachusetts Regulations 10.03 ([www.mass.gov/files/documents/2017/10/30/302cmr10.pdf](http://www.mass.gov/files/documents/2017/10/30/302cmr10.pdf)). See page 717 of the PDF file.

<sup>18</sup> Review Standards of the Billerica HDC, at § 6.10. See page 753 of the PDF file.

<sup>19</sup> CRT Purchase of 6 Old Elm St. (<https://www.masslandrecords.com/MiddlesexNorth/D/Default.aspx>); enter "CRT Development Realty" in the Business/Last Name section and then pick the 4/22/2025 transaction for 6 Old Elm St. See pages 755-758 of the PDF file.

By-Law.”<sup>20</sup> Per the by-law that established the Billerica HDC, its purpose is to promote the welfare of the public “through the preservation and protection of the distinctive characteristics of buildings and places significant in the history and architectural heritage of the Town of Billerica.”<sup>21</sup> Although Native American people may have been present prior to the existence of the dam, using that as a basis for demolishing a structure could be the basis for destroying any and every structure. The dam is both a locally and nationally significant structure, and its demolition would certainly be detrimental to both the dam and the Billerica Mills District, which is on the National Register of Historic Places. There is no logical basis for concluding otherwise; therefore, even if the existence of a hardship is accepted, the by-law does not allow that hardship, on its own, to be the basis for granting a certificate.

### **Regarding CRT’s claim that the HDC’s decision fails to address a Certificate of Non-Applicability specifically requested by CRT**

CRT made no such specific request. The application that CRT submitted to the HDC, through its agent, Gomez and Sullivan Engineers, was nothing more than the completed HDC form titled “Application for Historic Districts Commission Review.” The form states that its submission “will begin the process of review for a Certificate of Appropriateness, Non-Applicability, or Hardship.” It’s written in the disjunctive, and nowhere on the form did CRT request that the HDC consider whether its review standards would potentially not apply to the dam. In addition, the Supplemental Information submitted by CRT only states its belief that “the project would qualify for a hardship exemption.” CRT’s submission mentions “Certificate of Hardship” eleven times, but not once does it mention a “Certificate of Non-Applicability.”

At best, the non-applicability argument goes back to the threshold issue of whether the HDC has jurisdiction over the dam. Per the earlier discussion of terminology, and specifically what constitutes a structure within the scope of the HDC’s authority, the applicability of the HDC’s Review Standards to the dam is clear.

### **Regarding CRT’s claim that the HDC’s is insufficient in law ... and should be annulled.**

CRT claims that the HDC’s decision, due to not making findings of fact, is an error of law warranting its annulment. Although counsel cites *Warner v. Lexington Historic Districts Commission* for the proposition that decisions paraphrasing statutory language without making specific factual findings are erroneous, the basis for that case’s outcome is distinctly different from the matter at hand. In *Warner*, the Lexington HDC, in denying the application, was required to “notify the applicant in writing, setting forth therein the reasons for its determination.”<sup>22</sup> Per the Lexington ordinance, its HDC was required to consider several factors. The court in *Warner* concluded that “the [HDC’s] decision relied on criteria not found in the relevant enabling act or by-law, consisted of mere repetition of statutory language,”<sup>23</sup> and failed to include

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<sup>20</sup> Review Standards of the Billerica HDC, at § 6.11. See page 753 of the PDF file.

<sup>21</sup> By-Law to Establish the Billerica HDC, at § 1. See page 698 of the PDF file.

<sup>22</sup> *Warner v. Lexington HDC*, 64 Mass App. Ct. 78, 81 (2005). See page 761 of the PDF file.

<sup>23</sup> *Id.* at 78. See page 759 of the PDF file.

“explanations of how those statutory factors bore on their denial of the certificate.”<sup>24</sup> The holding in *Warner* merely established the logical requirement that town HDCs follow their own rules.

In the matter now before NMCOG, unlike the *Warner* case, there is no requirement that factual findings accompany a denial. As explicitly stated in the Billerica HDC Review Standards, “in order to issue a Certificate of Hardship, the Commission shall make specific factual findings.”<sup>25</sup> Neither the Review Standards nor M.G.L. Chapter 40C upon which they’re based require that a denial be accompanied by factual findings. Nevertheless, the HDC provided a clear, concise statement that demolition of the dam “would not be in the public’s best interests as the dam has local and national historical significance and should be protected and preserved.”<sup>26</sup>

Note that in § IV.B of CRT’s appeal letter, it prefaces text from § 12(d) of the HDC By-Law with the phrasing “with respect to a request for a Certificate of Hardship,” but that is a misleading expansion of what that section addresses. The section only addresses situations when the HDC does grant a Certificate of Hardship (not when it denies one).

CRT states that the HDC did not even consider the required elements under § 12(d) of the HDC By-Law. There is no basis for CRT to claim to know what the HDC did or did not consider. Members of the HDC attended multiple meetings where CRT’s agents provided information to consider, where members of the public provided their input, and where HDC members asked various questions.

The HDC also notes that the Certificate of Hardship provisions in its Review Standards are consistent with the provisions in M.G.L. Chapter 40C at § 10(c)<sup>27</sup> and are substantially identical to those of several other towns, such as:

- Reading,<sup>28</sup>
- Chelmsford,<sup>29</sup>

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<sup>24</sup> *Id.* at 82. See pages 761-762 of the PDF file.

<sup>25</sup> Review Standards of the Billerica HDC, at § 6.1. See page 753 of the PDF file.

<sup>26</sup> HDC Denial of Application. See page 764 of the PDF file.

<sup>27</sup> Massachusetts General Laws, Part I, Title VII, Chapter 40C, Section 10(c) (available at <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleVII/Chapter40C>). (“If the construction or alteration ...for which an application for a certificate of appropriateness has been filed shall be determined to be inappropriate, or in the event of an application for a certificate of hardship, the commission shall determine whether, owing to conditions especially affecting the building or structure involved, but not affecting the historic district generally, failure to approve an application will involve a substantial hardship, financial or otherwise, to the applicant and whether such application may be approved without substantial detriment to the public welfare and without substantial derogation from the intent and purposes of this chapter.”) See page 766 of the PDF file.

<sup>28</sup> Review Standards for Reading (<https://www.readingma.gov/DocumentCenter/View/1617/Guidelines-for-Historic-District-PDF>). (A certificate of hardship shall be issued if denying it “would constitute a hardship, financial or otherwise, on the property owner and if the proposed work does not conflict substantially with the intent and purposes of the Bylaw.”) See page 778 of the PDF file.

<sup>29</sup> Review Standards for Chelmsford ([https://chelmsfordgov.com/CHCwebsite/CHD\\_files/Review\\_Standards\\_2022-05-02.pdf](https://chelmsfordgov.com/CHCwebsite/CHD_files/Review_Standards_2022-05-02.pdf), at § 7.1). (“In order to issue a Certificate of Hardship, the Commission shall make specific factual findings demonstrating that: owing to conditions specific to a particular building or structure, but not affecting the historic district generally, failure to approve an application will result in substantial hardship, whether financial or otherwise, to the applicant, and that granting the application will not involve substantial detriment to the public welfare or substantial derogation from the intent and purpose of the historic by-law.”) See page 794 of the PDF file.

- Concord,<sup>30</sup> and
- Newton.<sup>31</sup>

### **In summary ...**

Destroying this dam would be a substantial derogation from the intent and purpose of the HCD's by-laws. The dam is a uniquely historical structure in that it didn't merely provide power to the mills in North Billerica – it enabled the creation and operation of the Middlesex Canal, which was essential to the development of industry in the region, as evidenced by Lowell's Middlesex Canal Historic District. It has been designated a Historic Civil Engineering Landmark by the American Society of Civil Engineers and is an integral, if not central, part of the Billerica Mills District, which is listed on the National Register of Historic Places<sup>32</sup> and on the Commonwealth's Register of Historic Places.<sup>33</sup> The continuing presence of the dam and its mill pond can facilitate redevelopment in the area due to their historic and aesthetic appeal, augmented by the upcoming opening of the new Middlesex Canal Museum adjacent to the dam and overlooking the mill pond, and made more likely by the revised MBTA zoning regulations that could lead to waterfront development in the area. Who knows, perhaps CRT could even make a profit from its recent \$400,000 land purchase.

The HDC believes that annulling its decision would ignore and negate the authority that Billerica granted to its HDC, and it would require ignoring the clearly stated, Mass General Law-compliant requirements that implement that authority and that the HDC adhered to in its decision. The HDC respectfully requests that NMCOG deny CRT's appeal or, if NMCOG believes that factual findings, though not required by statute or by-law, are warranted, remand the issue to the HDC for further consideration.

Thank you.

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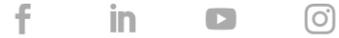
<sup>30</sup> Review Standards for Concord (<https://concordma.gov/1152/Concord-Historic-Districts-Act>, at § 9). See page 801 of the PDF file.

<sup>31</sup> Review Standards for Newton (<https://www.newtonma.gov/home/showpublisheddocument/29807/637444158437030000>, at § 22-40(b)). (stating that a certificate of hardship is “the certificate issued by a commission if it determines that owing to conditions especially affecting the building or structure involved, but not affecting the historic district generally, failure to approve an application will involve a substantial hardship, financial or otherwise, to the applicant and such application may be approved without substantial detriment to the public welfare and without substantial derogation from the intent and purposes of this section.”) See page 831 of the PDF file.

<sup>32</sup> <https://www.nps.gov/subjects/nationalregister/database-research.htm#table> (stating “this is a table of properties listed in the National Register of Historic Places”); <https://catalog.archives.gov/id/63795582> (this is the link for the later-approved application for the Billerica Mills District). See pages 872-916 of the PDF file

<sup>33</sup> <https://www.sec.state.ma.us/divisions/mhc/resources/theres-a-difference.htm> (stating “properties within Local Historic Districts and National Register Districts are automatically included in the State Register of Historic Places”). See page 917 of the PDF file.

<b>Footnote number</b>	<b>Reference Title</b>	<b>Page Range</b>
1	MRWC Talbot Mills Dam webpage	2 to 15
2	1999 Inspection for MA	16 to 53
3	2009 Inspection for CRT	54 to 106
4	2009 Inspection for CRT	54 to 106
5	2009 Inspection for CRT	54 to 106
6	2009 Inspection for CRT	54 to 106
7	2009 Inspection for CRT	54 to 106
8	Dam Safety Insp. Report Template	107 to 140
9	2015 Inspection for CRT	141 to 554
10	MRWC Story Map	555 to 639
11	2009 Dam Failure Analysis	640 to 697
12	2015 Inspection for CRT	141 to 554
13	By-Law to Establish the Billerica HDC	698 to 706
14	M.G.L. Ch. 40C Section 5	707 to 709
15	Demolition Review By-Law	710 to 712
16	By-Law to Establish the Billerica HDC	698 to 706
17	302 CMR 10.03	713 to 736
18	Review Standards for Billerica HDC	737 to 754
19	CRT Purchase of 6 Old Elm. St.	755 to 758
20	Review Standards for Billerica HDC	737 to 754
21	By-Law to Establish the Billerica HDC	698 to 706
22	Warner v. Lexington HDC	759 to 763
23	Warner v. Lexington HDC	759 to 763
24	Warner v. Lexington HDC	759 to 763
26	HDC Denial of Application	764 to 764
27	MGL Ch. 40C Section 10	765 to 768
28	Review Standards for Reading	769 to 778
29	Review Standards for Chelmsford	779 to 795
30	Review Standards for Concord	796 to 803
31	Review Standards for Newton	804 to 871
32	NRHP Desigation for Billerica Mills District	872 to 915
33	MA State Register of Historic Places	916 to 917



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# TALBOT MILLS DAM REMOVAL

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# TALBOT MILLS DAM

The Talbot Mills Dam, located on the Concord River in Billerica, is approximately 127 feet long and 10 feet high and was first built in 1711. The Concord River is part of the 399-square mile Sudbury-Assabet-Concord (SuAsCo) watershed, that runs northward from the headwaters of the Assabet and Sudbury rivers in Westborough to Concord where they join to form the Concord River, which then joins the Merrimack River in Lowell. From there the Merrimack flows northeast into the Atlantic Ocean/Gulf of Maine in Newburyport and Salisbury, Massachusetts.

The Talbot Mills Dam has a long and controversial past. Prior to its existence, the area was used extensively by Native Americans as fertile fishing grounds and as an important transportation route. The dam was first built for power supply and fire protection for the adjacent mill buildings. It later diverted water into the [Middlesex Canal that connected Lowell to Boston](#) using the water of the Concord River starting in 1803. Once built, the dam was believed to cause flooding for upstream farmers resulting in legal disputes and the dam being removed and rebuilt multiple times over nearly 150 years. The current dam was built in 1828 and is listed on the National Register of Historic Places. The dam now blocks the river that once sustained Native American populations with plentiful supplies of river herring and shad, preventing fish and other wildlife from migrating between the upper sections of the SuAsCo watershed and the Merrimack River and ocean.

In partnership with multiple state and federal agencies and local NGOs, the owner of the Talbot Mills Dam is seeking removal as the best solution to restore fish passage to the SuAsCo watershed, decommission aging infrastructure, eliminate ongoing maintenance and repair obligations, reduce upstream and downstream flood hazards, and improve water quality, aquatic habitat, and natural riverine processes. Throughout the dam's history, it has caught the attention of past state and federal agencies and even [Henry David Thoreau who spent years studying the river, the dam, and its impacts](#).

## BENEFITS OF DAM REMOVAL

While the dam played an important role in the Industrial Revolution, it no longer serves that purpose and the many benefits of removal have come to outweigh the costs.

## FISH PASSAGE

The dam is a major barrier to fish passage, and removal will provide an unprecedented amount of habitat for five main species: alewife and blueback herring (commonly referred to together as "river herring"), American eel, American shad, and sea lamprey. All of these species are diadromous, which means they carry out part of their life in the ocean, and part in rivers and lakes in order to survive.



Blueback herring



Alewife



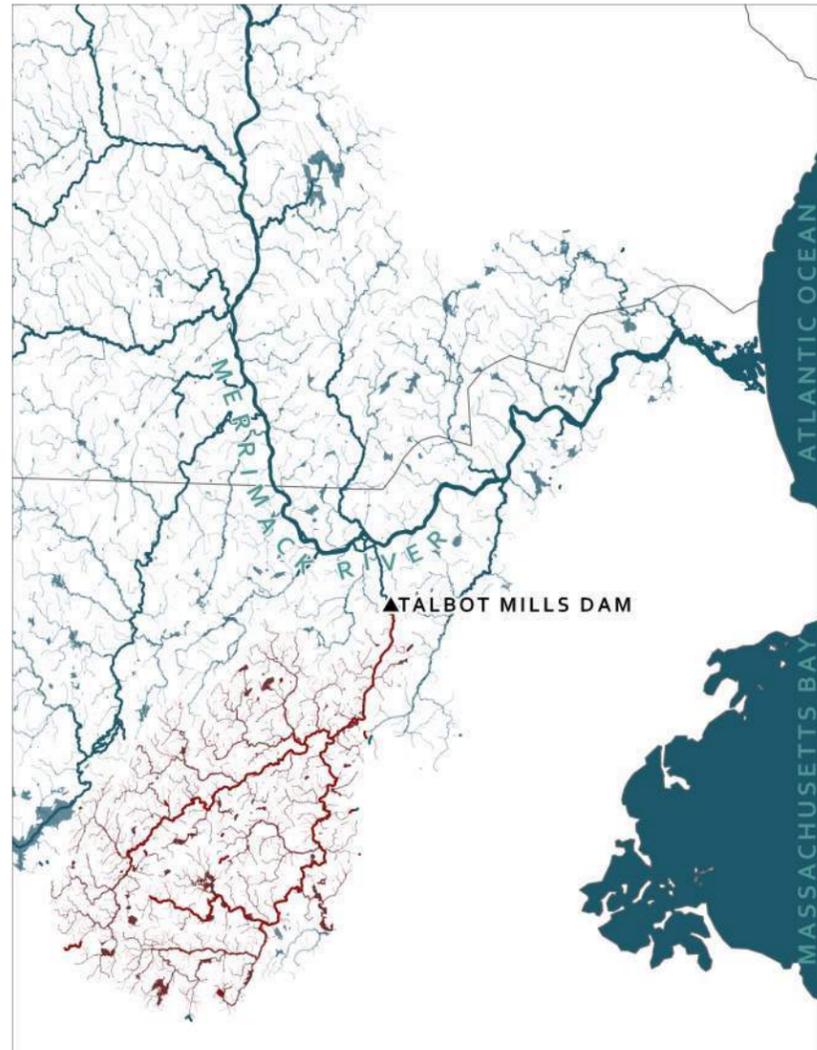
American shad



American eel



sea lamprey



The Talbot Mills Dam currently blocks these species from **35 miles of mainstem rivers, 100 miles of tributaries, and 260 acres of lakes and ponds**. Removing the dam would reconnect these rivers with the ocean. It is not just migratory and local fish who will benefit from being able to move up and downstream—all species who utilize the river benefit by being able to move freely. Turtles, otters, muskrats, beavers and many more species will benefit by accessing more habitat above and below the existing dam. Additionally, migratory fish like river herring and shad are an important component of the larger food web. **Restoring the spawning habitat of these migratory fishes will not only help their populations to recover and increase resilience to climate change, it will also support many other species of fishes, mammals, and birds in the rivers and oceans that depend on them as a food source.** This in turn will support both commercial and sports fisheries in the rivers and the Gulf of Maine.



Harbor seal



Great blue heron



Atlantic bluefin tuna



Bald eagle



Blanding's turtle



## WATER QUALITY

When water velocity is slowed, as it is behind a dam, the temperature increases as it's warmed by the sun. **This temperature shift, and associated water quality changes, can make the water uninhabitable for some species during the warmer months.** The Concord, Sudbury, and Assabet Rivers have many dams, resulting in a compounding effect on temperature increase as the water moves downstream and spends time in the impoundments behind each dam. **As temperature increases and water slows, dissolved oxygen decreases.** Most aquatic organisms rely on oxygen dissolved in water to breathe, and limited dissolved oxygen can be deadly for aquatic life. Improving water quality does not only benefit aquatic life, however. **Thousands of people currently get their drinking water from the Concord River** and improved water quality will benefit them as well.

## IMPROVED RIVERINE FUNCTIONS

The upstream areas of watersheds supply the downstream estuaries and marshes with sediment, nutrients, and all of the other components necessary for a healthy ecosystem. **Dams block natural sediment and nutrient transport, disrupting their conveyance downstream, and often resulting in a buildup behind the dams.** Excess nutrients, especially when compounded with warm water, can result in algae blooms, some of which may be toxic for people and animals, and other nuisance aquatic plants.

## FLOOD MITIGATION

The dam creates an artificially higher water level upstream. Because it is a run-of-river dam, it does not control flooding downstream as some larger dams do. **Removal of the dam would both reduce flooding upstream, and remove the risk of a catastrophic failure of the dam; which would release a significant amount of water at once, potentially flooding downstream properties.**

## CLIMATE RESILIENCE AND FLOODPLAIN ACCESS

The Talbot Mills Dam is surrounded by development, which means the river channel upstream is currently constricted on either side. With the removal of the dam, the river width above the dam site will decrease as the natural channel returns, and some of its historical floodplain will be restored. When large storms occur, the river can then fill the floodplains with water, rather than the surrounding streets and properties. Larger floodplains also slow the speed of the water, which makes it less destructive as it moves downstream. **As we expect more intense rainstorms with climate change, allowing the river to utilize these floodplains to manage flood water naturally will be particularly beneficial to the surrounding communities.**

## INVASIVE SPECIES REDUCTION



**Water chestnut** is an invasive plant that grows on the surface of shallow, stagnant water. It currently covers the Mill Pond behind the Talbot Mills Dam. The dense mats of non-native vegetation crowd out native aquatic plants that provide food and shelter to native fishes, birds, and insects. Water chestnut also blocks sunlight from reaching the water and creates wild swings in dissolved oxygen in the water. When the plants decompose, they reduce the available dissolved oxygen. **With the dam removed, the conditions that encourage water chestnut growth will be largely gone.**

## HEALTHIER ECOSYSTEMS

All of the above benefits together restore a river's natural functions, resulting in a healthier ecosystem. **When the river benefits, all of the systems that rely on it benefit as well.** For example, a migratory bird that passes through the Concord River watershed and is able to feed on fish and insects, then has the nourishment to travel to another completely different ecosystem where the bird contributes to the food web and ecosystem functions. Fish that migrate up through the Concord River to spawn also feed bass, bald eagles, seals, whales, tuna, cod, and other fish and birds out in the ocean. **These examples demonstrate how interconnected the SuAsCo watershed is with the greater ecosystem.**

## RECREATION

The SuAsCo watershed is already a great place for people to enjoy canoeing, kayaking, rafting, fishing, picnicking and bird-watching along the rivers. **Removal of the Talbot Mills Dam would provide an opportunity to engage in each of these activities in a new and different way.** It is currently very difficult for boaters to get around the Talbot Mills dam.

## DECOMMISSION AGING INFRASTRUCTURE

There are over 150 dams in the SuAsCo watershed. Many of these, including the Talbot Mills Dam, are privately owned. The Talbot Mills Dam is an intermediate-sized, significant hazard dam, meaning that due to its size and the amount of water stored behind it, failure of the dam could result in economic loss, environmental damage, disruption of lifeline facilities, or other impacts. **As the dam ages and its condition deteriorates, this risk to the community downstream and the liability to the dam owner become more imminent.**

# PROGRESS SO FAR

While the Talbot Mills Dam removal project is just gaining new attention, this effort has been ongoing for decades. Multiple studies have been completed on the dam itself, as well as on the water quality and river health, fish populations near the dam, and impact on water supply infrastructure. This work has been funded by the Nyanza Chemical Waste Dump Superfund Site Natural Resource Damages (NRD) Trustee Council (comprising the Massachusetts Executive Office of Energy and Environmental Affairs, represented by the Massachusetts Department of Environmental Protection, US Fish and Wildlife Service, and the National Oceanic and Atmospheric Administration (NOAA)), the Massachusetts Division of Ecological Restoration (DER) Priority Project Program (selected as a Priority Project in Dec. 2021), DER's Regional Partnerships Program, Massachusetts Environmental Trust, the Fuller Foundation and the National Park Services' Wild & Scenic Rivers Program.

Here is a brief history of the studies that have been completed to date:



[VIEW ALL STUDIES >](#)

**2016 Concord River Diadromous Fish Restoration Feasibility Study:** In 2014, the Massachusetts Division of Marine Fisheries (DMF) contracted Gomez and Sullivan Engineers to study if and how fish passage to the Concord River watershed could be restored. In 2016 the study concluded that fish passage restoration is possible, with some modifications to the existing infrastructure in the river. Most notably, it was found that the Talbot Mills Dam is the primary blockage for fish accessing the SuAsCo watershed.

**2020 Review of Talbot Mills Dam Removal Feasibility Study:** In 2020, the Town of Billerica contracted Streamworks, PLLC to conduct a review of the 2016 Feasibility Study. Streamworks generally agreed with the findings of the study, and made suggestions for follow-up analyses. This review mentioned that removal of the Talbot Mills dam had the potential to improve water quality in Concord River.

**2021 Merrimack River Comprehensive Plan for Diadromous Fishes:** In 2021 the Technical Committee for Anadromous Fishery Management of the Merrimack River Basin, made up of representatives from federal and state agencies in New Hampshire and Massachusetts, completed a comprehensive plan for restoring diadromous fish populations to the Merrimack River Watershed. Removal of Talbot Mills dam was identified as a top priority project resulting in significant potential to restore fish populations to the Merrimack River watershed.

**2021 Talbot Mills Dam Removal Targeted Impact Analysis:** In 2021, DMF contracted Gomez and Sullivan Engineers to study the impacts that dam removal would have on the Town of Billerica's drinking water intake, located 1.25 miles upstream of the dam. The study concluded that no significant impacts to the intake or water supply in general are expected from dam removal.

**2022 Review of Targeted Impact Analysis:** In 2022, the Town of Billerica contracted Streamworks, PLLC to conduct a review of the 2021 Targeted Impact Analysis. Streamworks found the conclusions of the analysis to be accurate and reasonable but suggested further studies. They supported Gomez and Sullivan's recommendation to move forward with design and permitting of the dam removal.

**2022 Talbot Mills Dam Removal–Intake Pump Performance Analysis:** In 2022, the Town of Billerica contracted Woodard and Curran New England to also study the potential impacts that dam removal would have on the Town's drinking water intake. The study concluded that dam removal would not likely cause issues at the intake structure. They recommended that the Town consider developing a second intake at another location on the river or an alternative water supply source due to the existing water quality concerns, and the Town having only one drinking water intake.

**2022 Talbot Mills Dam Removal Conceptual Design:** In 2022, DER contracted Gomez and Sullivan Engineers to develop a conceptual design for the removal of the Talbot Mills dam. This included an assessment of upstream and downstream impacts and an analysis of scour of existing infrastructure that could occur as a result of dam removal, and a plan for managing sediment behind the dam once the dam is removed.

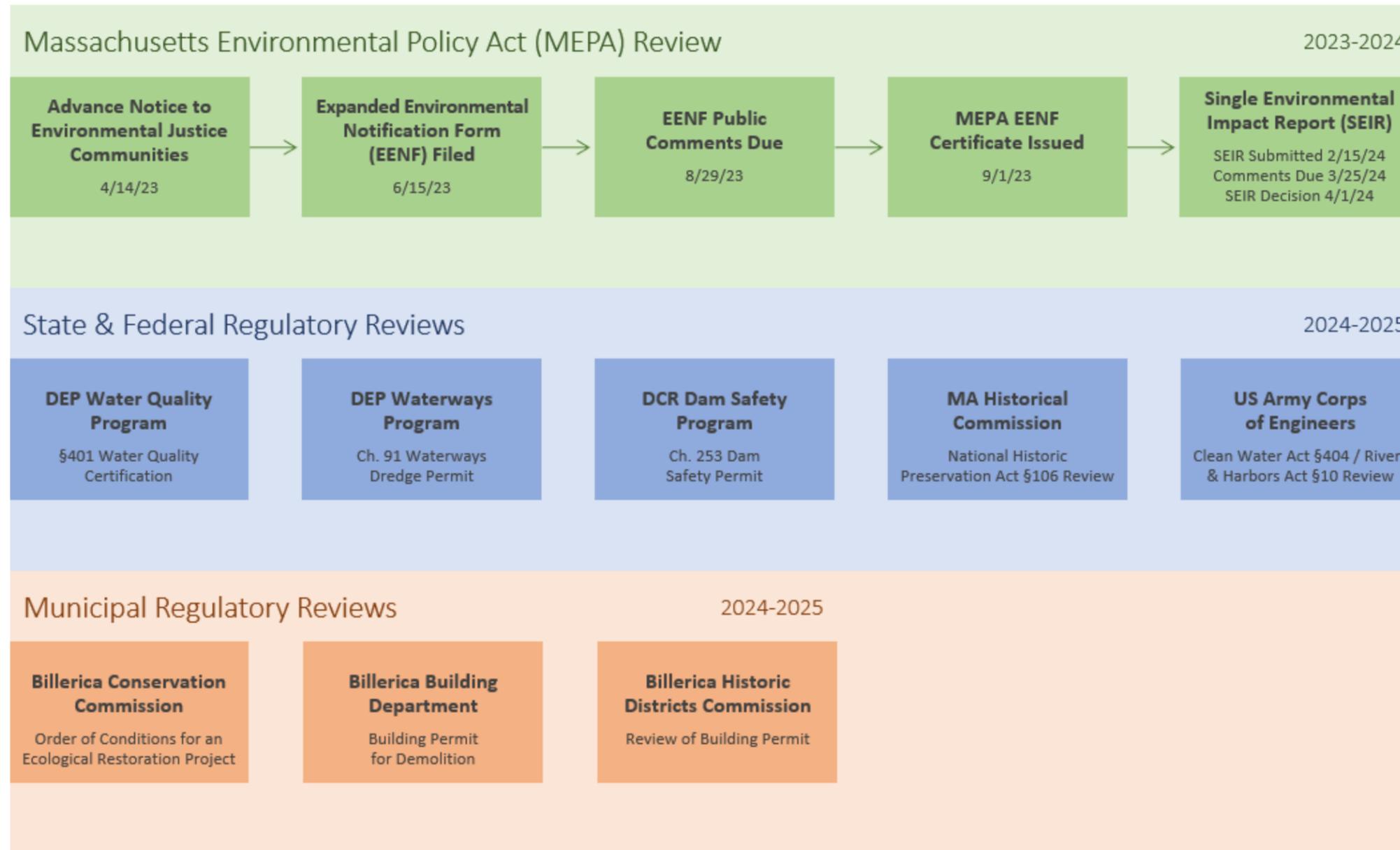
**2023 Talbot Mills Dam Removal Preliminary Design:** In 2023, OARS contracted Gomez and Sullivan Engineers to advance the dam removal design to the preliminary (permit-ready) stage. 60% complete drawings were included with the MEPA EENF filing, and 75% complete drawings were included with the MEPA SEIR filing (see links to these documents below under Regulatory Review).

# REGULATORY REVIEW

T

The environmental review process for the Talbot Mills Dam Removal Project under the [Massachusetts Environmental Policy Act \(MEPA\)](#) has been completed. The Secretary's Certificate for the Single Environmental Impact Report (SEIR) was issued on April 1, 2024, stating that the SEIR "adequately and properly complies with MEPA." The state-level MEPA process gathers information to ensure that all relevant environmental information is in hand before any permitting processes begin. The Single Environmental Impact Report (SEIR) was published in the *Environmental Monitor* on February 23, 2024. The SEIR is a comprehensive description of the project with detailed project plans, answers to questions raised in the Secretary's Certificate for the Expanded Environmental Notification Form (EENF), and responses to the comments submitted by the public and others. All filings and Certificates can be downloaded from MEPA's [Talbot Mills summary page](#).

# Talbot Mills Dam Removal Regulatory Review Timeline



## PUBLIC MEETINGS

Several public meetings, workshops, and other events will occur throughout the project where you can learn more and get involved. The meetings that have occurred so far are:

- August 7, 2014: The project team held a public information session. The session was held in-person and no recording is available.
- February 23, 2016: The project team held a public meeting. The meeting was held in-person and no recording is available.

- May 15, 2022: Members of the project team presented to the Middlesex Canal Association. [Watch the recording here.](#)
- June 29, 2022: The project team held a public meeting about the Talbot Mills Dam removal. [Watch the recording here.](#)
- April 10, 2023: Members of the project team gave an informational presentation to the Billerica Planning Board.
- April 12, 2023: Members of the project team gave an informal presentation to the Billerica Conservation Commission.
- April and May, 2023: OARS, one of the project leads, made informal presentations to various community groups in and around Billerica. Additional meetings and events will be held throughout the project. Sign up for email updates below to be notified when a meeting is upcoming or click the link to see if there are any upcoming events scheduled for this project.
- July 19, 2023 at 5:30 PM. MEPA held a remote consultation. View the meeting slides [here.](#)
- July 27, 2023 at 11 AM. MEPA held a site visit at the dam. View the handout [here.](#)

[SIGN UP FOR EMAIL UPDATES >](#)

[UPCOMING EVENTS >](#)

## IN THE NEWS

A variety of news outlets have reported on Talbot Mills over the years. Read a few recent articles below.

- [May 16, 2023 – Town officials, conservation groups disagree on fate of Talbot Mills Dam](#)
- [September 15, 2022 – Removing dams restores river ecology, here's how Massachusetts is stepping up](#)
- [August 12, 2022 – LTC Covers The Merrimack and Concord Rivers – Talbot Mills Dam Removal Project](#)
- [June 29, 2022 – Historic Talbot Mills dam meeting hears public concerns in Billerica](#)
- [June 27, 2022 – Talbot Mills Dam removal in Billerica would return Concord River flow, fish populations](#)
- [June 26, 2022 – The Five Minute Read. Dams, roads, polls and drone news](#)
- [June 21, 2022 – Fishing for a dam change at Talbot Mills dam in Billerica](#)
- [March 13, 2016 – It's historic water over the Talbot Dam](#)

## STILL HAVE QUESTIONS?

1. Read our full FAQ document which is updated regularly. If you don't find your questions there, [submit yours to be answered in the next update!](#)

READ THE  
FREQUENTLY ASKED  
QUESTIONS IN  
ENGLISH >

LEA LAS PREGUNTAS  
FRECUENTES EN  
ESPAÑOL >

LEIA AS PERGUNTAS  
FREQUENTES EM  
PORTUGUÊS >

សូមអានសំណួរ  
ដែលគេតែងតែសួរ  
ជាញឹកញាប់នេះ >

2. Visit our StoryMap, a tool to view information about the project in a visual and accessible way.

VISIT THE STORYMAP >

3. Reach out to any of the contacts below about the project and information posted here:

- Matt Brown, OARS: [mbrown@oars3rivers.org](mailto:mbrown@oars3rivers.org)
- Eric Hutchins, NOAA: [eric.hutchins@noaa.gov](mailto:eric.hutchins@noaa.gov)
- Jane Calvin, Lowell Parks and Conservation Trust: [jcalvin@lowelllandtrust.org](mailto:jcalvin@lowelllandtrust.org)

*The development of this webpage was funded in part by the [Massachusetts Environmental Trust](#). For more information, please visit [www.mass.gov/eea/met](http://www.mass.gov/eea/met)*

## SIGN UP FOR OUR NEWSLETTER!

SIGN UP >





# MRWC MERRIMACK RIVER WATERSHED COUNCIL

60 ISLAND ST., SUITE 246, LAWRENCE, MA 01840 • 54 PORTSMOUTH ST., CONCORD, NH 03301 • 978.655.4742 • EIN – 04-2633281 •  
INFO@MERRIMACK.ORG

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COMMONWEALTH OF MASSACHUSETTS  
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS  
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT



131 BARNUM ROAD, BUILDING 3701, DEVENS, MA 01432  
PHONE 978-772-4255 FAX 508-792-7718  
[www.state.ma.us/dem/](http://www.state.ma.us/dem/)

Aug 18 1999

CRT DEVELOPMENT  
67 Faulkner Street  
Billerica, MA 01821  
Attn: Robert Martin

Argeo Paul Cellucci  
GOVERNOR

08/10/99

Jane Swift  
VEUTENANTGOVERNOR

RE: Talbot Mills Dam, 4-9-31-1

Bob Durand  
SECRETARY

**NOTICE OF INSPECTION**

Peter C. Webber  
COMMISSIONER

Dear Mr. Martin:

In accordance with MGL c 253, s 44-50 and 302 CMR 10.00, the DEM Office of Dam Safety completed a visual inspection of Talbot Mills Dam, located in North Billerica, of which CRT Development, A Limited Partnership, owns. The inspection was completed by one of our consulting Engineers in accordance with required inspection frequencies.

Based on inspection results, the run-of-the-river masonry dam is considered to be in FAIR condition, and has moderate operational or maintenance deficiencies. Based on the applicable design storm, the dam is hydraulically adequate. A copy of the 5/20/99-inspection report and checklist is enclosed.

A written response to this Notice, regarding maintenance, within 180-days is required. In addition, it is suggested that recommendations listed in the enclosed report be followed.

If you have any questions, comments, or need technical assistance, please call our office. Thank you.

Sincerely,

R. David Clark  
Chief  
Office of Dam Safety

RDC/mam

c:\demdams\documents\007741tr.doc



**Department of Environmental Management  
Office of Dam Safety**

CRT DEVELOPMENT  
67 Faulkner Street  
Billerica, MA 01821

**Owned Dam**

**Inspection/Evaluation Report**

**Dam Name:** Talbot Mills Dam

**Dam ID#:** 4-9-31-1

**Army Corp ID#:** MA 00774

**Town:** North Billerica

**Consultant:** Weston & Sampson Engineers, Inc.

**Date of Inspection:** May 20, 1989

## PREFACE

Weston & Sampson Engineers, Inc. has completed this dam evaluation study as part of its contract with the Commonwealth of Massachusetts, Department of Environmental Management, Office of Dam Safety (DEM) 1999 dam inspection program. The purpose of this study is to identify those dams that pose hazards to public safety, human life, or public property.

Our findings, conclusions, and recommendations are based primarily on visual observations made during our site visits, review of DEM files, and limited engineering analysis. Detailed field programs and engineering analysis such as topographic mapping, subsurface exploration programs, laboratory testing, and detailed engineering analysis are beyond the scope of this study.

Please note that our description of the general dam conditions is based on the visual observations of the dam surficial conditions made during our site visit and on our review of the available data provided by DEM. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability of the dam, removes the normal loading conditions on the dam and may obscure certain conditions, which might be detectable if inspected under the normal loading conditions of the dam.

Also note that the dam's integrity and stability depend on numerous and constantly changing internal and external conditions, and are evolutionary in nature. It is incorrect to assume that the current observations of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected and avoided.

Mohammed M. Kheirallah  
Professional Engineer



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APPENDIX D	Hydrologic Data and Computations
APPENDIX E	Previous Inspection Reports
APPENDIX F	Dam Safety Detail Sheet

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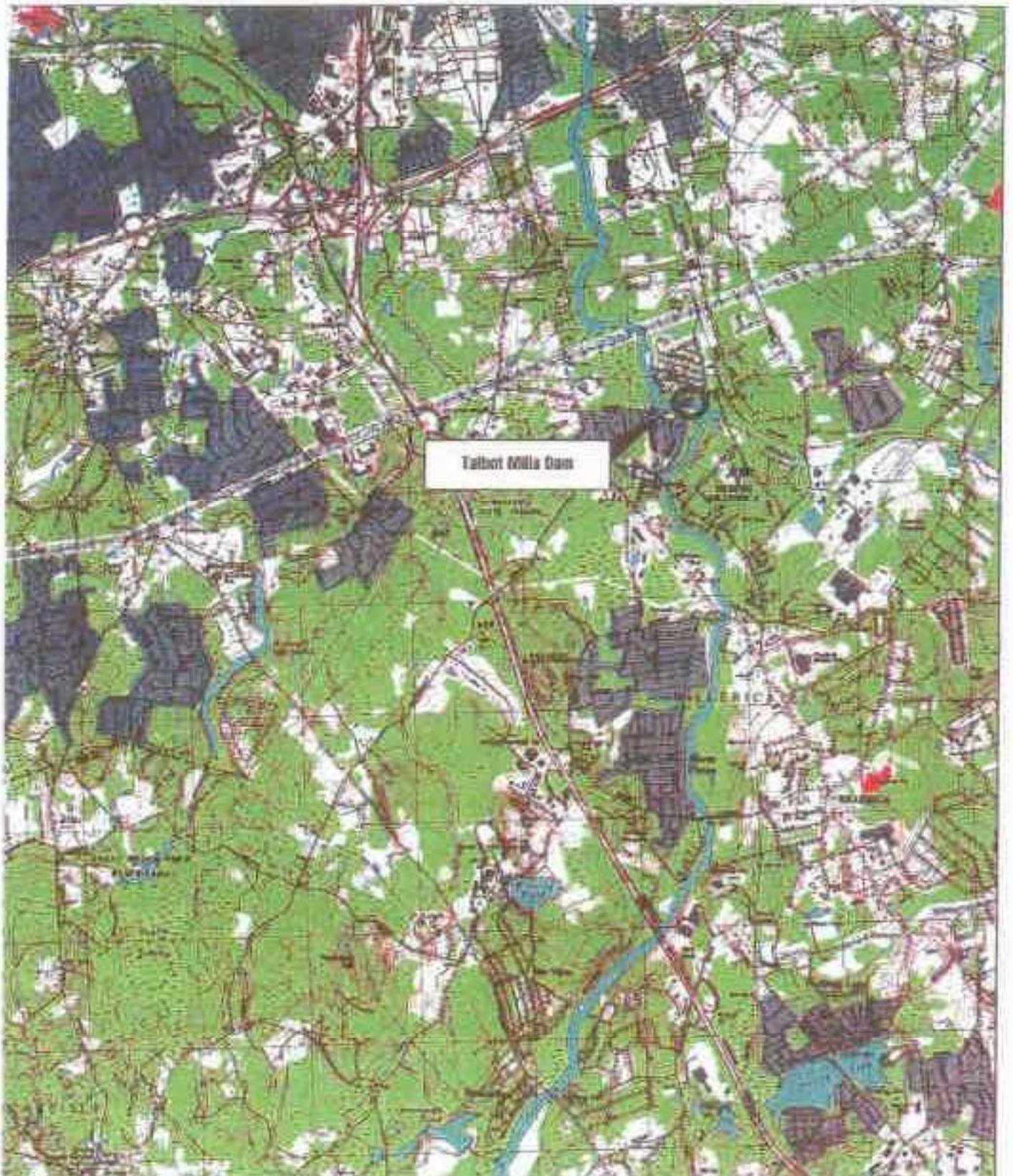


FIGURE 1  
TOWN OF NORTH BILLERICA, MASSACHUSETTS, TALBOT MILLS DAM  
LOCUS MAP

SOURCE: USGS 7.5 & 15 MINUTE SERIES, BILLERICA BASIN, QUAD, 1881

## 1.0 DESCRIPTION OF PROJECT

### 1.1 General

This report summarizes Weston & Sampson Engineers, Inc., (WSE) observations, findings, and recommendations for Talbot Mills Dam in North Billerica, Massachusetts. Our findings and recommendations are based on field observations made during our site visit to the dam on May 20, 1999, review of prior studies, and experience with similar dams.

#### 1.1.1 Authority

The Commonwealth of Massachusetts, Department of Environmental Management, Office of Dam Safety (DEM) has engaged the services of WSE to complete a dam inspection study of Talbot Mills Dam in North Billerica, Massachusetts, as part of DEM's 1999 Dam Inspection Program. We have completed this study as part of our annual contract with DEM, and based on their verbal authorization.

#### 1.1.2 Purpose of Work

The main purpose of this study is to evaluate the current conditions of Talbot Mills Dam to identify the need for any immediate emergency measures to avoid any threat to public safety or the environment. The study will also be used in comparison with prior ones to monitor the dam conditions, and to identify any progressive deterioration that will require repairs.

As part of our study, we completed the following scope of services:

1. Site reconnaissance to observe and document surficial dam conditions and any other signs of seepage, failure, or movement in the dam and related structures. Prior to the site visit, we contacted the person in charge of dam safety, as identified by DEM.
2. Reviewed available data from DEM files to obtain information on the dam construction, maintenance, and operations.
3. Met with the dam safety officer to obtain information on the dam history and conditions.
4. Performed limited engineering analysis to confirm available data in prior studies.
5. Prepared this report summarizing our findings, conclusions, and recommendations.

### 1.2 Description of Project

#### 1.2.1 Location

Talbot Mills Dam is located in North Billerica, Middlesex County, Massachusetts. The dam is on the Concord River immediately upstream of the Faulkner Street Bridge. It is located at the following approximate coordinates on the Billerica, Massachusetts, USGS Quadrangle:

Latitude: 42° 35.5' N  
Longitude: 71° 17.04' W

### 1.2.2 Owner/Operator

~~\_\_\_\_\_~~ Talbot Mills Dam. Mr. Bill Martin, Engineer at Cambridge Tool Manufacturing Company, is the designated "dam caretaker."

### 1.2.3 Purpose of Dam

The dam was originally constructed to impound water for power and fire protection for the mills, and to divert water into the old Middlesex Canal that flowed toward Boston. Currently, the dam is used for recreational and flood control purposes.

### 1.2.4 Description of Dam and Appurtenances

The Talbot Mills Dam is located on the Concord River immediately upstream of the Faulkner Street Bridge in North Billerica, Massachusetts. The dam was originally constructed in the late 1850s to impound water for power and fire protection for the mills, and to divert water into the old Middlesex Canal that flowed toward Boston.

The dam is approximately 160 feet long with a maximum height of about 12.5 feet. It is an overflow or run-of-river type stone masonry structure apparently seated on bedrock. The spillway is a broad-crested weir 160 feet long and 6 feet wide with crest elevation about 2 feet lower than the top of the dam. A 13-foot wide concrete-lined sluiceway and gate are located in the southern abutment. Five (5) wooden gates are located about 100 feet upstream of the northern abutment contact. Two outlet structures located in the northern side of the dam appear to be permanently blocked.

On the southern end of the dam, there is a canal to Faulkner Mill, and on the northern end, there are old gates for the Talbot Mills Sluiceway. Prior DEM inspection reports describe a stilling basin downstream of the Talbot Mills Sluiceway, which is not visible from the road. There are also flow screens on the downstream canal, control gates in a locked position, and a turbine, which has not been in operation since 1972.

### 1.2.5 Operations and Maintenance

There are no formal records kept on the operations and maintenance of this dam, nor are there standard operating procedures.

### 1.2.6 DEM Size Classification

Talbot Mills Dam has a maximum storage capacity of approximately 100 acre-feet and a maximum height of 15 feet. Although the dam was classified as small in size in prior reports, *the dam meet the requirements of an INTERMEDIATE size dam as stated in Massachusetts's regulation 302 CMR 10.06.*

### 1.2.7 DEM Hazard Classification

The possibility for loss of a few lives and appreciable economic damage that would occur to the Faulkner Street Bridge, Talbot Mill buildings, and possibly the wastewater treatment facility as a result of dam failure places the dam in the HIGH hazard category as defined in 302 CMR 10.06.

### **1.3 Engineering Data**

#### **1.3.1 Drainage Area**

The drainage area for Talbot Mills Dam is approximately 1243 acres.

#### **1.3.2 Reservoir**

##### **1.3.2.1 Length**

The length of the impoundment is approximately 200 feet.

##### **1.3.2.2 Surface Area**

The surface area is approximately 2 acres.

##### **1.3.2.3 Storage Area**

The storage area is approximately 400 acre-feet.

#### **1.3.3 Discharge at Dam Site**

Discharge is approximately 500 cfs in the Concord River downstream of Talbot Mills Dam.

#### **1.3.4 Additional Elevations**

No additional elevations are known for this dam.

#### **1.3.5 Main Spillway**

The main spillway is approximately 160 feet in length.

#### **1.3.6 Construction Records**

No design, repair, or maintenance data was available for the dam, which was constructed around the 1850s.

#### **1.3.7 Operational Records**

There are no operating records for this dam, according to Bill Martin.

## 2.0 VISUAL INSPECTION

### 2.1 General Findings

#### 2.1.1 Dam

Ms. Jennifer S. Rivers of WSE visited Talbot Mills Dam on May 20, 1999, to observe the surficial condition of the dam. At the time of inspection there was approximately 9± inches of flow over the spillway (Photo Nos. 1&2).

Although we could not visually observe the spillway due to the running water, it appeared to be in fair/good condition with no obvious misalignment, displaced masonry, or other defects. The north side of the dam and associated abutment appeared to be in satisfactory condition, and there was virtually no flow through the outlet pipes for the old gates (Photo No. 3) on that side. The south side of the dam was repaired at some time in the past as evidenced by a concrete face which appears to be newer than the rest of the concrete used to build the dam. Leakage was visible at the bottom corner of the concrete face adjacent to the spillway section. The dry masonry, which comprises the southern wall of the dam is missing some stones.

The Faulkner Street Bridge is approximately 45 feet downstream of the dam. There is one tree and a few outcrops of bedrock immediately downstream of the spillway (Photo No. 2) which appears to pose no obstruction to the flow of water. The north abutment immediately downstream of the dam was eroded as a result of high flows that occurred in spring 1987 (Photo No. 4). The south-facing downstream wall is beginning to erode the bedrock on which Cambridge Tool Manufacturing building is located (Photo No. 5), and the bridge abutment support is also beginning to show signs of deterioration or scouring (Figure No. 6).

#### 2.1.2 Appurtenant Structures

The concrete lining of the sluiceway in the South abutment is severely weathered and deteriorated (Photo No. 4). The gates located upstream of the North abutment have been described in previous reports as being inoperable; at the time of inspection they were overgrown with vegetation and in a state of disrepair. The diversion into the old canal was not observed.

#### 2.1.3 Downstream Area

The downstream area of Talbot Mills Dam is a stone and concrete-lined channel for approximately 500 feet. Downstream of this portion of the dam, the Concord River flows in its natural state. There are several homes located on the Concord River immediately downstream of Talbot Mills Dam.

#### 2.1.4 Reservoir Area

There is only a slight impoundment upstream of the dam. Approximate dimensions are 300 ft in width and 200 feet in length.

### 2.2 Caretaker Interview

On May 20, 1999, a WSE representative met with Mr. Bill Martin, Engineer, at Cambridge Tool Manufacturing. There is no formal operator of this dam; however, he explained that he was

given the responsibility for it. He said that in 1987 or thereabouts, the Army Corps of Engineers called him and asked him to lower the gates for this dam to mitigate downstream flooding. The gates were not operational, so he told them he could not do so. Other than that he has no records for the dam itself.

## 2.3 Operation and Maintenance Procedures

### 2.3.1 Operational Procedures

There are no operation procedures in place for Talbot Mills Dam. According to Mr. Martin, once in 1998, during a particularly heavy storm event, he was contacted by the Army Corps of Engineers and asked to lower the gate to mitigate upstream flooding. The gate is fixed, however, and therefore could not be lowered.

### 2.3.2 Maintenance of Dam and Operating Facilities

There is no routine maintenance performed for this dam.

### 2.3.3 Emergency Warning System

There is no formal Emergency Warning System in place for this dam.

### 2.3.4 Emergency Action Plan

There is no formal Emergency Action Plan in place for this dam.

## 2.4 Hydraulic/Hydrologic Data

WSE used the Rational Method (see Appendix D) to calculate an approximate flow given a 100-year flood scenario. Approximately 1002 cfs of water will discharge from the Talbot Mills Dam to the Concord River in the event of such a flood.

## 2.5 Structural Stability/Overtopping Potential

### 2.5.1 Structural Stability

Although the dam spillway appears to be stable, we could not inspect the structural elements of the spillway due to the running water. The northern and southern ends of the dam also appear to be stable except for the missing stones in the southern end.

### 2.5.2 Overtopping Potential

Based on limited hydraulic analysis of Talbot Mills Dam utilizing the Rational Method, WSE calculated a flow of 1002 cfs given the 100-year flood event. Please note that this method is preliminary in nature and provides a crude estimate of the peak flow based on a simplified mathematical model.

Our analysis indicates that the spillway capacity is 6773 cfs, thus the dam is capable of passing the 100-year flood without significant potential for overtopping.

### 3.0 ASSESSMENTS, RECOMMENDATIONS, AND REMEDIAL MEASURES

#### 3.1 Assessments

The dam abutments and the spillway show no sign of misalignment, movement, or vertical settlement. The southern abutment walls are missing some stones. There is some vegetation overgrowth in both the southern and northern ends of the dam.

The gates at the intake structures are inoperable. The training walls downstream of the dam show signs of deterioration.

*Based on our field observations, review of prior reports, and experience with similar projects, it is our opinion that Tuller Mills Dam is in FAIR condition.*

#### 3.2 Recommendations

Based on our assessment of the dam condition, we recommend that DEM, within one year of receiving this report, engage the services of a professional engineer, licensed in the Commonwealth of Massachusetts, to complete the following:

1. Evaluate the structural integrity and complete a detailed stability analysis of the dam and primarily the spillway.
2. Complete a detailed Hydraulic & Hydrogeologic analysis of the dam.
3. Prepare an Emergency Action Plan for the dam.

#### 3.3 Remedial Measures

We recommend the implementation of the following remedial measures within six months of the date of this report. We believe that DEM staff could complete some or all of the measures:

1. Remove all vegetation from the dam abutments and training walls.
2. Repair the gates to have control over the water elevation in the pond.

#### 3.4 Alternatives

At this time there are no viable alternatives to the above-recommended work.

#### 3.5 Cost Estimation

The following itemized costs for recommendations are based upon the assumption that the work would be completed within one year of this report.

<u>Engineering Recommendations</u>	
Perform Stability Analysis	\$3,700
Perform H&H	3,600
Prepare EAP	<u>3,200</u>
Subtotal	\$10,500

<u>Remedial Measures</u>	
Clearing	\$2,200
Repair gates	<u>12,300</u>
Subtotal	\$14,500
<b>TOTAL</b>	<b>\$25,000</b>

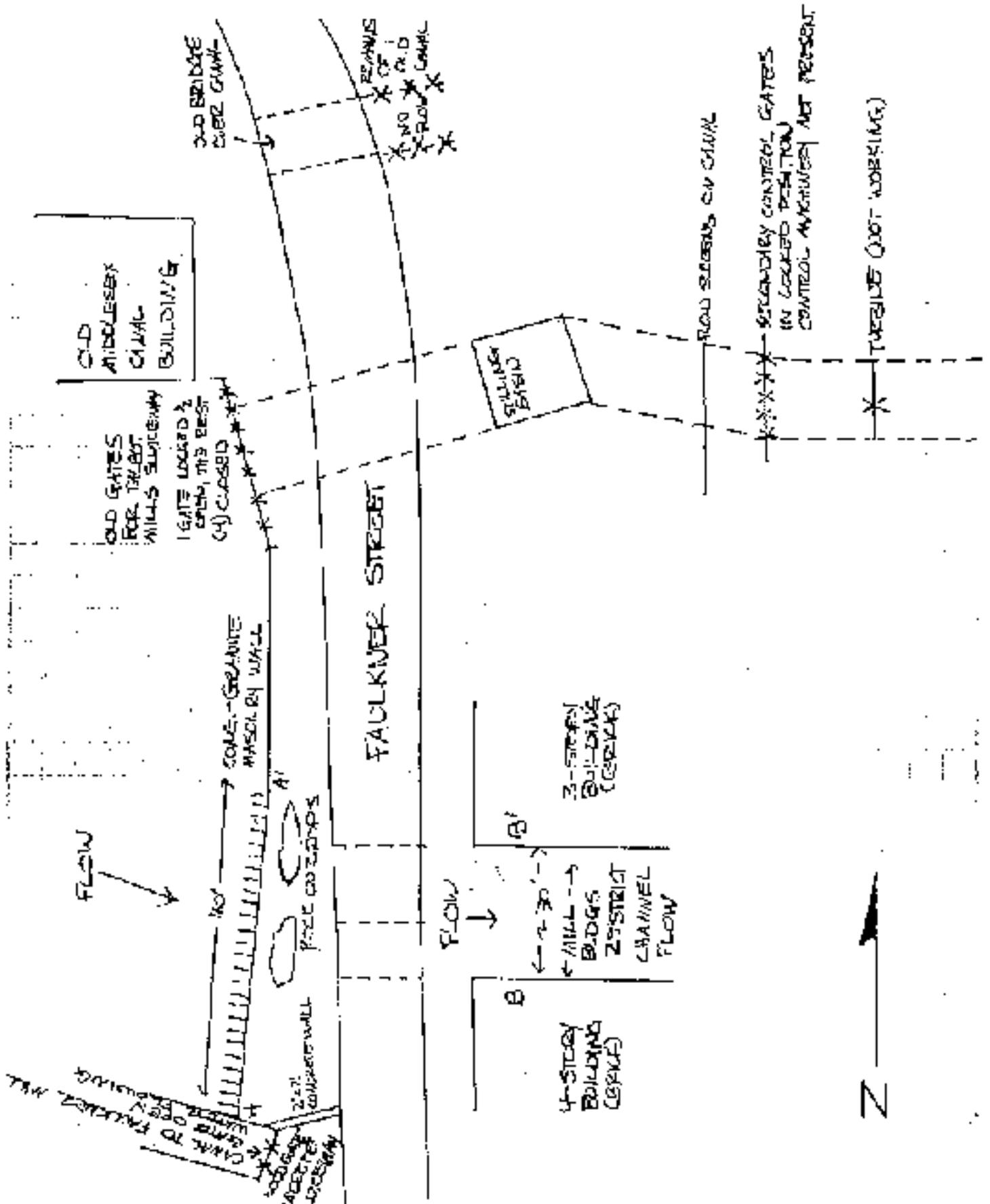
Please note that the above cost estimates are based on our understanding of the level of effort to complete the above-listed recommendations. These cost estimates may vary depending on the time the services are completed and the level of effort required to complete the services. Also, please note that these cost estimates do not include the total construction costs of the required repairs.

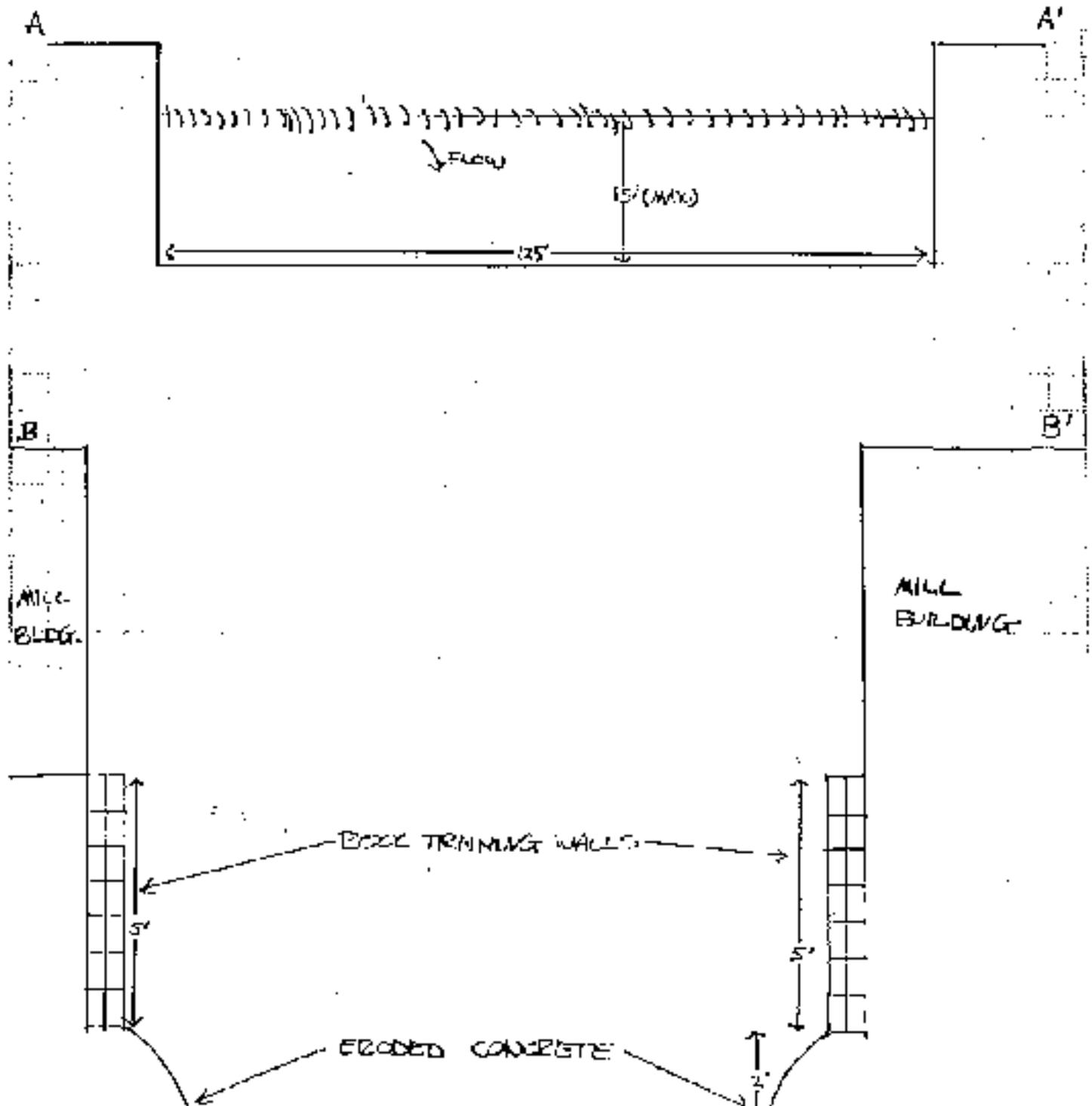
Talbot Mills Dam is considered to be in FAIR condition. If allowed to continue, the erosion of the right abutment could eventually affect the structural integrity of the dam and downstream highway bridge.

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**APPENDIX A**

**PLAN OF DAM AND AVAILABLE CONSTRUCTION DRAWINGS**





**APPENDIX B**

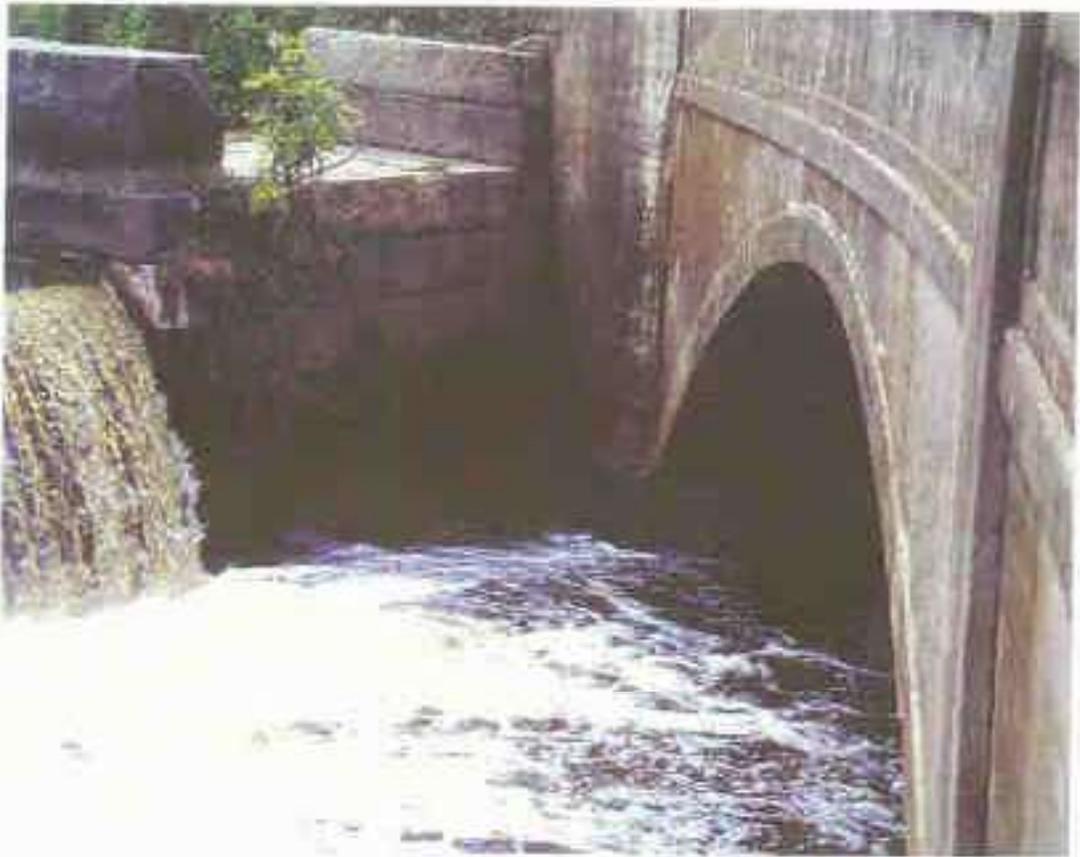
**PHOTOGRAPHS AND PHOTO LOCATIONS/DESCRIPTION**



**Photo 1.** Southeast-looking view of dam



**Photo 2.** Spillway



**Photo 3.** Outlet pipes for old gates



**Photo 4.** Training walls in downstream channel

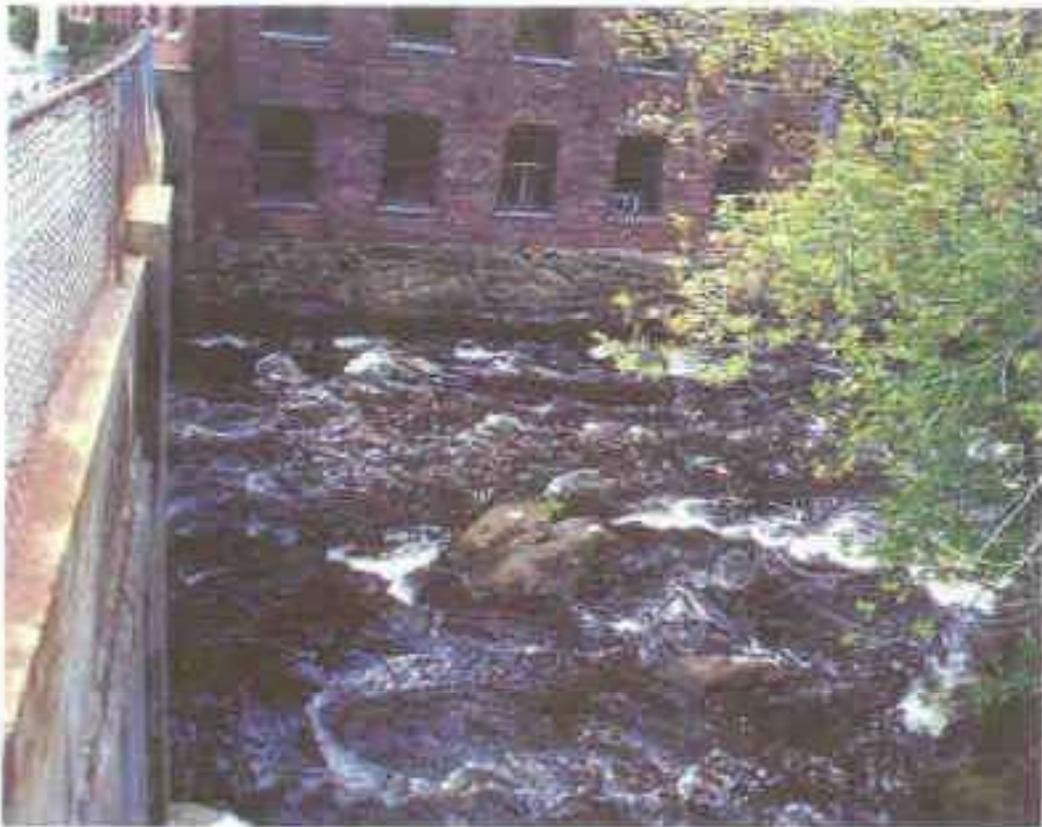
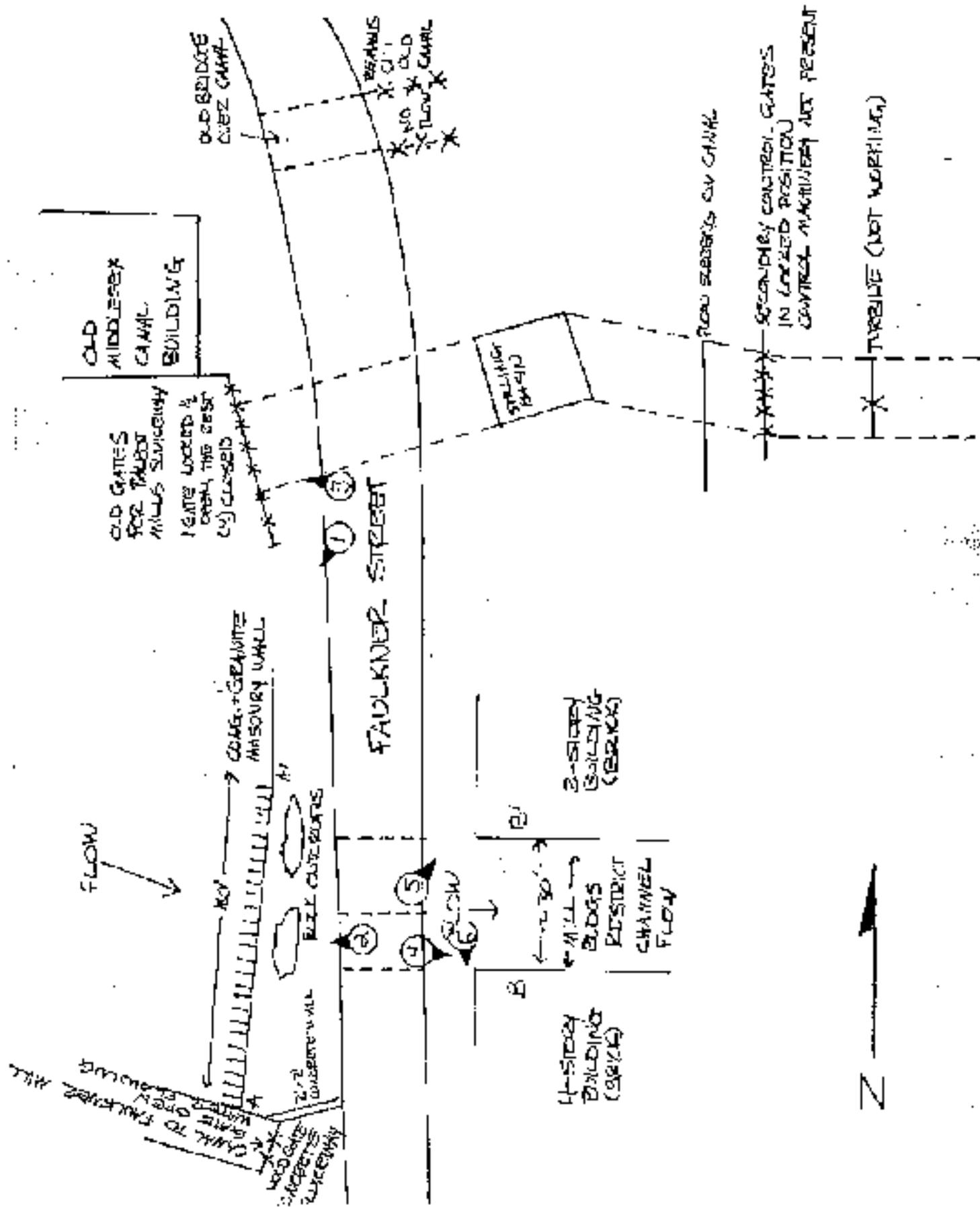


Photo 5. Mill building; downstream channel



Photo 6. Bridge abutment support



**APPENDIX C**  
**INSPECTION CHECKLIST**



NAME OF DAM: Tabularia Dam ID NO: 4-33-1 INSPECTION DATE: May 20, 1999

# EMBANKMENT

1 of 2

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS			CHECK ACTION NEEDED	
			MONITOR	INVESTIGATE	REPAIR		
DAM	1	SPURGE URNUKIC			OK		
	2	SIMON-ILU, ANVAL BURHOKY			OK		
	3	LOW AREAS			OK		
	4	HORVASKA, ANVAL BURHOKY			OK		
	5	K. GA AUDOR K. AUDOR			OK		
	6	VEGETATION CONDITION			OK		
UPSTREAM SLOPE	7						
	8						
	9	SLICE, SLO-GH, SCARP			OK		
	10	SLO-GH, SCARP			OK		
	11	SLO-GH, SCARP			OK		
	12	EMBANKMENT CONTACT			OK		
	13	EROSION			OK		
	14	VEGETATION CONDITION			OK		
15							
16							
ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE							

APPENDIX B - ENR 1001, See July 1999, Standardized for all dams

# EMBANKMENT

2 of 2

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK FOR ACTION NEEDED	
				NONCR	URGENT
DAMP STRONG SLOPE	17	WET AREA, NO PLANT			
	18	SEEPAGE			
	19	SLICE CUTS, SCARP			
	20	POUR POINT CONTACT			
	21	MINOR, MINIMAL WEAR			
	22	CRACKS			
	23	SLURRY, WEARMENT			
	24	VEGETATION CONTROL	some trees, big bush		X
	25				
	26				
SLOPE (EAST)	27	PLANT, WEAR, WEAR			
	28	GRAVE, WEAR, WEAR			
	29	WEAR			
	30	SURVEY MARKERS			
	31	WEAR			
	32	PREDICTION OF WEAR			
	33	LOCATION OF RECORDS			
	34				
	35				
	36				
ADDITIONAL COMMENTS: DEFECTS, TENDENCY, AFFILIABLE					

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# DOWNSTREAM AREA AND MISC.

1 of 1

APRA Inspected	ITEM NO.	CONDITION	OBSERVATIONS	CHECK ( ) ACTION NEEDED	
				MONITOR	INVESTIGATE/REPAIR
DOWNSTREAM AREA	36	SEWAGE TREATMENT LEAKAGE	none		
	37	FOUNDATION SERVICE	none		
	38	SL. BE. SL. JOINT, SCARP	none		
	39	EMERGENCY SYSTEM	drain pipe		
	40				
MISCELLANEOUS	41				
	42	DOWNSTREAM HAZARD DESCRIPTION			
	43	DATE OF LAST UPDATE OF EMERGENCY PLAN	yes		
	44	RESERVOIR SLOPES	OK		
	45	SCOUR PROTECTION	SCOUR PROTECT		
	46	SECURITY DEVICES	OK		
	47				
	48				
	49				
	50				
ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE					

APRA/PPC/US/VT/CSH Dam Inspection of Lakeville Hydroelectric Dam

DATE OF DAY: \_\_\_\_\_ TIME OF DAY: \_\_\_\_\_ JORN: 4-21-71 INSPECTION DATE: May 20, 1966

# SPILLWAYS

1 of 1

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECKING ACTION NEEDED	
				MONITOR	REPAIR
EVALES - HERRERA	51	C. B. ICE BLOCKS BEHIND	none		
	52	MOORION	none		
	53	VEGETATION CONDITION	none - none present in the form of bushes and trees		X
	54	SPILLS	small amount of copper nail made visible in downstream draft		X
	55				
	56				
	57	SEALS	OK		
	58	CHIMNEY FLU	OK		
	59	LUBRICATION	none		
	60	ROTOR MOUNTING	OK		
MON. ENGINE ROOM	61	WATER TIGHT			
	62	ROTOR AREA			
	63				
	64				
ENGINE	65	STRUCTURE	none		
	66	TRAILER	none		
	67	STILL ICE	none		
	68				
ADDITIONAL COMMENTS REFER TO GENERAL PAPERWORK					

REPRODUCED FROM THE NATIONAL ARCHIVES

NAME OF DAM: Taddei Mts Dam ID NO: 4-2-33-1 INSPECTION DATE: MAY 20, 1950

# OUTLET WORKS

1 of 1

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK ( ) ACTION NEEDED?	
				MONITOR	INVESTIGATE
OUTLET WORKS	70	INTAKE STRUCTURE	OK		
	71	TRASHPAC	NO		
	72	STILLING BASIN	NO		
	73	SPARK COLLECTOR			
	74	SECONDARY CLOSURE			
	75	CON. FOR INCL. VALVE			
	76	OUTLET PIPE	OK		
	77	OUTLET TOWER	NO		
	78	TRANSV. MOUNT. DAM TRIP	NO		
	79	SCOFF	NO		
80	PL. VALV. MOUNT. UNIT	NO			
81					
82					
83					
ADDITIONAL COMMENTS REFER TO DRAWING, IF APPLICABLE					

U.S. GOVERNMENT PRINTING OFFICE: 1947 O-348-100

NAME OF DAM: \_\_\_\_\_ INSPECTION DATE: \_\_\_\_\_ INSPECTION DATE: \_\_\_\_\_ May 20 1999

# CONCRETE/MASONRY DAMS

1011

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS		CHECKED ACTION NEEDED	
			MONITOR	INVESTIGATE	MONITOR	INVESTIGATE
UPSTREAM FACE	B4 SURFACE DEFECTS		OK			
	B5 JOINTS		OK			
	B6 ABNORMAL MOVEMENT		OK			
	B7 SETTLEMENT CRACKS		OK			
	B8					
	B9					
DOWNSTREAM CHANNEL	B10 SURFACE DEFECTS		OK			
	B11 JOINTS		OK			
	B12 ABNORMAL MOVEMENT		OK			
	B13 SETTLEMENT CRACKS		OK			
	B14					
	B15					
	B16					
	B17					
	B18					
	B19					
D	D1					
	D2					
	D3					
	D4					
	D5					
A. SOME OF THE COMMENTS FORM TO THE RIGHT, IF APPLICABLE						

FORM NO. 1011-1 (REV. 10/88)

APPENDIX D  
HYDROLOGIC DATA AND COMPUTATIONS

Weston & Sampson ENGINEERS, INC.	PROJECT:	DATE: 05.08.99	PAGE: 1 of 1
	DEM DAM INSPECTIONS		
	TALBOT MILLS DAM	BY: JSR	
		CK BY: PMA	

- Talbot Mills Dam  
North Berwick, MA

Peak Flow estimation using Rational Method<sup>\* \*\*</sup>

$$Q_p = C \cdot I \cdot A$$

where C is the runoff coefficient as estimated from Table 7-2 in *Hydrologic Analysis and Design* Richard H. McCuen, 1989 0.31

\*\*Assumed "C" type soils, slope 6%+, and 1/2 acre residential lots

A is the area in acres 1243 acres

I is the rainfall intensity in in/hr for the calculated time of concentration (T<sub>c</sub>) (see below)

$T_c = 0.007 \cdot (n \cdot L)^{0.58} / P_2^{0.48} \cdot S^{0.16}$

where n is assumed Manning roughness coefficient 0.05  
L is the flow length 4350 ft  
P<sub>2</sub> is 2-year, 24-hour rainfall = 0.135 in/hr \* 24 hours 3.24 in  
(see Boston intensity-duration-frequency chart, attached)  
S is slope of hydraulic grade, assumed to be 8 ‰

T<sub>c</sub> = 0.873858142 hours  
T<sub>c</sub> = 1.000 hour

Using this value, a recurrence interval of 100 years, and the intensity-duration-frequency chart for Boston, MA (see attached), we found the rainfall intensity, i, to be 2.6 in/hr

Therefore,  
 $Q_p = 0.31 \cdot 2.6 \cdot 1243$   
 $Q_p = 1001.858$

$$Q_p = 1002 \text{ cfs}$$

\*McCuen, R.H. (1989) *Hydrologic Analysis and Design*. Prentice Hall, Englewood Cliffs, NJ  
\*\*This method was developed for and is intended for use in small, urban watersheds  
\*\*These are preliminary calculations for estimation purposes only. A full hydrologic analysis is in order at this time

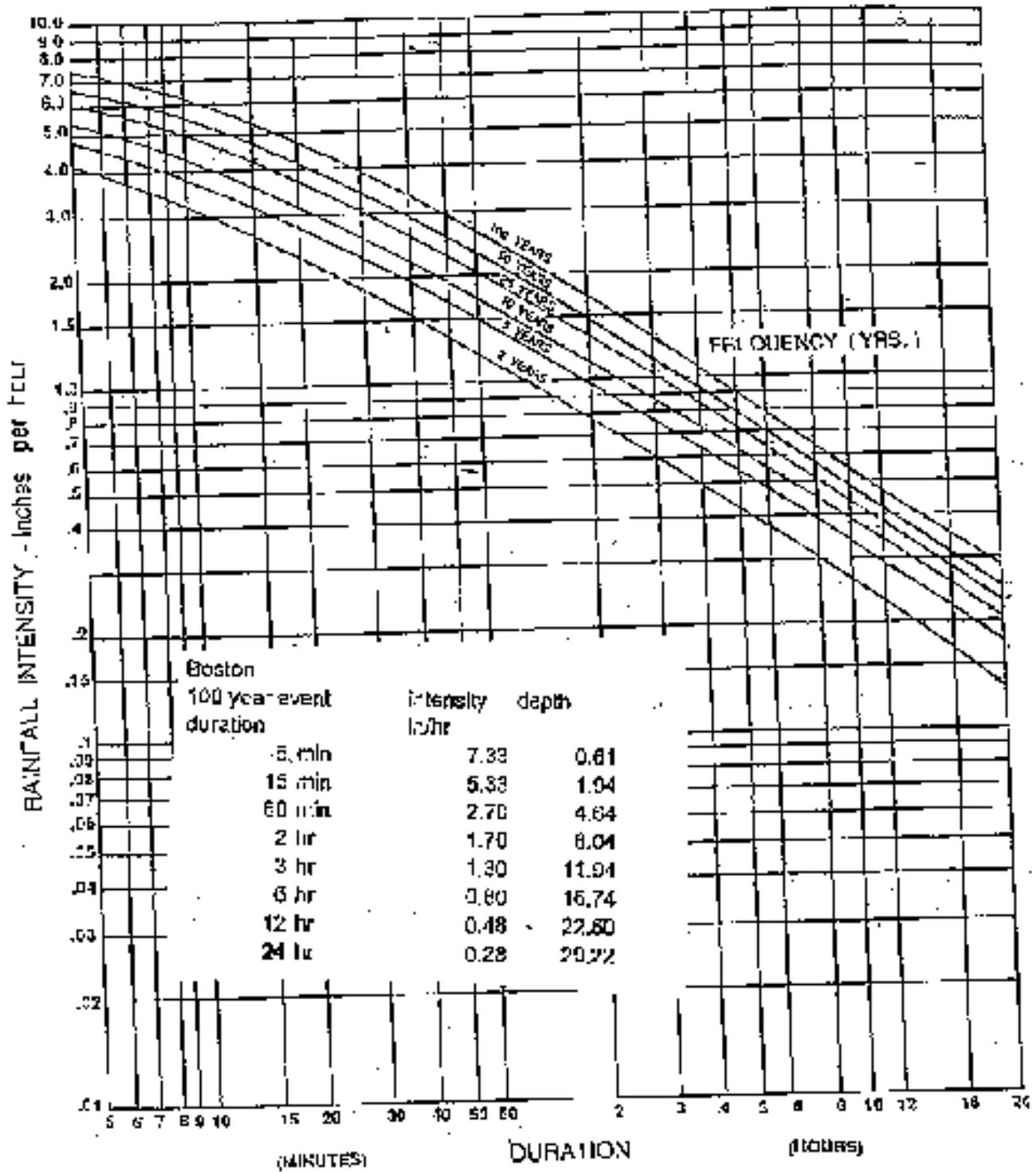


Figure 10-4. Intensity — Duration — Frequency Curve for Boston, MA

**APPENDIX E**  
**PREVIOUS INSPECTION REPORTS**

DEM files for the Talbot Mills Dam in North Billerica  
included the following inspection report:

Inspection/Evaluation Report  
O'Brien & Gere Engineers, Inc.  
November 17, 1987

**APPENDIX F**

**DAM SAFETY DETAIL SHEET**



EVALUATION FORM

DEM # 4-9-31-1

Dam Name Talbot Mills Dam

1. DESIGN 1    2    3    4    5  
 1 - unknown design  
 3 - some standard features  
 5 - state-of-the-art design

2. LEVEL OF MAINTENANCE 1    2    3    4    5  
 1 - no evidence of maintenance plan  
 3 - some level of maintenance work  
 5 - detailed, written report

3. EMERGENCY WARNING PLAN 1    2    3    4    5  
 1 - No plan/ideas for emergency response actions  
 3 - no plan, but well thought out  
 5 - detailed, written plan

4. EMBANKMENT 1    2    3    4    5  
 1 - evidence of piping and/or severe seepage  
 3 - serious seepage problem  
 5 - no evidence of seepage

-----

Not Applicable

5. CONCRETE/MASONRY 1    2    3    4    5  
 1 - major cracks/severe leaks or deficiencies throughout  
 3 - significant deficiencies/erosion or minor cracks  
 5 - no deficiencies apparent

6. LOW-LEVEL OUTLET

A - CAPACITY 1    2    3    4    5  
 1 - insufficient  
 3 - sufficient capacity  
 5 - greater than necessary

B - CONDITION 1    2    3    4    5  
 1 - inoperable and requires replacement  
 2 - inoperable/repairs required  
 3 - operable but needs repair  
 4 - operable/maintenance needed  
 5 - good operational condition

7.	SPILLWAY CAPACITY AS CAPACITY OF TEST FLOOD	1	2	3	4	5
	1 - 0 - 20%					
	2 - 21 - 40%					
	3 - 41 - 50%					
	4 - 61 - 80%					
	5 - 81 - 100%					

8.	GENERAL CONDITION	1	2	3	4	5
	1 - major operational/maintenance & structural deficiencies					
	3 - significant operation/maintenance deficiencies (no structural)					
	5 - no operation/maintenance or structural deficiencies					

9. ESTIMATED COST FOR REPAIRS:  
\$ 25,000

***TALBOT MILLS DAM***  
**PHASE I**  
**INSPECTION / EVALUATION REPORT**



**Dam Name:** Talbot Mills Dam  
**State Dam ID#:** 4-9-31-1  
**NID ID#:** MA 00774  
**Owner:** CRT Development  
**Owner Type:** Private  
**Town:** North Billerica  
**Consultant:** Geotechnical Consultants, Inc.  
**Date of Inspection:** May 22, 2009 Final



## EXECUTIVE SUMMARY

This Phase I Inspection/Evaluation Report details the inspection and evaluation of Talbot Mills Dam located in North Billerica, Massachusetts. The inspection was conducted on various dates between 26 January 2009 and 22 May 2009 by Geotechnical Consultants, Inc. of Marlborough, Massachusetts. As part of this study, a topographic survey was completed to provide a basis for some of the pertinent engineering data used to evaluate this dam.

Currently, the Talbot Mills Dam is classified as an Intermediate sized, High (Class III) Hazard potential structure. Based on our inspection, measurements and evaluation, it is our opinion the dam should be re-classified as an Intermediate sized, Significant (Class II) Hazard potential structure.

In general, the Talbot Mills Dam was found to be in fair condition primarily due to the lack of any operation or maintenance plan. Structurally, we found no indications of instability or seepage which comprise the integrity of the dam and appurtenant structures. The spillway appears to be adequately sized for the Spillway Design Flood (SDF); presuming the dam is re-classified as a Significant Hazard structure.

Some operational deficiencies exist and include:

- Minor seepage in the spillway abutment particularly at the left abutment.
- Trees located on the upstream side of the left embankment near the former intake gates to the Talbot Mills complex.
- Lack of an operable low level outlet and emergency bypass in the event of flooding.

Geotechnical Consultants, Inc. recommends the following actions be taken to address the deficiencies found at the dam during this inspection and evaluation:

- Prepare and implement “routine” inspection and maintenance plans for the operation and maintenance of this dam.
- Inspect the interior of the of the Talbot Mills complex, particularly the downstream end of the former intake structures.
- Repair/replace the sluiceway and stilling basin gates so that the gates are operational and can provide emergency bypass control.
- Repair/replace the left spillway abutment to provide an operational low level outlet and provide emergency bypass control.

## PREFACE

The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations and analyses involving subsurface investigations, testing and detailed computational evaluations are beyond the scope of this report.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection, along with data available to the inspection team. In cases where an impoundment is lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions, which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is critical to note that the condition of the dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

  
Dan Kenneally

  
Richard Pizzi, P.E.  
Massachusetts License No.: 32644  
GEOTECHNICAL CONSULTANTS, INC.



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## SECTION 1

### 1.0 DESCRIPTION OF PROJECT

#### 1.1 General

##### 1.1.1 Authority

The CRT Development Realty, LLC has retained Geotechnical Consultants, Inc. to perform a visual inspection and develop a report of conditions for the Mill Pond Dam, also known as the Talbot Mills Dam, in North Billerica, Massachusetts (Army Corps of Engineers ID #: MA 00774). This inspection and report were performed in accordance with MGL Chapter 253, Sections 44-50 of the Massachusetts General Laws as amended by Chapter 330 of the Acts of 2002.

##### 1.1.2 Purpose of Work

The purpose of this investigation is to inspect and evaluate the present condition of the dam and appurtenant structures in accordance with 302 CMR10.07 and to provide information that will assist in prioritizing dam repair needs, dam operation, and planning/conducting maintenance.

In 1999, Weston & Sampson Engineers, Inc. completed an evaluation study of this dam as part of its contract with the Commonwealth of Massachusetts, Department of Environmental Management, Office of Dam Safety (DEM). A copy of the Weston & Sampson report entitled *Owned Dam Inspection/Evaluation Report* dated May 20, 1999 was reviewed as part of our services and is attached as Appendix C.

The investigation is divided into four parts:

- obtain and review available reports, investigations, and data previously submitted to the owner pertaining to the dam and appurtenant structures;
- perform a visual inspection of the site;
- evaluate the status of an emergency action plan for the site and;
- prepare and submit a final report presenting the evaluation of the structure, including recommendations and remedial actions, and opinion of probable costs.

##### 1.1.3 Definitions

To provide the reader with a better understanding of the report, definitions of commonly used terms associated with dams are provided in Appendix D. Many of these terms may be included in this report. The terms are presented under common categories associated with dams which include: 1) orientation; 2) dam components; 3) size classification; 4) hazard classification; and 5) miscellaneous. All elevations referred to in this report are given in feet and are referenced to the National Geodetic Vertical Datum (NGVD) of 1929.

## 1.2 Description of Project

### 1.2.1 Location

The Talbot Mills Dam is located in Middlesex County in the village of North Billerica, Massachusetts. North Billerica is an unincorporated village of the town of Billerica, Massachusetts; one of nine villages that make up the Town of Billerica.

The Concord River flows through North Billerica, and at the old Talbot and Faulkner Mills is the Mill Pond and Dam marking the area where the old Middlesex Canal crossed over the river. This run-of-the-river dam and the impoundment are shown on the Billerica USGS quadrangle map at the following approximate coordinates:

Latitude: 42.59173° North  
Longitude: 71.28400° East

The best access for driving to the dam is via exit #29 off of US Route 3; then east on Billerica Road (State Route 129) for approximately 0.3 miles; turn north onto Brick Kiln Road for 0.4 miles; northeast onto Alpine Street for 0.4 miles; south onto Boston Road (State Route 3A) for approximately 400 feet; northeast onto Lowell Street for 0.5 miles; then northeast onto Old Elm Street 0.3 miles (Old Elm Street becomes Faulkner Street). The dam location and general vicinity are shown on the *Locus Plan* attached as Figure 1.

### 1.2.2 Owner/Operator

	Dam Owner	Dam Caretaker
Name	CRT Development Realty, LLC	Mr. William H. Martin
Mailing Address	6 Nicholas Circle	24 Ingleside Road
Town	Andover, MA 01810-4278	Lexington, MA 02470-2522
Daytime Phone	978-975-3687	781-676-7787
Emergency Phone		
Email Address		martinw@rcn.com

### 1.2.3 Purpose of the Dam

The area was originally meadow land and its hay and grass were used by the early English settlers as food for their farm animals. As it was subject to annual floods, attempts were made to curtail the problem. In 1659 William Sheldon received permission to construct a mill to grind corn, but it was not until 1708 that Christopher Osgood successfully erected an effective dam at the site. All subsequent owners of this spot trace their deed to Osgood and his dam. By the end of the 18th century there were five grist mills, three saw mills and one fulling mill at work here.

Faulkner Mills was at a crucial junction of waterways in the early 1800s. Not only

were the mills on the Concord River, a source of water power, but they were also at the highest point of the Middlesex Canal. The canal was the longest early American canal, dug entirely by hand and explosives, reaching over 20 miles from Boston at the southeast end to Lowell and the Merrimack River in the north. This canal would prove to be an important link for commerce in the early 1800s, before the advent of the railroads. The canal was the transport mechanism for lumber from New Hampshire, textiles from Lowell, and passengers from Boston.

During the period of the Middlesex Canal's operations, its Proprietors were in charge of the area and continued to run the mills as well as a fishway. For them, Loammi Baldwin replaced Osgood's old worn dam with a new one near the current dam at the Faulkner Street bridge. In 1828 the Proprietors again built a new dam on this site. At the Canal's demise, the control of the area passed to two families: the Faulkners and the Talbots.<sup>1</sup>

Currently, the dam is used for recreational purposes and flood control.

#### 1.2.4 Description of the Dam and Appurtenances

Talbot Mills Dam is located on the Concord River approximately 4.2 miles south of the confluence of the Concord and Merrimack Rivers. Overall, the dam, excluding the south training wall and sluiceway, is approximately 316 feet long with a maximum height of about 15 feet. It is an overflow or run-of-the-river type stone masonry, concrete and (presumably) earthen structure.

In 1999, Weston & Sampson Engineers, Inc. completed an evaluation study of the Talbot Mills Dam as part of its contract with the Commonwealth of Massachusetts, Department of Environmental Management, Office of Dam Safety (DEM). This is the last known inspection report for the dam and the information contained in the report was used as the basis for the current DCR size and hazard classification.

A copy of the Weston & Sampson report entitled *Owned Dam Inspection/Evaluation Report* dated May 20, 1999 was reviewed as part of our services and is included as Appendix C. Several inconsistencies were found in the report and are discussed in the assessment section of this report.

Due to the inconsistencies in the previous report and information on file with the DCR Office of Dam Safety, a complete survey of the dam and appurtenant structures as well as limited soundings to determine the water depth of the pond were made to provide a more complete and accurate basis for determination of both the DCR size and hazard classification. The survey was done by Eaglebrook Engineering & Survey, LLC in April 2009. A copy of *Site Plan*, drawing EX-1 dated April 20, 2009 is attached as Figure 2. for reference.

---

<sup>1</sup> <http://www.middlesexcanal.org/gallery.htm>

There are three primary components to this dam:

- main impoundment and intake structure to the Talbot Mills complex
- main spillway and abutments
- sluiceway and primary intake to the Faulkner Mills complex

#### 1.2.4.1 Main Impoundment

The primary dam structure is of unknown construction and makes up the left (south) portion of the dam. This area of the dam supports Old Elm Street/Faulker Street and separates the Mill Pond from the Talbot Mills complex located on the left bank of the river just downstream from the dam. Elevations along Old Elm Street/Faulkner Street over this area of the dam range between 114.5 and 116.0 feet NGVD.

A vertical concrete wall was constructed at the southernmost end of the left side of the dam. The 60 foot long concrete wall forms the upstream dam face of the dam and contains five intake gates which formerly provided water to the Talbot Mills. We understand the gates are no longer functional and the intake tunnels upstream of the Talbot Mills were filled with concrete at some time in the past. The top of the concrete wall is at approximately elevation 118.0 at the gates.

A masonry stone wall is located on the upstream side of the dam and is located between the north end of the concrete intake wall and the left abutment of the spillway. The stone wall is approximately 73 feet long. Elevations along the top of the stone wall range between 115.3 feet at the south end and 114.2 feet at the north end adjacent to the spillway abutment.

Further to the south, a stone wall serves as a training wall. The top of the training wall ranges between elevation 112.2 and elevation 114.9 feet. Grades behind the wall slope slightly upward to the old Middlesex Canal Building. Remnants of the old Middlesex Canal alignment are located to the south of the building but the canal channel is overgrown as shown in Photograph 12.

#### 1.2.4.2 Spillway

Although the primary spillway was not visible at any time during our several site visits due to the continued flow, both the left and right abutments were visible and appeared to be constructed of masonry granite blocks. During our site inspection on 22 May 2009, approximately 6-inches of water was flowing across the top of the spillway. It appears the spillway crest is square-cut with a near vertical face. A portion of the right abutment is constructed of cast-in-place concrete. Spot grades at the top of the abutments range between elevations 111.0± to 111.5±. The top elevation at the primary spillway was estimated in the field due to the high flow at elevation 109.7±. This elevation is consistent with the elevation provided in the

FEMA study<sup>2</sup> of the Concord River. A complete copy of the FEMA study is provided in Appendix E.

Two small low level outlets are located in the granite block left abutment. The outlets are blocked although some discharge was observed at the downstream end of the outlets. Invert elevations at the downstream end of the outlets is approximately 100.6 feet. The outlets are shown in Photograph 11.

Numerous bedrock outcrops are visible at the toe of the spillway and form the downstream channel bed. Elevations of the downstream channel bed vary due to the jagged rock profile. However, the estimated grade at the top of rock/toe of spillway near the centerline of the channel is approximately elevation 99.5±.

The primary spillway is approximately 127 feet long with a height of approximately 10.2 feet. Both the left and right spillway abutments provide auxiliary spilling capacity. The left spillway abutment is approximately 17 feet long with the crest at elevation 111.2 feet. The right spillway abutment is approximately 20 feet long with the crest at elevation 111.6 feet.

#### 1.2.4.3 Sluiceway

A sluiceway and intake structure provides water to the Faulkner Mills complex located on the right bank of the river just downstream from the dam. The sluiceway is approximately 13 feet wide and is located on the right side of the dam just east of the right spillway abutment. Walls of the sluiceway are constructed primarily of mortared masonry field stone but portions of the sluiceway are concrete lined. Water in the sluiceway passes under a small bridge supporting Faulkner Street and is discharged into a stilling basin located between Faulkner Street and the Faulkner Mill Complex. The outlet gate from the stilling basin is in an open locked position and directs flows through an intake tunnel to a turbine located within the mill complex. Reportedly, the turbine has not been in service since 1972.

A movable gate and concrete weir are located within the sluiceway just east of the Faulkner Street Bridge. The gate is in poor condition and water continuously bypasses the gate. It is unknown whether or not the gate is operational. There are no other controls for the dam.

A small park is located adjacent to the right abutment of the spillway. The park contains a sitting area and a historic marker dedicated to the employees of the Faulkner Mills. The marker is shown in Photograph 10. Access to the park is available from a paved parking lot just east of the river and south of Faulkner Street by crossing a pedestrian bridge over the sluiceway.

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<sup>2</sup>Federal Emergency Management Agency, *Flood Insurance Study*, town of Billerica, Massachusetts, Middlesex County; February 8, 1985.

#### 1.2.4.4 Mill Pond

The dam impounds water to form the Mill Pond. Surface area of the irregularly shaped pond was estimated using scaled aerial photographs from several sources. The approximate pond shoreline and computation of surface area are shown on Figure 3. Attached as Appendix G are eight aerial photographs obtained from Environmental Data Resources, Inc. and are specifically prepared for this site. The eight photos contained in the EDR Aerial Photo Decade Packaged were taken between 1938 and 2006 and, in general, show the pond shoreline has remained relatively unchanged throughout this period.

During periods of “normal” flow, we estimated that the pond occupies an area of 8.6± acres and contains two branches which are shown on Figure 3. and the aerial photos of Appendix G. The west branch forms the main channel of the Concord River. Within the deeper west branch, the current is typically strong throughout the year. The east branch is much shallower, and during the summer months, has almost no flow as evidenced by an annual growth of algae on the pond surface. The delineation between the algae growth and channel flow are clearly visible in the 1980 and 2006 aerial photographs.

A complete profile for the Concord River is contained in the FEMA Flood Study of 1985. Stream bed elevations and water depths through the west branch of the Mill Pond, along the primary flow path of the river, are shown at elevation 98.5± and 16± feet, respectively. Soundings taken in the shallower east branch of the Mill Pond showed the bed level to vary between elevations 108± near the periphery of the pond close to the north shore to elevations 103± at about the centerline of the east branch of the pond. No soundings were made at the south end of the east branch. Based on the general topography and evidence of aquatic plant growth at the south end of the east branch, we expect the water depths to be shallowest in this area. Using the information cited above along with the survey measurements and aerial photographs, we estimate the storage capacity of the Mill Pond at the 100-year flood level is 140 acre-feet.

#### 1.2.4.5 Faulkner Street Bridge

Located immediately downstream from the primary dam spillway is the Faulkner Street Bridge. Having a width of approximately 32 feet, the bridge carries two lanes of vehicle traffic and a pedestrian sidewalk on the west (downstream) side only. The curved concrete arch bridge has an overall length of approximately 120 feet. Each individual span of the dual span concrete arch is approximately 42 feet long at the base. It appears the center pier and abutment footings are armored and founded directly on the bedrock. The bridge can be seen in Photographs 4 and 5.

#### 1.2.5 Operations and Maintenance

The responsible party of the operations and maintenance of the Talbot Mills Dam is

CRT Development Realty, LLC of Lexington, Massachusetts. The caretaker is Mr. William H. Martin.

There are no formal records kept on the operations and maintenance of this dam, nor are there any written operating procedures for this dam.

No records could be found for any repairs, either major or minor made to this dam.

#### 1.2.6 DCR Size Classification

Talbot Mills dam has a height of approximately 10.2 feet measured from the lowest portion of the dam spillway to the lowest point in the channel at the downstream toe of the dam. The maximum storage capacity of the dam is 140 acre-feet. Therefore, in accordance with Department of Conservation and Recreation Office of Dam Safety classification, under Commonwealth of Massachusetts dam safety rules and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, Talbot Mills Dam is an intermediate size structure.

#### 1.2.7 DCR Hazard Classification

Talbot Mills Dam is located along Old Elm Street/Faulkner Street in North Billerica, Massachusetts immediately upstream from the Faulkner Street Bridge. It appears that a failure of the dam at maximum pool will not result in significant damage to the bridge or other downstream structures based on our review of the available flood records.

A review of the aerial photographs and topographic maps of the Concord River downstream of the Talbot Mills Dam indicated that the potential damage to habitable structures will be minor since no structures are in the direct path of the probable flood wave produced upon failure of the dam. In addition, both the Town of Billerica and the City of Lowell have adopted zoning and conservation bylaws which are consistent with FEMA recommendations for construction within the floodway. As a result, no more than a 2.0 foot incremental rise of flood water above the lowest ground elevation adjacent to the outside foundation walls, nor more than a 2.0 foot incremental rise of flood water above the lowest habitable floor elevation of structures within the floodway is likely to occur in the event of dam breach at the Talbot Mills Dam during the design flood event.

Given the minimal rise in flood water downstream in the event of a dam failure, the risk of loss of life and damage to homes, industrial or commercial facilities, secondary highways or railroads is considered to be low. Additionally, flooding as a result of a dam breach to the Talbot Mills Dam is unlikely to cause interruption of use or service of relatively important facilities located downstream of the dam.

Therefore, in accordance with Department of Conservation and Recreation classification procedures, under Commonwealth of Massachusetts dam safety rules

and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, Talbot Mills is classified as a Significant Hazard (Class II) structure.

### 1.3 Pertinent Engineering Data

#### 1.3.1 Drainage Area

The drainage area for the Talbot Mills Dam is approximately 370 square miles and extends through the communities of Concord Carlisle, Bedford, and Billerica. The two major waterways in Billerica are the Concord and Shawsheen Rivers. The Concord River is formed by the confluence of the Assabet and Sudbury Rivers, approximately one mile northwest of the center of Concord. The river system is often referred to as the Sudbury-Assabet-Concord (SuAsCo) river basin.

The Concord River flows sluggishly in a general northerly direction for approximately 16 miles before joining the Merrimack River in Lowell and falls 62 feet over its course. Approximately 50 feet of the drop occurs at dams in the first mile of the river in Lowell; downstream from the Talbot Mills Dam. The 11.5-mile reach of the Concord River from its confluence with the Assabet and Sudbury Rivers in Concord to North Billerica is controlled by the Talbot Mills Dam.

#### 1.3.2 Reservoir

	Length <sup>1</sup> (feet)	Width <sup>1</sup> (feet)	Surface Area (acres)	Storage Volume (acre-feet)
Normal Pool	1300	720	8.6	110
Maximum Pool	1360	780	12.6	162
SDF Pool	--	--	10.7	140

1. Maximum dimension

#### 1.3.3 Discharges at the Dam Site

Storm Event	Peak Discharges at Talbot Mills Dam (cfs)
10 Year	2,940
50 Year	4,660
100 Year	5,675
500 Year	8,395

#### 1.3.4 General Elevations (feet - Referenced to NGVD of 1929)

A.	Top of Dam	114.6
B.	Spillway Design Flood Pool (100 Yr.)	114.2
C.	Normal Pool	110.5
D.	Spillway Crest	109.7
E.	Upstream Water at Time of Inspection	111.1
F.	Streambed at Toe of the Dam	99.5
G.	Low Point along Toe of the Dam	99.5

#### 1.3.5 Main Spillway

A.	Type	Broad Crest
B.	Length	127 feet
C.	Invert Elevation	109.7 feet
D.	Upstream Channel Elevation	98.5 feet
E.	Downstream Channel Elevation	99.5 feet
F.	Downstream Water	102.5 feet

#### 1.3.6 Lower Level Outlet

A.	Type	Sluiceway with Gate
B.	Number of bays:	2 (at left spillway abutment)
C.	Invert:	105.7 feet
D.	Bay size:	13 feet open channel

#### 1.3.7 Design and Construction Records

No construction records or design data were available for review during the inspection and preparation of this report.

#### 1.3.8 Operating Records

There were no operating records or records of rainfall or pond height for this dam available at the time of the inspection.

## SECTION 2

### 2.0 INSPECTION

#### 2.1 Visual Inspection

Talbot Mills Dam was inspected on four dates between 26 January 2009 and 22 May 2009. At the time of the inspection, the weather varied from cold and cloudy to warm and sunny. Photographs to document the current conditions of the dam were taken during the inspections and are included in Appendix A. The level of the impoundment was 111.1-feet on 14 April 2009 and approximately 110.2 on 22 May 2009. Underwater areas were not inspected. A copy of the inspection checklist is included in Appendix B.

##### 2.1.1 General Findings

In general, Talbot Mills Dam was found to be in fair condition due to the lack of routine maintenance and operational procedures. We observed no structural defects or concerns. Specific concerns are identified in more detail in the sections below.

##### 2.1.2 Dam

###### *Abutments*

The left and right abutments appear sound with no evidence of erosion, significant seepage or cracking. Both abutments of the spillway appear to be founded on bedrock.

###### *Embankments*

The left embankment is of unknown construction but most likely consists of an earthen structure supporting Old Elm Street/Faulkner Street. Immediately downstream of the left embankment is the Talbot Mills Complex. No inspection was made of the interior space of the mill complex.

###### *Upstream Face*

The upstream face of the left embankment is constructed with a near vertical facing wall. Overall, the wall is approximately 133 long with a 60-foot long concrete facing at the south end and a 73-foot long stone masonry face between the concrete wall and the primary abutment to the north. Intake gates for the Talbot Mills complex are located at the concrete wall. However the gates are not operational and the intake tunnels have reportedly been infilled with concrete.

The tops of both the stone masonry and concrete facing walls are in good conditions with no observed cracks, bulges or misalignments. No evidence of erosion, sloughing or other indications of instability were observed at any time during our inspections.

### *Crest*

The crest of the embankment is nearly flat and level and supports the paved surface of Old Elm Street/Faulkner Street. This portion of the road leading to the Faulkner Street Bridge shows no indications of erosion or undue wear from traffic (either pedestrian or vehicular) and the area is well-maintained. Several trees are located at the upstream side of the crest; near the Talbot Mills intake gates.

### *Downstream Face*

The Talbot Mills complex is located at the downstream face of the embankment. No inspection was made of the interior space of the mill complex.

Right of the Spillway - This area is comprised of a portion of the Faulkner Street Embankment which is located between the right spillway abutment, the sluiceway and the stilling basin. This area is well maintained.

### *Drains*

There were no drains in use or visible at this dam at the time of our inspection.

### *Instrumentation*

There were no instruments at this dam at the time of our inspection.

### *Access Roads and Gates*

Access to the dam is via Old Elm and Faulkner Streets. The intake gates at the left side of the dam which formerly provided water to the Talbot Mills are not operational and the intake tunnels have reportedly been infilled with concrete.

A movable gate and concrete weir are located within the sluiceway just east of the Faulkner Street Bridge. The gate is in poor condition and water continuously bypasses the gate. It is unknown whether or not the gate is operational.

## 2.1.3 Appurtenant Structures

### *Primary Spillway*

Although the primary spillway was not visible at any time during our several site visits due to the continued flow, both the left and right abutments were visible and appeared to be constructed of masonry granite blocks. Information contained in the previous inspection report characterize the spillway as a granite block structure forming a broad crested weir. During our site inspection on 22 May 2009, approximately 6-inches of water was flowing across the top of the spillway. It appears the spillway crest is square-cut with a near vertical face.

The primary spillway is approximately 127 feet long with a height of approximately 10.2 feet. Direct measurement of the top of spillway elevation was not possible due to the continuous flow during each of our site visits. The top elevation at the primary spillway is estimated to be at elevation 109.7±. This elevation is consistent with the

data provided in the FEMA study<sup>3</sup> of the Concord River and the elevation shown on the river profile. A complete copy of the FEMA study is provided in Appendix E.

The primary spillway is flanked by small granite block abutments. A portion of the right abutment is constructed of cast-in-place concrete. At flood stages, the abutments serve as auxiliary spillways and provide additional discharge capacity. Spot grades at the top of the abutments range between elevations 111.2± to 111.6± with lengths of approximately 17 feet at the left abutment and 20 feet at the right abutment.

Numerous bedrock outcrops are visible at the toe of the spillway and form the downstream channel bed. Elevations of the downstream channel bed vary due to the jagged rock profile which can be seen in Photograph 2. However, the estimated grade at the top of rock/toe of spillway near the centerline of the channel is approximately elevation 99.5±.

A small tree is thriving amongst the jagged bedrock channel just downstream of the primary spillway. This tree was noted in the 1999 report prepared by Weston & Sampson and is clearly visible in the photographs contained in that report and in the attached Photograph 2.

Based on the FEMA study, the flood elevation for the 100 year storm event at the Talbot Mills Dam crests at elevation 114.7 feet and the estimated river flow at the dam is 5,675 cfs. A check of the spillway capacity is provided in Appendix F. At the 100 year design level, we estimate the spillway capacity to be approximately 6,650 cfs. Our estimate compares favorably with the estimated capacity provided in the 1999 Weston & Sampson report. Therefore, the spillway, in its current state is adequate to pass the design flood.

#### *Low Level Outlet*

There is no operational low level outlet for the dam. A sluiceway and intake structure provides water to the Faulkner Mills complex located on the right bank of the river just downstream from the dam. The sluiceway is approximately 13 feet wide and is located on the right side of the dam just east of the right spillway abutment. Walls of the sluiceway are constructed primarily of mortared masonry field stone but portions of the sluiceway are concrete lined. Water in the sluiceway passes under a small bridge supporting Faulkner Street and is deposited into a stilling basin located between Faulkner Street and the Faulkner Mill Complex. From the stilling basin, the outlet gate is in an open locked position and directs flows to a turbine which reportedly has not been in service since 1972.

A movable gate and concrete weir are located within the sluiceway just east of the Faulkner Street Bridge. The gate is in poor condition and water continuously

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<sup>3</sup>Federal Emergency Management Agency, *Flood Insurance Study*, Town of Billerica, Massachusetts, Middlesex County; February 8, 1985.

bypasses the gate. It is unknown whether or not the gate is operational. There are no other controls for the dam.

Two small low level outlets are located in the granite block left abutment of the spillway. The outlets are blocked although some discharge was observed at the downstream end of the outlets. The conditions of the upstream end of the outlets was not visible for inspection. Invert elevations at the downstream end of the outlets is approximately 100.6 feet. The outlets are shown in Photograph 11.

#### 2.1.4 Downstream Area

Downstream of the dam are the Talbot Mills and Faulkner Mills complexes. Both of these complexes are founded on the exposed bedrock walls adjacent to the downstream channel. Beyond the mill complexes, is a series floodplains and wetlands areas.

#### 2.1.5 Reservoir Area

The Talbot Mill Dam impounds water to form the Mill Pond. Surface area of the irregularly shaped pond was estimated using scaled aerial photographs from several sources taken over many years. For all years reviewed, the pond shoreline was relatively unchanged.

The pond is comprised of two branches. The west branch forms the main channel of the Concord River and is the deeper of the two while the east branch is much shallower. During the summer months, the east branch has almost no flow as evidenced by an annual growth of algae on the pond surface. The topography surrounding the pond is relatively flat and level with negligible risk of slides which potentially could affect the water level. A wetland area is located at the south end of the east branch which provides significant reserve capacity during periods of flooding.

### 2.2 Caretaker Interview

The caretaker is Mr. William H. Martin of 24 Ingleside Road in Lexington, Massachusetts. Mr. Martin was first interviewed on 26 January 2009; the day of our initial inspection. According to Mr. Martin, although originally part of the Talbot Mills and Faulkner Mills properties, when the mill complexes were sold in recent years, the dam site remained the possession of CRT Development Realty, LLC. Although the dam provided water power to the mill complexes, it is presently used exclusively for recreation, flood control and kept for its historical significance.

Mr. Martin indicated that no formal operation or maintenance plan exists for the dam and due to the formerly disputed ownership, no maintenance has been performed at the dam for several years.

## 2.3 Operation and Maintenance Procedures

At the time of the inspection there were no formal operation or maintenance plans available.

### 2.3.1 Operational Procedures

The dam spillway is uncontrolled, which means that the fixed elevation of the spillway crest controls the level of the impoundment. No other operational procedures are in place, or are required, for this dam.

### 2.3.2 Maintenance of Dam and Operating Facilities

There are no maintenance plans available for this dam.

## 2.4 Emergency Warning System

There was no information found on an emergency warning system for this dam. In 302 CMR 10.00: Dam Safety, Department of Conservation and Recreation, it is stated that all dams classified or reclassified as high hazard potential shall have an Emergency Action Plan ("EAP"). Therefore this dam does not need an EAP unless the Commissioner requires it from the Owner.

## 2.5 Hydrologic/Hydraulic Data

Talbot Mills Dam is an intermediate size, Class II (Significant) hazard structure and in accordance with Massachusetts Law, the spillway design flood (SDF) for the site is ¼ PMF (100 year) storm event. A FEMA flood study was completed for the Town of Billerica in 1985. A copy of the study entitled *Flood Insurance Study, Town of Billerica, Massachusetts, Middlesex County; February 8, 1985* is included as Appendix E.

## 2.6 Structural Stability/Overtopping Potential

### 2.6.1 Embankment Structural Stability

Based on our inspection and review, as well as historical evidence, the dam is stable. The spillway appears intact with a level crest. The impoundment side walls are vertical and level. The embankment supports Old Elm/Faulkner Street is paved and in good condition. There are no signs of vehicular ruts, foot trails, sloughing or animal burrows.

### 2.6.2 Overtopping Potential

Based on the analysis, there is little risk of overtopping during the Spillway Design Flood (SDF) for the 100-year recurrence interval. Historical reports provided in the

FEMA study suggests the dam has never experienced overtopping and the spillway is capable of passing the Design Flood (SDF) for the 100-year recurrence interval produces with a flow of 5,675 cfs.

## SECTION 3

### 3.0 ASSESSMENT AND RECOMMENDATIONS

#### 3.1 Assessment

The Talbot Mills Dam is located in Middlesex County in the village of North Billerica, Massachusetts. North Billerica is an unincorporated village of the town of Billerica, Massachusetts; one of nine villages that make up the Town of Billerica.

The Concord River flows through North Billerica, and at the old Talbot and Faulkner Mills, is the Mill Pond and Dam marking the area where the old Middlesex Canal crossed over the river. This run-of-the river dam and the impoundment are shown on the Billerica USGS quadrangle map at the following approximate coordinates:

Latitude:	42.59173° North
Longitude:	71.28400° East

In 1999, Weston & Sampson Engineers, Inc. completed an evaluation study of the Talbot Mills Dam as part of its contract with the Commonwealth of Massachusetts, Department of Environmental Management, Office of Dam Safety (DEM). This is the last known inspection report for the dam and the information contained in the report was used as the basis for the current DCR size and hazard classification.

A copy of the Weston & Sampson report entitled *Owned Dam Inspection/Evaluation Report* dated May 20, 1999 was reviewed as part of our services and is included as Appendix C.

Several inconsistencies were found in the report. The 1999 report classifies the dam as a high hazard intermediate size dam. However, the information contained in the report and used to make this determination is inconsistent. The information currently on file with DCR from the previous dam inspection and evaluation vary markedly from the actual conditions with respect to pertinent engineering data used to classify this dam. As a result of our findings, measurements and computations, it is our opinion that the dam should be reclassified. An *Application to Change Hazard Classification of Dam* will be submitted under separate cover along with substantiating data for review by the Commissioner.

Due to the inconsistencies in the previous report and information on file with the DCR Office of Dam Safety, a complete survey of the dam and appurtenant structures as well as limited soundings to determine the water depth of the pond depth were made to provide a more complete and accurate basis for determination of both the DCR size and hazard classification. The survey was done by Eaglebrook Engineering & Survey, LLC in April 2009. A copy of *Site Plan*, drawing EX-1 dated April 20, 2009 is attached as Figure 2. for reference.

A review of the aerial photographs and topographic maps of the Concord River downstream of the Talbot Mills Dam indicated that the potential damage to habitable structures will be minor since no structures are in the direct path of the probable flood wave produced upon failure of dam. In addition, both the Town of Billerica and the City of Lowell have adopted zoning and conservation bylaws which are consistent with FEMA recommendations for construction within the floodway. As a result, no more than a 2.0 foot incremental rise of flood water above the lowest ground elevation adjacent to the outside foundation walls, nor more than a 2.0 foot incremental rise of flood water above the lowest habitable floor elevation of structures within the floodway is likely to occur in the event of dam breach at the Talbot Mills Dam during the design flood event.

Given the minimal rise in flood water downstream in the event of a dam failure, the risk of loss of life and damage to homes, industrial or commercial facilities, secondary highways or railroads is considered to be low. Additionally, flooding as a result of a dam breach at the Talbot Mills Dam is unlikely to cause interruption of use or service of relatively important facilities located downstream of the dam.

Therefore, in accordance with Department of Conservation and Recreation classification procedures, under Commonwealth of Massachusetts dam safety rules and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, Talbot Mills Dam should be classified as a Class II (significant) hazard structure.

Based on the FEMA flood study of 1985 and the estimated spillway capacity, there is little risk of overtopping during the Spillway Design Flood (SDF) for the 100-year recurrence interval. Historical reports suggest the dam has never experienced overtopping. For the Talbot Mills Dam, the spillway capacity is adequate to pass the Spillway Design Flood (SDF) for the 100-year recurrence interval which produces a flow of 5,675 cfs.

In general, Talbot Mills Dam was found to be in fair condition primarily due to the lack of operation and maintenance plans. The noted deficiencies include:

- Lack of operation and maintenance plan.
- Lack of routine oversight of the dam, particularly during a storm event.
- Lack of working controls.
- Lack of functional low level outlet.
- Leaks and inability to control water at the sluiceway gate and weir.

When compared with the conditions reported in the previous inspection/evaluation report dated May 20, 1999, no significant changes were found. No seepage or other indications of instability were found in the embankment, walls, spillway or spillway abutments.

The following recommendations and remedial measures generally describe the

recommended approach to address current deficiencies at the dam. Prior to undertaking recommended maintenance, repairs and remedial measure, the applicability of environmental permits needs to be determined prior to undertaking activities that may occur within resource areas under the jurisdiction of local conservation commissions, MADEP, or other regulatory agencies.

### 3.2 Routine Maintenance

There is no routine maintenance procedures in place for this dam. A comprehensive maintenance and “routine” inspection plan should be implemented.

1. Regular maintenance activities should prevent growth of unwanted vegetation on the embankment, and pond periphery to reduce the potential for debris to impede flow over the spillway and downstream channel.
2. Clear debris from the spillway and downstream channel on a regular basis. Inspect the spillway for accumulation of debris particularly after storm events or other periods of high runoff.
3. Regularly inspect the dam for indications of seepage or erosion. Particular emphasis should be placed on:
4.
  - the spillway wall
  - portions of the impoundment facing walls immediately adjacent to the spillway on the left side of the dam
  - the fieldstone wall immediately downstream of the spillway and north of the Faulkner Street Bridge
  - removal of debris from the sluiceway and stilling basin on the right side of the primary spillway.

### 3.3 Recommendations, Maintenance, and Minor Repairs

These recommendations may require construction by a contractor experienced in dam repair.

- Remove trees on the upstream face of the roadway embankment near the non-functional intake gates to the Talbot Mills complex.
- Inspect the interior of the of the Talbot Mills complex, particularly the downstream end of the former intake structures. The infilling of the intake tunnels on the left side of the dam rendered these intakes inoperable. Given the configuration of the dam, proximity of the mill complexes, and change in ownership of the downstream properties, the re-construction of a low level outlet in this area is impractical.
- Repair/replace the sluiceway and stilling basin gates so that the gates are

operational and can provide emergency bypass control.

- Repair/replace the left spillway abutment to provide an operational low level outlet

### 3.4 Opinion of Probable Construction Costs

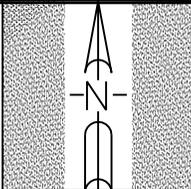
The following conceptual opinions of probable construction costs have been developed for the recommendations and remedial measures noted above. The costs herein are based on a limited investigation and are provided for general information only. This should not be considered an engineer's estimate, as actual construction costs may be somewhat less or considerably more than indicated

#### **Talbot Mills Dam**

- |   |          |
|---|----------|
| • Remove trees on the downstream face of the embankment | \$3,000  |
| • Repair/replace the sluiceway and stilling basin gates | \$60,000 |
| • Repair/replace the left spillway and install gates    | \$40,000 |



TALBOT MILLS DAM  
 Billerica, Massachusetts  
 NID ID# MA00774



LOCUS PLAN  
 U.S.G.S. QUADRANGLE  
 Billerica  
 APPROX. SCALE 1:24 000

**Geotechnical  
 Consultants, Inc.**

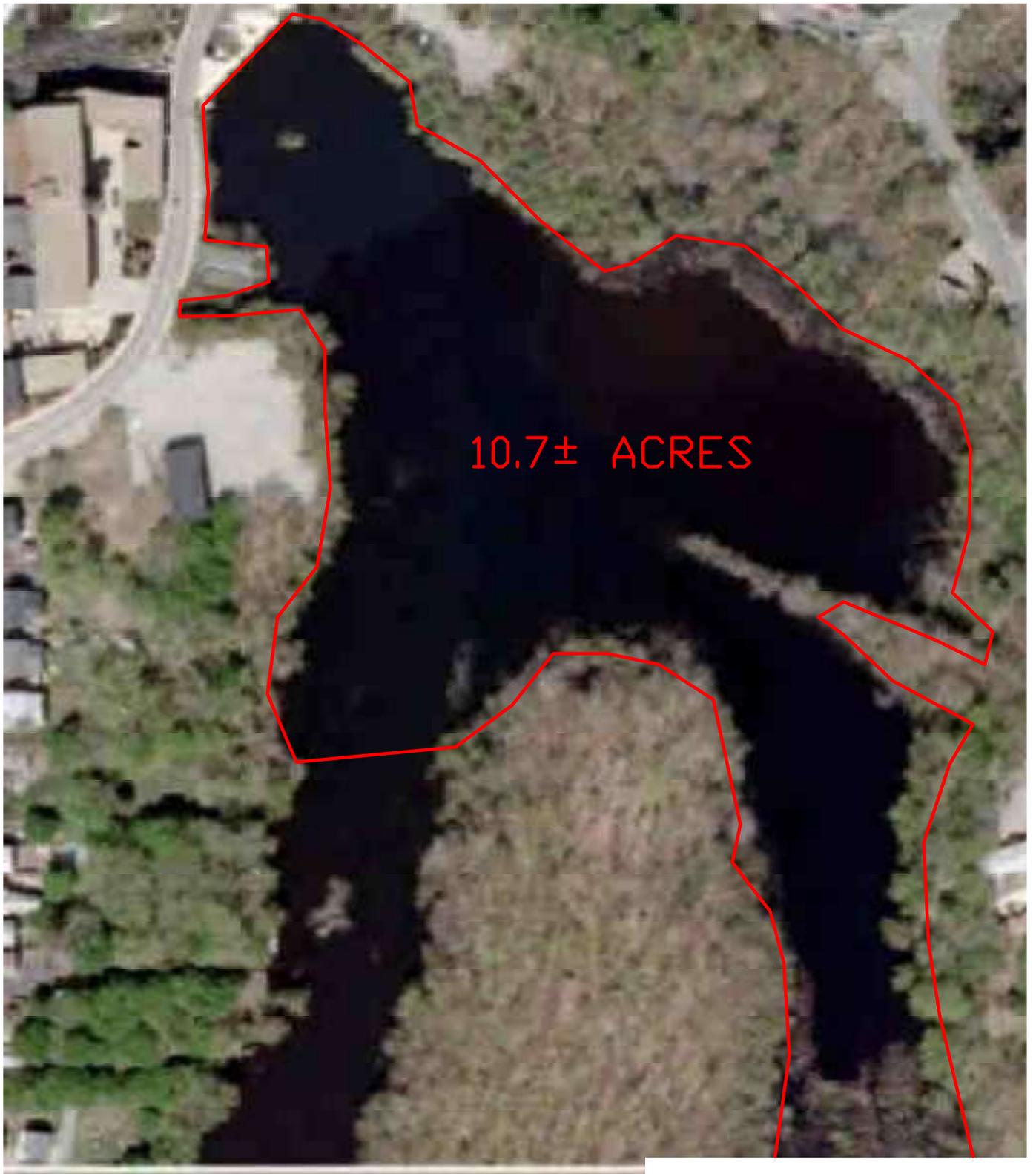
201 Boston Post Road West  
 Marlborough, MA 01752  
 (508)229-0900 FAX (508)229-2279



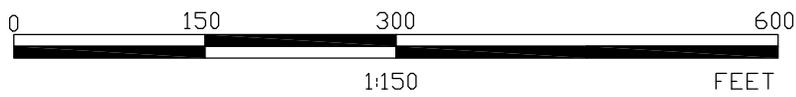
GCI Project # 2092945

Figure 1.





10.7± ACRES



 <b>Geotechnical Consultants, Inc.</b> 201 Boston Post Road West Marlborough, MA 01752 (508)229-0900 FAX (508)229-2279	Rev.	Date
	0	22 MAY 2009

### TALBOT MILLS DAM

FAULKNER STREET  
Billerica, Massachusetts

## FIG. 3

## **APPENDIX A**



**Photograph 1. Overview of Talbot Mills Dam Looking Downstream**



**Photograph 2. Overview of Talbot Mills Dam Looking Upstream**



**Photograph 3. Concrete Wall and Intake Gates Left of Spillway**



**Photograph 4. Downstream of Spillway Viewed from Left Abutment**



**Photograph 5. Falkner Street Bridge Viewed from Right Abutment**



**Photograph 6. Downstream Channel Viewed from Falkner Street Bridge**



**Photograph 7. Stilling Basin with Outlet Gate in Opened Locked**



**Photograph 8. Sluiceway with Movable Gate and Concrete Weir**



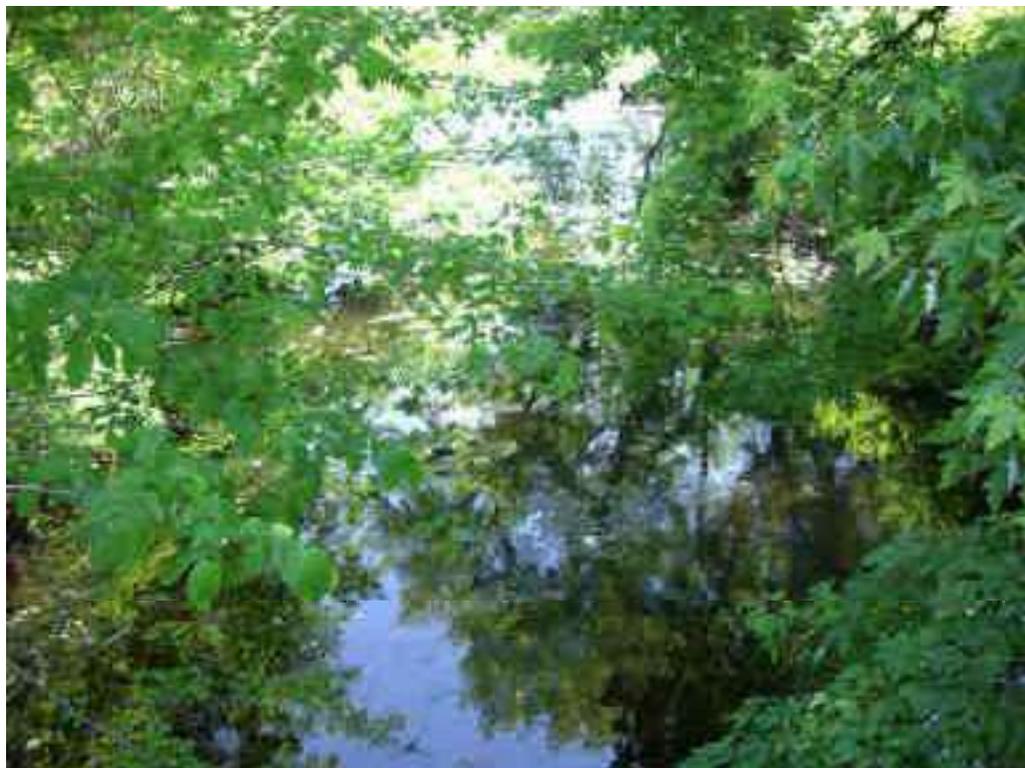
**Photograph 9. Water Seepage Through the Sluiceway Gate**



**Photograph 10. Historic Marker Dedicated to the Employees of Faulkner Mills**



**Photograph 11. Lower Level Outlet at Left Spillway Abutment**



**Photograph 12. Overgrown Alignment of Old Middlesex Canal**

## **APPENDIX B**

## DAM SAFETY INSPECTION CHECKLIST

NAME OF DAM:	Talbot Mills Dam		STATE ID #:	4-9-31-1	
REGISTERED:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	NID ID #:	MA 00774	
STATE SIZE CLASSIFICATION:	Intermediate		STATE HAZARD CLASSIFICATION:	Significant (Class II)	
<i>LOCATION INFORMATION</i>					
CITY/TOWN:	Billerica (Village of North Billerica)		COUNTY:	Middlesex	
DAM LOCATION:	67 Faulkner Street				
USGS QUAD:	Billerica				
DRAINAGE BASIN:	Sudbury-Assabet-Concord (SuAsCo)				
IMPOUNDMENT NAME(S):	Mill Pond (a.k.a. Talbot Mills Pond or Faulkner Mills Pond)				
<i>GENERAL DAM INFORMATION</i>					
TYPE OF DAM:	Masonry/Earth (SPILWAY: Masonry Gravity)		OVERALL LENGTH (FT):	316	
PURPOSE OF DAM:	Recreational and flood control purposes				
YEAR BUILT:	circa 1828				
STRUCTURAL HEIGHT (FT):	16+/-		NORMAL POOL STORAGE (ACRE-FT):	110 +/-	
HYDRAULIC HEIGHT (FT):	10.2		MAXIMUM POOL STORAGE (ACRE-FT):	162	
<i>FOR INTERNAL MADCR USE ONLY</i>					
FOLLOW-UP INSPECTION REQUIRED:	<input type="checkbox"/> YES	<input type="checkbox"/> NO	CONDITIONAL LETTER:	<input type="checkbox"/> YES	<input type="checkbox"/> NO

NAME OF DAM: Talbot Mills Dam STATE ID #: 4-9-31-1  
 NID ID #: MA 00774

INSPECTION SUMMARY

DATE OF INSPECTION: 1/26/09 & 4/14/09 & 5/22/09 DATE OF PREVIOUS INSPECTION: May 20, 1999

TEMPERATURE/WEATHER: Cloudy/Clear ARMY CORP PHASE I:  YES  NO IF YES, date \_\_\_\_\_

CONSULTANT: Geotechnical Consultants, Inc. PREVIOUS DCR PHASE I:  YES  NO IF YES, date 5/20/1999

BENCHMARK/DATUM: NGVD 1929 DATE OF LAST REHABILITATION: Unknown

OVERALL CONDITION: FAIR EL. TAILWATER DURING INSP.: 101.5 +/-

EL. POOL DURING INSP.: 111.1 (4/14/09)

PERSONS PRESENT AT INSPECTION

NAME	TITLE/POSITION	REPRESENTING
Richard Pizzi	Professional Engineer	Geotechnical Consultants, Inc.
Daniel Kenneally	Engineer	Geotechnical Consultants, Inc.

EVALUATION INFORMATION

E1) TYPE OF DESIGN	1	▼	E8) LOW-LEVEL OUTLET COND.	1	▼
E2) LEVEL OF MAINTENANCE	1	▼	E9) SPILLWAY DESIGN FLOOD	5	▼
E3) EMERGENCY ACTION PLAN	1	▼	E10) GENERAL CONDITIONS	3	▼
E4) EMBANKMENT SEEPAGE	5	▼	E11) ESTIMATED REPAIR COST (\$000)		
E5) EMBANKMENT CONDITION	5	▼	ROADWAY OVER CREST	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
E6) CONCRETE CONDITION	5	▼	BRIDGE NEAR DAM	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
E7) LOW-LEVEL OUTLET CAP	1	▼			

SIGNATURE OF INSPECTING ENGINEER: \_\_\_\_\_

NAME OF DAM: <u>Talbot Mills Dam</u>		STATE ID #:	<u>4-9-31-1</u>
		NID ID #:	<u>MA 00774</u>
OWNER:	ORGANIZATION	CARETAKER:	ORGANIZATION
NAME/TITLE	<u>CRT Development Realty, LLC</u>	NAME/TITLE	<u>CRT Development Realty, LLC</u>
STREET	<u>Mr. Robert Martin</u>	STREET	<u>Mr. William Martin</u>
TOWN, STATE, ZIP	<u>6 Nicholas Circle</u>	TOWN, STATE, ZIP	<u>24 Ingleside Road</u>
PHONE	<u>Andover, MA 01810-4278</u>	PHONE	<u>Lexington, MA 02470-2522</u>
FAX	<u>978-975-3687</u>	FAX	<u>781-862-4802</u>
EMAIL		EMAIL	<u>781-676-7787</u>
OWNER TYPE	<u>Private</u>	EMAIL	<u><a href="mailto:martinw@rcn.com">martinw@rcn.com</a></u>
PRIMARY SPILLWAY TYPE	<u>Broad Crest granite Masonry</u>		
SPILLWAY LENGTH (FT)	<u>127</u>	SPILLWAY CAPACITY (CFS)	<u>6030</u>
AUXILIARY SPILLWAY TYPE	<u>Overflow - Both Side of Primary</u>	AUX. SPILLWAY CAPACITY (CFS)	<u>620</u>
NUMBER OF OUTLETS	<u>1</u>	OUTLET(S) CAPACITY (CFS)	<u>Unknown - Gate is non-functional</u>
TYPE OF OUTLETS	<u>Sluiceway with Gate</u>	TOTAL DISCHARGE CAPACITY (CFS)	<u>6650</u>
DRAINAGE AREQ (SQ MI)	<u>370</u>	SPILLWAY DESIGN FLOOD (PERIOD/CFS)	<u>100 year / 5,675 cfs</u>
HAS DAM BEEN BREACHED OR OVERTOPPED	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	IF YES, PROVIDE DATE(S)	
FISH LADDER (LIST TYPE IF PRESENT)	<u>None</u>		
DOES CREST SUPPORT PUBLIC ROAD?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	IF YES, ROAD NAME:	<u>Old Elm Street/Faulkner Street</u>
PUBLIC BRIDGE WITHIN 50' OF DAM?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	IF YES, ROAD/BRIDGE NAME:	<u>Faulkner Street Bridge</u>

Embankment Crest

NAME OF DAM: Talbot Mills Dam STATE ID #: 4-9-31-1

INSPECTION DATE: 4/14/2009 & 5/22/2009 NID ID #: MA 00774

**EMBANKMENT**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
CREST	SURFACE TYPE SURFACE CRACKING SINKHOLES, ANIMAL BURROWS VERTICAL ALIGNMENT (DEPRESSIONS) HORIZONTAL ALIGNMENT RUTS AND/OR PUDDLES VEGETATION (PRESENCE/CONDITION) ABUTMENT CONTACT	Paved roadway None observed None observed No depressions or sinkholes observed Straight None Observed Small trees adjacent to upstream face near concrete intake structure face wall Good; no indications of seepage			

ADDITIONAL COMMENTS:

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Downstream Side

NAME OF DAM: Talbot Mills Dam STATE ID #: 4-9-31-1

INSPECTION DATE: 4/14/2009 & 5/22/2009 NID ID #: MA 00774

EMBANKMENT			
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION
D/S SLOPE	WET AREAS (NO FLOW) SEEPAGE SLIDE, SLOUGH, SCARP EMB.-ABUTMENT CONTACT SINKHOLE/ANIMAL BURROWS EROSION UNUSUAL MOVEMENT VEGETATION (PRESENCE/CONDITION)	None observed	
		None observed	
		None	
		OK	
		None observed	
		None observed	
		None observed	
		None	

REPAIR

MONITOR

ADDITIONAL COMMENTS: NOTE: the Talbot Mills Complex and the Faulkner Mills complex at form both the left and right downstream side of the dam, respectively. These properties are not owned by the dam owners. Access to the inside of the mill complexes was not available at the time of this inspection.



Instrumentation

NAME OF DAM: Talbot Mills Dam STATE ID #: 4-9-31-1

INSPECTION DATE: 4/14/2009 & 5/22/2009 NID ID #: MA 00774

<b>EMBANKMENT</b>			
AREA INSPECTED	CONDITION	OBSERVATIONS	
INSTR.	PIEZOMETERS	N/A	NO ACTION
	OBSERVATION WELLS	N/A	MONITOR
	STAFF GAGE AND RECORDER	N/A	REPAIR
	WEIRS	N/A	
	INCLINOMETERS	N/A	
	SURVEY MONUMENTS	N/A	
	DRAINS	N/A	
	FREQUENCY OF READINGS	N/A	
	LOCATION OF READINGS	N/A	

ADDITIONAL COMMENTS: There is no known instrumentation at any part of the dam or appurtenant structures.

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Downstream Area

NAME OF DAM: Talbot Mills Dam STAE ID #: 4-9-31-1

INSPECTION DATE: 4/14/2009 & 5/22/2009 NID ID #: MA 00774

**DOWNSTREAM AREA**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR	
D/S AREA	ABUTMENT LEAKAGE	None observed				
	FOUNDATION SEEPAGE	None observed				
	SLIDE,SLOUGH,SCARP	None observed				
	WEIRS	N/A				
	DRAINAGE SYSTEM	N/A				
	INSTRUMENTATION	N/A				
	VEGETATION	None				
	ACCESSIBILITY	Not Accessible				
	DOWNSTREAM HAZARD DESCRIPTION	The Faulkner Street Bridge is immediately downstream of the dam spillway. The Talbot and Faulkner Mills are on the left and right channel banks, respectively.				
	DATE OF LAST EAP UPDATE	None				

ADDITIONAL COMMENTS: NOTE: the Talbot Mills Complex and the Faulkner Mills complex at form both the left and right downstream side of t  
respectively. These properties are not owned by the dam owners. Access to the inside of the mill complexes was not  
at the time of this inspection.

Misc.

NAME OF DAM: <u>Talbot Mills Dam</u>		STATE ID #: <u>4-9-31-1</u>
INSPECTION DATE: <u>4/14/2009 &amp; 5/22/2009</u>		NID ID #: <u>MA 00774</u>
<b>MISCELLANEOUS</b>		
AREA INSPECTED	CONDITION	OBSERVATIONS
MISC.	RESERVOIR DEPTH (AVG) RESERVOIR SHORELINE RESERVOIR SLOPES ACCESS ROADS SECURITY DEVICES VANDALISM OR TRESPASS AVAILABILITY OF PLANS AVAILABILITY OF DESIGN CALCS AVAILABILITY OF EAP/LAST UPDATE AVAILABILITY OF O&M MANUAL CARETAKER/OWNER AVAILABLE CONFINED SPACE ENTRY REQUIRED	6± ft Generally flat and level. Some trees, little underbrush No significant slopes Old Elm Street/Faulkner Street None YES: <input type="checkbox"/> NO: <input checked="" type="checkbox"/> WHAT: YES: <input type="checkbox"/> NO: <input checked="" type="checkbox"/> DATE: YES: <input checked="" type="checkbox"/> NO: <input type="checkbox"/> DATE: YES: <input type="checkbox"/> NO: <input checked="" type="checkbox"/> PURPOSE:
ADDITIONAL COMMENTS: _____ _____ _____		

Primary Spillway

NAME OF DAM: Talbot Mills Dam STATE ID #: 4-9-31-1

INSPECTION DATE: 4/14/2009 & 5/22/2009 NID ID #: MA 00774

**PRIMARY SPILLWAY**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
SPILLWAY	SPILLWAY TYPE WEIR TYPE SPILLWAY CONDITION TRAINING WALLS SPILLWAY CONTROLS AND CONDITION UNUSUAL MOVEMENT APPROACH AREA DISCHARGE AREA DEBRIS WATER LEVEL AT TIME OF INSPECTION	Broad Crested Masonry - probably granite block construction (see note 1) N/A Presumed Good - No indications of instability N/A - Small stone wall at left embankment None None observed Clear and unobstructed Clear - one tree growing among rocks immediately downstream of spillway No indications of debris upstream or downstream (see note 2) Elevation 111.1 on 14 April 2009; 110.3 on 22 May 2009.			

ADDITIONAL COMMENTS: 1. At all inspection dates, the spillway was not visible due to continuous flow.  
2. Some small branches located in stilling basin

Auxiliary Spillway

NAME OF DAM: Talbot Mills Dam STATE ID #: 4-9-31-1

INSPECTION DATE: 4/14/2009 & 5/22/2009 NID ID #: MA 00774

**AUXILIARY SPILLWAY**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
SPILLWAY	SPILLWAY TYPE WEIR TYPE SPILLWAY CONDITION TRAINING WALLS SPILLWAY CONTROLS AND CONDITION UNUSUAL MOVEMENT APPROACH AREA DISCHARGE AREA DEBRIS WATER LEVEL AT TIME OF INSPECTION	Sluiceway at right of primary spillway; serves as intake for Faulkner Mills N/A Fair Masonry Stone and concrete. Wood Gate - Non Functional None observed Clear, unobstructed. Discharge through Faulkner Mills Complex; Not inspected Minor debris (wood) in stilling basin N/A			

ADDITIONAL COMMENTS:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Outlet Works

NAME OF DAM: Talbot Mills Dam STATE ID #: 4-9-31-1

INSPECTION DATE: 4/14/2009 & 5/22/2009 NID ID #: MA 00774

**OUTLET WORKS**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
OUTLET WORKS	TYPE				
	INTAKE STRUCTURE				
	TRASHRACK		Note 1.		
	PRIMARY CLOSURE		Intake tunnel under Old Elm Street reportedly filled with concrete-no records.		
	SECONDARY CLOSURE		N/A		
	CONDUIT		N/A		
	OUTLET STRUCTURE/HEADWALL		N/A		
	EROSION ALONG TOE OF DAM		N/A		
	SEEPAGE/LEAKAGE		N/A		
	DEBRIS/BLOCKAGE		Outlet structure located within Talbot Mills complex - not inspected.		
	UNUSUAL MOVEMENT		None observed. Bedrock visible at channel bed		
	DOWNSTREAM AREA		None observed.		
MISCELLANEOUS		Reportedly completely block by concrete infill - no records available.			
		None observed.			
		Not inspected.			

ADDITIONAL COMMENTS: 1. Five (5) manually operated wood gates at left of primary spillway-gates not operational. These gates formerly intake structure for the Talbot Mills complex. Also, a blocked low level outlet is located in the left spillway abutment. Some seepage observed through outlet. No gates visible at this outlet.

Concrete/Masonry Dams

NAME OF DAM: Talbot Mills Dam STATE ID #: 4-9-31-1

INSPECTION DATE: 4/14/2009 & 5/22/2009 NID ID #: MA 00774

**CONCRETE/MASONRY DAMS**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
GENERAL	TYPE AVAILABILITY OF PLANS AVAILABILITY OF DESIGN CALCS PIEZOMETERS OBSERVATION WELLS INCLINOMETERS SEEPAGE GALLERY UNUSUAL MOVEMENT	None Available None Available None Available None Available None Available N/A None observed			

ADDITIONAL COMMENTS:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_







# COMMONWEALTH OF MASSACHUSETTS

## Department of Conservation and Recreation

### Office of Dam Safety

#### **PHASE I FORMAL DAM INSPECTION REPORT FORMAT and Submission Requirements**

Amended by the Office Dam Safety June 2021.

**Available Assistance:** Please contact the Office of Dam Safety at 508-792-7716 ext 41828 or [dam.safety@mass.gov](mailto:dam.safety@mass.gov) if you need assistance or have any questions pertaining to preparation of Phase I Formal Dam Inspection Reports.

#### **Report Format:**

General guidelines for conducting Phase I inspections and presenting Phase I inspection reports are included within this document.

The attached file contains a format to be followed in the preparation of dam safety Phase I inspection reports in accordance with current dam safety procedures of the Massachusetts Office of Dam Safety. The format is based upon the Phase I inspection format from the Army Corps of Engineers and includes inspection checklists and definitions for use during both the inspection process and in reviewing the completed report.

302 CMR 10.00 requires inspecting engineers to be Commonwealth of Massachusetts Registered Professional Engineers with a Civil Engineering license with experience in dam safety inspections and engineering.

This report format is provided as a guide to establish minimum report requirements. It should be noted that sections may need to be added to the report or expanded to accommodate the features and configurations specific to the dam being evaluated. Each dam inspection must be conducted and the report prepared and stamped by a Massachusetts registered professional engineer experienced in dam inspection, engineering, and design to assess the need to provide additional information.

The content of completed inspection reports shall be the sole responsibility of the inspecting engineer and user of this report format.

It is the responsibility of the inspecting engineer to verify the basic statistical data for the dam (e.g., structural height, hydraulic height, normal and maximum impoundment size, drainage area, latitude and longitude, etc.) by visual inspection and simple measurements (e.g., measuring tape, click wheel, surveyors rod and level, etc. for field measurements; planimeter, CAD for drainage areas; conic method of computing reservoir volume from surface area, etc.). Use of sophisticated survey techniques is not expected. If measured statistical data are substantially different from those values currently in the Office of Dam Safety database, provide a description of how the measured values were obtained and a statement that the measured data are the correct values.

The document is intended to be made available in an editable form to serve as a guide or template for presenting dam safety inspection results to the Office of Dam Safety.

## Submission Requirements:

- *All reports shall be printed double-sided without plastic or laminated covers. Paper shall be sufficiently opaque so that text and illustrations on one side of a page do not impair readability of the other side. In the instance where readability is compromised, printing single-sided is acceptable for those affected pages.*
- *The reports shall be bound only by staples on the left edge of the report document.*
- *One bound color copy of the final inspection report shall be provided to the Office of Dam Safety along with an electronic copy of the complete report in unlocked, searchable PDF (compatible with Adobe Reader Version 6.0 or later) format, and an electronic copy of the completed Excel inspection checklist worksheet file using the latest DCR prescribed format. Electronic files shall be provided via email attachment to [DAM.SAFETY@MASS.GOV](mailto:DAM.SAFETY@MASS.GOV), via ftp site, or otherwise via the internet. If this is not possible, CD, thumb drive, or other portable media will be accepted. The electronic copy in PDF shall consist of a single unlocked, searchable file containing the entire report (cover page, P.E. stamp and signature, text of report, evaluation form, checklist, photographs, drawings, etc.) Electronic files should be saved using the following naming convention “MA#####\_Dam Name\_Town\_Phase I\_YYYY-MM-DD”. Submission of incomplete reports, reports not in PDF, or collections of separate files will be considered to be non-compliant and will be returned to the owner for resubmission.*
- **Mail one required hard copy to:**
  - Commonwealth of Massachusetts**
  - Department of Conservation and Recreation**
  - Office of Dam Safety – Inspections Unit**
  - 180 Beaman Street**
  - West Boylston, MA 01583**

>>These two pages are to be omitted from the final inspection report.<<

**-- DAM NAME --**

**PHASE I**

**INSPECTION / EVALUATION REPORT**

- *One bound color copy of the final inspection report shall be provided to the Office of Dam Safety along with an electronic copy of the complete report in unlocked, searchable PDF (compatible with Adobe Reader Version 6.0 or later) format, and an electronic copy of the completed Excel inspection checklist worksheet file using the latest DCR prescribed format. Electronic files shall be provided via email attachment to [DAM.SAFETY@MASS.GOV](mailto:DAM.SAFETY@MASS.GOV), ftp site, or otherwise via the internet. If this is not possible, CD, thumb drive, or other portable media will be accepted. The electronic copy in PDF shall consist of a single unlocked, searchable file containing the entire report (cover page, PE stamp and signature, text of report, evaluation form, checklist, photographs, drawings etc.) Electronic files should be saved using the following naming convention “**MA#####\_Dam Name\_Town\_Phase I\_YYYY-MM-DD**”. Submission of incomplete reports, reports not in PDF, or collections of separate files will be considered to be non-compliant and will be returned to the owner for resubmission.*

- *Provide Overview Photo to Identify Dam –*

Dam Name:

National ID No.:

Owner:

Town:

Consultant:

Date of Inspection:

*[Add corporate logo in bottom right corner of cover]*

## EXECUTIVE SUMMARY

*[This section should consist of a narrative that provides an executive summary of this inspection report. At a minimum this section should include the following:*

- *Name of dam and town*
- *Date of inspection*
- *Name of Engineering Consultant completing the inspection*
- *Condition of the dam (Good, Satisfactory, Fair, Poor, Unsafe – choose one, do not use “Fair to Poor”)*
- *Brief summary of major deficiencies*
- *Brief summary of activities since the last inspection*
- *Brief summary of major recommendations*

*Immediately following this section should be the Dam Evaluation Summary Detail Sheet that will be used by the Office of Dam Safety to update the database. This sheet is generated automatically from the inspection checklist. Modifications to the setup of this form shall not be made. An example of this form is shown.]*

## DAM EVALUATION SUMMARY DETAIL SHEET

[Replace this page with “Dam Evaluation Summary Detail Sheet” from Excel checklist when report pdf is compiled.]

## PREFACE

The assessment of the general condition of the dam reported herein was based upon available data and visual inspections. Detailed investigations and analyses involving topographic mapping, subsurface investigations, testing and detailed computational evaluations were beyond the scope of this report unless reported otherwise.

In reviewing this report, it should be realized that the reported condition of the dam was based on observations of field conditions at the time of inspection, along with data available to the inspection team.

It is critical to note that the condition of the dam depends on numerous and constantly changing internal and external conditions and is evolutionary in nature. It would be incorrect to assume that the reported condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

---

*Licensed Professional's Signature\**

*\* 302 CMR 10.00 requires inspecting engineers to be Commonwealth of Massachusetts Registered Professional Engineers with a **Civil Engineering license** with experience in dam safety inspections and engineering.*

**[Licensed Professional's Typed Name]**

Massachusetts License No.: **[Include Inspecting Engineer's License Number]**

License Type:

**[Title]**

**[Company]**



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### TABLES

- 1.1 Summary Data Table

***[Add additional tables as required.]***

### FIGURES

- Figure 1: Locus Plan ***[USGS topo sheet]***  
Figure 2: Aerial Photograph  
Figure 3: Drainage Area  
Figure 4: Dam and Downstream Area  
Figure 5: Site Sketch

***[Add additional figures as required to depict the configuration of the dam]***

### APPENDICES

- Appendix A: Photographs  
Appendix B: Inspection Checklist  
Appendix C: Previous Reports and References  
Appendix D: Definitions

***[Add additional appendices as required]***

## SECTION 1

### 1.0 DESCRIPTION OF PROJECT

#### 1.1 General

##### 1.1.1 Authority

**[Client]** retained **[Consultant]** to perform a visual inspection and develop a report of conditions for the dam at the **[Impoundment Name]** along the **[River Name]** in **[Town or City Name]**, **[County]** County, Massachusetts. This inspection and report were performed in accordance with MGL Chapter 253, Sections 44-50 of the Massachusetts General Laws as amended by Chapter 330 of the Acts of 2002.

##### 1.1.2 Purpose of Work

The purpose of this investigation was to inspect and evaluate the present condition of the dam and appurtenant structures in accordance with 302 CMR10.07 to provide information that will assist in both prioritizing dam repair needs and planning/conducting maintenance and operation.

The investigation was divided into four parts: 1) obtain and review available reports, investigations, and data previously submitted to the owner pertaining to the dam and appurtenant structures; 2) perform a visual inspection of the site; 3) evaluate the status of an emergency action plan for the site and, 4) prepare and submit a final report presenting the evaluation of the structure, including recommendations and remedial actions, and opinion of probable costs.

##### 1.1.3 Definitions

To provide the reader with a better understanding of the report, definitions of commonly used terms associated with dams are provided in Appendix D. Many of these terms may be included in this report. The terms are presented under common categories associated with dams which include: 1) orientation; 2) dam components; 3) size classification; 4) hazard classification; and 5) miscellaneous.

#### 1.2 Description of Project

##### 1.2.1 Location

***[Insert description of the dam location including longitude, latitude, and proximity to population centers. Check the latitude and longitude using topo map, aerial photograph, GIS, Web-based GIS (MassGIS, Google Earth, etc.) or GPS unit in the field. Include directions to the dam from nearest population center or major roadway. Utilize GPS unit accurate to within 5 meters to check latitude and longitude. Report the location of dam in decimal degree format to at least 5 decimal places (about 1 meter precision). Utilize WGS84 datum, for compliance with MassGIS. Point location recorded for dam should be the intersection of the dam structure crest centerline and the primary spillway where the primary spillway abuts the dam. If the primary spillway is separated from the main dam, record the dam location as the point of intersection of the crest centerline and either: (1) the original stream bed, (2) the outlet structure, (3) the section of maximum height, or (4) the approximate mid-point along the crest length. Confirm accuracy of GPS collected point data with appropriate computer mapping tools that utilize MassGIS coordinate system. Alternative method for documenting the point***

***location is to utilize computer mapping tools with sufficient base maps such as 1:5000 MassGIS ortho photos that are consistent with MassGIS coordinate system. Include the point latitude/longitude on your locus map in Figure 1 in this report.]***

#### 1.2.2 Owner/Caretaker

See Table 1.1 for current owner and caretaker data (names and contact information).

#### 1.2.3 Purpose of the Dam

See Table 1.1 for the current purpose of the dam.

***[Note current purpose of the dam (i.e., Recreation, Water Supply, Irrigation, Farm Pond, Flood Control, Hydropower). If the dam's original design purpose is different from its current purpose that information should be provided in this section.]***

#### 1.2.4 Description of the Dam and Appurtenances

***[Provide detailed description of the intended design of the dam and all appurtenant structures including spillways, instruments, dikes, cutoff walls, security devices, etc. This section should define the components of the dam, provide general dimensions, and discuss the configuration of the system and any known design features. The engineer is expected to check the basic statistical data (structural height, hydraulic height, normal and maximum impoundment volumes). If measured values differ substantially from data in Office of Dam Safety database, provide a description of the method used to obtain the measured data. Do not include here a description of deficiencies, if any, noted during the inspection.]***

#### 1.2.5 Operations and Maintenance

***[Identify the party responsible for Operations and Maintenance of the dam and provide a description of ongoing maintenance activities. Describe normal operating procedures, if available, for summer and winter conditions.]***

#### 1.2.6 DCR Size Classification

***[Dam Name]*** has a height of dam of approximately ***[dam structural height]*** and a maximum storage capacity of ***[storage at maximum water storage elevation]*** acre-feet. Refer to Appendix D for definitions of height of dam and storage. Therefore, in accordance with Department of Conservation and Recreation Office of Dam Safety classification, under Commonwealth of Massachusetts dam safety rules and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, ***[Dam Name]*** is a ***[Size Classification]*** size structure.

***[Measure the vertical height of dam from the lowest portion of the natural ground, including any stream channel, along the downstream toe of the dam to the low point of the crest of the dam.]***

#### 1.2.7 DCR Hazard Potential Classification

***[Dam Name]*** is located upstream of ***[Description of inundation zone including specific developments as appropriate]***. It appears that a failure of the dam at maximum pool will ***[Describe impacts per 302 CMR 10.00]***. Therefore, in accordance with Department of

Conservation and Recreation classification procedures, under Commonwealth of Massachusetts dam safety rules and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, *[Dam Name]* should be classified as a *[Hazard Potential Class (Level)]* hazard potential dam. The Hazard Potential Classification recommendation *[is / is not]* consistent with the Hazard Potential Classification on record with the Office of Dam Safety for *[Dam Name]*.

*[If the Consultant or Owner believes that the Hazard Potential Class should be changed from the current Class listed in the Office of Dam Safety Database, the Owner must separately file an Application for a Hazard Potential Class Change with the Office of Dam Safety. Additional studies may be required to be submitted with the application. The Application Form is available from the Office of Dam Safety website: <https://www.mass.gov/service-details/hazard-reconsideration>]*

### 1.3 Pertinent Engineering Data

#### 1.3.1 Drainage Area

The drainage area for *[Dam Name]* is approximately *[Drainage Area]* square miles and extends through the communities of *[provide a list of Towns or localities within the drainage area]*.

*[The inspecting engineer shall perform his/her own calculation of the drainage area – do not rely on data in prior reports. Comment upon relevant features within the drainage area (i.e., presence of upstream dams or reservoirs), prominent characteristics of the drainage area (i.e., hilly or flat topography, sluggish or flashy flood characteristics), and method used in determining the drainage area.]*

#### 1.3.2 Reservoir

See Table 1.1 for data about normal, maximum, and spillway design flood (SDF) pools. These data were calculated based on *[bathymetric surveys or data, U.S. Army corps of Engineers Conic Method for Reservoir Values, other]*.

*[Verify information obtained from previous reports and/or make reasonable estimates – do not state N/A. In the event no bathymetric study data exist for the impoundment make an estimate of the impoundment volume. In order to estimate the impoundment volume, collect existing available information (via topographic maps and orthophotos available from your own sources or MassGIS or other providers) on the surface area (in acres) to confirm or estimate the normal pool surface area and top of dam maximum pool surface area of the impoundment. Take measurements in the field to determine both the normal pool hydraulic height and maximum structural height of the dam consistent with 302 CMR 10.00. With available information on surface area, dam height and basin slopes, develop an estimate of the size (volume in acre-feet) of the impoundment at normal pool and maximum pool consistent with 302 CMR 10.00. The Corps of Engineers Conic Method for Reservoir Volumes can also be used to calculate the storage, see*

<https://www.hec.usace.army.mil/software/legacy/hecl/documentation/hecluser.pdf>

#### 1.3.3 Discharges at the Dam Site

*[Describe/reference records of discharges at the dam outlets including, but not limited to, date, flows, and maximum reservoir elevations.]*

1.3.4 General Elevations (feet)

- A. Top of Dam
- B. Spillway Design Flood Pool
- C. Normal Pool
- D. Spillway Crest
- E. ***[Additional elevations as appropriate for specific dam]***
- F. Upstream Water at Time of Inspection
- G. Downstream Water at Time of Inspection
- H. Streambed at Toe of the Dam
- I. Low Point along Toe of the Dam ***[Elevation and station]***

1.3.5 Main Spillway Data

- A. Type ***[Material: concrete, stone masonry, bedrock, grassed, wood, rubber; Form: ogee, drop, morning glory, broad-crested, labyrinth, gated (type), siphon]***
- B. Weir Length
- C. Weir Crest Elevation
- D. Upstream Channel
- E. Downstream Channel
- F. Downstream Outlet Invert or Channel Bottom Elevation

1.3.6 ***[Additional information and elevations as appropriate for specific dam (e.g., auxiliary/emergency spillway data, low-level outlet data, dike data, etc.)]***

1.3.7 Design and Construction Records and History

***[Description of available design and construction records, including any rehabilitation or other repairs, if any. The description should include a general description of the work completed, the extent of the work completed, date when the work was implemented, and the engineer of record for the work. A reference to this information should be included within Appendix C.]***

1.3.8 Operating Records

***[Provide a description of operating records, if any, where they are maintained, how often they are updated, and who is responsible for updating the data.]***

1.4 Summary Data Table

**[Replace this page with 1.1 Summary Data Table from the Inspection Checklist (Excel file) as completed by the inspecting engineer. In the case when there is no record hydrologic/hydraulic analysis report, the flood flow and spillway data will not be reported. Otherwise, all other data must be provided and presented as accurate data pertaining to the current inspection.]**

## SECTION 2

### 2.0 INSPECTION

#### 2.1 Visual Inspection

***[Dam Name]*** was inspected on ***[Date]***. At the time of the inspection, the weather was ***[Weather including average temperature and indication of precipitation. If significant rainfall has occurred prior to the inspection and may be impacting the conditions as observed, that should be noted here. Similarly, for prolonged low water conditions, if appropriate]***. Photographs to document the current conditions of the dam were taken during the inspection and are included in Appendix A. The level of the impoundment was ***[Elevation with reference to normal pool elevation]***. Underwater areas were not inspected ***[Unless completed as part of an expanded scope of work]***. A copy of the inspection checklist is included in Appendix B. ***[If the report covers two or more structures with separate ID numbers, provide a separate complete checklist for each structure]***.

##### 2.1.1 General Findings

In general, ***[Dam Name]*** was found to be in ***[Good, Satisfactory, Fair, Poor, or Unsafe]*** ***[do not use mixed condition codes, e.g., "Fair to Poor"]*** condition with ***[General Concern/Observations]***. The specific concerns are identified in more detail in the sections below:

***[Complete the following sections with specific descriptions of observations and conditions encountered during the inspection. Keep observations of structures with separate ID numbers separate. Observations should reference a baseline or other means of locating the referenced deficiency at some point in the future. Where photographs are taken of a particular deficiency, reference should be made to the specific photograph. In the event the dam is found to be breached, indicate whether the dam appears to be adequately breached or not. Breached condition indicates the water level is at streambed elevation and the dam is not impounding water. If the dam is partially breached and there exists the potential to re-impound, the dam should be described as being in Unsafe condition.]***

##### 2.1.2 Dam

- ***Abutments***
- ***Upstream Face***
- ***Crest***
- ***Downstream Face***
- ***Drains***
- ***Instrumentation***
- ***Access Roads and Gates***

***[Comments should address compliance (e.g., healthy grass cover, uniform riprap cover, good abutment contact, etc.), as well as deficiencies (e.g., exposed sand and gravel, erosion, cracking, woody vegetation, seepage, flow rates, unusual movement, etc.). Information should be presented in a clear and organized fashion to expedite review and comparison to prior and future reports.]***

### 2.1.3 Appurtenant Structures

- Primary Spillway

*[This section should provide a description of the condition of the primary spillway structure including, but not limited to, the following components: left and right training walls; wing walls; weirs; aprons; stilling basins; gates/stoplogs; operators; operating platforms and bridges; piers and other support structures; and discharge channels.]*

- Low-Level Outlets

*[This section should provide a description of the condition of the low-level outlet structure including, but not limited to, the following components: wing walls; headwalls, gates and stop logs; approaches; trash racks; stilling or impact basins; operators; operating platforms and bridges; secondary (auxiliary) controls; and discharge channels. This section should indicate whether the system is operable and whether it results in a continuously charged pipe extending through the embankment.]*

- Auxiliary/Emergency Spillway

*[This section should provide a description of the condition of the auxiliary/emergency spillway structure including, but not limited to, the following components: left and right training walls; wing walls; weirs; aprons; stilling basins; gates/stoplogs; operators; operating platforms and bridges; piers; and other support structures; and discharge channels.]*

- Dikes

*[This section should provide a description of the condition of all dikes, including, but not limited to, the following: left and right abutments, upstream and downstream slopes/faces, and crest. The discussion should include applicable blanket, toe and chimney drains.]*

### 2.1.4 Downstream Area

*[This section should provide a description of the immediate downstream area including, but limited to, the following: vegetation, terrain, seepage, drainage, and access.]*

### 2.1.5 Reservoir Area

*[This section should describe the impoundment, including but not limited to the following: impoundment compass orientation, special features (e.g., dam is located within a protected cove or inlet), surrounding topography, level of surrounding development and use, potential for slides to impact water levels, and location of borrow areas that may be susceptible to slides.]*

## 2.2 Caretaker Interview

*[This section should include, but not necessarily be limited to: date of interview, name, and specifics of conversation with caretaker including, but not limited to: history, operating procedures, low-level outlet operation and maintenance history; emergency response*

*procedures, current and historic concerns, documentation and records; recent developments; overtopping and flood of record events. This information should also be referenced in the appropriate section of the report.]*

### 2.3 Operation and Maintenance Procedures

*[A discussion of the availability of a formal operations and maintenance (O&M) manual should be discussed in this section. The intent of the following sections is to summarize the content of the manual and when it was last updated.]*

#### 2.3.1 Operational Procedures

*[Describe Operational Procedures including frequency of tasks, record keeping and training. Discussion of low-level outlet exercising should be indicated]*

#### 2.3.2 Maintenance of Dam and Operating Facilities

*[Describe maintenance including frequency of tasks, record keeping, and training.]*

### 2.4 Emergency Warning System

*[Describe response procedures, availability of an Emergency Action Plan (EAP), contents of EAP, and other emergency warning features or devices. This section should also indicate the applicability of the plan and when it was last updated and when and how training for an emergency has been conducted].*

### 2.5 Awareness of Potential Dam Related Safety Hazards at, near, and on Dams

*[It is the responsibility of the inspecting engineer to:*

- *Identify potential safety hazards, that may exist at, near, and on the dam.*
  - *The potential safety hazard considerations should be described as related to structural, mechanical, water and land related features pertaining to the dam including areas immediate upstream and downstream from the dam, as well as downstream from the dam along the stream channel if dam operations include deliberate releases of water from the dam.*
- *Make specific recommendations to limit or prevent exposure to potential safety hazards at, near and on the dam, that are related to structural, mechanical, water and land related features pertaining to the dam.*
  - *Make recommendations to erect fencing, railing, barricades, etc. that may be appropriate to limit or prevent exposure to potential safety hazards.*
  - *Make recommendations to install signage that limits or prohibits access to areas that may present potential safety hazards.*
  - *Make recommendations to install safety hazard warning signs to make visitors aware of specifically identified potential safety hazards.*
- *Make specific recommendations for safety signage, booms, and buoys on the upstream approach to the dam and downstream from the dam as may be necessary to limit exposure to potential water-based safety hazards. Potential water-based safety hazards, that should be identified include but shall not be limited to boating, fishing, swimming, and wading. Such signage may also need to be recommended for placement at, near, and on the dam.*

Identify if it appears that the dam is a low head dam such that under certain conditions a potentially dangerous submerged hydraulic roller can form immediately downstream from the dam spillway. As necessary, include additional information or comment on this condition.

***In addition to the above observations and recommendations, include the following notes.]***

Implementation of any recommendations may require local, state, or federal permits as well as securing property rights if subject areas are not owned by the dam owner. Securing such permits and/or land rights is the sole responsibility of the dam owner.

The dam owner is reminded that the Dam Safety Regulations 302 CMR Section 10.13: Liability (1), states: *The owner shall be responsible and liable for damage to property of others or injury to persons, including but not limited to, loss of life resulting from the operation, failure of or mis-operation of a dam.*

## 2.6 Hydrologic/Hydraulic Data

***[Describe/summarize Hydrologic/Hydraulic (H&H) analyses and results presently or previously performed, if any. Include report titles, authors, and dates in Appendix C. This section should discuss the applicability of the previous results based upon changes within the drainage area or at the dam since the completion of the H&H analyses.]***

***[If insufficient data exist for a thorough review or significant changes have occurred since the last analyses, completion of a new H&H analyses should be recommended in Section 3.2.]***

***[A summary of available information provided within this section should include, but not be limited to:***

- A. Spillway Design Flood (SDF) Return Period***
- B. Precipitation (inches) and methodology***
- C. SDF Inflow (cfs)***
- D. SDF Outflow (cfs)***
- E. Principal Spillway Capacity (cfs)***
- F. Auxiliary Spillway Capacity (cfs)***
- G. Low-level Outlet Capacity (cfs)***
- H. Percentage of the SDF that can be safely routed through the reservoir without overtopping the dam.***
- I. SDF Peak Reservoir Elevation (feet)***
- J. Maximum Depth of Overtopping for SDF (ft) (if applicable)***
- K. Maximum Duration of Overtopping for SDF (hours) (if applicable)]***

***[Discuss the likelihood of overtopping based upon the results of current or previous H&H Evaluations. Evaluate the impact of overtopping as presented in the H&H analyses as it relates to erosion of the embankment, head cutting of channels and unlined spillways, and erosion of the downstream areas.]***

## 2.7 Structural and Seepage Stability

### 2.7.1 Embankment Structural Stability

*[Provide a summary of the stability of embankments based upon visual observation/inspection, an evaluation of previous structural stability analyses, and a reference to previous analyses performed. Any previous analyses should be listed in Appendix C. The evaluation should include static and dynamic stability based upon the usual, unusual, and extreme loading scenarios included in 302 CMR10.14(9). Physical evidence of instabilities should be highlighted.]*

*Should insufficient data be available for a review, recommendations should be made to collect necessary data and complete analyses in accordance with 302 CMR 10.14.]*

### 2.7.2 Structural Stability of Non-Embankment Structures

*[Provide a summary of the stability of non-embankment structures based upon visual observation/inspection, an evaluation of previous structural stability, analyses, and a reference to previous analyses performed. The evaluation should include static and dynamic stability based upon the usual, unusual, and extreme loading scenarios included in 302 CMR10.14(9). Physical evidence of instabilities should be highlighted.]*

*Should insufficient data be available for a review, recommendations should be made to collect necessary data and complete analyses in accordance with 302 CMR 10.14.]*

### 2.7.3 Seepage Stability

*[Provide an evaluation of the potential for seepage instability of water impoundment structures due to internal erosion or piping. Describe known data about seepage including:*

- *Observations of seepage (locations, volume)*
- *Seepage instrumentation*
- *Filters or zonation of embankments*
- *Foundation soils*

*If significant seepage exists at unfiltered locations, provide recommendations for appropriate data collection, monitoring, and analysis.]*

## SECTION 3

### 3.0 ASSESSMENTS AND RECOMMENDATIONS

#### 3.1 Assessments

In general, the overall condition of *[Dam Name]* is *[Good, Satisfactory, Fair, Poor, or Unsafe – do not use mixed conditions, e.g., “Fair to Poor”]*. The dam was found to have the following deficiencies:

- 1.
- 2.
- 3.

*[Provide a numbered list of deficiencies here – do not simply refer back to Section 2. Copy this list to the Deficiencies Tab in the Dam Inspection Checklist Excel spreadsheet. Provide the spreadsheet in electronic format as a separate file, in addition to the PDF copy of the report].*

*[The rating for the overall condition of the dam should be based upon all aspects of the dam including structural integrity, operational procedures, maintenance, and compliance with design standards. Refer to the guidance in Appendix B.]*

*[A comparison to the previously reported condition of the dam should be included in this section. Conditions that have been improved as well as those that have worsened since the last inspection should be indicated. Major recommendations from previous inspections should be described, as well as the level of compliance with those recommendations.]*

<i>Previously Identified Deficiency</i>	<i>Resolution or Current Condition</i>

*[Provide assessment and implications of inspection observations as appropriate.]*

The following recommendations and remedial measures generally describe the recommended approach to address current deficiencies at the dam. Prior to undertaking recommended maintenance, repairs, or remedial measures, the applicability of environmental permits needs to be determined for activities that may occur within resource areas under the jurisdiction of local conservation commissions, MADEP, or other regulatory agencies.

#### 3.2 Studies and Analyses

*[This section should identify those studies that should be completed to evaluate concerns and/or comply with current regulations. These studies and analyses could include but are not limited to the following: Underwater Inspection; H&H analyses; Stability Analysis; Dam Break Analysis; Operations and Maintenance (O&M) Manual; Emergency Action Plan (EAP); Downstream Hazard Assessment and Seepage Evaluation.]*

### 3.3 Recurrent Maintenance Recommendations

*[This section should discuss those activities that should be undertaken on a regular or yearly basis. Typically, these activities are recurrent maintenance level activities that can be undertaken by the dam owner/caretaker and do not require engineering design or permitting.]*

### 3.4 Minor Repair Recommendations

*[This section should discuss recommended studies or activities to improve the overall condition of the dam that do not alter the current design of the dam. These recommendations may require design by a professional engineer and construction by a contractor experienced in dam repair. A Chapter 253 permit may be required. Within this section the rationale for the recommended repairs or maintenance activity should be provided to assist the owner/caretaker.]*

### 3.5 Remedial Modifications Recommendations

*[This section should include recommended modifications to the dam that alter the current configuration or design of the dam that are necessary to meet stability, seepage or safety concerns as well as comply with current state requirements. These recommendations will require design by a professional engineer and construction by a contractor experienced in dam repair. A Chapter 253 permit will likely be required.]*

### 3.6 Alternatives

*[This section should include a discussion of practical alternatives to the recommendations presented above. Examples include, but are not limited to, alternative armoring approaches, alternative spillway configurations, or alternative stabilizations. Possibilities of dam removal should be considered. Advantages and disadvantages should be discussed to assist the owner/caretaker in evaluating the information presented herein.]*

### 3.7 Opinion of Probable Construction Costs

*[Provide Opinions of Probable Cost for implementing the recommendations and alternatives. This information should be based upon published estimating guides, current market pricing, and manufacturer information where applicable. Where possible, an indication of engineering and permitting effort should be incorporated. As all opinions are based upon purely conceptual data, opinions should include construction contingencies. Opinions of probable cost should be presented for all activities recommended or described in Sections 3.2 through 3.6.]*

## FIGURES

## FIGURES INSTRUCTION PAGE:

*Figures should include:*

1. ***Locus Plan - Dam and Impoundment Area:***
  - *A color locus map developed from USGS Quad sheet or GIS mapping that depicts the location of the dam, the entire impoundment, and the general area of the dam. The plan should include a scale, north arrow and be presented with a title block that indicates the dam name, National ID No., town, USGS quadrangle, the source of the map, and the Latitude/Longitude point location of the dam. The recommended size for this figure is 8.5 x 11.*
  
2. ***Aerial Photograph – Dam and Impoundment Area:***
  - *A color (if available) or black and white highest available resolution ortho-photo locus map that depicts the location of the dam, the entire impoundment, and the general area of the dam. The plan should include a scale, north arrow, and be presented with a title block that indicates the dam name, National ID No., town, the source of the map, and the Latitude/Longitude point location of the dam. The recommended size for this figure is 8.5 x 11.*
  
3. ***Drainage area:***
  - *A color locus map developed from USGS Quad sheet that depicts the location of the dam, the entire drainage area delineated on the map. The plan should include a scale, north arrow and be presented with a title block that indicates the dam name, National ID No., drainage area in square miles, town, USGS quadrangle, the source of the map, and the Latitude/Longitude point location of the dam. The recommended size for this figure is 8.5 x 11.*
  
4. ***Dam and Area Downstream from Dam:***
  - *A color locus map developed from USGS Quad sheet that depicts the location of the dam, the area several miles downstream from the dam likely to be affected by a dam breach. The plan should include a scale, north arrow and be presented with a title block that indicates the dam name, National ID No., town, USGS quadrangle, the source of the map, and the Latitude/Longitude point location of the dam. The recommended size for this figure is 8.5 x 11.*
  
5. ***Dam Site Sketch or Plan (with photo locations/orientation):***
  - *Site plan based upon construction plans or information gathered during the inspection. Plan should include a scale, north arrow, an indication of flow direction, depiction of photo locations and orientation (for clarity a separate figure showing photo locations and orientations can be provided in Appendix A) and provide sufficient detail to identify the dam components and features. The size of this figure should be adjusted in order to provide a plan of appropriate scale to show relevant site features.*

APPENDIX A  
**Photographs**

## PHOTOGRAPHS INSTRUCTION PAGE:

*All photographs shall be color photographs. Photographs shall be clear and include scale references where applicable. Photographs shall include, but not be limited to the following:*

1. *Overview of dam from upstream*
2. *Overview of dam from downstream*
3. *Overview of upstream face from right abutment*
4. *Overview of upstream face from left abutment*
5. *Overview of dam crest from right abutment*
6. *Overview of dam crest from left abutment*
7. *Overview of downstream face from right abutment*
8. *Overview of downstream face from left abutment*
9. *Overview of spillway from upstream*
10. *Overview of spillway from downstream (tailrace or channel area)*
11. *Overview of right training wall*
12. *Overview of left training wall*
13. *Overview of weir*
14. *Overview of stilling basin*
15. *Overview of downstream channel*
16. *Overview of gatehouse exterior*
17. *Overview of gatehouse interior*
18. *Overview of operators*
19. *Outlet inlets and discharge points*
20. *Overview of reservoir*
21. *Areas of specific deficiencies (e.g., cracks, erosion, displacement, seeps, deterioration, etc.)*
22. *Photos of any Potential Public Safety Issues at dam*

*Each photograph shall include a caption indicating the subject of the photograph as well as highlighting any specific deficiencies pictured. All photographs shall be presented with no more than two (2) photos per page. Photo location and orientation shall be indicated on the site plan included in the section entitled "Figures". Alternatively, for clarity, a separate figure can be provided in this appendix to show figure locations.*

APPENDIX B  
**Inspection Checklist**

*Dam Name and Town*

Date of Inspection: *DATE*

## DAM SAFETY INSPECTION CHECKLIST INSTRUCTION PAGE

The checklist (Excel file) includes sections applicable to a variety of dam structure types. Carefully follow the instructions on the first tab of the checklist. Complete those pages pertaining to each structure and omit pages that are not relevant or mark them “Not Applicable.” The Checklist must be signed by the inspecting engineer and a clean, neat copy included in the final inspection report. Use the checklist to generate the Dam Evaluation Summary Detail Sheet (should immediately follow the Executive Summary) and Table 1.1 (should immediately follow Section 1.0).

### E1: DESIGN METHODOLOGY

1. Unknown Design – no design records available
2. No design or post-design analyses
3. No analyses, but dam features appear suitable
4. Design or post-design analyses show dam meets most criteria
5. State of the art design – design records available & dam meets all criteria

### E2: LEVEL OF MAINTENANCE

1. Dam in disrepair, no evidence of maintenance, no O&M manual
2. Dam in poor level of upkeep, very little maintenance, no O&M manual
3. Dam in fair level of upkeep, some maintenance, and standard procedures
4. Adequate level of maintenance and standard procedures
5. Dam well maintained, detailed maintenance plan that is executed

### E3: EMERGENCY ACTION PLAN

1. No plan or idea of what to do in the event of an emergency
2. Some idea but no written plan
3. No formal plan but well thought out
4. Available written plan that needs updating
5. Detailed, updated written plan available, filed with MADCR, annual training

### E4: EMBANKMENT SEEPAGE (Embankment, Foundation & Abutments)

1. Severe piping and/or seepage with no monitoring
2. Evidence of monitored piping and seepage
3. No piping but monitored seepage
4. Minor seepage or high volumes of seepage with filtered collection
5. No seepage or minor seepage with filtered collection

### E5: EMBANKMENT CONDITION (see Note 1)

1. Severe erosion and/or large trees
2. Significant erosion or significant woody vegetation
3. Brush and exposed embankment soils, or moderate erosion
4. Unmaintained grass, rodent activity and maintainable erosion
5. Well maintained, healthy uniform grass cover

### E6: CONCRETE CONDITION (see Note 2)

1. Major cracks, misalignment, discontinuities causing leaks, seepage or stability concerns
2. Cracks with misalignment inclusive of transverse cracks with no misalignment but with potential for significant structural degradation
3. Significant longitudinal cracking and minor transverse cracking
4. Spalling and minor surface cracking
5. No apparent deficiencies

### E7: LOW-LEVEL OUTLET DISCHARGE CAPACITY

1. No low-level outlet, no provisions (e.g., pumps, siphons) for emptying pond
2. No operable outlet, plans for emptying pond, but no equipment
3. Outlet with insufficient drawdown capacity, pumping equipment available
4. Operable gate with sufficient drawdown capacity
5. Operable gate with capacity greater than necessary

### E8: LOW-LEVEL OUTLET PHYSICAL CONDITION

1. Outlet inoperative needs replacement, non-existent or inaccessible
2. Outlet inoperative needs repair
3. Outlet operable but needs repair
4. Outlet operable but needs maintenance
5. Outlet and operator operable and well maintained

### E9: SPILLWAY DESIGN FLOOD CAPACITY

1. 0 - 50% of the SDF or unknown
2. 51 - 90% of the SDF
3. 91 - 100% of the SDF
4. >100% of the SDF with actions required by caretaker (e.g., open outlet)
5. >100% of the SDF with no actions required by caretaker

### E10: OVERALL PHYSICAL CONDITION OF THE DAM

1. *UNSAFE* – Major structural, operational, and maintenance deficiencies exist under normal operating conditions
2. *POOR* - Significant structural, operation and maintenance deficiencies are clearly recognized for normal loading conditions
3. *FAIR* - Significant operational and maintenance deficiencies, no structural deficiencies. Potential deficiencies exist under unusual loading conditions that may realistically occur. Can be used when uncertainties exist as to critical parameters
4. *SATISFACTORY* - Minor operational and maintenance deficiencies. Infrequent hydrologic events would probably result in deficiencies.
5. *GOOD* - No existing or potential deficiencies recognized. Safe performance is expected under all loading including SDF

### E11: ESTIMATED REPAIR COST

Estimation of the total cost to address all identified structural, operational, maintenance deficiencies. Cost shall be developed utilizing standard estimating guides and procedures

### *Guidelines and Notes for Evaluations*

Each of the evaluation categories has 5 rating levels. In general, the rating levels in each category are intended to reflect the following conditions:

1. Unsafe
2. Poor
3. Fair
4. Satisfactory
5. Good

### E10-Overall Safety Rating Guideline

Unless the inspecting engineer presents compelling data, analyses, and observations that justify a higher rating, E10-Overall Safety Rating of the Dam shall not be higher than the lowest ranking in these high importance categories:

-E4-Seepage,

- E5-Embankment Condition (for embankment dams), and
- E6-Concrete Condition (for dams where concrete structures retain water).

**Note 1 - Embankment Condition Factor of Safety Criteria**

In addition to the inspection conditions listed, the embankment condition rating should consider the slope stability Factor of Safety (FS) according to the following guidelines for downstream (D/S) and upstream slopes (U/S).

	<b>Normal Pool</b>	<b>SDF</b>	<b>Seismic</b>	<b>Rapid Drawdown</b>
<b>Rating</b>	<b>D/S &amp; U/S FS</b>	<b>D/S FS</b>	<b>D/S &amp; U/S FS</b>	<b>U/S FS</b>
1	<1.3	<1.1	<1.0	<1.0
2	<1.5	<1.4	<1.0	<1.1
3	>1.5	<1.5	<1.1	<1.2
4	>1.5	>1.5	>1.1	>1.2
5	>1.5	>1.5	>1.1	>1.2

In the absence of stability analyses, use the following factors to evaluate the stability component of the embankment rating. The inspecting engineer will need to consider all factors in combination as the exact combination of conditions listed will rarely occur. For slopes, > indicates “steeper than.”

<b>Rating</b>	<b>Slopes</b>	<b>Seepage</b>	<b>Material</b>	<b>Compaction</b>
1	>2H:1V	>5' above toe	SP, ML*, SM*	Loose or unknown
2	>2.5H:1V	>2' above toe	ML**, MH	Loose or unknown
3	>3H:1V	at toe	SM**, SW, CH	Likely compacted
4	<3H:1V	DS of toe	SC, CL	Compacted
5	<3H:1V	None	Suitably Zoned	Compacted

ML\* - Non-plastic silt or any silt or clay susceptible to dispersion

ML\*\* - Silt with some plasticity (non-dispersive)

SM\* - Uniform silty fine sand

SM\*\* - Widely graded silty sand

**Note 2 - Concrete Condition Factor of Safety Criteria**

In addition to the inspection conditions listed, ratings should consider the sliding stability Factors of Safety (FS) for any concrete structures that retain water according to the following guidelines.

**FS Criteria for Dams with Limited Structure and Foundation Information and Testing**

<b>Rating</b>	<b>Normal Pool FS</b>	<b>SDF FS</b>	<b>Ice Loading FS</b>	<b>Seismic FS</b>
1	<2.0	<1.3	<1.3	<1.0
2	<3.0	<2.0	<2.0	<1.3
3	>3.0	>2.0	>2.0	<1.5
4	>3.0	>2.0	>2.0	>1.5
5	>3.0	>2.0	>2.0	>1.5

**FS Criteria for Dams with Well Defined Structure and Foundation Information and Testing**

<b>Rating</b>	<b>Normal Pool FS</b>	<b>SDF FS</b>	<b>Ice Loading FS</b>	<b>Seismic FS</b>
1	<1.5	<1.3	<1.3	<1.0
2	<2.0	<1.7	<1.7	<1.0
3	<3.0	<2.0	<2.0	<1.1
4	>3.0	>2.0	>2.0	<1.3
5	>3.0	>2.0	>2.0	>1.3

***See Appendix D for a complete listing of dam orientation and terminology definitions.***

Upstream – Shall mean the side of the dam that borders the impoundment.

Downstream – Shall mean the high side of the dam, the side opposite the upstream side.

Right – Shall mean the area to the right when looking in the downstream direction.

Left – Shall mean the area to the left when looking in the downstream direction.

Height of Dam – Shall mean the vertical distance from the lowest portion of the natural ground, including any stream channel, along the downstream toe of the dam to the crest of the dam.

Embankment – Shall mean the fill material, usually earth or rock, placed with sloping sides, such that it forms a permanent barrier that impounds water.

Crest – Shall mean the top of the dam, usually provides a road or path across the dam.

Abutment – Shall mean that part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment.

Appurtenant Works – Shall mean structures, either in dams or separate therefrom, including but not be limited to, spillways; reservoirs and their rims; low-level outlet works; and water conduits including tunnels, pipelines, or penstocks, either through the dams or their abutments.

Spillway – Shall mean a structure over or through which water flows are discharged. If the flow is controlled by gates or boards, it is a controlled spillway; if the fixed elevation of the spillway crest controls the level of the impoundment, it is an uncontrolled spillway.

APPENDIX C  
**Previous Reports and References**

## PREVIOUS REPORTS AND REFERENCES

*[A list of previous reports and references should be presented in chronological order (most recent to oldest) utilizing standard bibliographic procedures. Reports and references pertaining specifically to the dam should be separated from technical bibliographic entries utilized for research purposes during the development of the report.]*

The following is a list of reports that were located during the file review or were referenced in previous reports.

- 1. Historic Report 1 title, report prepared by [Insert Name], city/town, date of preparation.*
- 2. Historic Plan 1 title, Sheet No., plans prepared by [Insert Name], city town, date of preparation.*

The following references were utilized during the preparation of this report and the development of the recommendations presented herein.

- 1. Author, "Technical Reference 1 Title", Publisher, City, copyright date.*

APPENDIX D  
**Definitions**

## COMMON DAM SAFETY DEFINITIONS

For a comprehensive list of dam engineering terminology and definitions refer to 302 CMR10.00 Dam Safety, or other reference published by FERC, Dept. of the Interior Bureau of Reclamation, or FEMA. Please note should discrepancies between definitions exist, those definitions included within 302 CMR 10.00 govern for dams located within the Commonwealth of Massachusetts.

### Orientation

Upstream – Shall mean the side of the dam that borders the impoundment.

Downstream – Shall mean the high side of the dam, the side opposite the upstream side.

Right – Shall mean the area to the right when looking in the downstream direction.

Left – Shall mean the area to the left when looking in the downstream direction.

### Dam Components

Dam – Shall mean any artificial barrier, including appurtenant works, which impounds or diverts water.

Embankment – Shall mean the fill material, usually earth or rock, placed with sloping sides, such that it forms a permanent barrier that impounds water.

Crest – Shall mean the top of the dam, usually provides a road or path across the dam.

Abutment – Shall mean that part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment.

Appurtenant Works – Shall mean structures, either in dams or separate therefrom, including but not be limited to, spillways; reservoirs and their rims; low-level outlet works; and water conduits including tunnels, pipelines, or penstocks, either through the dams or their abutments.

Spillway – Shall mean a structure over or through which water flows are discharged. If the flow is controlled by gates or boards, it is a controlled spillway; if the fixed elevation of the spillway crest controls the level of the impoundment, it is an uncontrolled spillway.

### Size Classification

(as listed in Commonwealth of Massachusetts, 302 CMR 10.00 *Dam Safety*)

Large – structure with a height greater than 40 feet or a storage capacity greater than 1,000 acre-feet.

Intermediate – structure with a height between 15 and 40 feet or a storage capacity of 50 to 1,000 acre-feet.

Small – structure with a height between 6 and 15 feet and a storage capacity of 15 to 50 acre-feet.

Non-Jurisdictional – structure less than 6 feet in height or having a storage capacity of less than 15 acre-feet.

## **Hazard Classification**

(as listed in Commonwealth of Massachusetts, 302 CMR 10.00 *Dam Safety*)

High Hazard (Class I) – Shall mean dams located where failure will likely cause loss of life and serious damage to home(s), industrial or commercial facilities, important public utilities, main highway(s) or railroad(s).

Significant Hazard (Class II) – Shall mean dams located where failure may cause loss of life and damage to home(s), industrial or commercial facilities, secondary highway(s) or railroad(s) or cause the interruption of the use or service of relatively important facilities.

Low Hazard (Class III) – Dams located where failure may cause minimal property damage to others. Loss of life is not expected.

## **General**

EAP – Emergency Action Plan – Shall mean a predetermined (and properly documented) plan of action to be taken to reduce the potential for property damage and/or loss of life in an area affected by an impending dam failure.

O&M Manual – Operations and Maintenance Manual; Document identifying routine maintenance and operational procedures under normal and storm conditions.

Normal Pool – Shall mean the elevation of the impoundment during normal operating conditions.

Acre-foot – Shall mean a unit of volumetric measure that would cover one acre to a depth of one foot. It is equal to 43,560 cubic feet. One million U.S. gallons = 3.068 acre-feet.

Height of Dam (Structural Height) – Shall mean the vertical distance from the lowest portion of the natural ground, including any stream channel, along the downstream toe of the dam to the lowest point on the crest of the dam.

Hydraulic Height – means the height to which water rises behind a dam and the difference between the lowest point in the original streambed at the axis of the dam and the maximum controllable water surface.

Maximum Water Storage Elevation – means the maximum elevation of water surface which can be contained by the dam without overtopping the embankment section.

Spillway Design Flood (SDF) – Shall mean the flood used in the design of a dam and its appurtenant works particularly for sizing the spillway and outlet works, and for determining maximum temporary storage and height of dam requirements.

Maximum Storage Capacity – The volume of water contained in the impoundment at maximum water storage elevation.

Normal Storage Capacity – The volume of water contained in the impoundment at normal water storage elevation.

## **Condition Rating**

Unsafe – Major structural\*, operational, and maintenance deficiencies exist under normal operating conditions.

Poor – Significant structural\*, operation and maintenance deficiencies are clearly recognized for normal loading conditions.

Fair – Significant operational and maintenance deficiencies, no structural deficiencies. Potential deficiencies exist under unusual loading conditions that may realistically occur. Can be used when uncertainties exist as to critical parameters.

Satisfactory – Minor operational and maintenance deficiencies. Infrequent hydrologic events would probably result in deficiencies.

Good – No existing or potential deficiencies recognized. Safe performance is expected under all loading including SDF.

\* Structural deficiencies include but are not limited to the following:

- Excessive uncontrolled seepage (e.g., upwelling of water, evidence of fines movement, flowing water, erosion, etc.)
- Missing riprap with resulting erosion of slope
- Sinkholes, particularly behind retaining walls and above outlet pipes, possibly indicating loss of soil due to piping, rather than animal burrows
- Excessive vegetation and tree growth, particularly if it obscures features of the dam and the dam cannot be fully inspected
- Deterioration of concrete structures (e.g., exposed rebar, tilted walls, large cracks with or without seepage, excessive spalling, etc.)
- Inoperable outlets (gates and valves that have not been operated for many years or are broken)

***TALBOT MILLS DAM***  
**PHASE I**  
**INSPECTION / EVALUATION REPORT**



**Dam Name:** Talbot Mills Dam  
**State Dam ID#:** 4-9-31-1  
**NID ID#:** MA 00774  
**Owner:** CRT Development  
**Owner Type:** Private  
**Town:** North Billerica  
**Consultant:** Geotechnical Consultants, Inc.  
**Date of Inspection:** November 6, 2015



## EXECUTIVE SUMMARY

This Phase I Inspection/Evaluation Report details the inspection and evaluation of Talbot Mills Dam located in North Billerica, Massachusetts. The inspection was conducted on 28 October 2015 and 6 November 2015 by Geotechnical Consultants, Inc. of Marlborough, Massachusetts.

Currently, the Talbot Mills Dam is classified as an Intermediate sized, Significant (Class II) Hazard potential structure. Based on our inspection, measurements and evaluation, it is our opinion the dam should remain as an Intermediate sized, Significant (Class II) Hazard potential structure.

In general, the Talbot Mills Dam was found to be in fair condition primarily due to the lack of any operation or maintenance plan. Structurally, we found no indications of instability or seepage which comprise the integrity of the dam and appurtenant structures. The spillway appears to be adequately sized for the Spillway Design Flood (SDF).

Some operational deficiencies exist and include:

- Minor seepage in the spillway abutment particularly at the left abutment.
- Trees located on the upstream side of the left embankment near the former intake gates to the Talbot Mills complex.
- Lack of an operable low level outlet and emergency bypass in the event of flooding.

Geotechnical Consultants, Inc. recommends the following actions be taken to address the deficiencies found at the dam during this inspection and evaluation:

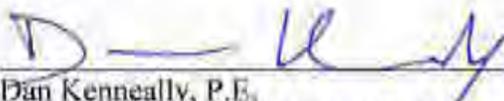
- Prepare and implement “routine” inspection and maintenance plans for the operation and maintenance of this dam.
- Inspect the interior of the of the Talbot Mills complex, particularly the downstream end of the former intake structures.
- Repair/replace the sluiceway and stilling basin gates so that the gates are operational and can provide emergency bypass control.
- Repair/replace the left spillway abutment to provide an operational low level outlet and provide emergency bypass control.

## PREFACE

The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations and analyses involving subsurface investigations, testing and detailed computational evaluations are beyond the scope of this report.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection, along with data available to the inspection team. In cases where an impoundment is lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions, which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is critical to note that the condition of the dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

  
Dan Kenneally, P.E.  
Massachusetts License No.: 50527



  
Richard Pizzi, P.E.  
Massachusetts License No.: 32644  
GEOTECHNICAL CONSULTANTS



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## SECTION 1

### 1.0 DESCRIPTION OF PROJECT

#### 1.1 General

##### 1.1.1 Authority

The CRT Development Realty, LLC has retained Geotechnical Consultants, Inc. to perform a visual inspection and develop a report of conditions for the Mill Pond Dam, also known as the Talbot Mills Dam along the Concord River, in North Billerica, Massachusetts (Army Corps of Engineers ID #: MA 00774). This inspection and report were performed in accordance with MGL Chapter 253, Sections 44-50 of the Massachusetts General Laws as amended by Chapter 330 of the Acts of 2002.

##### 1.1.2 Purpose of Work

The purpose of this investigation is to inspect and evaluate the present condition of the dam and appurtenant structures in accordance with 302 CMR10.07 and to provide information that will assist in prioritizing dam repair needs, dam operation, and planning/conducting maintenance.

The investigation is divided into four parts:

- obtain and review available reports, investigations, and data previously submitted to the owner pertaining to the dam and appurtenant structures;
- perform a visual inspection of the site;
- evaluate the status of an emergency action plan for the site and;
- prepare and submit a final report presenting the evaluation of the structure, including recommendations and remedial actions, and opinion of probable costs.

##### 1.1.3 Definitions

To provide the reader with a better understanding of the report, definitions of commonly used terms associated with dams are provided in Appendix D. Many of these terms may be included in this report. The terms are presented under common categories associated with dams which include: 1) orientation; 2) dam components; 3) size classification; 4) hazard classification; and 5) miscellaneous. All elevations referred to in this report are given in feet and are referenced to the National Geodetic Vertical Datum (NGVD) of 1929.

## 1.2 Description of Project

### 1.2.1 Location

The Talbot Mills Dam is located in Middlesex County in the village of North Billerica, Massachusetts. North Billerica is an unincorporated village of the town of Billerica, Massachusetts; one of nine villages that make up the Town of Billerica.

The Concord River flows through North Billerica, and at the old Talbot and Faulkner Mills is the Mill Pond and Dam marking the area where the old Middlesex Canal crossed over the river. This run-of-the-river dam and the impoundment are shown on the Billerica USGS quadrangle map at the following approximate coordinates:

Latitude:	42.59173° North
Longitude:	71.28400° East

The best access for driving to the dam is via exit #29 off of US Route 3; then east on Billerica Road (State Route 129) for approximately 0.3 miles; turn north onto Brick Kiln Road for 0.4 miles; northeast onto Alpine Street for 0.4 miles; south onto Boston Road (State Route 3A) for approximately 400 feet; northeast onto Lowell Street for 0.5 miles; then northeast onto Old Elm Street 0.3 miles (Old Elm Street becomes Faulkner Street). The dam location and general vicinity are shown on the *Locus Plan* attached as Figure 1.

### 1.2.2 Owner/Operator

See Table 1.1 for current owner and caretaker data (names and contact information).

### 1.2.3 Purpose of the Dam

The area was originally meadow land and its hay and grass were used by the early English settlers as food for their farm animals. As it was subject to annual floods, attempts were made to curtail the problem. In 1659 William Sheldon received permission to construct a mill to grind corn, but it was not until 1708 that Christopher Osgood successfully erected an effective dam at the site. All subsequent owners of this spot trace their deed to Osgood and his dam. By the end of the 18th century there were five grist mills, three saw mills and one fulling mill at work here.

Faulkner Mills was at a crucial junction of waterways in the early 1800s. Not only were the mills on the Concord River, a source of water power, but they were also at the highest point of the Middlesex Canal. The canal was the longest early American canal, dug entirely by hand and explosives, reaching over 20 miles from Boston at the southeast end to Lowell and the Merrimack River in the north. This canal would prove to be an important link for commerce in the early 1800s, before the advent of the railroads. The canal was the transport mechanism for lumber from New Hampshire, textiles from Lowell, and passengers from Boston.

During the period of the Middlesex Canal's operations, its Proprietors were in charge of the area and continued to run the mills as well as a fishway. For them, Loammi Baldwin replaced Osgood's old worn dam with a new one near the current dam at the Faulkner Street bridge. In 1828 the Proprietors again built a new dam on this site. At the Canal's demise, the control of the area passed to two families: the Faulkners and the Talbots.<sup>1</sup>

Currently, the dam is used for recreational purposes and flood control.

#### 1.2.4 Description of the Dam and Appurtenances

Talbot Mills Dam is located on the Concord River approximately 4.2 miles south of the confluence of the Concord and Merrimack Rivers. Overall, the dam, excluding the south training wall and sluiceway, is approximately 316 feet long with a maximum height of about 15 feet. It is an overflow or run-of-the-river type stone masonry, concrete and (presumably) earthen structure.

In 2009, Geotechnical Consultants, Inc. completed an evaluation study of the Talbot Mills Dam as part of its contract with the dam owner. This is the last known inspection report for the dam and the information contained in the report was used as the basis for the current DCR size and hazard classification.

A copy of the Geotechnical Consultants report entitled *Talbot Mills Dam Phase I Inspection/Evaluation Report* dated May 22, 2009 was reviewed as part of our services and is included as Appendix C.

As part of the dam inspection done in 2009, a complete survey of the dam and appurtenant structures as well as limited soundings to determine the water depth of the pond were made to provide a more complete and accurate basis for determination of both the DCR size and hazard classification. The survey was done by Eaglebrook Engineering & Survey, LLC in April 2009. A copy of *Site Plan*, drawing EX-1 dated April 20, 2009 is attached as Figure 2. for reference.

There are three primary components to this dam:

- main impoundment and intake structure to the Talbot Mills complex
- main spillway and abutments
- sluiceway and primary intake to the Faulkner Mills complex

##### 1.2.4.1 Main Impoundment

The primary dam structure is of unknown construction and makes up the left (south) portion of the dam. This area of the dam supports Old Elm Street/Faulker Street and separates the Mill Pond from the Talbot Mills complex located on the left bank of the

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<sup>1</sup> <http://www.middlesexcanal.org/gallery.htm>

river just downstream from the dam. Elevations along Old Elm Street/Faulkner Street over this area of the dam range between 114.5 and 116.0 feet NGVD.

A vertical concrete wall was constructed at the southernmost end of the left side of the dam. The 60 foot long concrete wall forms the upstream dam face of the dam and contains five intake gates which formerly provided water to the Talbot Mills. We understand the gates are no longer functional and the intake tunnels upstream of the Talbot Mills were filled with concrete at some time in the past. The top of the concrete wall is at approximately elevation 118.0 at the gates.

A masonry stone wall is located on the upstream side of the dam and is located between the north end of the concrete intake wall and the left abutment of the spillway. The stone wall is approximately 73 feet long. Elevations along the top of the stone wall range between 115.3 feet at the south end and 114.2 feet at the north end adjacent to the spillway abutment.

Further to the south, a stone wall serves as a training wall. The top of the training wall ranges between elevation 112.2 and elevation 114.9 feet. Grades behind the wall slope slightly upward to the old Middlesex Canal Building. Remnants of the old Middlesex Canal alignment are located to the south of the building as shown in Photograph 12.

#### 1.2.4.2 Spillway

Although the primary spillway was not visible at any time during our site visit due to the continued flow, both the left and right abutments were visible and appeared to be constructed of masonry granite blocks. During our final site inspection on 6 November 2015, approximately 6-inches of water was flowing across the top of the spillway. It appears the spillway crest is square-cut with a near vertical face. A portion of the right abutment is constructed of cast-in-place concrete. Spot grades at the top of the abutments range between elevations 111.0± to 111.5±. The top elevation at the primary spillway was estimated in the field due to the high flow at elevation 109.7±. This elevation is consistent with the elevation provided in the FEMA study<sup>2</sup> of the Concord River. A complete copy of the FEMA study is provided in Appendix E.

Two small low level outlets are located in the granite block left abutment. The outlets are blocked although some discharge was observed at the downstream end of the outlets. Invert elevations at the downstream end of the outlets is approximately 100.6 feet. The outlets are shown in Photograph 11.

Numerous bedrock outcrops are visible at the toe of the spillway and form the downstream channel bed. Elevations of the downstream channel bed vary due to the

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<sup>2</sup>Federal Emergency Management Agency, *Flood Insurance Study*, town of Billerica, Massachusetts, Middlesex County; February 8, 1985.

jagged rock profile. However, the estimated grade at the top of rock/toe of spillway near the centerline of the channel is approximately elevation 99.5±.

The primary spillway is approximately 127 feet long with a height of approximately 10.2 feet. Both the left and right spillway abutments provide auxiliary spilling capacity. The left spillway abutment is approximately 17 feet long with the crest at elevation 111.2 feet. The right spillway abutment is approximately 20 feet long with the crest at elevation 111.6 feet.

#### 1.2.4.3 Sluiceway

A sluiceway and intake structure provides water to the Faulkner Mills complex located on the right bank of the river just downstream from the dam. The sluiceway is approximately 13 feet wide and is located on the right side of the dam just east of the right spillway abutment. Walls of the sluiceway are constructed primarily of mortared masonry field stone but portions of the sluiceway are concrete lined. Water in the sluiceway passes under a small bridge supporting Faulkner Street and is discharged into a stilling basin located between Faulkner Street and the Faulkner Mill Complex. The outlet gate from the stilling basin is in an open locked position and directs flows through an intake tunnel to a turbine located within the mill complex. Reportedly, the turbine has not been in service since 1972.

A movable gate and concrete weir are located within the sluiceway just east of the Faulkner Street Bridge. The gate is in poor condition and water continuously bypasses the gate. It is unknown whether or not the gate is operational. There are no other controls for the dam.

A small park is located adjacent to the right abutment of the spillway. The park contains a sitting area and a historic marker dedicated to the employees of the Faulkner Mills. The marker is shown in Photograph 10. Access to the park is available from a paved parking lot just east of the river and south of Faulkner Street by crossing a pedestrian bridge over the sluiceway.

#### 1.2.4.4 Mill Pond

The dam impounds water to form the Mill Pond. Surface area of the irregularly shaped pond was estimated using scaled aerial photographs from several sources. The approximate pond shoreline and computation of surface area are shown on Figure 3. Attached as Appendix G are eight aerial photographs obtained from Environmental Data Resources, Inc. and are specifically prepared for this site. The eight photos contained in the EDR Aerial Photo Decade Packaged were taken between 1938 and 2006 and, in general, show the pond shoreline has remained relatively unchanged throughout this period.

During periods of “normal” flow, we estimated that the pond occupies an area of 8.6± acres and contains two branches which are shown on Figure 3. and the aerial photos

of Appendix G. The west branch forms the main channel of the Concord River. Within the deeper west branch, the current is typically strong throughout the year. The east branch is much shallower, and during the summer months, has almost no flow as evidenced by an annual growth of algae on the pond surface. The delineation between the algae growth and channel flow are clearly visible in the 1980 and 2006 aerial photographs.

A complete profile for the Concord River is contained in the FEMA Flood Study of 1985. Stream bed elevations and water depths through the west branch of the Mill Pond, along the primary flow path of the river, are shown at elevation 98.5± and 16± feet, respectively. Soundings taken in the shallower east branch of the Mill Pond showed the bed level to vary between elevations 108± near the periphery of the pond close to the north shore to elevations 103± at about the centerline of the east branch of the pond. No soundings were made at the south end of the east branch. Based on the general topography and evidence of aquatic plant growth at the south end of the east branch, we expect the water depths to be shallowest in this area. Using the information cited above along with the survey measurements and aerial photographs, we estimate the storage capacity of the Mill Pond at the 100-year flood level is 140 acre-feet.

#### 1.2.4.5 Faulkner Street Bridge

Located immediately downstream from the primary dam spillway is the Faulkner Street Bridge. Having a width of approximately 32 feet, the bridge carries two lanes of vehicle traffic and a pedestrian sidewalk on the west (downstream) side only. The curved concrete arch bridge has an overall length of approximately 120 feet. Each individual span of the dual span concrete arch is approximately 42 feet long at the base. It appears the center pier and abutment footings are armored and founded directly on the bedrock. The bridge can be seen in Photograph 5.

#### 1.2.5 Operations and Maintenance

The responsible party of the operations and maintenance of the Talbot Mills Dam is CRT Development Realty, LLC of Naples, Florida. The caretaker is Mr. Bruce Henriksen of 80 Washington Street in Norwell, Massachusetts.

There are no formal records kept on the operations and maintenance of this dam, nor are there any written operating procedures for this dam.

No records could be found for any repairs, either major or minor made to this dam.

#### 1.2.6 DCR Size Classification

Talbot Mills dam has a height of approximately 10.2 feet measured from the lowest portion of the dam spillway to the lowest point in the channel at the downstream toe of the dam. The maximum storage capacity of the dam is 140 acre-feet. Therefore, in accordance with Department of Conservation and Recreation Office of Dam Safety classification, under Commonwealth of Massachusetts dam safety rules and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, Talbot Mills Dam is an intermediate size structure.

#### 1.2.7 DCR Hazard Classification

Talbot Mills Dam is located along Old Elm Street/Faulkner Street in North Billerica, Massachusetts immediately upstream from the Faulkner Street Bridge. It appears that a failure of the dam at maximum pool will not result in significant damage to the bridge or other downstream structures based on our review of the available flood records.

A review of the aerial photographs and topographic maps of the Concord River downstream of the Talbot Mills Dam indicated that the potential damage to habitable structures will be minor since no structures are in the direct path of the probable flood wave produced upon failure of the dam. In addition, both the Town of Billerica and the City of Lowell have adopted zoning and conservation bylaws which are consistent with FEMA recommendations for construction within the floodway. As a result, no more than a 2.0 foot incremental rise of flood water above the lowest ground elevation adjacent to the outside foundation walls, nor more than a 2.0 foot incremental rise of flood water above the lowest habitable floor elevation of structures within the floodway is likely to occur in the event of dam breach at the Talbot Mills Dam during the design flood event.

Given the minimal rise in flood water downstream in the event of a dam failure, the risk of loss of life and damage to homes, industrial or commercial facilities, secondary highways or railroads is considered to be low. Additionally, flooding as a result of a dam breach to the Talbot Mills Dam is unlikely to cause interruption of use or service of relatively important facilities located downstream of the dam.

Therefore, in accordance with Department of Conservation and Recreation classification procedures, under Commonwealth of Massachusetts dam safety rules and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, Talbot Mills should be classified as a Significant (Class II) hazard potential dam. The Hazard Potential Classification recommendation is consistent with the Hazard Potential Classification on record with the Office of Dam Safety for Talbot Mills Dam.

### 1.3 Pertinent Engineering Data

#### 1.3.1 Drainage Area

The drainage area for the Talbot Mills Dam is approximately 370 square miles and extends through the communities of Concord Carlisle, Bedford, and Billerica. The two major waterways in Billerica are the Concord and Shawsheen Rivers. The Concord River is formed by the confluence of the Assabet and Sudbury Rivers, approximately one mile northwest of the center of Concord. The river system is often referred to as the Sudbury-Assabet-Concord (SuAsCo) river basin.

The Concord River flows sluggishly in a general northerly direction for approximately 16 miles before joining the Merrimack River in Lowell and falls 62 feet over its course. Approximately 50 feet of the drop occurs at dams in the first mile of the river in Lowell; downstream from the Talbot Mills Dam. The 11.5-mile reach of the Concord River from its confluence with the Assabet and Sudbury Rivers in Concord to North Billerica is controlled by the Talbot Mills Dam.

#### 1.3.2 Reservoir

	Length <sup>1</sup> (feet)	Width <sup>1</sup> (feet)	Surface Area (acres)	Storage Volume (acre-feet)
Normal Pool	1300	720	8.6	110
Maximum Pool	1360	780	12.6	162
SDF Pool	--	--	10.7	140

1. Maximum dimension

#### 1.3.3 Discharges at the Dam Site

Storm Event	Peak Discharges at Talbot Mills Dam (cfs)
10 Year	2,940
50 Year	4,660
100 Year	5,675
500 Year	8,395

#### 1.3.4 General Elevations (feet - Referenced to NGVD of 1929)

A.	Top of Dam	114.6
B.	Spillway Design Flood Pool (100 Yr.)	114.2
C.	Normal Pool	110.5
D.	Spillway Crest	109.7
E.	Upstream Water at Time of Inspection	110.8
F.	Downstream Water at Time of Inspection	100.5
G.	Streambed at Toe of the Dam	99.5
H.	Low Point along Toe of the Dam	99.5

#### 1.3.5 Main Spillway

A.	Type	Broad Crest
B.	Length	127 feet
C.	Invert Elevation	109.7 feet
D.	Upstream Channel Elevation	98.5 feet
E.	Downstream Channel Elevation	99.5 feet
F.	Downstream Water	100.5 feet

#### 1.3.6 Lower Level Outlet

A.	Type	Sluiceway with Gate
B.	Number of bays:	2 (at left spillway abutment)
C.	Invert:	105.7 feet
D.	Bay size:	13 feet open channel

#### 1.3.7 Design and Construction Records

No construction records or design data were available for review during the inspection and preparation of this report.

#### 1.3.8 Operating Records

There were no operating records or records of rainfall or pond height for this dam available at the time of the inspection.

## SECTION 2

### 2.0 INSPECTION

#### 2.1 Visual Inspection

Talbot Mills Dam was inspected on 28 October 2015 and 6 November. At the time of the final inspection, the weather was in cloudy and in the 50's. Photographs to document the current conditions of the dam were taken during the inspections and are included in Appendix A. The level of the impoundment was approximately 110.8 on 6 November 2015. Underwater areas were not inspected. A copy of the inspection checklist is included in Appendix B.

##### 2.1.1 General Findings

In general, Talbot Mills Dam was found to be in fair condition due to the lack of routine maintenance and operational procedures. We observed no structural defects or concerns. The specific concerns are identified in more detail in the sections below.

##### 2.1.2 Dam

###### *Abutments*

The left and right abutments appear sound with no evidence of erosion, significant seepage or cracking. Both abutments of the spillway appear to be founded on bedrock.

###### *Embankments*

The left embankment is of unknown construction but most likely consists of an earthen structure supporting Old Elm Street/Faulkner Street. Immediately downstream of the left embankment is the Talbot Mills Complex. No inspection was made of the interior space of the mill complex.

###### *Upstream Face*

The upstream face of the left embankment is constructed with a near vertical facing wall. Overall, the wall is approximately 133 long with a 60-foot long concrete facing at the south end and a 73-foot long stone masonry face between the concrete wall and the primary abutment to the north. Intake gates for the Talbot Mills complex are located at the concrete wall. However the gates are not operational and the intake tunnels have reportedly been infilled with concrete.

The tops of both the stone masonry and concrete facing walls are in good conditions with no observed cracks, bulges or misalignments. No evidence of erosion, sloughing or other indications of instability were observed at any time during our inspections.

### *Crest*

The crest of the embankment is nearly flat and level and supports the paved surface of Old Elm Street/Faulkner Street. This portion of the road leading to the Faulkner Street Bridge shows no indications of erosion or undue wear from traffic (either pedestrian or vehicular) and the area is well-maintained. Several trees are located at the upstream side of the crest; near the Talbot Mills intake gates.

### *Downstream Face*

The Talbot Mills complex is located at the downstream face of the embankment. No inspection was made of the interior space of the mill complex.

Right of the Spillway - This area is comprised of a portion of the Faulkner Street Embankment which is located between the right spillway abutment, the sluiceway and the stilling basin. This area is well maintained.

### *Drains*

There were no drains in use or visible at this dam at the time of our inspection.

### *Instrumentation*

There were no instruments at this dam at the time of our inspection.

### *Access Roads and Gates*

Access to the dam is via Old Elm and Faulkner Streets. The intake gates at the left side of the dam which formerly provided water to the Talbot Mills are not operational and the intake tunnels have reportedly been infilled with concrete.

A movable gate and concrete weir are located within the sluiceway just east of the Faulkner Street Bridge. The gate is in poor condition and water continuously bypasses the gate. It is unknown whether or not the gate is operational.

## 2.1.3 Appurtenant Structures

### *Primary Spillway*

Although the primary spillway was not visible at any time during our site visit due to the continued flow, both the left and right abutments were visible and appeared to be constructed of masonry granite blocks. Information contained in the previous inspection report characterize the spillway as a granite block structure forming a broad crested weir. During our final site inspection on 6 November 2015 , approximately 6-inches of water was flowing across the top of the spillway. It appears the spillway crest is square-cut with a near vertical face.

The primary spillway is approximately 127 feet long with a height of approximately 10.2 feet. Direct measurement of the top of spillway elevation was not possible due to the continuous flow during each of our site visits. The top elevation at the primary spillway is estimated to be at elevation 109.7±. This elevation is consistent with the

data provided in the FEMA study<sup>3</sup> of the Concord River and the elevation shown on the river profile. A complete copy of the FEMA study is provided in Appendix E.

The primary spillway is flanked by small granite block abutments. A portion of the right abutment is constructed of cast-in-place concrete. At flood stages, the abutments serve as auxiliary spillways and provide additional discharge capacity. Spot grades at the top of the abutments range between elevations 111.2± to 111.6± with lengths of approximately 17 feet at the left abutment and 20 feet at the right abutment.

Numerous bedrock outcrops are visible at the toe of the spillway and form the downstream channel bed. Elevations of the downstream channel bed vary due to the jagged rock profile which can be seen in Photographs 2 and 5. However, the estimated grade at the top of rock/toe of spillway near the centerline of the channel is approximately elevation 99.5±.

A small tree which was once thriving amongst the jagged bedrock channel just downstream of the primary spillway is now declining in health with portions of the tree laying just downstream of the primary spillway. This tree was noted in the 1999 report prepared by Weston & Sampson and the 2009 report prepared by Geotechnical Consultants and is clearly visible in the photographs contained in those reports and in the attached Photographs 2 and 5.

Based on the FEMA study, the flood elevation for the 100 year storm event at the Talbot Mills Dam crests at elevation 114.7 feet and the estimated river flow at the dam is 5,675 cfs. A check of the spillway capacity is provided in Appendix F. At the 100 year design level, we estimate the spillway capacity to be approximately 6,650 cfs. Our estimate compares favorably with the estimated capacity provided in the 1999 Weston & Sampson report and the 2009 Geotechnical Consultants report. Therefore, the spillway, in its current state is adequate to pass the design flood.

#### *Low Level Outlet*

There is no operational low level outlet for the dam. A sluiceway and intake structure provides water to the Faulkner Mills complex located on the right bank of the river just downstream from the dam. The sluiceway is approximately 13 feet wide and is located on the right side of the dam just east of the right spillway abutment. Walls of the sluiceway are constructed primarily of mortared masonry field stone but portions of the sluiceway are concrete lined. Water in the sluiceway passes under a small bridge supporting Faulkner Street and is deposited into a stilling basin located between Faulkner Street and the Faulkner Mill Complex. From the stilling basin, the outlet gate is in an open locked position and directs flows to a turbine which reportedly has not been in service since 1972.

---

<sup>3</sup>Federal Emergency Management Agency, *Flood Insurance Study*, Town of Billerica, Massachusetts, Middlesex County; February 8, 1985.

A movable gate and concrete weir are located within the sluiceway just east of the Faulkner Street Bridge. The gate is in poor condition and water continuously bypasses the gate. It is unknown whether or not the gate is operational. There are no other controls for the dam.

Two small low level outlets are located in the granite block left abutment of the spillway. The outlets are blocked although some discharge was observed at the downstream end of the outlets. The conditions of the upstream end of the outlets was not visible for inspection. Invert elevations at the downstream end of the outlets is approximately 100.6 feet. The outlets are shown in Photograph 11.

#### 2.1.4 Downstream Area

Downstream of the dam are the Talbot Mills and Faulkner Mills complexes. Both of these complexes are founded on the exposed bedrock walls adjacent to the downstream channel. Beyond the mill complexes, is a series floodplains and wetlands areas.

#### 2.1.5 Reservoir Area

The Talbot Mill Dam impounds water to form the Mill Pond. Surface area of the irregularly shaped pond was estimated using scaled aerial photographs from several sources taken over many years. For all years reviewed, the pond shoreline was relatively unchanged.

The pond is comprised of two branches. The west branch forms the main channel of the Concord River and is the deeper of the two while the east branch is much shallower. During the summer months, the east branch has almost no flow as evidenced by an annual growth of algae on the pond surface. The topography surrounding the pond is relatively flat and level with negligible risk of slides which potentially could affect the water level. A wetland area is located at the south end of the east branch which provides significant reserve capacity during periods of flooding.

## 2.2 Caretaker Interview

The caretaker is Mr. Bruce Henriksen of 80 Washington Street, Building S, in Norwell, Massachusetts. Mr. Henriksen was first interviewed on 18 November 2015. He has taken over the caretaker position from William Martin since our inspection in 2009. At the time of our interview Mr. Henriksen did not know of a maintenance plan or of any work that taken place on the dam since he became involved.

According to Mr. Robert Martin, although originally part of the Talbot Mills and Faulkner Mills properties, when the mill complexes were sold in recent years, the dam site remained the possession of CRT Development Realty, LLC. Although the dam provided water power to the mill complexes, it is presently used exclusively for

recreation, flood control and kept for its historical significance.

Mr. Martin indicated that no formal operation or maintenance plan exists for the dam and due to the formerly disputed ownership, no maintenance has been performed at the dam for several years. He did state that some level of clearing debris has taken place since the last inspection.

### 2.3 Operation and Maintenance Procedures

At the time of the inspection there were no formal operation or maintenance plans available.

#### 2.3.1 Operational Procedures

The dam spillway is uncontrolled, which means that the fixed elevation of the spillway crest controls the level of the impoundment. No other operational procedures are in place, or are required, for this dam.

#### 2.3.2 Maintenance of Dam and Operating Facilities

There are no maintenance plans available for this dam.

### 2.4 Emergency Warning System

There was no information found on an emergency warning system for this dam. In 302 CMR 10.00: Dam Safety, Department of Conservation and Recreation, it is stated that all dams classified or reclassified as high hazard potential shall have an Emergency Action Plan ("EAP"). Therefore this dam does not need an EAP unless the Commissioner requires it from the Owner.

### 2.5 Hydrologic/Hydraulic Data

Talbot Mills Dam is an intermediate size, Class II (Significant) hazard structure and in accordance with Massachusetts Law, the spillway design flood (SDF) for the site is ¼ PMF (100 year) storm event. A FEMA flood study was completed for the Town of Billerica in 1985. A copy of the study entitled *Flood Insurance Study*, Town of Billerica, Massachusetts, Middlesex County; February 8, 1985 is included as Appendix E.

### 2.6 Structural and Seepage Stability

#### 2.6.1 Embankment Structural Stability

Based on our inspection and review, as well as historical evidence, the dam is stable. The spillway appears intact with a level crest. The impoundment side walls are vertical and level. The embankment supports Old Elm/Faulkner Street is paved and

in good condition. There are no signs of vehicular ruts, foot trails, sloughing or animal burrows.

### 2.6.2 Structural Stability of Non-Embankment Structures

From our observations the Talbot Mills and Faulkner Mills complexes are founded on the exposed bedrock walls adjacent to the downstream channel. The Faulkner Street Bridge, as it appears, the center pier and abutment footings are armored and founded directly on the bedrock. We recommend that the necessary data should be collected to complete an analyses of the structural stability of non-embankment structures in accordance with 302 CMR 10.14.

### 2.6.3 Seepage Stability

There was no significant seepage observed during our site visits on 28 October 2015 and 6 November 2015. No seepage instrumentation was available and it appears that all field stone and concrete is founded on rock.

## SECTION 3

### 3.0 ASSESSMENT AND RECOMMENDATIONS

#### 3.1 Assessments

The Talbot Mills Dam is located in Middlesex County in the village of North Billerica, Massachusetts. North Billerica is an unincorporated village of the town of Billerica, Massachusetts; one of nine villages that make up the Town of Billerica.

The Concord River flows through North Billerica, and at the old Talbot and Faulkner Mills, is the Mill Pond and Dam marking the area where the old Middlesex Canal crossed over the river. This run-of-the river dam and the impoundment are shown on the Billerica USGS quadrangle map at the following approximate coordinates:

Latitude:	42.59173° North
Longitude:	71.28400° East

In 2009, Geotechnical Consultants, Inc. completed an evaluation study of the Talbot Mills Dam as part of its contract with the owner. This is the last known inspection report for the dam and the information contained in the report was used as the basis for the current DCR size and hazard classification.

A copy of the Geotechnical Consultants report entitled *Talbot Mills Dam Phase I Inspection/Evaluation Report* dated May 22, 2009 was reviewed as part of our services and is included as Appendix C.

In the previous report, a complete survey of the dam and appurtenant structures as well as limited soundings to determine the water depth of the pond depth were made to provide a more complete and accurate basis for determination of both the DCR size and hazard classification. The survey was done by Eaglebrook Engineering & Survey, LLC in April 2009. A copy of *Site Plan*, drawing EX-1 dated April 20, 2009 is attached as Figure 2. for reference.

A review of the aerial photographs and topographic maps of the Concord River downstream of the Talbot Mills Dam indicated that the potential damage to habitable structures will be minor since no structures are in the direct path of the probable flood wave produced upon failure of dam. In addition, both the Town of Billerica and the City of Lowell have adopted zoning and conservation bylaws which are consistent with FEMA recommendations for construction within the floodway. As a result, no more than a 2.0 foot incremental rise of flood water above the lowest ground elevation adjacent to the outside foundation walls, nor more than a 2.0 foot incremental rise of flood water above the lowest habitable floor elevation of structures within the floodway is likely to occur in the event of dam breach at the Talbot Mills Dam during the design flood event.

Given the minimal rise in flood water downstream in the event of a dam failure, the risk of loss of life and damage to homes, industrial or commercial facilities, secondary highways or railroads is considered to be low. Additionally, flooding as a result of a dam breach at the Talbot Mills Dam is unlikely to cause interruption of use or service of relatively important facilities located downstream of the dam.

Therefore, in accordance with Department of Conservation and Recreation classification procedures, under Commonwealth of Massachusetts dam safety rules and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, Talbot Mills Dam should be classified as a Class II (significant) hazard structure.

Based on the FEMA flood study of 1985 and the estimated spillway capacity, there is little risk of overtopping during the Spillway Design Flood (SDF) for the 100-year recurrence interval. Historical reports suggest the dam has never experienced overtopping. For the Talbot Mills Dam, the spillway capacity is adequate to pass the Spillway Design Flood (SDF) for the 100-year recurrence interval which produces a flow of 5,675 cfs.

In general, the overall condition of Talbot Mills Dam is fair. This condition is primarily due to the lack of operation and maintenance plans. The noted deficiencies include:

- Lack of operation and maintenance plan.
- Lack of routine oversight of the dam, particularly during a storm event.
- Lack of working controls.
- Lack of functional low level outlet.
- Leaks and inability to control water at the sluiceway gate and weir.

When compared with the conditions reported in the previous inspection/evaluation report dated May 22, 2009, no significant changes were found. No seepage or other indications of instability were found in the embankment, walls, spillway or spillway abutments.

The following recommendations and remedial measures generally describe the recommended approach to address current deficiencies at the dam. Prior to undertaking recommended maintenance, repairs and remedial measure, the applicability of environmental permits needs to be determined prior to undertaking activities that may occur within resource areas under the jurisdiction of local conservation commissions, MADEP, or other regulatory agencies.

### 3.2 Studies and Analyses

In 302 CMR 10.00: Dam Safety, Department of Conservation and Recreation, it is stated that all dams classified or reclassified as high hazard potential shall have an Emergency Action Plan ("EAP"). Therefore this dam does not need an EAP unless

the Commissioner requires it from the Owner. We do recommend that an Operations and Maintenance (O&M) Manual should be implemented.

### 3.3 Recurrent Maintenance Recommendations

There is no routine maintenance procedures in place for this dam. A comprehensive maintenance and “routine” inspection plan should be implemented.

1. Regular maintenance activities should prevent growth of unwanted vegetation on the embankment, and pond periphery to reduce the potential for debris to impede flow over the spillway and downstream channel.
2. Clear debris from the spillway and downstream channel on a regular basis. Inspect the spillway for accumulation of debris particularly after storm events or other periods of high runoff.
3. Regularly inspect the dam for indications of seepage or erosion. Particular emphasis should be placed on:
  - the spillway wall
  - portions of the impoundment facing walls immediately adjacent to the spillway on the left side of the dam
  - the fieldstone wall immediately downstream of the spillway and north of the Faulkner Street Bridge
  - removal of debris and unwanted vegetation from the sluiceway and stilling basin on the right side of the primary spillway.

### 3.4 Recommendations, Maintenance, and Minor Repairs

These recommendations may require construction by a contractor experienced in dam repair.

- Remove trees on the upstream face of the roadway embankment near the non-functional intake gates to the Talbot Mills complex.
- Remove trees on the just downstream of the primary spillway.
- Inspect the interior of the of the Talbot Mills complex, particularly the downstream end of the former intake structures. The infilling of the intake tunnels on the left side of the dam rendered these intakes inoperable. Given the configuration of the dam, proximity of the mill complexes, and change in ownership of the downstream properties, the re-construction of a low level outlet in this area is impractical.
- Repair/replace the sluiceway and stilling basin gates so that the gates are operational and can provide emergency bypass control.

- Repair/replace the left spillway abutment to provide an operational low level outlet

### 3.5 Opinion of Probable Construction Costs

The following conceptual opinions of probable construction costs have been developed for the recommendations and remedial measures noted above. The costs herein are based on a limited investigation and are provided for general information only. This should not be considered an engineer's estimate, as actual construction costs may be somewhat less or considerably more than indicated

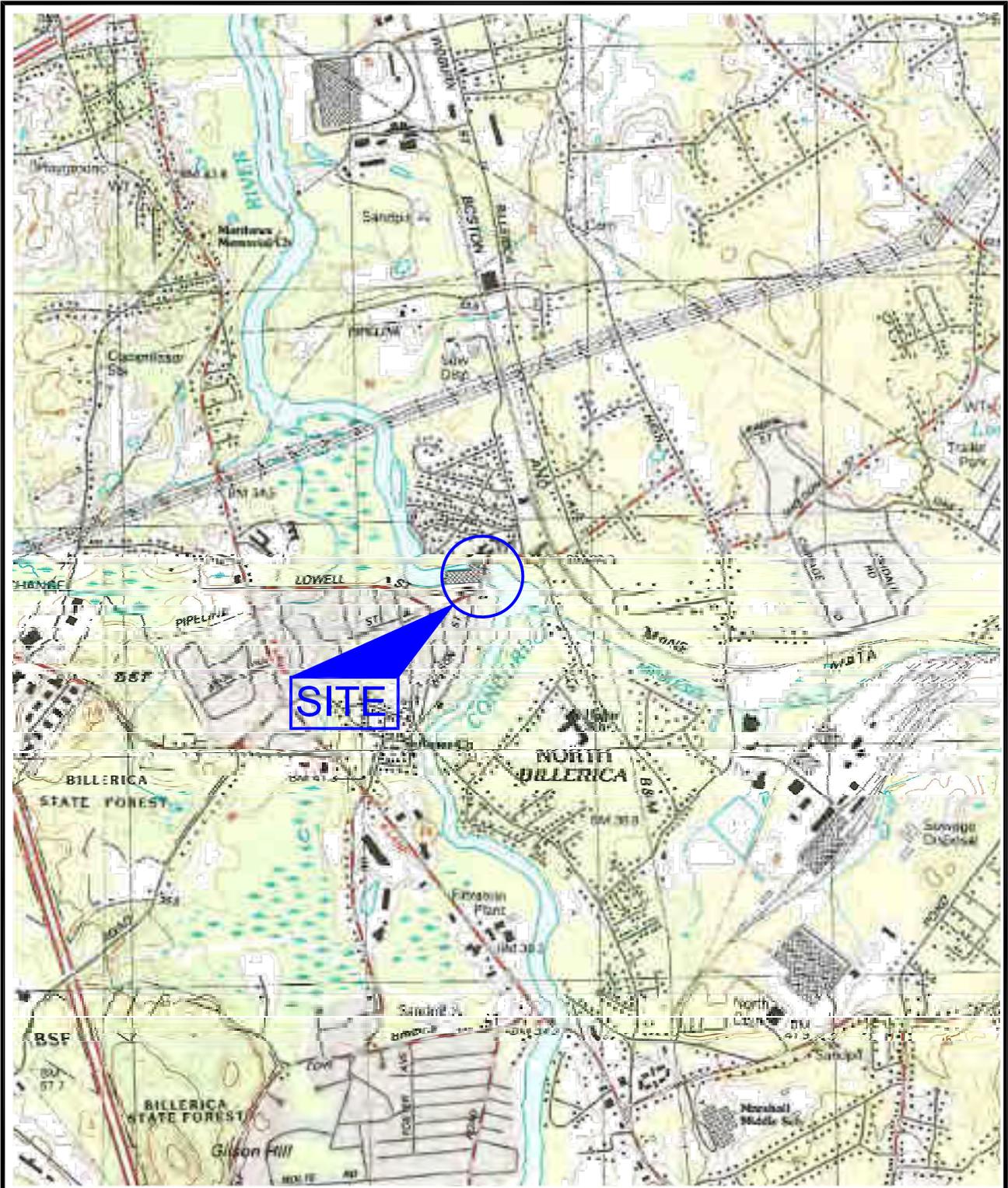
#### **Talbot Mills Dam**

- |   |          |
|---|----------|
| • Remove trees  | \$5,000  |
| • Repair/replace the sluiceway and stilling basin gates | \$60,000 |
| • Repair/replace the left spillway and install gates    | \$40,000 |

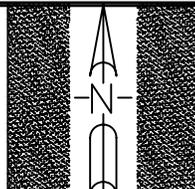
## 1.1 Summary Data Table

Required Phase I Report Data	Data Provided by the Inspecting Engineer
National ID #	MA 00774
Dam Name	Talbot Mills Dam
Dam Name (Alternate)	Old Elm Street/Old Elm Street Extension
River Name	Concord River
Impoundment Name	Mill Pond (a.k.a. Talbot Mills Pond or Faulkner Mills P
Hazard Class	Significant
Size Class	Intermediate
Dam Type	Masonry/Earth (Spillway: Masonry Gravity)
Dam Purpose	Recreational and flood control purposes
Structural Height of Dam (feet)	16±
Hydraulic Height of Dam (feet)	10.2
Drainage Area (sq. mi.)	370
Reservoir Surface Area (acres)	10.7
Normal Impoundment Volume (acre-feet)	110±
Max Impoundment Volume ((top of dam) acre-feet)	162
SDF Impoundment Volume* (acre-feet)	140
Spillway Type	Broad Crest granite Masonry
Spillway Length (feet)	127
Freeboard at Normal Pool (feet)	5
Principal Spillway Capacity* (cfs)	6030
Auxiliary Spillway Capacity* (cfs)	620
Low-Level Outlet Capacity* (cfs)	Unknown - Gate is non-functional
Spillway Design Flood* (flow rate - cfs)	100 year / 5,675 cfs
Winter Drawdown (feet below normal pool)	0
Drawdown Impoundment Vol. (acre-feet)	110
Latitude	42.59173° North
Longitude	71.28400° East
City/Town	Billerica
County Name	Middlesex
Public Road on Crest	Faulkner Street
Public Bridge over Spillway	Faulkner Street Bridge
EAP Date (if applicable)	0
Owner Name	CRT Development Realty, LLC
Owner Address	242 5th Street South
Owner Town	Naples, FL 34102
Owner Phone	978-314-8080
Owner Emergency Phone	0
Owner Type	Private
Caretaker Name	Mr. Bruce Henriksen
Caretaker Address	80 Washington Street, Building S
Caretaker Town	Norwell, MA 02061
Caretaker Phone	781-878-9111
Caretaker Emergency Phone	0
Date of Field Inspection	11/6/2015
Consultant Firm Name	Geotechnical Consultants, Inc.
Inspecting Engineer	Daniel Kenneally
Engineer Phone Number	508-229-0900

\*In the event a hydraulic and hydrologic analysis has not been completed for the dam, indicate "No H&H" in this table, recommendation section shall include specific recommendation to hire a qualified dam engineering consultant to conduct analysis to determine spillway adequacy in conformance with 302 CMR 10.00.



TALBOT MILLS DAM  
 Billerica, Massachusetts  
 NID ID# MA00774



LOCUS PLAN  
 U.S.G.S. QUADRANGLE  
 Billerica  
 APPROX. SCALE 1:24 000

**Geotechnical  
 Consultants, Inc.**

201 Boston Post Road West  
 Marlborough, MA 01752  
 (508)229-0900 FAX (508)229-2279



GCI Project # 2154003

Figure 1.



EAGLEBROOK

EAGLEBROOK ENGINEERING & SURVEY, LLC

199 NEWBURY STREET  
DANVERS, MASS. 01923  
TEL: (781) 771-7310

Geotechnical Consultants, Inc.

201 Boston Post Road West  
Marlborough, MA 01752  
Phone: (508)229-0900  
FAX (508)229-2279  
www.geotechnical.us

TALBOT MILL DAM  
LOCATED IN  
BILLERICA, MASSACHUSETTS  
PREPARED FOR  
GEOTECHNICAL CONSULTANTS, INC.  
201 BOSTON POST ROAD WEST  
MARLBOROUGH, MASSACHUSETTS



DATE:  
APRIL 20, 2009

NO.	DATE	DESCRIPTION
1	5-22-09	Spillway Grades

DRAWN BY: MJJ  
CHECKED BY: MJJ/RP  
SCALE: AS NOTED

PROJECT NO. 09-011

TITLE:  
**SITE PLAN**  
**EX-1**

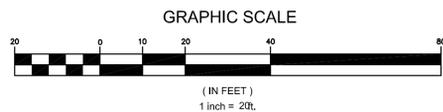
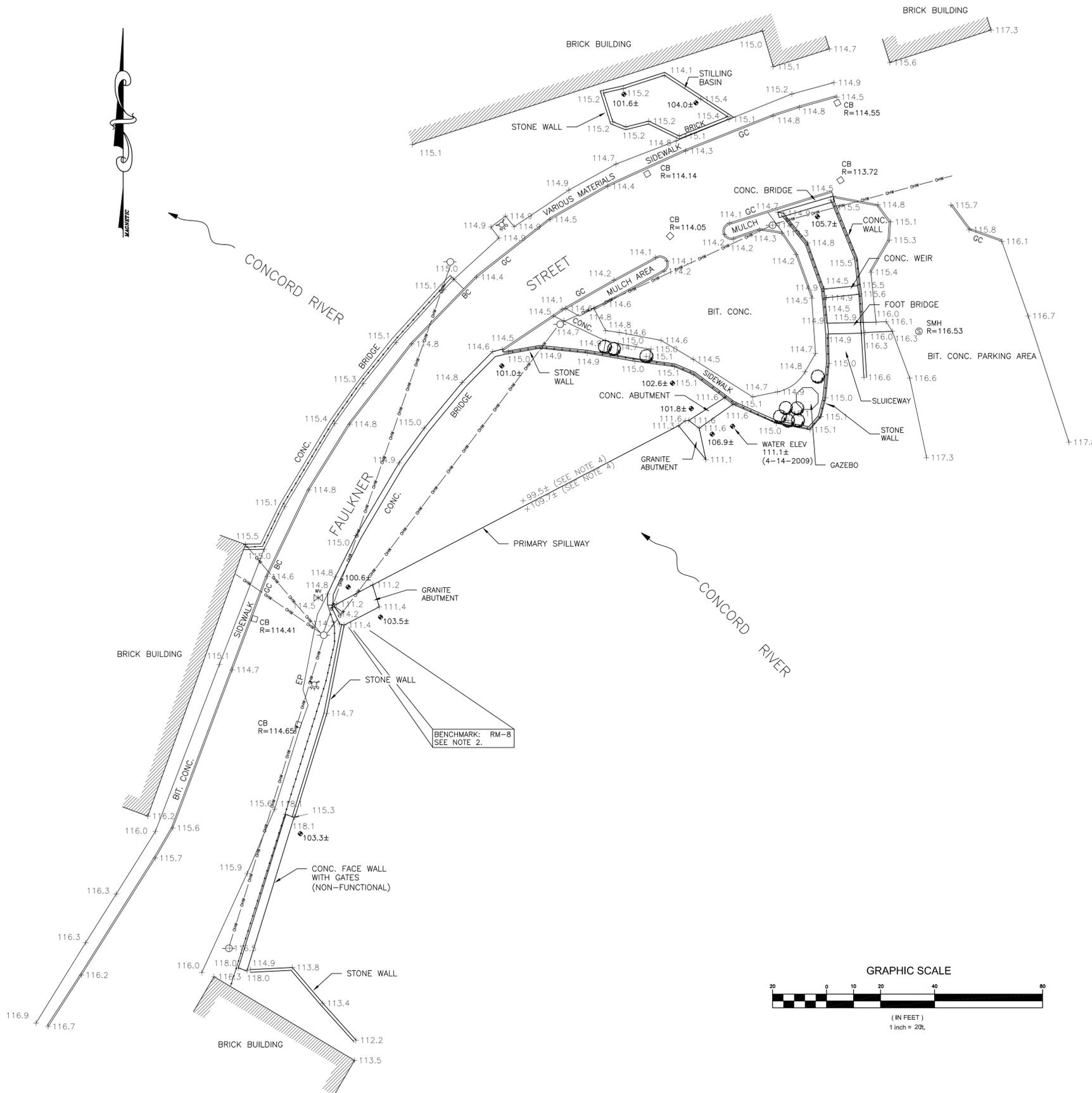
SHEET No. 1 OF 1

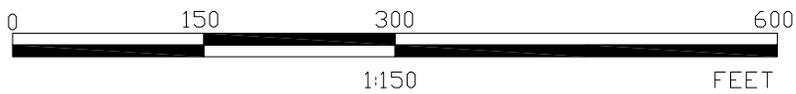
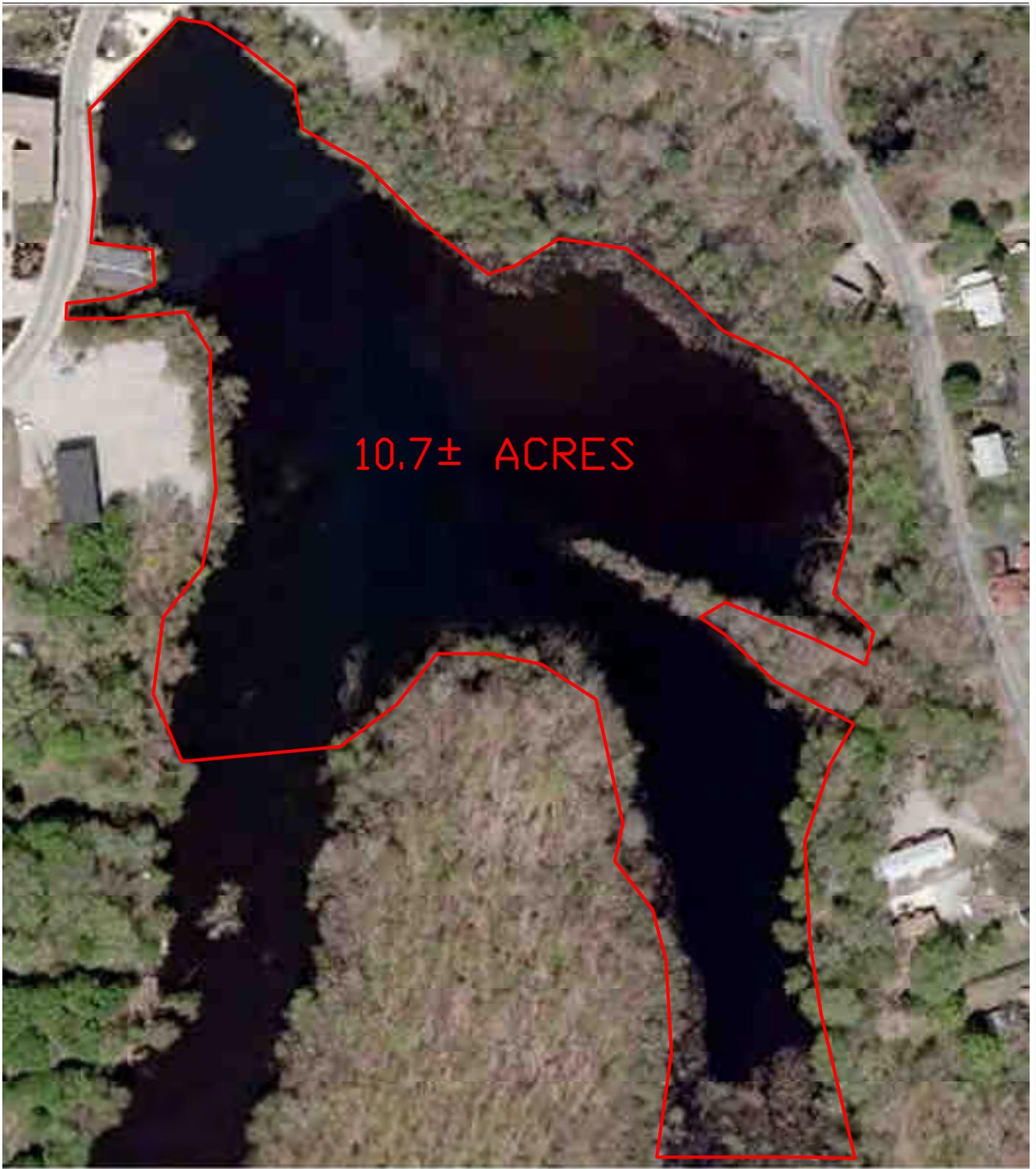
NOTES:

1. THE FIELD WORK WAS PERFORMED ON APRIL 14, 2009. A MAGNETIC NORTH READING WAS OBTAINED DURING THE FIELD WORK.
2. THE STARTING VERTICAL BENCHMARK IS THE NORTHEAST SIDE OF THE TOP OF GRANITE BLOCK, AT THE SOUTHWEST END OF THE TALBOT MILL DAM NEAR FAULKNER STREET, ON THE SOUTHWEST SIDE OF THE SPILLWAY AT GROUND LEVEL. A SQUARE CUT WAS NOT FOUND ON THE GRANITE BLOCK. ELEVATION IS 114.26 (RM-8) ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 AS DEPICTED ON THE FEMA FLOOD MAP 250183, PANEL 5 OF 10 DATED AUGUST 5, 1985. A BENCHMARK WAS CHECKED AS PROVIDED BY THE BILLERICA ENGINEERING DEPARTMENT SINCE THE SQUARE CUT WAS NOT VISIBLE. THE BENCHMARK VERIFIED THE ACCURACY OF RM-8. IT IS DESCRIBED AS A HYDRANT SPINDLE AT THE SOUTHEAST CORNER OF LOWELL STREET AND TALBOT STREET (ELEV. 131.39)
3. THE SOLE PURPOSE OF THIS PLAN IS TO DEPICT PLANIMETRIC AND SPOT ELEVATIONS IN THE VICINITY OF THE TALBOT MILL DAM.
4. GRADES AT MID-POINT OF SPILLWAY WERE TAKEN FROM FEMA FLOOD INSURANCE STUDY DATED FEBRUARY 5, 1985.

LEGEND:

- BIT. CONC. BITUMINOUS CONCRETE
- GC GRANITE CURB
- CONC. CONCRETE
- CB CATCHBASIN
- R RIM
- SMH SEWER MANHOLE
- +110.0 SPOT ELEVATION
- 110.0± GROUND ELEVATION (UNLESS NOTED OTHERWISE)
- TREE
- EP EDGE OF PAVEMENT
- BC BITUMINOUS CONCRETE CURB
- UTILITY POLE
- OHW- OVERHEAD WIRES





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 (508)229-0900 FAX (508)229-2279

Rev.	Date
0	6 NOVEMBER 2015

**TALBOT MILLS DAM**  
 FAULKNER STREET  
 Billerica, Massachusetts

**FIG. 3**

## **APPENDIX A**



**Photograph 1. Overview of Talbot Mills Dam Looking Downstream**



**Photograph 2. Overview of Talbot Mills Dam Looking Upstream**



**Photograph 3. Concrete Wall and Intake Gates Left of Spillway**



**Photograph 4. Downstream of Spillway Viewed from Left Abutment**



**Photograph 5. Falkner Street Bridge Viewed from Right Abutment**



**Photograph 6. Downstream Channel Viewed from Falkner Street Bridge**



**Photograph 7. Stilling Basin with Outlet Gate Locked in Open**



**Photograph 8. Sluiceway with Movable Gate and Concrete Weir**



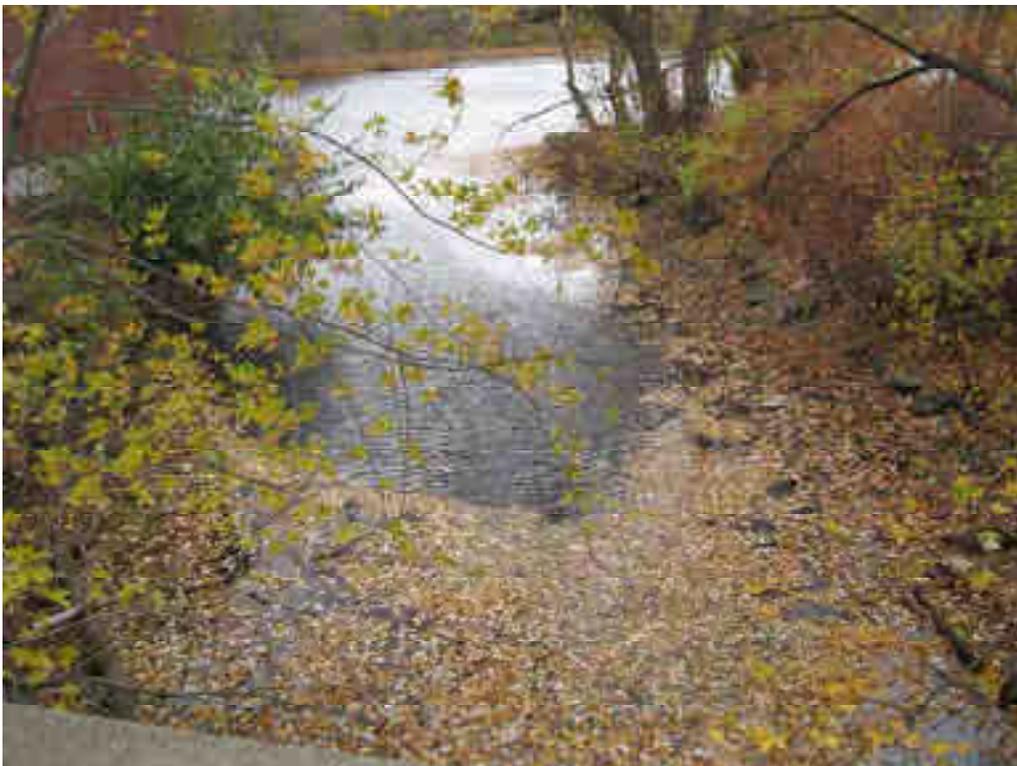
**Photograph 9. Water Seepage Through the Sluiceway Gate**



**Photograph 4. Historic Marker Dedicated to the Employees of Faulkner Mills**



**Photograph 11. Lower Level Outlet at Left Spillway Abutment**



**Photograph 12. Alignment of Old Middlesex Canal**

## **APPENDIX B**

### DAM SAFETY INSPECTION CHECKLIST

NAME OF DAM: <u>Talbot Mills Dam</u>	STATE ID #: <u>4-9-31-1</u>
REGISTERED: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	NID ID #: <u>MA 00774</u>
STATE SIZE CLASSIFICATION: <u>Intermediate</u>	STATE HAZARD CLASSIFICATION: <u>Significant</u>
	CHANGE IN HAZARD CLASSIFICATION REQUESTED?: <u>No</u>
<u><i>DAM LOCATION INFORMATION</i></u>	
CITY/TOWN: <u>Billerica</u>	COUNTY: <u>Middlesex</u>
DAM LOCATION: <u>67 Faulkner Street</u> (street address if known)	ALTERNATE DAM NAME: <u>Old Elm Street/Old Elm Street Extension</u>
USGS QUAD.: <u>Billerica</u>	LAT.: <u>42.59173° North</u> LONG.: <u>71.28400° East</u>
DRAINAGE BASIN: <u>Concord</u>	RIVER: <u>Concord River</u>
IMPOUNDMENT NAME(S): <u>Mill Pond (a.k.a. Talbot Mills Pond or Faulkner Mills Pond)</u>	
<u><i>GENERAL DAM INFORMATION</i></u>	
TYPE OF DAM: <u>Masonry/Earth (Spillway: Masonry Gravity)</u>	OVERALL LENGTH (FT): <u>316</u>
PURPOSE OF DAM: <u>Recreational and flood control purposes</u>	NORMAL POOL STORAGE (ACRE-FT): <u>110±</u>
YEAR BUILT: <u>circa 1828</u>	MAXIMUM POOL STORAGE (ACRE-FT): <u>162</u>
STRUCTURAL HEIGHT (FT): <u>16±</u>	EL. NORMAL POOL (FT): <u>110.5±</u>
HYDRAULIC HEIGHT (FT): <u>10.2</u>	EL. MAXIMUM POOL (FT): <u>114.8±</u>
<u><i>FOR INTERNAL MADCR USE ONLY</i></u>	
FOLLOW-UP INSPECTION REQUIRED: <input type="checkbox"/> YES <input type="checkbox"/> NO	CONDITIONAL LETTER: <input type="checkbox"/> YES <input type="checkbox"/> NO

NAME OF DAM: <u>Talbot Mills Dam</u>		STATE ID #: <u>4-9-31-1</u>	
INSPECTION DATE: <u>November 6, 2015</u>		NID ID #: <u>MA 00774</u>	
<u>INSPECTION SUMMARY</u>			
DATE OF INSPECTION: <u>November 6, 2015</u>		DATE OF PREVIOUS INSPECTION: <u>May 22, 2009</u> <input type="checkbox"/> YE <input checked="" type="checkbox"/> N	
TEMPERATURE/WEATHER: <u>50's, Cloudy</u>		ARMY CORPS PHASE I: <input checked="" type="checkbox"/> YE <input type="checkbox"/> N If YES, date _____	
CONSULTANT: <u>Geotechnical Consultants, Inc.</u>		PREVIOUS DCR PHASE I: _____ If YES, date <u>5/22/2009</u>	
BENCHMARK/DATUM: <u>NGVD 1929</u>			
OVERALL PHYSICAL CONDITION OF DAM: <u>FAIR</u>		DATE OF LAST REHABILITATION: <u>Unknown</u>	
SPILLWAY CAPACITY: <u>&gt;100% SDF w/ no actions by Caretaker</u>			
EL. POOL DURING INSP.: <u>110.8±</u>		EL. TAILWATER DURING INSP.: <u>100.5±</u>	
<u>PERSONS PRESENT AT INSPECTION</u>			
<u>NAME</u>	<u>TITLE/POSITION</u>	<u>REPRESENTING</u>	
<u>Daniel Kenneally</u>	<u>Professional Engineer</u>	<u>Geotechnical Consultants, Inc.</u>	
_____	_____	_____	
_____	_____	_____	
_____	_____	_____	
_____	_____	_____	
<u>EVALUATION INFORMATION</u>			
		Click on box to select E-code	Click on box to select E-code
E1) TYPE OF DESIGN	<input type="text" value="1"/>	E8) LOW-LEVEL OUTLET CONDITION	<input type="text" value="1"/>
E2) LEVEL OF MAINTENANCE	<input type="text" value="1"/>	E9) SPILLWAY DESIGN FLOOD CAPACITY	<input type="text" value="5"/>
E3) EMERGENCY ACTION PLAN	<input type="text" value="1"/>	E10) OVERALL PHYSICAL CONDITION	<input type="text" value="3"/>
E4) EMBANKMENT SEEPAGE	<input type="text" value="5"/>	E11) ESTIMATED REPAIR COST	<input type="text"/>
E5) EMBANKMENT CONDITION	<input type="text" value="5"/>	ROADWAY OVER CREST	<input type="text" value="YES"/>
E6) CONCRETE CONDITION	<input type="text" value="4"/>	BRIDGE NEAR DAM	<input type="text" value="YES"/>
E7) LOW-LEVEL OUTLET CAPACITY	<input type="text" value="1"/>		
NAME OF INSPECTING ENGINEER: <u>Daniel Kenneally</u>		SIGNATURE: _____	

NAME OF DAM: <u>Talbot Mills Dam</u>		STATE ID #: <u>4-9-31-1</u>	
INSPECTION DATE: <u>November 6, 2015</u>		NID ID #: <u>MA 00774</u>	
OWNER: ORGANIZATION	<u>CRT Development Realty, LLC</u>	CARETAKER: ORGANIZATION	<u>LMHS, PC</u>
NAME/TITLE	<u>Mr. Robert Martin</u>	NAME/TITLE	<u>Mr. Bruce Henriksen</u>
STREET	<u>242 5th Street South</u>	STREET	<u>80 Washington Street, Building S</u>
TOWN, STATE, ZIP	<u>Naples, FL 34102</u>	TOWN, STATE, ZIP	<u>Norwell, MA 02061</u>
PHONE	<u>978-314-8080</u>	PHONE	<u>781-878-9111</u>
EMERGENCY PH. #	<u></u>	EMERGENCY PH. #	<u></u>
FAX	<u></u>	FAX	<u></u>
EMAIL	<u><a href="mailto:martin181@gmail.com">martin181@gmail.com</a></u>	EMAIL	<u><a href="mailto:bhenriksen@lmhspc.com">bhenriksen@lmhspc.com</a></u>
OWNER TYPE	<u>Private</u>		
PRIMARY SPILLWAY TYPE <u>Broad Crest granite Masonry</u>			
SPILLWAY LENGTH (FT)	<u>127</u>	SPILLWAY CAPACITY (CFS)	<u>6,030</u>
AUXILIARY SPILLWAY TYPE	<u>Overflow - Both Side of Primary</u>	AUX. SPILLWAY CAPACITY (CFS)	<u>620</u>
NUMBER OF OUTLETS	<u>1</u>	OUTLET(S) CAPACITY (CFS)	<u>Unknown - Gate is non-functional</u>
TYPE OF OUTLETS	<u>Sluiceway with Gate</u>	TOTAL DISCHARGE CAPACITY (CFS)	<u>6,650</u>
DRAINAGE AREA (SQ MI)	<u>370</u>	SPILLWAY DESIGN FLOOD (PERIOD/CFS)	<u>100 year / 5,675 cfs</u>
HAS DAM BEEN BREACHED OR OVERTOPPED	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	IF YES, PROVIDE DATE(S)	<u></u>
FISH LADDER (LIST TYPE IF PRESENT)	<u>None</u>		
DOES CREST SUPPORT PUBLIC ROAD?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	IF YES, ROAD NAME:	<u>Old Elm Street/Faulkner Street</u>
PUBLIC BRIDGE WITHIN 50' OF DAM?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	IF YES, ROAD/BRIDGE NAME:	<u>Faulkner Street Bridge</u>
		MHD BRIDGE NO. (IF APPLICABLE)	<u></u>

NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: November 6, 2015

NID ID #: MA 00774

**EMBANKMENT (CREST)**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
CREST	1. SURFACE TYPE	Paved Roadway			
	2. SURFACE CRACKING	None observed			
	3. SINKHOLES, ANIMAL BURROWS	None observed			
	4. VERTICAL ALIGNMENT (DEPRESSIONS)	No depressions or sinkholes observed			
	5. HORIZONTAL ALIGNMENT	Straight			
	6. RUTS AND/OR PUDDLES	None observed			
	7. VEGETATION (PRESENCE/CONDITION)	Small trees adjacent to upstream face near concrete in take structure face wall			
	8. ABUTMENT CONTACT	Good; no indications of seepage			

ADDITIONAL COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: November 6, 2015

NID ID #: MA 00774

**EMBANKMENT (D/S SLOPE)**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S SLOPE	1. WET AREAS (NO FLOW)	None observed			
	2. SEEPAGE	None observed			
	3. SLIDE, SLOUGH, SCARP	None			
	4. EMB.-ABUTMENT CONTACT	OK			
	5. SINKHOLE/ANIMAL BURROWS	None observed			
	6. EROSION	None observed			
	7. UNUSUAL MOVEMENT	None observed			
	8. VEGETATION (PRESENCE/CONDITION)	None			

ADDITIONAL COMMENTS: NOTE: the Talbot Mills Complex and the Faulkner Mills complex from both the left and right downstream sides of the dam, respectively. These properties are not owned by the dam owners. Access to the inside of the mill complexes was not available at the time of this inspection.

NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: November 6, 2015

NID ID #: MA 00774

**EMBANKMENT (U/S SLOPE)**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S SLOPE	1. SLIDE, SLOUGH, SCARP	None observed. (see note 1)			
	2. SLOPE PROTECTION TYPE AND COND.	See note 1. Condition of walls; good.			
	3. SINKHOLE/ANIMAL BURROWS	None observed			
	4. EMB.-ABUTMENT CONTACT	OK. No observed indications of seepage.			
	5. EROSION	None observed			
	6. UNUSUAL MOVEMENT	None observed			
	7. VEGETATION (PRESENCE/CONDITION)	Small trees adjacent to upstream face near concrete intake structure face wall at top			

ADDITIONAL COMMENTS: 1. Upstream faces of dam are constructed with either masonry stone walls or concrete wall.

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NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: November 6, 2015

NID ID #: MA 00774

**INSTRUMENTATION**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
INSTR.	1. PIEZOMETERS	N/A			
	2. OBSERVATION WELLS	N/A			
	3. STAFF GAGE AND RECORDER	N/A			
	4. WEIRS	N/A			
	5. INCLINOMETERS	N/A			
	6. SURVEY MONUMENTS	N/A			
	7. DRAINS	N/A			
	8. FREQUENCY OF READINGS	N/A			
	9. LOCATION OF READINGS	N/A			

ADDITIONAL COMMENTS: There is no known instrumentation at any part of the dam or appurtenant structures.

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NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: November 6, 2015

NID ID #: MA 00774

**DOWNSTREAM AREA**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S AREA	1. ABUTMENT LEAKAGE	None observed			
	2. FOUNDATION SEEPAGE	None observed			
	3. SLIDE, SLOUGH, SCARP	None observed			
	4. WEIRS	N/A			
	5. DRAINAGE SYSTEM	N/A			
	6. INSTRUMENTATION	N/A			
	7. VEGETATION	Trees within the bedrock outcrops.			
	8. ACCESSIBILITY	Not Accessible			
9. DOWNSTREAM HAZARD DESCRIPTION	The Faulkner Street Bridge is immediately downstream of the dam spillway. The Talbot and Faulkner Mills are on the left and right channel banks, respectively.				
10. DATE OF LAST EAP UPDATE		0			

ADDITIONAL COMMENTS: NOTE: the Talbot Mills Complex and the Faulkner Mills complex from both the left and right downstream sides of the dam, respectively. These properties are not owned by the dam owners. Access to the inside of the mill complexes was not available at the time of this inspection.

NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: November 6, 2015

NID ID #: MA 00774

**MISCELLANEOUS**

AREA INSPECTED	CONDITION	OBSERVATIONS
MISC.	1. RESERVOIR DEPTH (AVG)	6± feet
	2. RESERVOIR SHORELINE	Generally flat and level. Some trees and little underbrush.
	3. RESERVOIR SLOPES	No significant slopes
	4. ACCESS ROADS	Old Elm Street/Faulkner Street
	5. SECURITY DEVICES	None
	6. VANDALISM OR TRESPASS	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO      WHAT:
	7. AVAILABILITY OF PLANS	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO      DATE:
	8. AVAILABILITY OF DESIGN CALCS	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO      DATE:
	9. AVAILABILITY OF EAP/LAST UPDATE	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO      DATE:
	10. AVAILABILITY OF O&M MANUAL	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO      DATE:
	11. CARETAKER/OWNER AVAILABLE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO      DATE: November 18, 2015
	12. CONFINED SPACE ENTRY REQUIRED	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO      PURPOSE:

ADDITIONAL COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: November 6, 2015

NID ID #: MA 00774

**PRIMARY SPILLWAY**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
SPILLWAY	SPILLWAY TYPE	Broad Crested Masonry - probably granite block construction (see note 1)			
	WEIR TYPE	N/A			
	SPILLWAY CONDITION	Presumed Good - No indication of instability			
	TRAINING WALLS	N/A - Small stone wall at left embankment			
	SPILLWAY CONTROLS AND CONDITION	None			
	UNUSUAL MOVEMENT	None observed			
	APPROACH AREA	Mostly clear and unobstructed. Some tree branches need to be removed.			
	DISCHARGE AREA	One tree growing among the rocks immediately downstream of spillway			
	DEBRIS	Some tree branches located within the discharge area (see note 2)			
	WATER LEVEL AT TIME OF INSPECTION	Elevation 110.5 on 6 November 2015.			

ADDITIONAL COMMENTS: 1. During the inspection date, only a small portion was visible due to the continuous flow.  
 2. Some small branches located in the stilling basin. A portion of the tree downstream of the spillway broke off and is laying immediately downstream of the spillway.

NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: November 6, 2015

NID ID #: MA 00774

**AUXILIARY SPILLWAY**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
SPILLWAY	SPILLWAY TYPE	Sluiceway at right of primary spillway; serves as intake for Faulkner Mills			
	WEIR TYPE	N/A			
	SPILLWAY CONDITION	Fair			
	TRAINING WALLS	Masonry stone and concrete			
	SPILLWAY CONTROLS AND CONDITION	Wood Gate - Non Functional			
	UNUSUAL MOVEMENT	None observed			
	APPROACH AREA	Clear, unobstructed			
	DISCHARGE AREA	Discharge through Faulkner Mills Complex; Not inspected			
	DEBRIS	Minor debris (wood, trash) in stilling basin and some vegetation growing within.			
	WATER LEVEL AT TIME OF INSPECTION	N/A			

ADDITIONAL COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: November 6, 2015

NID ID #: MA 00774

**OUTLET WORKS**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
OUTLET WORKS	TYPE	Note 1.			
	INTAKE STRUCTURE	Intake tunnel under Old Elm Street reportedly filled with concrete - no records.			
	TRASHRACK	N/A			
	PRIMARY CLOSURE	N/A			
	SECONDARY CLOSURE	N/A			
	CONDUIT	N/A			
	OUTLET STRUCTURE/HEADWALL	Outlet structure located within Talbot Mills complex - not inspected.			
	EROSION ALONG TOE OF DAM	None observed. Bedrock visible at channel bed			
	SEEPAGE/LEAKAGE	None observed.			
	DEBRIS/BLOCKAGE	Reportedly completely blocked by concrete infill - no records available.			
	UNUSUAL MOVEMENT	None observed.			
	DOWNSTREAM AREA	Not inspected.			
MISCELLANEOUS					

ADDITIONAL COMMENTS: 1. Five (5) manually operated wooden gates left of the primary spillway- gates not operational. These gates formerly intake structure for the Talbot Mills complex. Also, a blocked low level outlet is located in the left spillway abutment. Some seepage was observed through the outlet. Not gates visible at this outlet.

NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: November 6, 2015

NID ID #: MA 00774

**CONCRETE/MASONRY DAMS**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
GENERAL	TYPE				
	AVAILABILITY OF PLANS	None available			
	AVAILABILITY OF DESIGN CALCS	None available			
	PIEZOMETERS	None available			
	OBSERVATION WELLS	None available			
	INCLINOMETERS	None available			
	SEEPAGE GALLERY	N/A			
	UNUSUAL MOVEMENT	None observed			

ADDITIONAL COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: November 6, 2015

NID ID #: MA 00774

**CONCRETE/MASONRY DAMS (CREST)**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
CREST	TYPE				
	SURFACE CONDITIONS	Good condition. Concrete limited face wall at intake gate left of primary spillway.			
	CONDITIONS OF JOINTS	No observed cracks or indications of seepage.			
	UNUSUAL MOVEMENT	None observed			
	HORIZONTAL ALIGNMENT	Straight. No observed displacements.			
	VERTICAL ALIGNMENT	Straight. No observed displacements.			

ADDITIONAL COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: November 6, 2015

NID ID #: MA 00774

**CONCRETE/MASONRY DAMS (DOWNSTREAM FACE)**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S FACE	TYPE				
	SURFACE CONDITIONS	Surface appeared to be in good condition. See note 1.			
	CONDITIONS OF JOINTS	The joints looked to be in good condition. See note 1.			
	UNUSUAL MOVEMENT	None observed. See note 1.			
	ABUTMENT CONTACT	See note 1.			
	LEAKAGE	None observed. See note 1.			

ADDITIONAL COMMENTS: 1. During the inspection date, only a very small portion of the spillway was visible. Any observations listed above are based on only the small portion that was visible at the time of the inspection.

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NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: November 6, 2015

NID ID #: MA 00774

**CONCRETE/MASONRY DAMS (UPSTREAM FACE)**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S FACE	TYPE				
	SURFACE CONDITIONS	Flat and level. No indications of seepage such as sinkholes or depressions.			
	CONDITIONS OF JOINTS	Ok; minor seepage at granite block abutment joints.			
	UNUSUAL MOVEMENT	None observed			
	ABUTMENT CONTACTS	Clean contact. No seepage observed.			

ADDITIONAL COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

## **APPENDIX C**



COMMONWEALTH OF MASSACHUSETTS  
 EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS  
 DEPARTMENT OF ENVIRONMENTAL MANAGEMENT



131 BARNUM ROAD, BUILDING 3701, DEVENS, MA 01432  
 PHONE 978-772-4255 FAX 508-792-7718  
[www.state.ma.us/dem/](http://www.state.ma.us/dem/)

Aug 18 1999

CRT DEVELOPMENT  
 67 Faulkner Street  
 Billerica, MA 01821  
 Attn: Robert Martin

Argeo Paul Cellucci  
 GOVERNOR

08/10/99

Jane Swift  
 UEUTENANTGOVERNOR

RE: Talbot Mills Dam, 4-9-31-1

Bob Durand  
 SECRETARY

**NOTICE OF INSPECTION**

Peter C. Webber  
 COMMISSIONER

Dear Mr. Martin:

In accordance with MGL c 253, s 44-50 and 302 CMR 10.00, the DEM Office of Dam Safety completed a visual inspection of Talbot Mills Dam, located in North Billerica, of which CRT Development, A Limited Partnership, owns. The inspection was completed by one of our consulting Engineers in accordance with required inspection frequencies.

Based on inspection results, the run-of-the-river masonry dam is considered to be in FAIR condition, and has moderate operational or maintenance deficiencies. Based on the applicable design storm, the dam is hydraulically adequate. A copy of the 5/20/99-inspection report and checklist is enclosed.

A written response to this Notice, regarding maintenance, within 180-days is required. In addition, it is suggested that recommendations listed in the enclosed report be followed.

If you have any questions, comments, or need technical assistance, please call our office. Thank you.

Sincerely,

R. David Clark  
 Chief  
 Office of Dam Safety

RDC/mam

c:\demdams\documents\007741tr.doc



**Department of Environmental Management  
Office of Dam Safety**

CRT DEVELOPMENT  
57 Faulkner Street  
Billerica, MA 01821

**Owned Dam**

**Inspection/Evaluation Report**

**Dam Name:** Talbot Mills Dam

**Dam ID#:** 4-9-31-1

**Army Corp ID#:** MA 00774

**Town:** North Billerica

**Consultant:** Weston & Sampson Engineers, Inc.

**Date of Inspection:** May 20, 1999

## PREFACE

Weston & Sampson Engineers, Inc. has completed this dam evaluation study as part of its contract with the Commonwealth of Massachusetts, Department of Environmental Management, Office of Dam Safety (DEM) 1999 dam inspection program. The purpose of this study is to identify those dams that pose hazards to public safety, human life, or public property.

Our findings, conclusions, and recommendations are based primarily on visual observations made during our site visits, review of DEM files, and limited engineering analysis. Detailed field programs and engineering analysis such as topographic mapping, subsurface exploration programs, laboratory testing, and detailed engineering analysis are beyond the scope of this study.

Please note that our description of the general dam conditions is based on the visual observations of the dam surficial conditions made during our site visit and on our review of the available data provided by DEM. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability of the dam, removes the normal loading conditions on the dam and may obscure certain conditions, which might be detectable if inspected under the normal loading conditions of the dam.

Also note that the dam's integrity and stability depend on numerous and constantly changing internal and external conditions, and are evolutionary in nature. It is incorrect to assume that the current observations of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected and avoided.

Mohammed M. Kheirallah  
Professional Engineer



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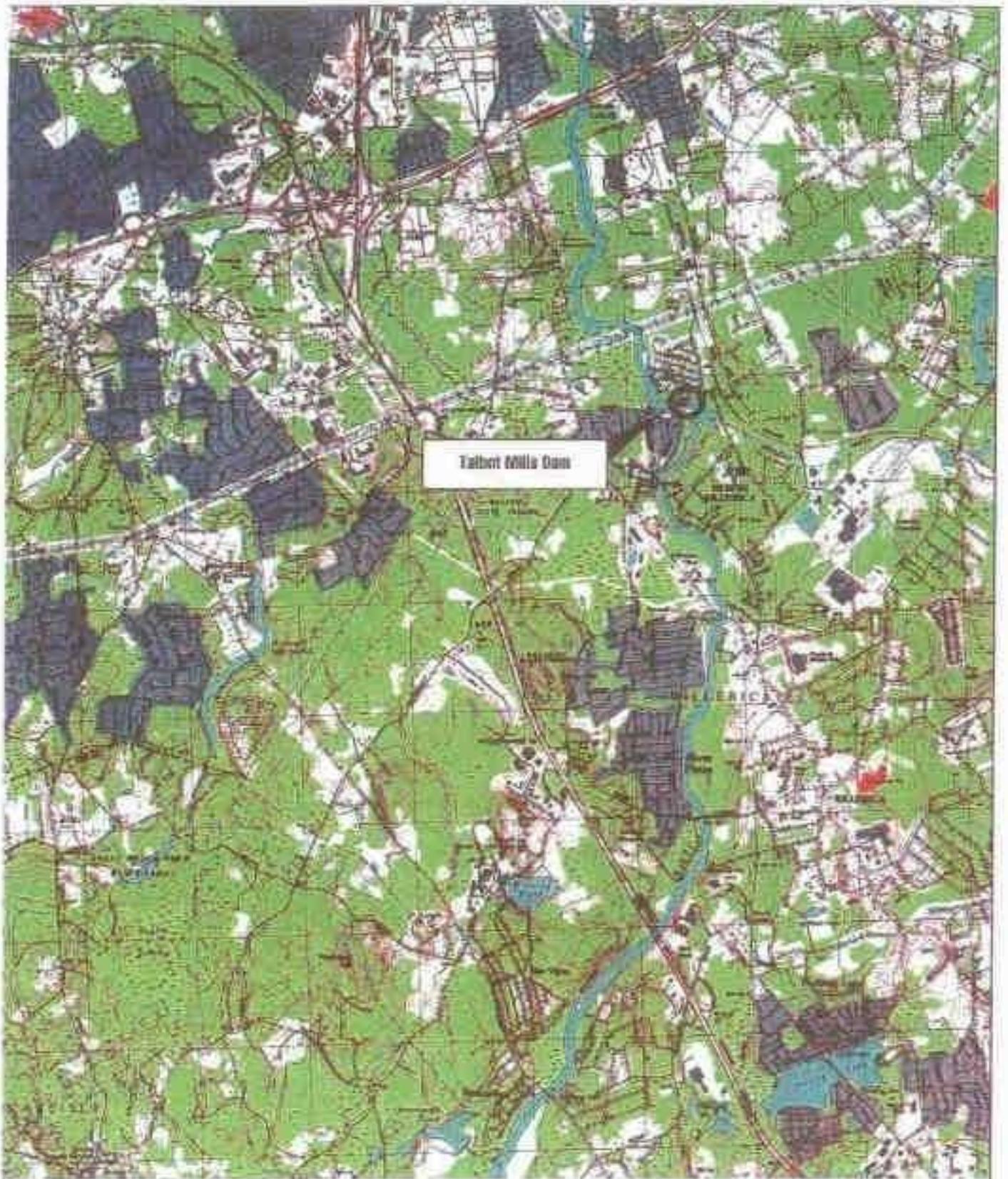


FIGURE 1  
TOWN OF NORTH BILLERICK, MASSACHUSETTS, TALBOT MILLS DAM  
LOCUS MAP

SOURCE: USGS 7.5 & 15 MINUTE SERIES, BILLERICK MASS. QUAD, 1981

## 1.0 DESCRIPTION OF PROJECT

### 1.1 General

This report summarizes Weston & Sampson Engineers, Inc., (WSE) observations, findings, and recommendations for Talbot Mills Dam in North Billerica, Massachusetts. Our findings and recommendations are based on field observations made during our site visit to the dam on May 20, 1999, review of prior studies, and experience with similar dams.

#### 1.1.1 Authority

The Commonwealth of Massachusetts, Department of Environmental Management, Office of Dam Safety (DEM) has engaged the services of WSE to complete a dam inspection study of Talbot Mills Dam in North Billerica, Massachusetts, as part of DEM's 1999 Dam Inspection Program. We have completed this study as part of our annual contract with DEM, and based on their verbal authorization.

#### 1.1.2 Purpose of Work

The main purpose of this study is to evaluate the current conditions of Talbot Mills Dam to identify the need for any immediate emergency measures to avoid any threat to public safety or the environment. The study will also be used in comparison with prior ones to monitor the dam conditions, and to identify any progressive deterioration that will require repairs.

As part of our study, we completed the following scope of services:

1. Site reconnaissance to observe and document surficial dam conditions and any other signs of seepage, failure, or movement in the dam and related structures. Prior to the site visit, we contacted the person in charge of dam safety, as identified by DEM.
2. Reviewed available data from DEM files to obtain information on the dam construction, maintenance, and operations.
3. Met with the dam safety officer to obtain information on the dam history and conditions.
4. Performed limited engineering analysis to confirm available data in prior studies.
5. Prepared this report summarizing our findings, conclusions, and recommendations.

### 1.2 Description of Project

#### 1.2.1 Location

Talbot Mills Dam is located in North Billerica, Middlesex County, Massachusetts. The dam is on the Concord River immediately upstream of the Faulkner Street Bridge. It is located at the following approximate coordinates on the Billerica, Massachusetts, USGS Quadrangle:

Latitude: 42° 35.5' N  
Longitude: 71° 17.04' W

### 1.2.2 Owner/Operator

~~\_\_\_\_\_~~ Talbot Mills Dam. Mr. Bill Martin, Engineer at Cambridge Tool Manufacturing Company, is the designated "dam caretaker."

### 1.2.3 Purpose of Dam

The dam was originally constructed to impound water for power and fire protection for the mills, and to divert water into the old Middlesex Canal that flowed toward Boston. Currently, the dam is used for recreational and flood control purposes.

### 1.2.4 Description of Dam and Appurtenances

The Talbot Mills Dam is located on the Concord River immediately upstream of the Faulkner Street Bridge in North Billerica, Massachusetts. The dam was originally constructed in the late 1850s to impound water for power and fire protection for the mills, and to divert water into the old Middlesex Canal that flowed toward Boston.

The dam is approximately 160 feet long with a maximum height of about 12.5 feet. It is an overflow or run-of-river type stone masonry structure apparently seated on bedrock. The spillway is a broad-crested weir 160 feet long and 6 feet wide with crest elevation about 2 feet lower than the top of the dam. A 13-foot wide concrete-lined sluiceway and gate are located in the southern abutment. Five (5) wooden gates are located about 100 feet upstream of the northern abutment contact. Two outlet structures located in the northern side of the dam appear to be permanently blocked.

On the southern end of the dam, there is a canal to Faulkner Mill, and on the northern end, there are old gates for the Talbot Mills Sluiceway. Prior DEM inspection reports describe a stilling basin downstream of the Talbot Mills Sluiceway, which is not visible from the road. There are also flow screens on the downstream canal, control gates in a locked position and a turbine, which has not been in operation since 1972.

### 1.2.5 Operations and Maintenance

There are no formal records kept on the operations and maintenance of this dam, nor are there standard operating procedures.

### 1.2.6 DEM Size Classification

Talbot Mills Dam has a maximum storage capacity of approximately 100 acre-feet and a maximum height of 13 feet. Although the dam was classified as small in size in prior reports, the dam meet the requirements of an INTERMEDIATE size dam as stated in Massachusetts's regulation 302 CMR 10.06.

### 1.2.7 DEM Hazard Classification

The possibility for loss of a few lives and appreciable economic damage that would occur to the Faulkner Street Bridge, Talbot Mill buildings, and possibly the wastewater treatment facility as a result of dam failure places the dam in the HIGH hazard category as defined in 302 CMR 10.06.



## 2.0 VISUAL INSPECTION

### 2.1 General Findings

#### 2.1.1 Dam

Ms. Jennifer S. Rivers of WSE visited Talbot Mills Dam on May 20, 1999, to observe the superficial condition of the dam. At the time of inspection there was approximately 9± inches of flow over the spillway (Photo Nos. 1&2).

Although we could not visually observe the spillway due to the running water, it appeared to be in fair/good condition with no obvious misalignment, displaced masonry, or other defects. The north side of the dam and associated abutment appeared to be in satisfactory condition, and there was virtually no flow through the outlet pipes for the old gates (Photo No. 3) on that side. The south side of the dam was repaired at some time in the past as evidenced by a concrete face which appears to be newer than the rest of the concrete used to build the dam. Leakage was visible at the bottom corner of the concrete face adjacent to the spillway section. The dry masonry, which comprises the southern wall of the dam is missing some stones.

The Faulkner Street Bridge is approximately 45 feet downstream of the dam. There is one tree and a few outcrops of bedrock immediately downstream of the spillway (Photo No. 2) which appears to pose no obstruction to the flow of water. The north abutment immediately downstream of the dam was eroded as a result of high flows that occurred in spring 1987 (Photo No. 4). The south-facing downstream wall is beginning to erode the bedrock on which Cambridge Tool Manufacturing building is located (Photo No. 5), and the bridge abutment support is also beginning to show signs of deterioration or scouring (Figure No. 6).

#### 2.1.2 Appurtenant Structures

The concrete lining of the sluiceway in the South abutment is severely weathered and deteriorated (Photo No. 4). The gates located upstream of the North abutment have been described in previous reports as being inoperable; at the time of inspection they were overgrown with vegetation and in a state of disrepair. The diversion into the old canal was not observed.

#### 2.1.3 Downstream Area

The downstream area of Talbot Mills Dam is a stone and concrete-lined channel for approximately 500 feet. Downstream of this portion of the dam, the Concord River flows in its natural state. There are several homes located on the Concord River immediately downstream of Talbot Mills Dam.

#### 2.1.4 Reservoir Area

There is only a slight impoundment upstream of the dam. Approximate dimensions are 300 ft in width and 200 feet in length.

### 2.2 Caretaker Interview

On May 20, 1999, a WSE representative met with Mr. Bill Martin, Engineer, at Cambridge Tool Manufacturing. There is no formal operator of this dam; however, he explained that he was

given the responsibility for it. He said that in 1987 or thereabouts, the Army Corps of Engineers called him and asked him to lower the gates for this dam to mitigate downstream flooding. The gates were not operational, so he told them he could not do so. Other than that he has no records for the dam itself.

## 2.3 Operation and Maintenance Procedures

### 2.3.1 Operational Procedures

There are no operation procedures in place for Talbot Mills Dam. According to Mr. Martin, once in 1998, during a particularly heavy storm event, he was contacted by the Army Corps of Engineers and asked to lower the gate to mitigate upstream flooding. The gate is fixed, however, and therefore could not be lowered.

### 2.3.2 Maintenance of Dam and Operating Facilities

There is no routine maintenance performed for this dam.

### 2.3.3 Emergency Warning System

There is no formal Emergency Warning System in place for this dam.

### 2.3.4 Emergency Action Plan

There is no formal Emergency Action Plan in place for this dam.

## 2.4 Hydraulic/Hydrologic Data

WSE used the Rational Method (see Appendix D) to calculate an approximate flow given a 100-year flood scenario. Approximately 1002 cfs of water will discharge from the Talbot Mills Dam to the Concord River in the event of such a flood.

## 2.5 Structural Stability/Overtopping Potential

### 2.5.1 Structural Stability

Although the dam spillway appears to be stable, we could not inspect the structural elements of the spillway due to the running water. The northern and southern ends of the dam also appear to be stable except for the missing stones in the southern end.

### 2.5.2 Overtopping Potential

Based on limited hydraulic analysis of Talbot Mills Dam utilizing the Rational Method, WSE calculated a flow of 1002 cfs given the 100-year flood event. Please note that this method is preliminary in nature and provides a crude estimate of the peak flow based on a simplified mathematical model.

Our analysis indicates that the spillway capacity is 6773 cfs, thus the dam is capable of passing the 100-year flood without significant potential for overtopping.

### 3.0 ASSESSMENTS, RECOMMENDATIONS, AND REMEDIAL MEASURES

#### 3.1 Assessments

The dam abutments and the spillway show no sign of misalignment, movement, or vertical settlement. The southern abutment walls are missing some stones. There is some vegetation overgrowth in both the southern and northern ends of the dam.

The gates at the intake structures are inoperable. The training walls downstream of the dam show signs of deterioration.

*Based on our field observations, review of prior reports, and experience with similar projects, it is our opinion that Tubed Mills Dam is in FAIR condition.*

#### 3.2 Recommendations

Based on our assessment of the dam condition, we recommend that DEM, within one year of receiving this report, engage the services of a professional engineer, licensed in the Commonwealth of Massachusetts, to complete the following:

1. Evaluate the structural integrity and complete a detailed stability analysis of the dam and primarily the spillway.
2. Complete a detailed Hydraulic & Hydrogeologic analysis of the dam.
3. Prepare an Emergency Action Plan for the dam.

#### 3.3 Remedial Measures

We recommend the implementation of the following remedial measures within six months of the date of this report. We believe that DEM staff could complete some or all of the measures:

1. Remove all vegetation from the dam abutments and training walls.
2. Repair the gates to have control over the water elevation in the pond.

#### 3.4 Alternatives

At this time there are no viable alternatives to the above-recommended work.

#### 3.5 Cost Estimation

The following itemized costs for recommendations are based upon the assumption that the work would be completed within one year of this report.

<u>Engineering Recommendations</u>	
Perform Stability Analysis	\$3,700
Perform H&H	3,600
Prepare EAP	<u>3,200</u>
Subtotal	\$10,500

<u>Remedial Measures</u>	
Clearing	\$2,200
Repair gates	<u>12,300</u>
Subtotal	\$14,500
<b>TOTAL</b>	<b>\$25,000</b>

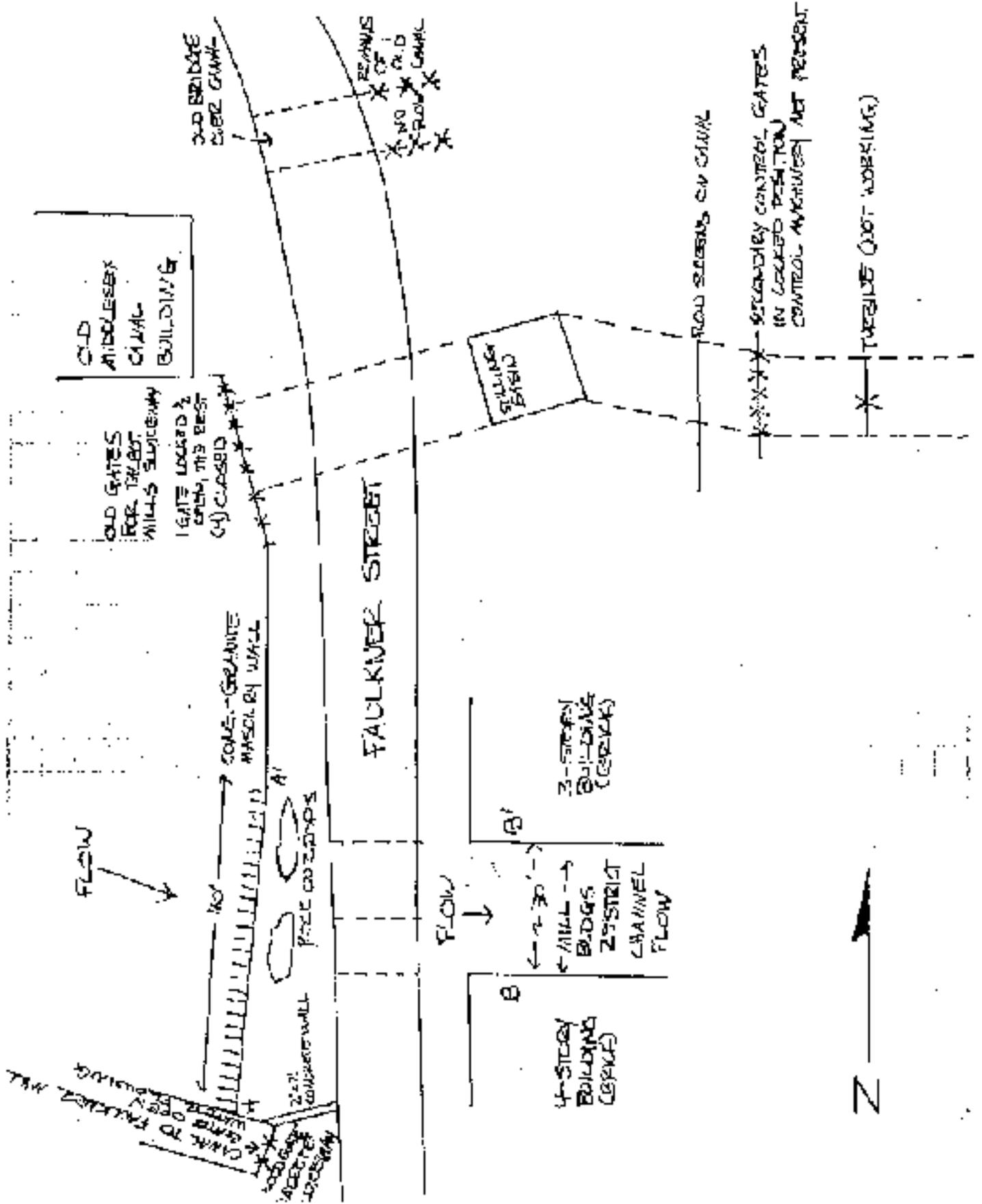
Please note that the above cost estimates are based on our understanding of the level of effort to complete the above-listed recommendations. These cost estimates may vary depending on the time the services are completed and the level of effort required to complete the services. Also, please note that these cost estimates do not include the total construction costs of the required repairs.

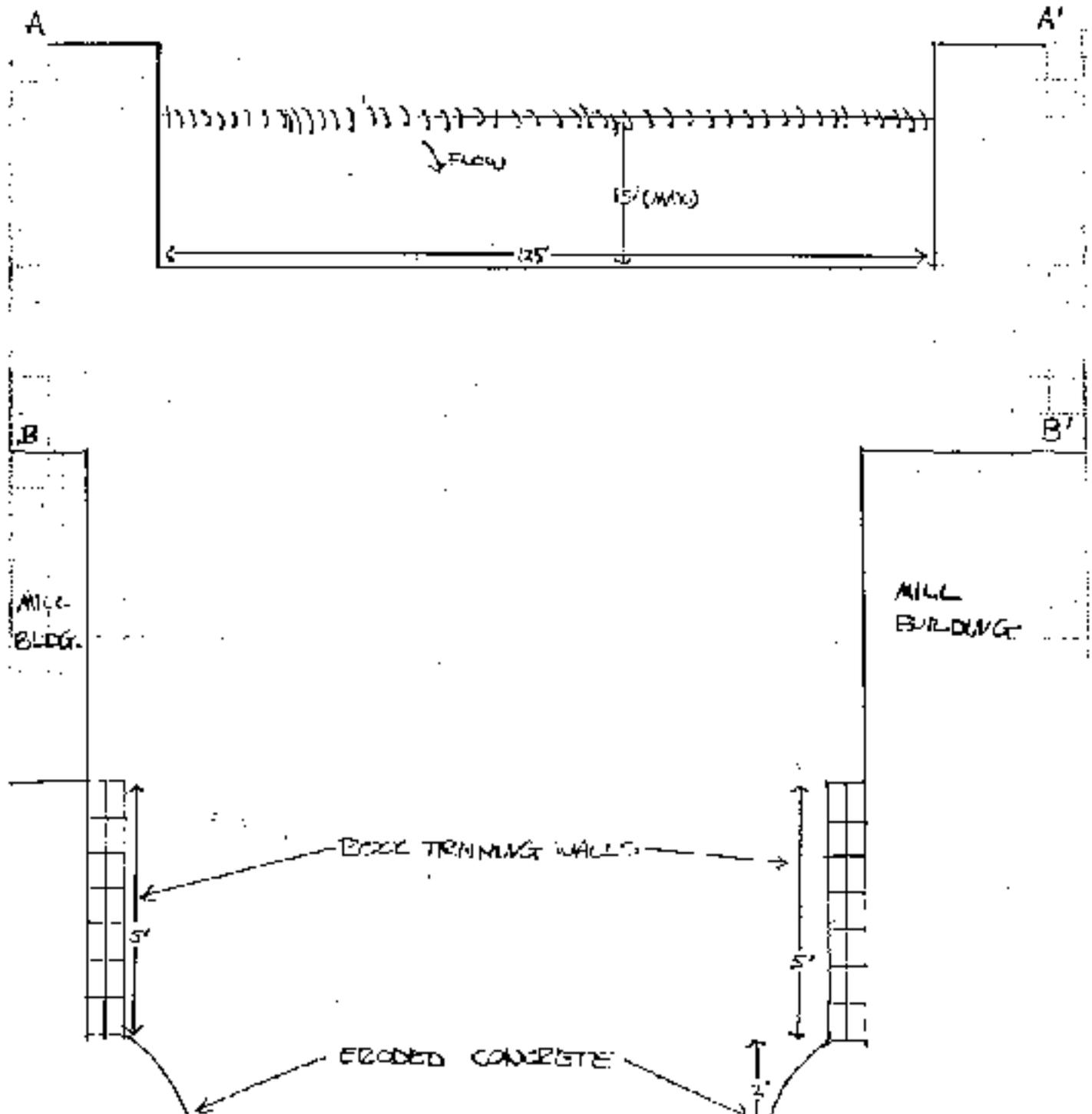
Talbot Mills Dam is considered to be in FAIR condition. If allowed to continue, the erosion of the right abutment could eventually affect the structural integrity of the dam and downstream highway bridge.

\\hpw\INVENTORY\DEM Dam\rep\1999\Billerica\Talbot\final rps.doc

**APPENDIX A**

**PLAN OF DAM AND AVAILABLE CONSTRUCTION DRAWINGS**





**APPENDIX B**

**PHOTOGRAPHS AND PHOTO LOCATIONS/DESCRIPTION**



Photo 1. Southeast-looking view of dam



Photo 2. Spillway

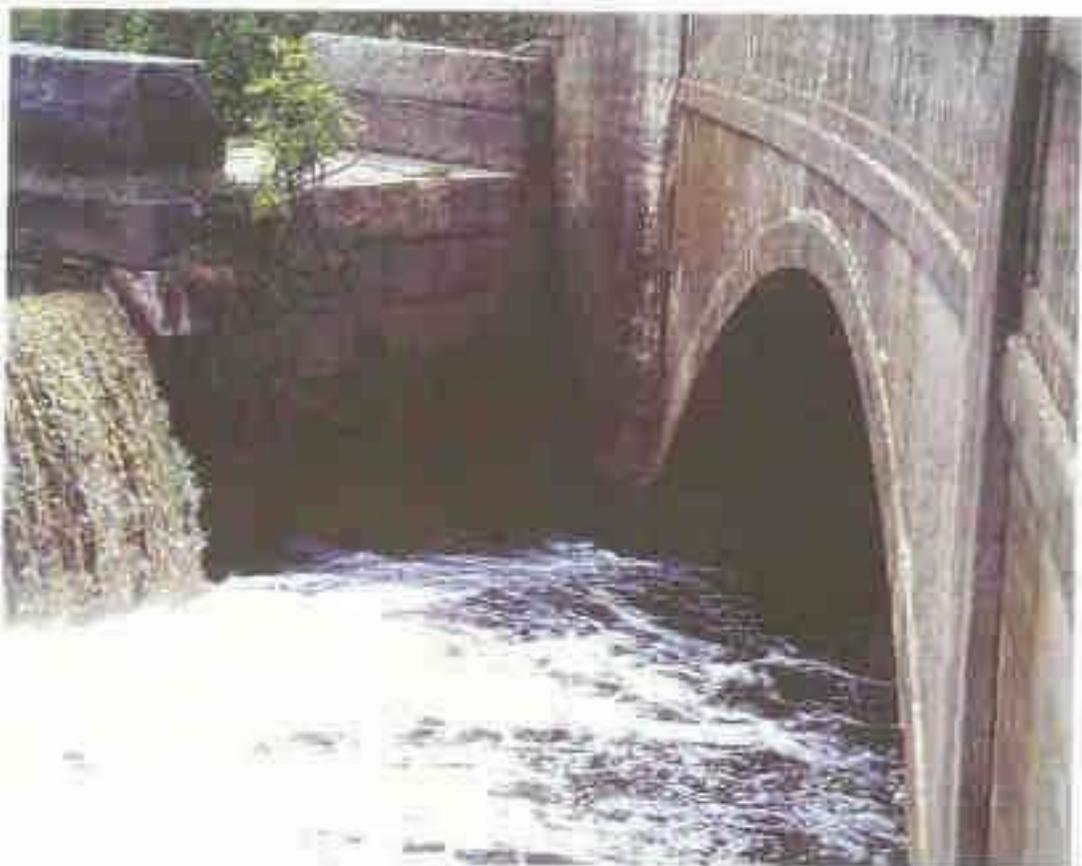


Photo 3. Outlet pipes for old gates



Photo 4. Training walls in downstream channel

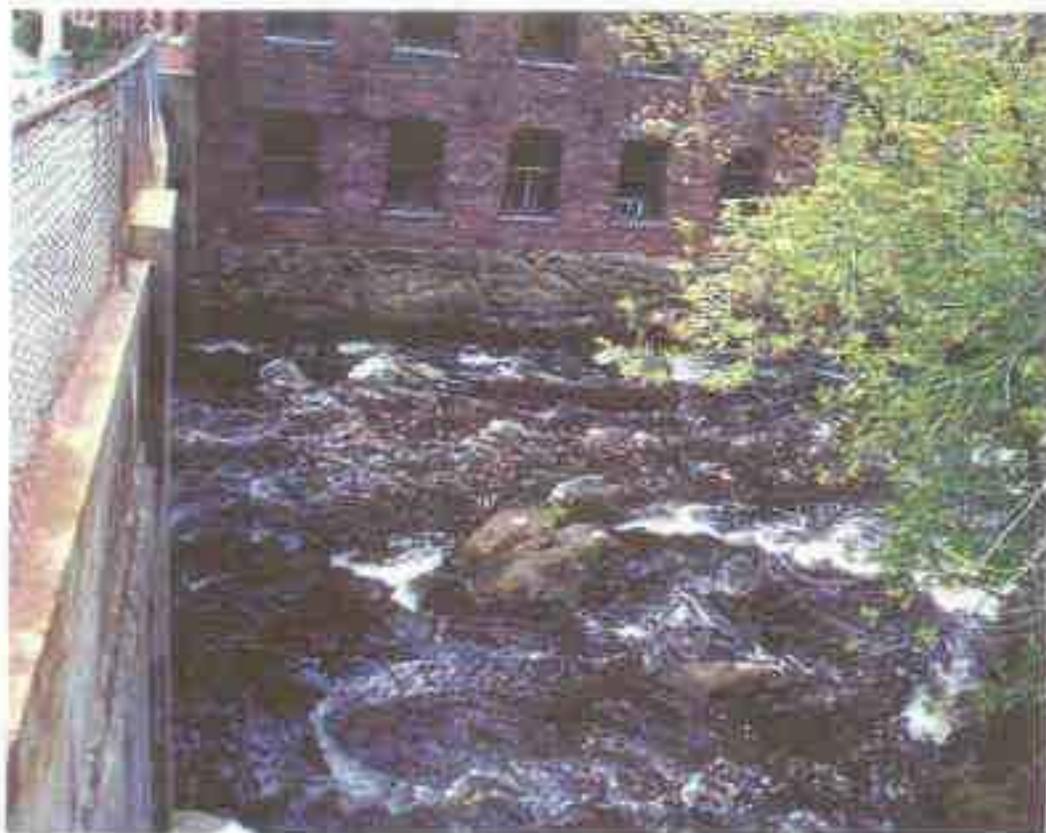
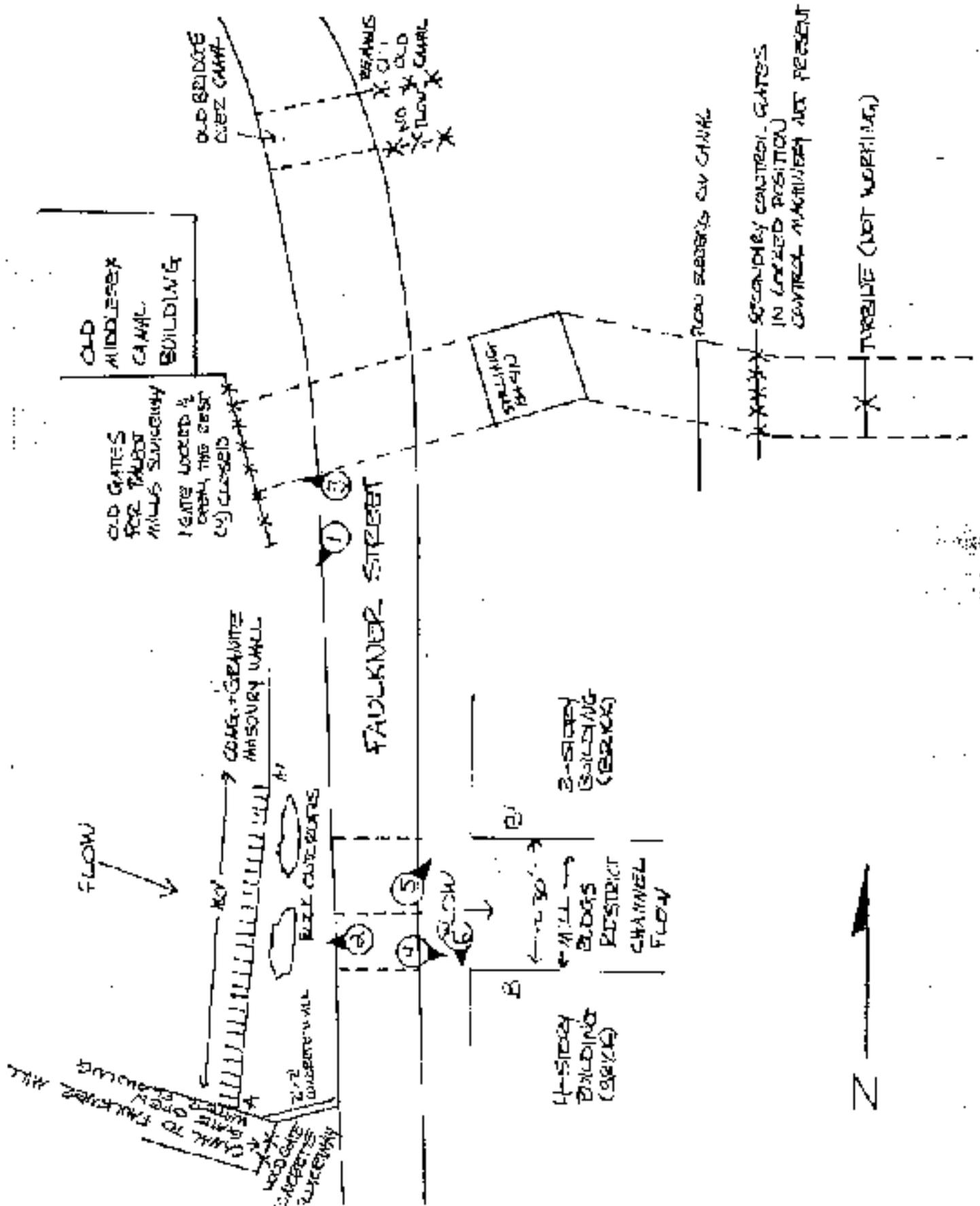


Photo 5. Mill building; downstream channel



Photo 6. Bridge abutment support



**APPENDIX C**  
**INSPECTION CHECKLIST**



# EMBANKMENT

1 of 2

AREA INSPECTED	ITEM NO.	CONDITION	CHECK / ACTION NEEDED		
			MONITOR	INVESTIGATE	REPAIR
GRASS	1	SURFACE CRACKING	OK		
	2	SHOULDER, ANIMAL BURROW	POOR		
	3	LOW AREAS:	POOR		
	4	HOMOGENEOUS, WELL-DISTRIBUTED	OK		
	5	W. GRASS UNDER P. COLLAR	POOR		
	6	VEGETATION CONDITION	OK		
SPRINKLE SLOPE	7				
	8				
	9	SLICE, SLO. GR. SCARP	POOR		
	10	SLOPE APPROXIMATE	OK		
SPRINKLE SLOPE	11	MIX-GRADE, ANIMAL BURROW	POOR		
	12	EMB. JAIL. CONTACT	OK		
	13	EROSION	POOR		
	14	VEGETATION CONDITION	POOR OVERGROWN TRIPS		
	15				
	16				
ADDITIONAL COMMENTS REFER TO ITEM NO. IF APPLICABLE					

APPROPRIATE DAM DATA SHEET ATTACHED FOR DISCUSSION

NAME OF DAM: TRIBBLE DAM ID NO: 44-01-1 INSPECTION DATE: May 21, 1957

# EMBANKMENT

2 of 2

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK FOR ACTION NEEDED	
				NONOK	URGENT
UPPER DAM SLOPE	17	WEST APPROXIMATE FLOW	12:30 P		
	18	SEEPAGE	NO P		
	19	TOE OF CUTS	OK		
	20	TOE OF CUT	OK		
	21	TOE OF CUT	OK		
	22	TOE OF CUT	OK		
	23	TOE OF CUT	OK		
	24	TOE OF CUT	OK		
	25	TOE OF CUT	OK		
	26	TOE OF CUT	OK		
DOWN DAM SLOPE	27	TOE OF CUT	OK		
	28	TOE OF CUT	OK		
	29	TOE OF CUT	OK		
	30	TOE OF CUT	OK		
	31	TOE OF CUT	OK		
	32	TOE OF CUT	OK		
	33	TOE OF CUT	OK		
	34	TOE OF CUT	OK		
	35	TOE OF CUT	OK		
	36	TOE OF CUT	OK		
*ADDITIONAL COMMENTS: REFER TO TERN NO. 2 AFFILIATE					

UNIVERSITY OF CALIFORNIA - RIVERSIDE

NAME OF DAM: Tipton Mills Dam ID NO: 44-31-1 INSPECTION DATE: May 20, 1999

# DOWNSTREAM AREA AND MISC.

1 of 1

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK ( ) ACTION NEEDED	
				MONITOR	REPAIR
DOWNSTREAM AREA	36	SEWAGE TREATMENT PLANT	none		
	37	FOUNDATION BEHIND DAM	none		
	38	SL DE, SLOUGH, SCOUR	none		
	39	DRAINAGE SYSTEM	drain pipes		
	40				
	41				
MISCELLANEOUS	42	ROCKS NEAR HAZARD DESCRIPTION			
	43	DATE OF LAST EMERGENCY FLOOD	no		
	44	PROPERTY SLOPES	ok		
	45	UTILITY LOCATIONS	surface street		
	46	SECURITY DEVICES	no		
	47				
	48				
	49				
	50				
ADDITIONAL COMMENTS: REFER TO ITEM NO., IF APPLICABLE					

\*REPRODUCED FROM THE NATIONAL ARCHIVES AT COLLEGE PARK, MARYLAND







**APPENDIX D**  
**HYDROLOGIC DATA AND COMPUTATIONS**

Weston & Sampson ENGINEERS, INC.	PROJECT: DEM DAM INSPECTIONS TALBOT MILLS DAM	DATE: 05.08.99	PAGE: 1 of 1
		BY: JSR	
		CK BY: PMA	

- Talbot Mills Dam  
North Billerica, MA

Peak Flow estimation using Rational Method<sup>\* \*\*</sup>

**Qp = C \* I \* A**

where C is the runoff coefficient as estimated from Table 7-2 in *Hydrologic Analysis and Design* Richard H. McCuen, 1989 **0.31**

\*\*Assumed "C" type soils, slope 6%+, and 1/2 acre residential lots

A is the area in acres **1243 acres**

I is the rainfall intensity in in/hr for the calculated time of concentration (Tc) - (see below)

$T_c = .007 * (n * L)^2 / P_2^2 * S^4$

where n is assumed Manning roughness coefficient **0.05**  
L is the flow length **4350 ft**  
P<sub>2</sub> is 2-year, 24-hour rainfall = 0.135 in/hr \* 24 hours **3.24 in**  
(see Boston intensity-duration-frequency chart, attached)  
S is slope of hydraulic grade, assumed to be **8 %**

Tc = 0.873858142 hours  
Tc = 1.000 hour

Using this value, a recurrence interval of 100 years, and the intensity-duration-frequency chart for Boston, MA (see attached), we found the rainfall intensity, i, to be **2.6 in/hr**

Therefore,  
Qp = 0.31 \* 2.6 \* 1243  
Qp = 1001.858

**Qp = 1002 cfs**

\*McCuen, R.H. (1989) Hydrologic Analysis and Design. Prentice Hall, Englewood Cliffs, NJ  
^This method was developed for and is intended for use in small, urban watersheds  
\*\*These are preliminary calculations for estimation purposes only. A full hydrologic analysis is in order at this time

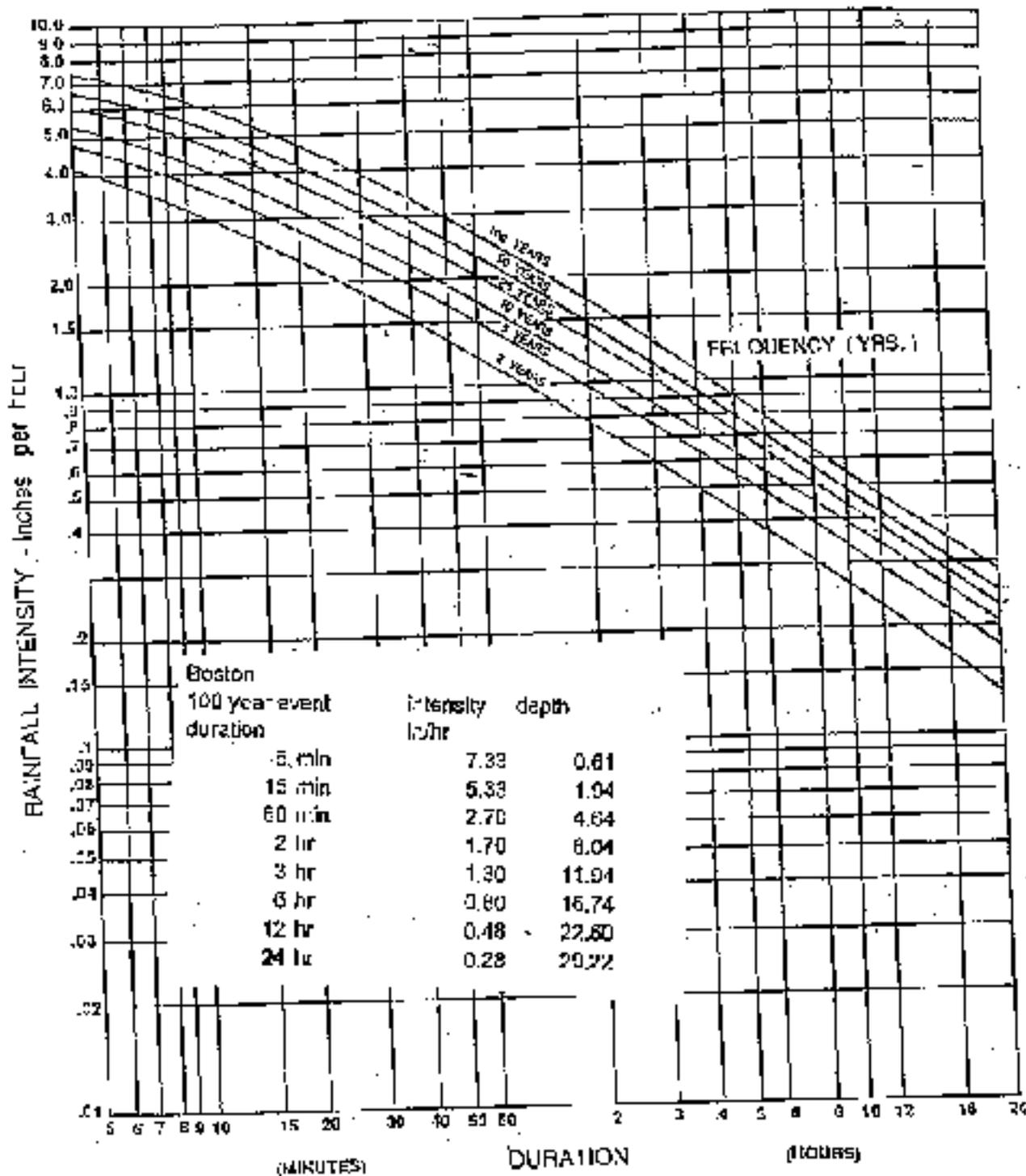


Figure 10-4. Intensity — Duration — Frequency Curve for Boston, MA

**APPENDIX E**  
**PREVIOUS INSPECTION REPORTS**

DEM files for the Talbot Mills Dam in North Billerica  
included the following inspection report:

Inspection/Evaluation Report  
O'Brien & Gere Engineers, Inc.  
November 17, 1987

**APPENDIX F**  
**DAM SAFETY DETAIL SHEET**

# Department of Environmental Management DAM Detail

**National ID:** MA0074      **Item# Code:** 11gh      **LEGS Quad:** Billerica      **Design:**  
**District #:** 4      **Size Class:** Intermediate      **Inspection Reg.:**      **Main Level:**  
**County #:** 9      **Dam Type:** Gravity Masonry      **Inspection Cond.:**      **Emerg. Plan:** NO  
**Town #:** 31      **Purpose:** Fire protection      **Last Insp. Date:**      **Embarkment:**  
**Dam #:** 1      **Year Comp:** 1950s      **Owner:**      **Concrete Cond.:**  
**Dam Name:** Talbot Mill Dam      **Struct. Height:** 7.5 ft.      **DEM Inspection:**      **Low Level Capact:**  
**River:** Concord River      **Hydro. Height:** 12 ft.      **Next Inspection:**      **Low Level Outlet:**  
**Imp. Name:** Concord River      **Drain. Area:** 1243 acres      **Consultant:** Weston S. Sampson      **% Capacity:**  
**Basin:** 14b      **Normal Storage:** 100 acre-ft.      **Consultant Date:**      **DEM Condition:** fair  
**ERT DEVELOPMENT**      **Max. Storage:** 100 acre-ft.      **Activity Phase:** 1 rpt      **Repair Cost:** \$75,000  
**67 Faulkner Street**      **Spill Length:** 120 ft.      **DEM Phase:** 1 rpt      **Key:**  
**BILLERICA, MA 01821**      **Spill Type:** stone masonry      **Insp #7:**      **Permit:**  
**Phone:** [REDACTED]      **Spill Width:** 5 ft.      **Insp #8:**      **Road:**  
**Owner Type:**      **Spill Capacity:** 88% of BDF      **Insp #9:**      **Drivage:**  
**Contractor:** Bill Martin, Engineer      **Lat. Dec:** 42° 35.5' N      **Prop #10:**      **No file:**  
**Cambridge Tooling Co.**      **Long. Dec:** 71° 17.04' W      **FERC License:**      **Registered:**  
**Street:** 67 Faulkner St.      **Town:** North Billerica      **Compliance:**  
**Phone:**      **Next date changed:**

- Comment 1:
- Comment 2:
- Comment 3:

EVALUATION FORM

DEM # 4-9-31-1

Dam Name Talbot Mills Dam

- |       |  |   |                                     |                                     |   |   |   |
|-------|--|---|-------------------------------------|-------------------------------------|---|---|---|
| 1.    | <p><b>DESIGN</b></p> <p>1 - unknown design</p> <p>3 - some standard features</p> <p>5 - state-of-the-art design</p>  | 1 | <input checked="" type="checkbox"/> | 3                                   | 4 | 5 |   |
| 2.    | <p><b>LEVEL OF MAINTENANCE</b></p> <p>1 - no evidence of maintenance plan</p> <p>3 - some level of maintenance work</p> <p>5 - detailed, written report</p>  | 1 | <input checked="" type="checkbox"/> | 3                                   | 4 | 5 |   |
| 3.    | <p><b>EMERGENCY WARNING PLAN</b></p> <p>1 - No plan/ideas for emergency response actions</p> <p>3 - no plan, but well thought out</p> <p>5 - detailed, written plan</p>  | 1 | <input type="checkbox"/>            | 2                                   | 3 | 4 | 5 |
| ----- |  |   |                                     |                                     |   |   |   |
| 4.    | <p><b>EMBANKMENT</b></p> <p>1 - evidence of piping and/or severe seepage</p> <p>3 - serious seepage problem</p> <p>5 - no evidence of seepage</p>  | 1 | 2                                   | 3                                   | 4 | 5 |   |
|       |  |   | Not Applicable                      |                                     |   |   |   |
| 5.    | <p><b>CONCRETE/MASONRY</b></p> <p>1 - major cracks/severe leaks or deficiencies throughout</p> <p>3 - significant deficiencies/erosion or minor cracks</p> <p>5 - no deficiencies apparent</p>   | 1 | 2                                   | <input checked="" type="checkbox"/> | 4 | 5 |   |
| 6.    | <p><b>LOW-LEVEL OUTLET</b></p> <p><b>A - CAPACITY</b></p> <p>1 - insufficient</p> <p>3 - sufficient capacity</p> <p>5 - greater than necessary</p> <p><b>B - CONDITION</b></p> <p>1 - inoperable and requires replacement</p> <p>2 - inoperable/repairs required</p> <p>3 - operable but needs repair</p> <p>4 - operable/maintenance needed</p> <p>5 - good operational condition</p> | 1 | <input checked="" type="checkbox"/> | 3                                   | 4 | 5 |   |
|       |  | 1 | <input type="checkbox"/>            | 2                                   | 3 | 4 | 5 |

7.	SPILLWAY CAPACITY AS CAPACITY OF TEST FLOOD	1	2	3	4	B
	1 - 0 - 20%					
	2 - 21 - 40%					
	3 - 41 - 60%					
	4 - 61 - 80%					
	5 - 81 - 100%					

8.	GENERAL CONDITION	1	2	B	4	5
	1 - major operational/maintenance & structural deficiencies					
	3 - significant operation/maintenance deficiencies (no structural)					
	5 - no operation/maintenance or structural deficiencies					

9. ESTIMATED COST FOR REPAIRS:  
\$ 25,000

***TALBOT MILLS DAM***  
**PHASE I**  
**INSPECTION / EVALUATION REPORT**



**Dam Name:** Talbot Mills Dam  
**State Dam ID#:** 4-9-31-1  
**NID ID#:** MA 00774  
**Owner:** CRT Development  
**Owner Type:** Private  
**Town:** North Billerica  
**Consultant:** Geotechnical Consultants, Inc.  
**Date of Inspection:** May 22, 2009 Final



## EXECUTIVE SUMMARY

This Phase I Inspection/Evaluation Report details the inspection and evaluation of Talbot Mills Dam located in North Billerica, Massachusetts. The inspection was conducted on various dates between 26 January 2009 and 22 May 2009 by Geotechnical Consultants, Inc. of Marlborough, Massachusetts. As part of this study, a topographic survey was completed to provide a basis for some of the pertinent engineering data used to evaluate this dam.

Currently, the Talbot Mills Dam is classified as an Intermediate sized, High (Class III) Hazard potential structure. Based on our inspection, measurements and evaluation, it is our opinion the dam should be re-classified as an Intermediate sized, Significant (Class II) Hazard potential structure.

In general, the Talbot Mills Dam was found to be in fair condition primarily due to the lack of any operation or maintenance plan. Structurally, we found no indications of instability or seepage which comprise the integrity of the dam and appurtenant structures. The spillway appears to be adequately sized for the Spillway Design Flood (SDF); presuming the dam is re-classified as a Significant Hazard structure.

Some operational deficiencies exist and include:

- Minor seepage in the spillway abutment particularly at the left abutment.
- Trees located on the upstream side of the left embankment near the former intake gates to the Talbot Mills complex.
- Lack of an operable low level outlet and emergency bypass in the event of flooding.

Geotechnical Consultants, Inc. recommends the following actions be taken to address the deficiencies found at the dam during this inspection and evaluation:

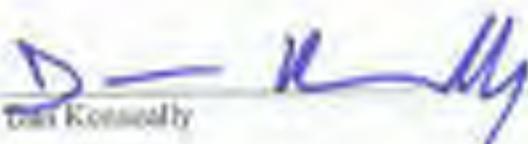
- Prepare and implement “routine” inspection and maintenance plans for the operation and maintenance of this dam.
- Inspect the interior of the of the Talbot Mills complex, particularly the downstream end of the former intake structures.
- Repair/replace the sluiceway and stilling basin gates so that the gates are operational and can provide emergency bypass control.
- Repair/replace the left spillway abutment to provide an operational low level outlet and provide emergency bypass control.

## PREFACE

The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations and analyses involving subsurface investigations, testing and detailed computational evaluations are beyond the scope of this report.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection, along with data available to the inspection team. In cases where an impoundment is lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions, which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is critical to note that the condition of the dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

  
Dan Kennedy

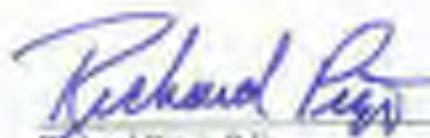
  
Richard Pitz, P.E.  
Massachusetts License No.: 32644  
GEOTECHNICAL CONSULTANTS, INC.



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## SECTION 1

### 1.0 DESCRIPTION OF PROJECT

#### 1.1 General

##### 1.1.1 Authority

The CRT Development Realty, LLC has retained Geotechnical Consultants, Inc. to perform a visual inspection and develop a report of conditions for the Mill Pond Dam, also known as the Talbot Mills Dam, in North Billerica, Massachusetts (Army Corps of Engineers ID #: MA 00774). This inspection and report were performed in accordance with MGL Chapter 253, Sections 44-50 of the Massachusetts General Laws as amended by Chapter 330 of the Acts of 2002.

##### 1.1.2 Purpose of Work

The purpose of this investigation is to inspect and evaluate the present condition of the dam and appurtenant structures in accordance with 302 CMR10.07 and to provide information that will assist in prioritizing dam repair needs, dam operation, and planning/conducting maintenance.

In 1999, Weston & Sampson Engineers, Inc. completed an evaluation study of this dam as part of its contract with the Commonwealth of Massachusetts, Department of Environmental Management, Office of Dam Safety (DEM). A copy of the Weston & Sampson report entitled *Owned Dam Inspection/Evaluation Report* dated May 20, 1999 was reviewed as part of our services and is attached as Appendix C.

The investigation is divided into four parts:

- obtain and review available reports, investigations, and data previously submitted to the owner pertaining to the dam and appurtenant structures;
- perform a visual inspection of the site;
- evaluate the status of an emergency action plan for the site and;
- prepare and submit a final report presenting the evaluation of the structure, including recommendations and remedial actions, and opinion of probable costs.

##### 1.1.3 Definitions

To provide the reader with a better understanding of the report, definitions of commonly used terms associated with dams are provided in Appendix D. Many of these terms may be included in this report. The terms are presented under common categories associated with dams which include: 1) orientation; 2) dam components; 3) size classification; 4) hazard classification; and 5) miscellaneous. All elevations referred to in this report are given in feet and are referenced to the National Geodetic Vertical Datum (NGVD) of 1929.

## 1.2 Description of Project

### 1.2.1 Location

The Talbot Mills Dam is located in Middlesex County in the village of North Billerica, Massachusetts. North Billerica is an unincorporated village of the town of Billerica, Massachusetts; one of nine villages that make up the Town of Billerica.

The Concord River flows through North Billerica, and at the old Talbot and Faulkner Mills is the Mill Pond and Dam marking the area where the old Middlesex Canal crossed over the river. This run-of-the-river dam and the impoundment are shown on the Billerica USGS quadrangle map at the following approximate coordinates:

Latitude: 42.59173° North  
Longitude: 71.28400° East

The best access for driving to the dam is via exit #29 off of US Route 3; then east on Billerica Road (State Route 129) for approximately 0.3 miles; turn north onto Brick Kiln Road for 0.4 miles; northeast onto Alpine Street for 0.4 miles; south onto Boston Road (State Route 3A) for approximately 400 feet; northeast onto Lowell Street for 0.5 miles; then northeast onto Old Elm Street 0.3 miles (Old Elm Street becomes Faulkner Street). The dam location and general vicinity are shown on the *Locus Plan* attached as Figure 1.

### 1.2.2 Owner/Operator

	Dam Owner	Dam Caretaker
Name	CRT Development Realty, LLC	Mr. William H. Martin
Mailing Address	6 Nicholas Circle	24 Ingleside Road
Town	Andover, MA 01810-4278	Lexington, MA 02470-2522
Daytime Phone	978-975-3687	781-676-7787
Emergency Phone		
Email Address		martinw@rcn.com

### 1.2.3 Purpose of the Dam

The area was originally meadow land and its hay and grass were used by the early English settlers as food for their farm animals. As it was subject to annual floods, attempts were made to curtail the problem. In 1659 William Sheldon received permission to construct a mill to grind corn, but it was not until 1708 that Christopher Osgood successfully erected an effective dam at the site. All subsequent owners of this spot trace their deed to Osgood and his dam. By the end of the 18th century there were five grist mills, three saw mills and one fulling mill at work here.

Faulkner Mills was at a crucial junction of waterways in the early 1800s. Not only

were the mills on the Concord River, a source of water power, but they were also at the highest point of the Middlesex Canal. The canal was the longest early American canal, dug entirely by hand and explosives, reaching over 20 miles from Boston at the southeast end to Lowell and the Merrimack River in the north. This canal would prove to be an important link for commerce in the early 1800s, before the advent of the railroads. The canal was the transport mechanism for lumber from New Hampshire, textiles from Lowell, and passengers from Boston.

During the period of the Middlesex Canal's operations, its Proprietors were in charge of the area and continued to run the mills as well as a fishway. For them, Loammi Baldwin replaced Osgood's old worn dam with a new one near the current dam at the Faulkner Street bridge. In 1828 the Proprietors again built a new dam on this site. At the Canal's demise, the control of the area passed to two families: the Faulkners and the Talbots.<sup>1</sup>

Currently, the dam is used for recreational purposes and flood control.

#### 1.2.4 Description of the Dam and Appurtenances

Talbot Mills Dam is located on the Concord River approximately 4.2 miles south of the confluence of the Concord and Merrimack Rivers. Overall, the dam, excluding the south training wall and sluiceway, is approximately 316 feet long with a maximum height of about 15 feet. It is an overflow or run-of-the-river type stone masonry, concrete and (presumably) earthen structure.

In 1999, Weston & Sampson Engineers, Inc. completed an evaluation study of the Talbot Mills Dam as part of its contract with the Commonwealth of Massachusetts, Department of Environmental Management, Office of Dam Safety (DEM). This is the last known inspection report for the dam and the information contained in the report was used as the basis for the current DCR size and hazard classification.

A copy of the Weston & Sampson report entitled *Owned Dam Inspection/Evaluation Report* dated May 20, 1999 was reviewed as part of our services and is included as Appendix C. Several inconsistencies were found in the report and are discussed in the assessment section of this report.

Due to the inconsistencies in the previous report and information on file with the DCR Office of Dam Safety, a complete survey of the dam and appurtenant structures as well as limited soundings to determine the water depth of the pond were made to provide a more complete and accurate basis for determination of both the DCR size and hazard classification. The survey was done by Eaglebrook Engineering & Survey, LLC in April 2009. A copy of *Site Plan*, drawing EX-1 dated April 20, 2009 is attached as Figure 2. for reference.

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<sup>1</sup> <http://www.middlesexcanal.org/gallery.htm>

There are three primary components to this dam:

- main impoundment and intake structure to the Talbot Mills complex
- main spillway and abutments
- sluiceway and primary intake to the Faulkner Mills complex

#### 1.2.4.1 Main Impoundment

The primary dam structure is of unknown construction and makes up the left (south) portion of the dam. This area of the dam supports Old Elm Street/Faulker Street and separates the Mill Pond from the Talbot Mills complex located on the left bank of the river just downstream from the dam. Elevations along Old Elm Street/Faulkner Street over this area of the dam range between 114.5 and 116.0 feet NGVD.

A vertical concrete wall was constructed at the southernmost end of the left side of the dam. The 60 foot long concrete wall forms the upstream dam face of the dam and contains five intake gates which formerly provided water to the Talbot Mills. We understand the gates are no longer functional and the intake tunnels upstream of the Talbot Mills were filled with concrete at some time in the past. The top of the concrete wall is at approximately elevation 118.0 at the gates.

A masonry stone wall is located on the upstream side of the dam and is located between the north end of the concrete intake wall and the left abutment of the spillway. The stone wall is approximately 73 feet long. Elevations along the top of the stone wall range between 115.3 feet at the south end and 114.2 feet at the north end adjacent to the spillway abutment.

Further to the south, a stone wall serves as a training wall. The top of the training wall ranges between elevation 112.2 and elevation 114.9 feet. Grades behind the wall slope slightly upward to the old Middlesex Canal Building. Remnants of the old Middlesex Canal alignment are located to the south of the building but the canal channel is overgrown as shown in Photograph 12.

#### 1.2.4.2 Spillway

Although the primary spillway was not visible at any time during our several site visits due to the continued flow, both the left and right abutments were visible and appeared to be constructed of masonry granite blocks. During our site inspection on 22 May 2009, approximately 6-inches of water was flowing across the top of the spillway. It appears the spillway crest is square-cut with a near vertical face. A portion of the right abutment is constructed of cast-in-place concrete. Spot grades at the top of the abutments range between elevations 111.0± to 111.5±. The top elevation at the primary spillway was estimated in the field due to the high flow at elevation 109.7±. This elevation is consistent with the elevation provided in the

FEMA study<sup>2</sup> of the Concord River. A complete copy of the FEMA study is provided in Appendix E.

Two small low level outlets are located in the granite block left abutment. The outlets are blocked although some discharge was observed at the downstream end of the outlets. Invert elevations at the downstream end of the outlets is approximately 100.6 feet. The outlets are shown in Photograph 11.

Numerous bedrock outcrops are visible at the toe of the spillway and form the downstream channel bed. Elevations of the downstream channel bed vary due to the jagged rock profile. However, the estimated grade at the top of rock/toe of spillway near the centerline of the channel is approximately elevation 99.5±.

The primary spillway is approximately 127 feet long with a height of approximately 10.2 feet. Both the left and right spillway abutments provide auxiliary spilling capacity. The left spillway abutment is approximately 17 feet long with the crest at elevation 111.2 feet. The right spillway abutment is approximately 20 feet long with the crest at elevation 111.6 feet.

#### 1.2.4.3 Sluiceway

A sluiceway and intake structure provides water to the Faulkner Mills complex located on the right bank of the river just downstream from the dam. The sluiceway is approximately 13 feet wide and is located on the right side of the dam just east of the right spillway abutment. Walls of the sluiceway are constructed primarily of mortared masonry field stone but portions of the sluiceway are concrete lined. Water in the sluiceway passes under a small bridge supporting Faulkner Street and is discharged into a stilling basin located between Faulkner Street and the Faulkner Mill Complex. The outlet gate from the stilling basin is in an open locked position and directs flows through an intake tunnel to a turbine located within the mill complex. Reportedly, the turbine has not been in service since 1972.

A movable gate and concrete weir are located within the sluiceway just east of the Faulkner Street Bridge. The gate is in poor condition and water continuously bypasses the gate. It is unknown whether or not the gate is operational. There are no other controls for the dam.

A small park is located adjacent to the right abutment of the spillway. The park contains a sitting area and a historic marker dedicated to the employees of the Faulkner Mills. The marker is shown in Photograph 10. Access to the park is available from a paved parking lot just east of the river and south of Faulkner Street by crossing a pedestrian bridge over the sluiceway.

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<sup>2</sup>Federal Emergency Management Agency, *Flood Insurance Study*, town of Billerica, Massachusetts, Middlesex County; February 8, 1985.

#### 1.2.4.4 Mill Pond

The dam impounds water to form the Mill Pond. Surface area of the irregularly shaped pond was estimated using scaled aerial photographs from several sources. The approximate pond shoreline and computation of surface area are shown on Figure 3. Attached as Appendix G are eight aerial photographs obtained from Environmental Data Resources, Inc. and are specifically prepared for this site. The eight photos contained in the EDR Aerial Photo Decade Packaged were taken between 1938 and 2006 and, in general, show the pond shoreline has remained relatively unchanged throughout this period.

During periods of “normal” flow, we estimated that the pond occupies an area of 8.6± acres and contains two branches which are shown on Figure 3. and the aerial photos of Appendix G. The west branch forms the main channel of the Concord River. Within the deeper west branch, the current is typically strong throughout the year. The east branch is much shallower, and during the summer months, has almost no flow as evidenced by an annual growth of algae on the pond surface. The delineation between the algae growth and channel flow are clearly visible in the 1980 and 2006 aerial photographs.

A complete profile for the Concord River is contained in the FEMA Flood Study of 1985. Stream bed elevations and water depths through the west branch of the Mill Pond, along the primary flow path of the river, are shown at elevation 98.5± and 16± feet, respectively. Soundings taken in the shallower east branch of the Mill Pond showed the bed level to vary between elevations 108± near the periphery of the pond close to the north shore to elevations 103± at about the centerline of the east branch of the pond. No soundings were made at the south end of the east branch. Based on the general topography and evidence of aquatic plant growth at the south end of the east branch, we expect the water depths to be shallowest in this area. Using the information cited above along with the survey measurements and aerial photographs, we estimate the storage capacity of the Mill Pond at the 100-year flood level is 140 acre-feet.

#### 1.2.4.5 Faulkner Street Bridge

Located immediately downstream from the primary dam spillway is the Faulkner Street Bridge. Having a width of approximately 32 feet, the bridge carries two lanes of vehicle traffic and a pedestrian sidewalk on the west (downstream) side only. The curved concrete arch bridge has an overall length of approximately 120 feet. Each individual span of the dual span concrete arch is approximately 42 feet long at the base. It appears the center pier and abutment footings are armored and founded directly on the bedrock. The bridge can be seen in Photographs 4 and 5.

#### 1.2.5 Operations and Maintenance

The responsible party of the operations and maintenance of the Talbot Mills Dam is

CRT Development Realty, LLC of Lexington, Massachusetts. The caretaker is Mr. William H. Martin.

There are no formal records kept on the operations and maintenance of this dam, nor are there any written operating procedures for this dam.

No records could be found for any repairs, either major or minor made to this dam.

#### 1.2.6 DCR Size Classification

Talbot Mills dam has a height of approximately 10.2 feet measured from the lowest portion of the dam spillway to the lowest point in the channel at the downstream toe of the dam. The maximum storage capacity of the dam is 140 acre-feet. Therefore, in accordance with Department of Conservation and Recreation Office of Dam Safety classification, under Commonwealth of Massachusetts dam safety rules and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, Talbot Mills Dam is an intermediate size structure.

#### 1.2.7 DCR Hazard Classification

Talbot Mills Dam is located along Old Elm Street/Faulkner Street in North Billerica, Massachusetts immediately upstream from the Faulkner Street Bridge. It appears that a failure of the dam at maximum pool will not result in significant damage to the bridge or other downstream structures based on our review of the available flood records.

A review of the aerial photographs and topographic maps of the Concord River downstream of the Talbot Mills Dam indicated that the potential damage to habitable structures will be minor since no structures are in the direct path of the probable flood wave produced upon failure of the dam. In addition, both the Town of Billerica and the City of Lowell have adopted zoning and conservation bylaws which are consistent with FEMA recommendations for construction within the floodway. As a result, no more than a 2.0 foot incremental rise of flood water above the lowest ground elevation adjacent to the outside foundation walls, nor more than a 2.0 foot incremental rise of flood water above the lowest habitable floor elevation of structures within the floodway is likely to occur in the event of dam breach at the Talbot Mills Dam during the design flood event.

Given the minimal rise in flood water downstream in the event of a dam failure, the risk of loss of life and damage to homes, industrial or commercial facilities, secondary highways or railroads is considered to be low. Additionally, flooding as a result of a dam breach to the Talbot Mills Dam is unlikely to cause interruption of use or service of relatively important facilities located downstream of the dam.

Therefore, in accordance with Department of Conservation and Recreation classification procedures, under Commonwealth of Massachusetts dam safety rules

and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, Talbot Mills is classified as a Significant Hazard (Class II) structure.

### 1.3 Pertinent Engineering Data

#### 1.3.1 Drainage Area

The drainage area for the Talbot Mills Dam is approximately 370 square miles and extends through the communities of Concord Carlisle, Bedford, and Billerica. The two major waterways in Billerica are the Concord and Shawsheen Rivers. The Concord River is formed by the confluence of the Assabet and Sudbury Rivers, approximately one mile northwest of the center of Concord. The river system is often referred to as the Sudbury-Assabet-Concord (SuAsCo) river basin.

The Concord River flows sluggishly in a general northerly direction for approximately 16 miles before joining the Merrimack River in Lowell and falls 62 feet over its course. Approximately 50 feet of the drop occurs at dams in the first mile of the river in Lowell; downstream from the Talbot Mills Dam. The 11.5-mile reach of the Concord River from its confluence with the Assabet and Sudbury Rivers in Concord to North Billerica is controlled by the Talbot Mills Dam.

#### 1.3.2 Reservoir

	Length <sup>1</sup> (feet)	Width <sup>1</sup> (feet)	Surface Area (acres)	Storage Volume (acre-feet)
Normal Pool	1300	720	8.6	110
Maximum Pool	1360	780	12.6	162
SDF Pool	--	--	10.7	140

1. Maximum dimension

#### 1.3.3 Discharges at the Dam Site

Storm Event	Peak Discharges at Talbot Mills Dam (cfs)
10 Year	2,940
50 Year	4,660
100 Year	5,675
500 Year	8,395

#### 1.3.4 General Elevations (feet - Referenced to NGVD of 1929)

A.	Top of Dam	114.6
B.	Spillway Design Flood Pool (100 Yr.)	114.2
C.	Normal Pool	110.5
D.	Spillway Crest	109.7
E.	Upstream Water at Time of Inspection	111.1
F.	Streambed at Toe of the Dam	99.5
G.	Low Point along Toe of the Dam	99.5

#### 1.3.5 Main Spillway

A.	Type	Broad Crest
B.	Length	127 feet
C.	Invert Elevation	109.7 feet
D.	Upstream Channel Elevation	98.5 feet
E.	Downstream Channel Elevation	99.5 feet
F.	Downstream Water	102.5 feet

#### 1.3.6 Lower Level Outlet

A.	Type	Sluiceway with Gate
B.	Number of bays:	2 (at left spillway abutment)
C.	Invert:	105.7 feet
D.	Bay size:	13 feet open channel

#### 1.3.7 Design and Construction Records

No construction records or design data were available for review during the inspection and preparation of this report.

#### 1.3.8 Operating Records

There were no operating records or records of rainfall or pond height for this dam available at the time of the inspection.

## SECTION 2

### 2.0 INSPECTION

#### 2.1 Visual Inspection

Talbot Mills Dam was inspected on four dates between 26 January 2009 and 22 May 2009. At the time of the inspection, the weather varied from cold and cloudy to warm and sunny. Photographs to document the current conditions of the dam were taken during the inspections and are included in Appendix A. The level of the impoundment was 111.1-feet on 14 April 2009 and approximately 110.2 on 22 May 2009. Underwater areas were not inspected. A copy of the inspection checklist is included in Appendix B.

##### 2.1.1 General Findings

In general, Talbot Mills Dam was found to be in fair condition due to the lack of routine maintenance and operational procedures. We observed no structural defects or concerns. Specific concerns are identified in more detail in the sections below.

##### 2.1.2 Dam

###### *Abutments*

The left and right abutments appear sound with no evidence of erosion, significant seepage or cracking. Both abutments of the spillway appear to be founded on bedrock.

###### *Embankments*

The left embankment is of unknown construction but most likely consists of an earthen structure supporting Old Elm Street/Faulkner Street. Immediately downstream of the left embankment is the Talbot Mills Complex. No inspection was made of the interior space of the mill complex.

###### *Upstream Face*

The upstream face of the left embankment is constructed with a near vertical facing wall. Overall, the wall is approximately 133 long with a 60-foot long concrete facing at the south end and a 73-foot long stone masonry face between the concrete wall and the primary abutment to the north. Intake gates for the Talbot Mills complex are located at the concrete wall. However the gates are not operational and the intake tunnels have reportedly been infilled with concrete.

The tops of both the stone masonry and concrete facing walls are in good conditions with no observed cracks, bulges or misalignments. No evidence of erosion, sloughing or other indications of instability were observed at any time during our inspections.

### *Crest*

The crest of the embankment is nearly flat and level and supports the paved surface of Old Elm Street/Faulkner Street. This portion of the road leading to the Faulkner Street Bridge shows no indications of erosion or undue wear from traffic (either pedestrian or vehicular) and the area is well-maintained. Several trees are located at the upstream side of the crest; near the Talbot Mills intake gates.

### *Downstream Face*

The Talbot Mills complex is located at the downstream face of the embankment. No inspection was made of the interior space of the mill complex.

Right of the Spillway - This area is comprised of a portion of the Faulkner Street Embankment which is located between the right spillway abutment, the sluiceway and the stilling basin. This area is well maintained.

### *Drains*

There were no drains in use or visible at this dam at the time of our inspection.

### *Instrumentation*

There were no instruments at this dam at the time of our inspection.

### *Access Roads and Gates*

Access to the dam is via Old Elm and Faulkner Streets. The intake gates at the left side of the dam which formerly provided water to the Talbot Mills are not operational and the intake tunnels have reportedly been infilled with concrete.

A movable gate and concrete weir are located within the sluiceway just east of the Faulkner Street Bridge. The gate is in poor condition and water continuously bypasses the gate. It is unknown whether or not the gate is operational.

## 2.1.3 Appurtenant Structures

### *Primary Spillway*

Although the primary spillway was not visible at any time during our several site visits due to the continued flow, both the left and right abutments were visible and appeared to be constructed of masonry granite blocks. Information contained in the previous inspection report characterize the spillway as a granite block structure forming a broad crested weir. During our site inspection on 22 May 2009, approximately 6-inches of water was flowing across the top of the spillway. It appears the spillway crest is square-cut with a near vertical face.

The primary spillway is approximately 127 feet long with a height of approximately 10.2 feet. Direct measurement of the top of spillway elevation was not possible due to the continuous flow during each of our site visits. The top elevation at the primary spillway is estimated to be at elevation 109.7±. This elevation is consistent with the

data provided in the FEMA study<sup>3</sup> of the Concord River and the elevation shown on the river profile. A complete copy of the FEMA study is provided in Appendix E.

The primary spillway is flanked by small granite block abutments. A portion of the right abutment is constructed of cast-in-place concrete. At flood stages, the abutments serve as auxiliary spillways and provide additional discharge capacity. Spot grades at the top of the abutments range between elevations 111.2± to 111.6± with lengths of approximately 17 feet at the left abutment and 20 feet at the right abutment.

Numerous bedrock outcrops are visible at the toe of the spillway and form the downstream channel bed. Elevations of the downstream channel bed vary due to the jagged rock profile which can be seen in Photograph 2. However, the estimated grade at the top of rock/toe of spillway near the centerline of the channel is approximately elevation 99.5±.

A small tree is thriving amongst the jagged bedrock channel just downstream of the primary spillway. This tree was noted in the 1999 report prepared by Weston & Sampson and is clearly visible in the photographs contained in that report and in the attached Photograph 2.

Based on the FEMA study, the flood elevation for the 100 year storm event at the Talbot Mills Dam crests at elevation 114.7 feet and the estimated river flow at the dam is 5,675 cfs. A check of the spillway capacity is provided in Appendix F. At the 100 year design level, we estimate the spillway capacity to be approximately 6,650 cfs. Our estimate compares favorably with the estimated capacity provided in the 1999 Weston & Sampson report. Therefore, the spillway, in its current state is adequate to pass the design flood.

#### *Low Level Outlet*

There is no operational low level outlet for the dam. A sluiceway and intake structure provides water to the Faulkner Mills complex located on the right bank of the river just downstream from the dam. The sluiceway is approximately 13 feet wide and is located on the right side of the dam just east of the right spillway abutment. Walls of the sluiceway are constructed primarily of mortared masonry field stone but portions of the sluiceway are concrete lined. Water in the sluiceway passes under a small bridge supporting Faulkner Street and is deposited into a stilling basin located between Faulkner Street and the Faulkner Mill Complex. From the stilling basin, the outlet gate is in an open locked position and directs flows to a turbine which reportedly has not been in service since 1972.

A movable gate and concrete weir are located within the sluiceway just east of the Faulkner Street Bridge. The gate is in poor condition and water continuously

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<sup>3</sup>Federal Emergency Management Agency, *Flood Insurance Study*, Town of Billerica, Massachusetts, Middlesex County; February 8, 1985.

bypasses the gate. It is unknown whether or not the gate is operational. There are no other controls for the dam.

Two small low level outlets are located in the granite block left abutment of the spillway. The outlets are blocked although some discharge was observed at the downstream end of the outlets. The conditions of the upstream end of the outlets was not visible for inspection. Invert elevations at the downstream end of the outlets is approximately 100.6 feet. The outlets are shown in Photograph 11.

#### 2.1.4 Downstream Area

Downstream of the dam are the Talbot Mills and Faulkner Mills complexes. Both of these complexes are founded on the exposed bedrock walls adjacent to the downstream channel. Beyond the mill complexes, is a series floodplains and wetlands areas.

#### 2.1.5 Reservoir Area

The Talbot Mill Dam impounds water to form the Mill Pond. Surface area of the irregularly shaped pond was estimated using scaled aerial photographs from several sources taken over many years. For all years reviewed, the pond shoreline was relatively unchanged.

The pond is comprised of two branches. The west branch forms the main channel of the Concord River and is the deeper of the two while the east branch is much shallower. During the summer months, the east branch has almost no flow as evidenced by an annual growth of algae on the pond surface. The topography surrounding the pond is relatively flat and level with negligible risk of slides which potentially could affect the water level. A wetland area is located at the south end of the east branch which provides significant reserve capacity during periods of flooding.

### 2.2 Caretaker Interview

The caretaker is Mr. William H. Martin of 24 Ingleside Road in Lexington, Massachusetts. Mr. Martin was first interviewed on 26 January 2009; the day of our initial inspection. According to Mr. Martin, although originally part of the Talbot Mills and Faulkner Mills properties, when the mill complexes were sold in recent years, the dam site remained the possession of CRT Development Realty, LLC. Although the dam provided water power to the mill complexes, it is presently used exclusively for recreation, flood control and kept for its historical significance.

Mr. Martin indicated that no formal operation or maintenance plan exists for the dam and due to the formerly disputed ownership, no maintenance has been performed at the dam for several years.

## 2.3 Operation and Maintenance Procedures

At the time of the inspection there were no formal operation or maintenance plans available.

### 2.3.1 Operational Procedures

The dam spillway is uncontrolled, which means that the fixed elevation of the spillway crest controls the level of the impoundment. No other operational procedures are in place, or are required, for this dam.

### 2.3.2 Maintenance of Dam and Operating Facilities

There are no maintenance plans available for this dam.

## 2.4 Emergency Warning System

There was no information found on an emergency warning system for this dam. In 302 CMR 10.00: Dam Safety, Department of Conservation and Recreation, it is stated that all dams classified or reclassified as high hazard potential shall have an Emergency Action Plan ("EAP"). Therefore this dam does not need an EAP unless the Commissioner requires it from the Owner.

## 2.5 Hydrologic/Hydraulic Data

Talbot Mills Dam is an intermediate size, Class II (Significant) hazard structure and in accordance with Massachusetts Law, the spillway design flood (SDF) for the site is ¼ PMF (100 year) storm event. A FEMA flood study was completed for the Town of Billerica in 1985. A copy of the study entitled *Flood Insurance Study*, Town of Billerica, Massachusetts, Middlesex County; February 8, 1985 is included as Appendix E.

## 2.6 Structural Stability/Overtopping Potential

### 2.6.1 Embankment Structural Stability

Based on our inspection and review, as well as historical evidence, the dam is stable. The spillway appears intact with a level crest. The impoundment side walls are vertical and level. The embankment supports Old Elm/Faulkner Street is paved and in good condition. There are no signs of vehicular ruts, foot trails, sloughing or animal burrows.

### 2.6.2 Overtopping Potential

Based on the analysis, there is little risk of overtopping during the Spillway Design Flood (SDF) for the 100-year recurrence interval. Historical reports provided in the

FEMA study suggests the dam has never experienced overtopping and the spillway is capable of passing the Design Flood (SDF) for the 100-year recurrence interval produces with a flow of 5,675 cfs.

## SECTION 3

### 3.0 ASSESSMENT AND RECOMMENDATIONS

#### 3.1 Assessment

The Talbot Mills Dam is located in Middlesex County in the village of North Billerica, Massachusetts. North Billerica is an unincorporated village of the town of Billerica, Massachusetts; one of nine villages that make up the Town of Billerica.

The Concord River flows through North Billerica, and at the old Talbot and Faulkner Mills, is the Mill Pond and Dam marking the area where the old Middlesex Canal crossed over the river. This run-of-the river dam and the impoundment are shown on the Billerica USGS quadrangle map at the following approximate coordinates:

Latitude:	42.59173° North
Longitude:	71.28400° East

In 1999, Weston & Sampson Engineers, Inc. completed an evaluation study of the Talbot Mills Dam as part of its contract with the Commonwealth of Massachusetts, Department of Environmental Management, Office of Dam Safety (DEM). This is the last known inspection report for the dam and the information contained in the report was used as the basis for the current DCR size and hazard classification.

A copy of the Weston & Sampson report entitled *Owned Dam Inspection/Evaluation Report* dated May 20, 1999 was reviewed as part of our services and is included as Appendix C.

Several inconsistencies were found in the report. The 1999 report classifies the dam as a high hazard intermediate size dam. However, the information contained in the report and used to make this determination is inconsistent. The information currently on file with DCR from the previous dam inspection and evaluation vary markedly from the actual conditions with respect to pertinent engineering data used to classify this dam. As a result of our findings, measurements and computations, it is our opinion that the dam should be reclassified. An *Application to Change Hazard Classification of Dam* will be submitted under separate cover along with substantiating data for review by the Commissioner.

Due to the inconsistencies in the previous report and information on file with the DCR Office of Dam Safety, a complete survey of the dam and appurtenant structures as well as limited soundings to determine the water depth of the pond depth were made to provide a more complete and accurate basis for determination of both the DCR size and hazard classification. The survey was done by Eaglebrook Engineering & Survey, LLC in April 2009. A copy of *Site Plan*, drawing EX-1 dated April 20, 2009 is attached as Figure 2. for reference.

A review of the aerial photographs and topographic maps of the Concord River downstream of the Talbot Mills Dam indicated that the potential damage to habitable structures will be minor since no structures are in the direct path of the probable flood wave produced upon failure of dam. In addition, both the Town of Billerica and the City of Lowell have adopted zoning and conservation bylaws which are consistent with FEMA recommendations for construction within the floodway. As a result, no more than a 2.0 foot incremental rise of flood water above the lowest ground elevation adjacent to the outside foundation walls, nor more than a 2.0 foot incremental rise of flood water above the lowest habitable floor elevation of structures within the floodway is likely to occur in the event of dam breach at the Talbot Mills Dam during the design flood event.

Given the minimal rise in flood water downstream in the event of a dam failure, the risk of loss of life and damage to homes, industrial or commercial facilities, secondary highways or railroads is considered to be low. Additionally, flooding as a result of a dam breach at the Talbot Mills Dam is unlikely to cause interruption of use or service of relatively important facilities located downstream of the dam.

Therefore, in accordance with Department of Conservation and Recreation classification procedures, under Commonwealth of Massachusetts dam safety rules and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, Talbot Mills Dam should be classified as a Class II (significant) hazard structure.

Based on the FEMA flood study of 1985 and the estimated spillway capacity, there is little risk of overtopping during the Spillway Design Flood (SDF) for the 100-year recurrence interval. Historical reports suggest the dam has never experienced overtopping. For the Talbot Mills Dam, the spillway capacity is adequate to pass the Spillway Design Flood (SDF) for the 100-year recurrence interval which produces a flow of 5,675 cfs.

In general, Talbot Mills Dam was found to be in fair condition primarily due to the lack of operation and maintenance plans. The noted deficiencies include:

- Lack of operation and maintenance plan.
- Lack of routine oversight of the dam, particularly during a storm event.
- Lack of working controls.
- Lack of functional low level outlet.
- Leaks and inability to control water at the sluiceway gate and weir.

When compared with the conditions reported in the previous inspection/evaluation report dated May 20, 1999, no significant changes were found. No seepage or other indications of instability were found in the embankment, walls, spillway or spillway abutments.

The following recommendations and remedial measures generally describe the

recommended approach to address current deficiencies at the dam. Prior to undertaking recommended maintenance, repairs and remedial measure, the applicability of environmental permits needs to be determined prior to undertaking activities that may occur within resource areas under the jurisdiction of local conservation commissions, MADEP, or other regulatory agencies.

### 3.2 Routine Maintenance

There is no routine maintenance procedures in place for this dam. A comprehensive maintenance and “routine” inspection plan should be implemented.

1. Regular maintenance activities should prevent growth of unwanted vegetation on the embankment, and pond periphery to reduce the potential for debris to impede flow over the spillway and downstream channel.
2. Clear debris from the spillway and downstream channel on a regular basis. Inspect the spillway for accumulation of debris particularly after storm events or other periods of high runoff.
3. Regularly inspect the dam for indications of seepage or erosion. Particular emphasis should be placed on:
4.
  - the spillway wall
  - portions of the impoundment facing walls immediately adjacent to the spillway on the left side of the dam
  - the fieldstone wall immediately downstream of the spillway and north of the Faulkner Street Bridge
  - removal of debris from the sluiceway and stilling basin on the right side of the primary spillway.

### 3.3 Recommendations, Maintenance, and Minor Repairs

These recommendations may require construction by a contractor experienced in dam repair.

- Remove trees on the upstream face of the roadway embankment near the non-functional intake gates to the Talbot Mills complex.
- Inspect the interior of the of the Talbot Mills complex, particularly the downstream end of the former intake structures. The infilling of the intake tunnels on the left side of the dam rendered these intakes inoperable. Given the configuration of the dam, proximity of the mill complexes, and change in ownership of the downstream properties, the re-construction of a low level outlet in this area is impractical.
- Repair/replace the sluiceway and stilling basin gates so that the gates are

operational and can provide emergency bypass control.

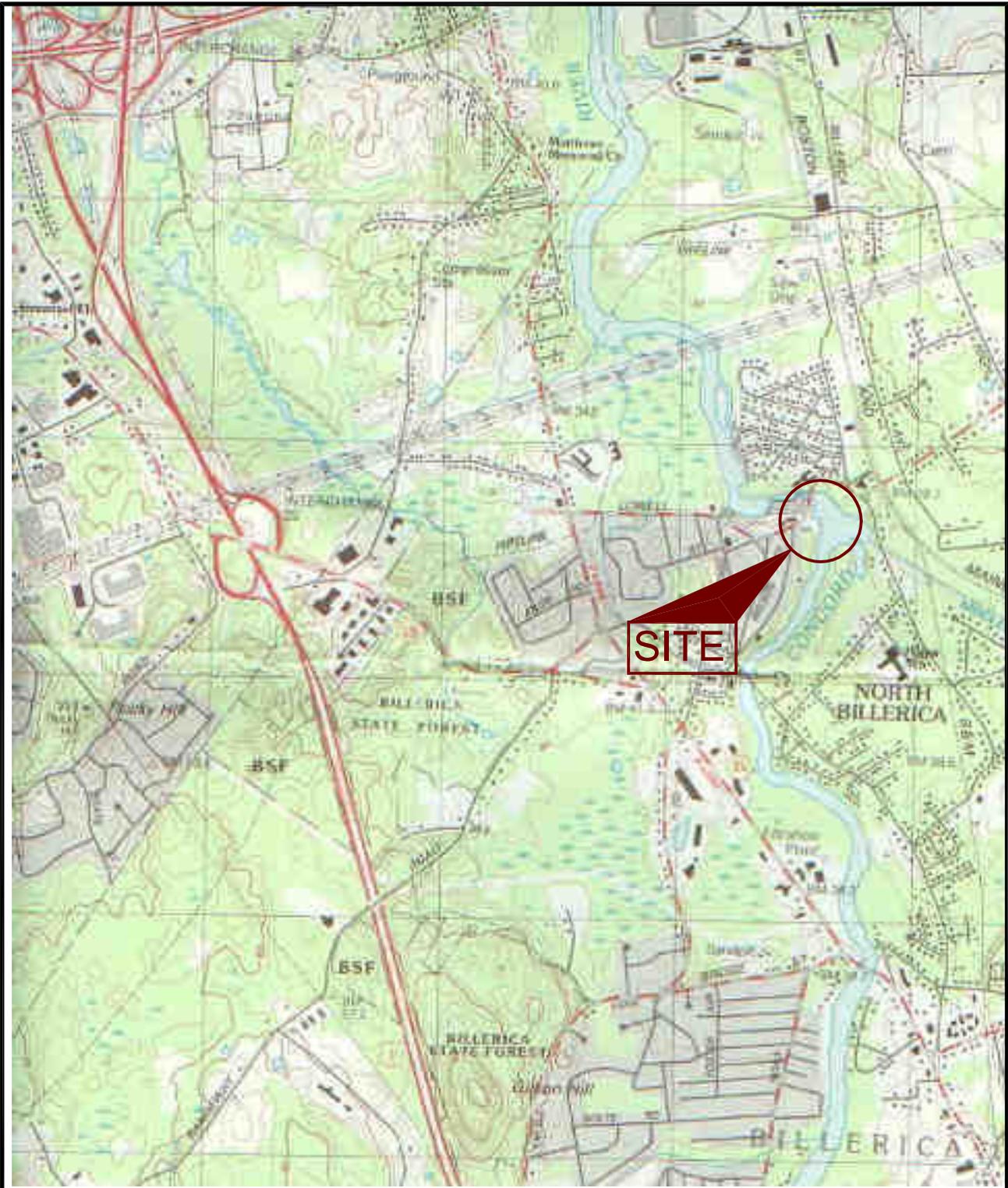
- Repair/replace the left spillway abutment to provide an operational low level outlet

### 3.4 Opinion of Probable Construction Costs

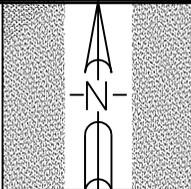
The following conceptual opinions of probable construction costs have been developed for the recommendations and remedial measures noted above. The costs herein are based on a limited investigation and are provided for general information only. This should not be considered an engineer's estimate, as actual construction costs may be somewhat less or considerably more than indicated

#### **Talbot Mills Dam**

- |   |          |
|---|----------|
| • Remove trees on the downstream face of the embankment | \$3,000  |
| • Repair/replace the sluiceway and stilling basin gates | \$60,000 |
| • Repair/replace the left spillway and install gates    | \$40,000 |



TALBOT MILLS DAM  
 Billerica, Massachusetts  
 NID ID# MA00774



LOCUS PLAN  
 U.S.G.S. QUADRANGLE  
 Billerica  
 APPROX. SCALE 1:24 000

**Geotechnical  
 Consultants, Inc.**

201 Boston Post Road West  
 Marlborough, MA 01752  
 (508)229-0900 FAX (508)229-2279



GCI Project # 2092945

Figure 1.



EAGLEBROOK

EAGLEBROOK ENGINEERING & SURVEY, LLC

199 NEWBURY STREET  
DANVERS, MASS. 01923  
TEL: (781) 771-7310

Geotechnical  
Consultants, Inc.

201 Boston Post Road West  
Marlborough, MA 01752  
Phone: (508)229-0900  
FAX (508)229-2279  
www.geotechnical.us

TALBOT MILL DAM  
LOCATED IN  
BILLERICA, MASSACHUSETTS  
PREPARED FOR  
GEOTECHNICAL CONSULTANTS, INC.  
201 BOSTON POST ROAD WEST  
MARLBOROUGH, MASSACHUSETTS



DATE:  
APRIL 20, 2009

REVISIONS:	NO.:	DESCRIPTION:	DATE:
	1	Spillway Grades	5-22-09

DRAWN BY: MJJ  
CHECKED BY: MJJ/RP  
SCALE: AS NOTED

PROJECT NO. 09-011

TITLE:  
**SITE PLAN**  
EX-1

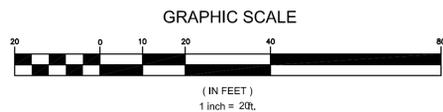
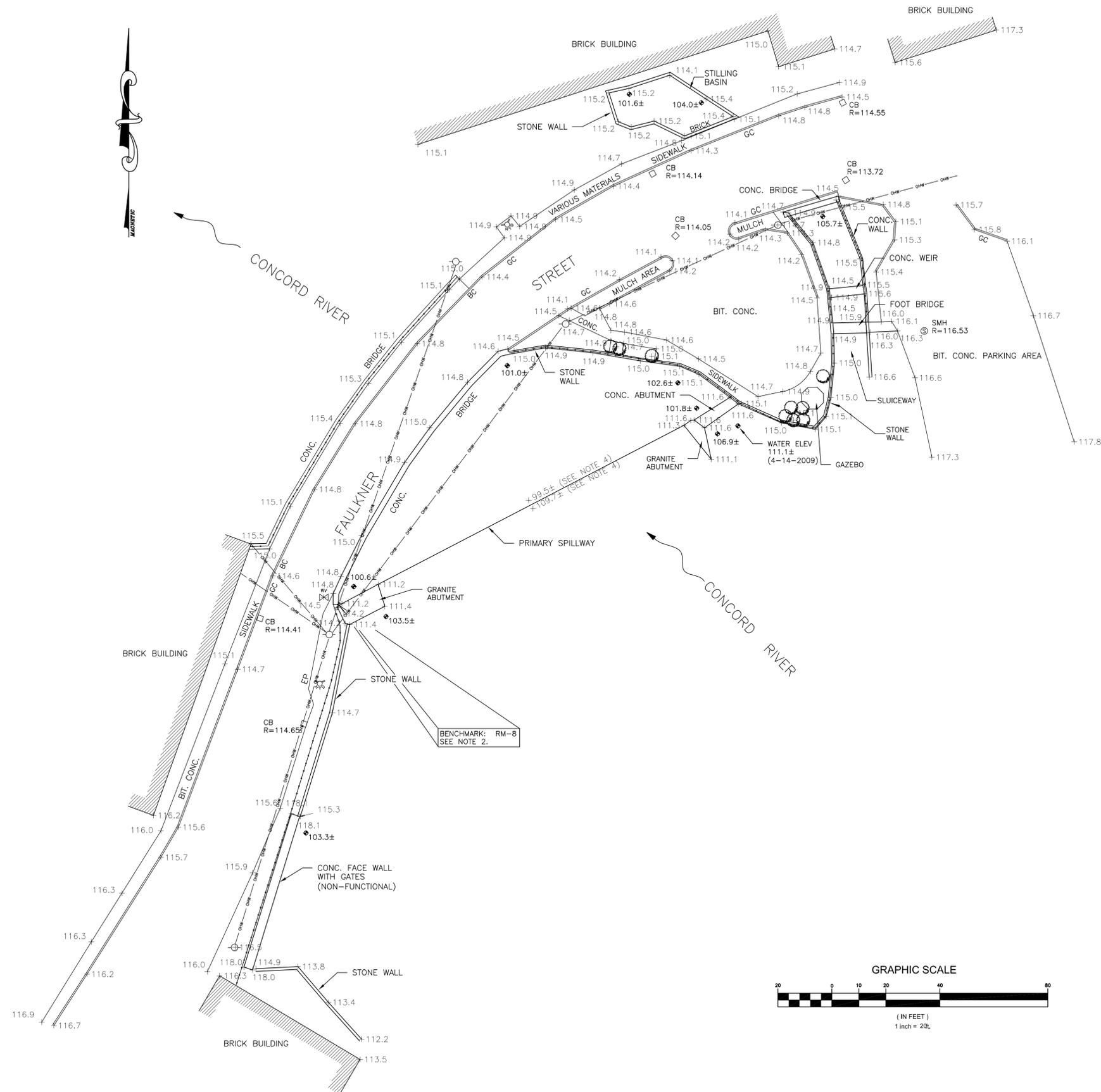
SHEET No. 1 OF 1

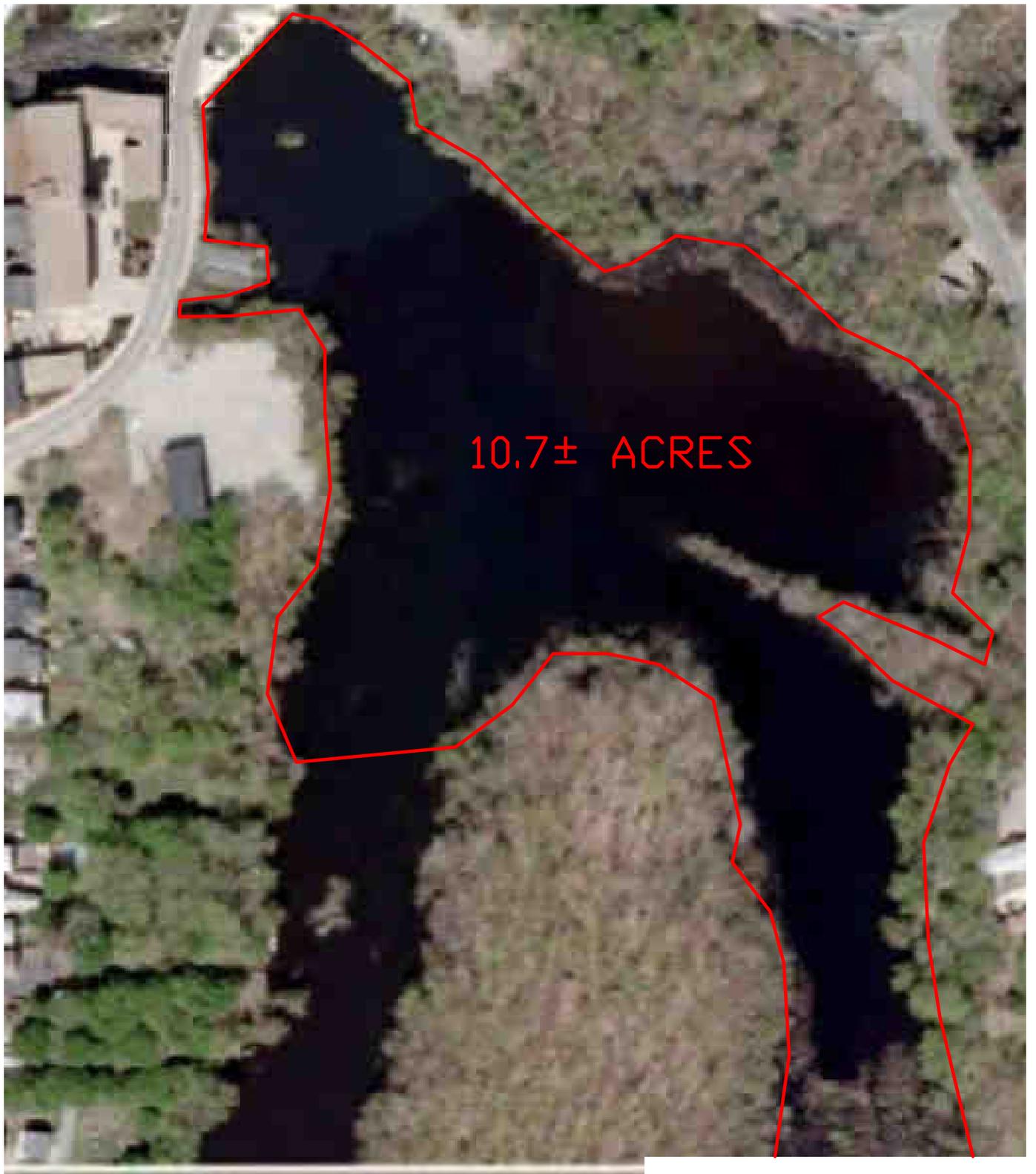
NOTES:

1. THE FIELD WORK WAS PERFORMED ON APRIL 14, 2009. A MAGNETIC NORTH READING WAS OBTAINED DURING THE FIELD WORK.
2. THE STARTING VERTICAL BENCHMARK IS THE NORTHEAST SIDE OF THE TOP OF GRANITE BLOCK, AT THE SOUTHWEST END OF THE TALBOT MILL DAM NEAR FAULKNER STREET, ON THE SOUTHWEST SIDE OF THE SPILLWAY AT GROUND LEVEL. A SQUARE CUT WAS NOT FOUND ON THE GRANITE BLOCK. ELEVATION IS 114.26 (RM-8) ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 AS DEPICTED ON THE FEMA FLOOD MAP 250183, PANEL 5 OF 10 DATED AUGUST 5, 1985. A BENCHMARK WAS CHECKED AS PROVIDED BY THE BILLERICA ENGINEERING DEPARTMENT SINCE THE SQUARE CUT WAS NOT VISIBLE. THE BENCHMARK VERIFIED THE ACCURACY OF RM-8. IT IS DESCRIBED AS A HYDRANT SPINDLE AT THE SOUTHEAST CORNER OF LOWELL STREET AND TALBOT STREET (ELEV. 131.39)
3. THE SOLE PURPOSE OF THIS PLAN IS TO DEPICT PLANIMETRIC AND SPOT ELEVATIONS IN THE VICINITY OF THE TALBOT MILL DAM.
4. GRADES AT MID-POINT OF SPILLWAY WERE TAKEN FROM FEMA FLOOD INSURANCE STUDY DATED FEBRUARY 5, 1985.

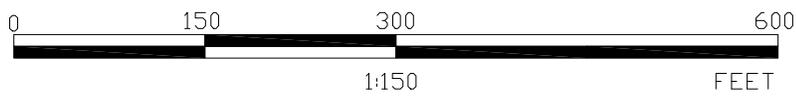
LEGEND:

- BIT. CONC. BITUMINOUS CONCRETE
- GC GRANITE CURB
- CONC. CONCRETE
- CB CATCHBASIN
- R RIM
- SMH SEWER MANHOLE
- +110.0 SPOT ELEVATION
- 110.0± GROUND ELEVATION (UNLESS NOTED OTHERWISE)
- TREE
- EP EDGE OF PAVEMENT
- BC BITUMINOUS CONCRETE CURB
- UTILITY POLE
- OHW- OVERHEAD WIRES





10.7± ACRES



<p><b>Geotechnical Consultants, Inc.</b>          201 Boston Post Road West          Marlborough, MA 01752          (508)229-0900 FAX (508)229-2279</p> 	Rev.	Date
	0	22 MAY 2009

**TALBOT MILLS DAM**  
 FAULKNER STREET  
 Billerica, Massachusetts

**FIG. 3**

## **APPENDIX A**



**Photograph 1. Overview of Talbot Mills Dam Looking Downstream**



**Photograph 2. Overview of Talbot Mills Dam Looking Upstream**



**Photograph 3. Concrete Wall and Intake Gates Left of Spillway**



**Photograph 4. Downstream of Spillway Viewed from Left Abutment**



**Photograph 5. Falkner Street Bridge Viewed from Right Abutment**



**Photograph 6. Downstream Channel Viewed from Falkner Street Bridge**



**Photograph 7. Stilling Basin with Outlet Gate in Opened Locked**



**Photograph 8. Sluiceway with Movable Gate and Concrete Weir**



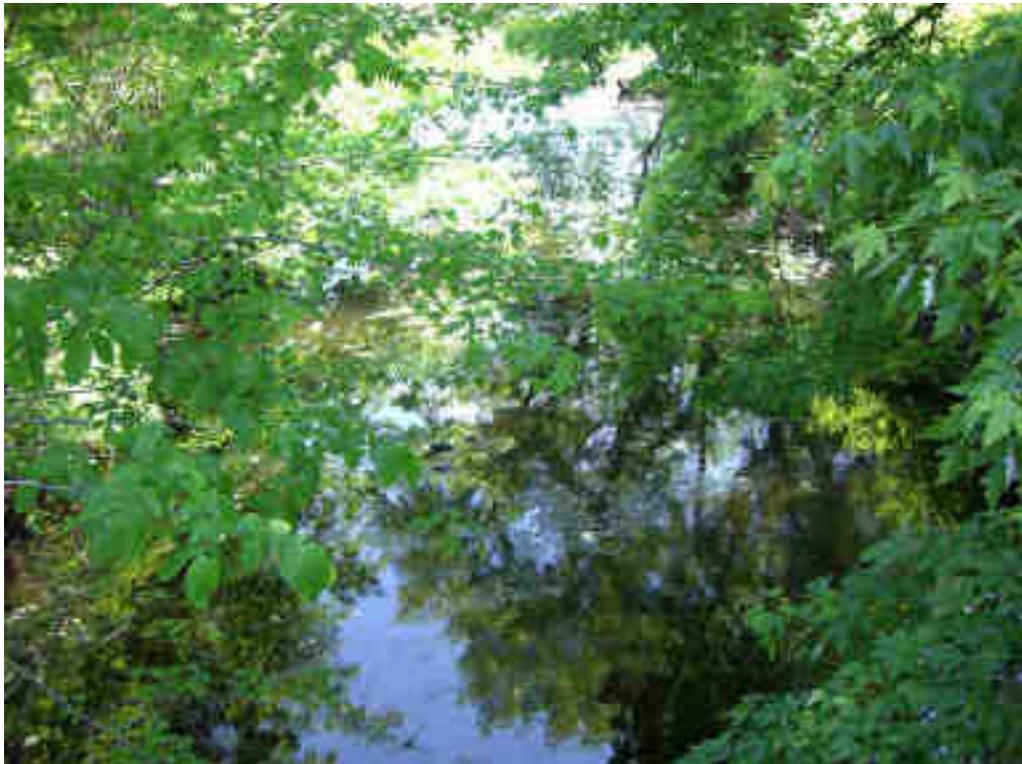
**Photograph 9. Water Seepage Through the Sluiceway Gate**



**Photograph 10. Historic Marker Dedicated to the Employees of Faulkner Mills**



**Photograph 11. Lower Level Outlet at Left Spillway Abutment**



**Photograph 12. Overgrown Alignment of Old Middlesex Canal**

## **APPENDIX B**

### DAM SAFETY INSPECTION CHECKLIST

NAME OF DAM: <u>Talbot Mills Dam</u>	STATE ID #: <u>4-9-31-1</u>
REGISTERED: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	NID ID #: <u>MA 00774</u>
STATE SIZE CLASSIFICATION: <u>Intermediate</u>	STATE HAZARD CLASSIFICATION: <u>Significant (Class II)</u>
<u>LOCATION INFORMATION</u>	
CITY/TOWN: <u>Billerica (Village of North Billerica)</u>	COUNTY: <u>Middlesex</u>
DAM LOCATION: <u>67 Faulkner Street</u>	AKA NAME: <u>Old Elm Street/Old Elm Street Extension</u>
USGS QUAD.: <u>Billerica</u>	LAT.: <u>42.59173° North</u> LONG.: <u>71.28400° East</u>
DRAINAGE BASIN: <u>Sudbury-Assabet-Concord (SuAsCo)</u>	RIVER: <u>Concord River</u>
IMPOUNDMENT NAME(S): <u>Mill Pond (a.k.a.Talbot Mills Pond or Faulkner Mills Pond)</u>	
<u>GENERAL DAM INFORMATION</u>	
TYPE OF DAM: <u>Masonry/Earth (SPILWAY: Masonry Gravity)</u>	OVERALL LENGTH (FT): <u>316</u>
PURPOSE OF DAM: <u>Recreational and flood control purposes</u>	NORMAL POOL STORAGE (ACRE-FT): <u>110 +/-</u>
YEAR BUILT: <u>circa 1828</u>	MAXIMUM POOL STORAGE (ACRE-FT): <u>162</u>
STRUCTURAL HEIGHT (FT): <u>16+/-</u>	EL. NORMAL POOL (FT): <u>110.5 +/-</u>
HYDRAULIC HEIGHT (FT): <u>10.2</u>	EL. MAXIMUM POOL (FT): <u>114.8 +/-</u>
<u>FOR INTERNAL MADCR USE ONLY</u>	
FOLLOW-UP INSPECTION REQUIRED: <input type="checkbox"/> YES <input type="checkbox"/> NO	CONDITIONAL LETTER: <input type="checkbox"/> YES <input type="checkbox"/> NO

NAME OF DAM: Talbot Mills Dam STATE ID #: 4-9-31-1  
 NID ID #: MA 00774

INSPECTION SUMMARY

DATE OF INSPECTION: 1/26/09 & 4/14/09 & 5/22/09 DATE OF PREVIOUS INSPECTION: May 20, 1999  
 TEMPERATURE/WEATHER: Cloudy/Clear ARMY CORP PHASE I:  YES  NO If YES, date \_\_\_\_\_  
 CONSULTANT: Geotechnical Consultants, Inc. PREVIOUS DCR PHASE I:  YES  NO If YES, date 5/20/1999  
 BENCHMARK/DATUM: NGVD 1929  
 OVERALL CONDITION: FAIR DATE OF LAST REHABILITATION: \_\_\_\_\_ Unknown  
 EL. POOL DURING INSP.: 111.1 (4/14/09) EL. TAILWATER DURING INSP.: 101.5 +/-

PERSONS PRESENT AT INSPECTION

<u>NAME</u>	<u>TITLE/POSITION</u>	<u>REPRESENTING</u>
<u>Richard Pizzi</u>	<u>Professional Engineer</u>	<u>Geotechnical Consultants, Inc.</u>
<u>Daniel Kenneally</u>	<u>Engineer</u>	<u>Geotechnical Consultants, Inc.</u>

EVALUATION INFORMATION

E1) TYPE OF DESIGN	1	▼	E8) LOW-LEVEL OUTLET COND.	1	▼
E2) LEVEL OF MAINTENANCE	1	▼	E9) SPILLWAY DESIGN FLOOD	5	▼
E3) EMERGENCY ACTION PLAN	1	▼	E10) GENERAL CONDITIONS	3	▼
E4) EMBANKMENT SEEPAGE	5	▼	E11) ESTIMATED REPAIR COST (\$000)		
E5) EMBANKMENT CONDITION	5	▼	ROADWAY OVER CREST	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
E6) CONCRETE CONDITION	5	▼	BRIDGE NEAR DAM	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
E7) LOW-LEVEL OUTLET CAP	1	▼			

SIGNATURE OF INSPECTING ENGINEER: \_\_\_\_\_

NAME OF DAM: <u>Talbot Mills Dam</u>		STATE ID #: <u>4-9-31-1</u>
		NID ID #: <u>MA 00774</u>
OWNER: ORGANIZATION	<u>CRT Development Realty, LLC</u>	CARETAKER: ORGANIZATION
NAME/TITLE	<u>Mr. Robert Martin</u>	NAME/TITLE
STREET	<u>6 Nicholas Circle</u>	STREET
TOWN, STATE, ZIP	<u>Andover, MA 01810-4278</u>	TOWN, STATE, ZIP
PHONE	<u>978-975-3687</u>	PHONE
FAX		FAX
EMAIL		EMAIL
OWNER TYPE	<u>Private</u>	<u>CRT Development Realty, LLC</u>
		<u>Mr. William Martin</u>
		<u>24 Ingleside Road</u>
		<u>Lexington, MA 02470-2522</u>
		<u>781-862-4802</u>
		<u>781-676-7787</u>
		<u><a href="mailto:martinw@rcn.com">martinw@rcn.com</a></u>
PRIMARY SPILLWAY TYPE	<u>Broad Crest granite Masonry</u>	
SPILLWAY LENGTH (FT)	<u>127</u>	SPILLWAY CAPACITY (CFS) <u>6030</u>
AUXILIARY SPILLWAY TYPE	<u>Overflow - Both Side of Primary</u>	
AUX. SPILLWAY CAPACITY (CFS)	<u>620</u>	
NUMBER OF OUTLETS	<u>1</u>	OUTLET(S) CAPACITY (CFS) <u>Unknown - Gate is non-functional</u>
TYPE OF OUTLETS	<u>Sluiceway with Gate</u>	
TOTAL DISCHARGE CAPACITY (CFS)	<u>6650</u>	
DRAINAGE AREQ (SQ MI)	<u>370</u>	SPILLWAY DESIGN FLOOD (PERIOD/CFS) <u>100 year / 5,675 cfs</u>
HAS DAM BEEN BREACHED OR OVERTOPPED	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, PROVIDE DATE(S) _____	
FISH LADDER (LIST TYPE IF PRESENT)	<u>None</u>	
DOES CREST SUPPORT PUBLIC ROAD?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO IF YES, ROAD NAME: <u>Old Elm Street/Faulkner Street</u>	
PUBLIC BRIDGE WITHIN 50' OF DAM?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO IF YES, ROAD/BRIDGE NAME: <u>Faulkner Street Bridge</u>	

Embankment Crest

NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: 4/14/2009 & 5/22/2009

NID ID #: MA 00774

**EMBANKMENT**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
CREST	SURFACE TYPE	Paved roadway			
	SURFACE CRACKING	None observed			
	SINKHOLES, ANIMAL BURROWS	None observed			
	VERTICAL ALIGNMENT (DEPRESSIONS)	No depressions or sinkholes observed			
	HORIZONTAL ALIGNMENT	Straight			
	RUTS AND/OR PUDDLES	None Observed			
	VEGETATION (PRESENCE/CONDITION)	Small trees adjacent to upstream face near concrete intake structure face wall			
	ABUTMENT CONTACT	Good; no indications of seepage			

ADDITIONAL COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Downstream Side

NAME OF DAM: Talbot Mills Dam STATE ID #: 4-9-31-1  
 INSPECTION DATE: 4/14/2009 & 5/22/2009 NID ID #: MA 00774

**EMBANKMENT**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S SLOPE	WET AREAS (NO FLOW)	None observed			
	SEEPAGE	None observed			
	SLIDE, SLOUGH, SCARP	None			
	EMB.-ABUTMENT CONTACT	OK			
	SINKHOLE/ANIMAL BURROWS	None observed			
	EROSION	None observed			
	UNUSUAL MOVEMENT	None observed			
	VEGETATION (PRESENCE/CONDITION)	None			

ADDITIONAL COMMENTS: NOTE: the Talbot Mills Complex and the Faulkner Mills complex at form both the left and right downstream side of the dam, respectively. These properties are not owned by the dam owners. Access to the inside of the mill complexes was not available at the time of this inspection.

Upstream side

NAME OF DAM: <u>Talbot Mills Dam</u>	STATE ID #: <u>4-9-31-1</u>
INSPECTION DATE: <u>4/14/2009 &amp; 5/22/2009</u>	NID ID #: <u>MA 00774</u>

**EMBANKMENT**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S SLOPE	SLIDE, SLOUGH, SCARP	None observed. (see note 1)			
	SLOPE PROTECTION TYPE AND COND.	See note 1. Condition of walls; good.			
	SINKHOLE/ANIMAL BURROWS	None observed			
	EMB.-ABUTMENT CONTACT	OK. No observed indications of seepage.			
	EROSION	None observed			
	UNUSUAL MOVEMENT	None observed			
	VEGETATION (PRESENCE/CONDITION)	Small trees adjacent to upstream face near concrete intake structure face wall at top.			

ADDITIONAL COMMENTS: 1. Upstream faces of dam are constructed with either masonry stone walls or concrete wall.

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Instrumentation

NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: 4/14/2009 & 5/22/2009

NID ID #: MA 00774

**EMBANKMENT**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
INSTR.	PIEZOMETERS	N/A			
	OBSERVATION WELLS	N/A			
	STAFF GAGE AND RECORDER	N/A			
	WEIRS	N/A			
	INCLINOMETERS	N/A			
	SURVEY MONUMENTS	N/A			
	DRAINS	N/A			
	FREQUENCY OF READINGS	N/A			
	LOCATION OF READINGS	N/A			

ADDITIONAL COMMENTS: There is no known instrumentation at any part of the dam or appurtenant structures.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



Downstream Area

NAME OF DAM: <u>Talbot Mills Dam</u>	STAE ID #: <u>4-9-31-1</u>
INSPECTION DATE: <u>4/14/2009 &amp; 5/22/2009</u>	NID ID #: <u>MA 00774</u>

**DOWNSTREAM AREA**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S AREA	ABUTMENT LEAKAGE	None observed			
	FOUNDATION SEEPAGE	None observed			
	SLIDE,SLOUGH,SCARP	None observed			
	WEIRS	N/A			
	DRAINAGE SYSTEM	N/A			
	INSTRUMENTATION	N/A			
	VEGETATION	None			
	ACCESSIBILITY	Not Accessible			
	DOWNSTREAM HAZARD DESCRIPTION	The Faulkner Street Bridge is immediately downstream of the dam spillway. The Talbot and Faulkner Mills are on the left and right channel banks, respectively.			
	DATE OF LAST EAP UPDATE	None			

ADDITIONAL COMMENTS: NOTE: the Talbot Mills Complex and the Faulkner Mills complex at form both the left and right downstream side of tl  
respectively. These properties are not owned by the dam owners. Access to the inside of the mill complexes was not  
at the time of this inspection.

Misc.

NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: 4/14/2009 & 5/22/2009

NID ID #: MA 00774

**MISCELLANEOUS**

AREA INSPECTED	CONDITION	OBSERVATIONS
MISC.	RESERVOIR DEPTH (AVG)	6± ft
	RESERVOIR SHORELINE	Generally flat and level. Some trees, little underbrush
	RESERVOIR SLOPES	No significant slopes
	ACCESS ROADS	Old Elm Street/Faulkner Street
	SECURITY DEVICES	None
	VANDALISM OR TRESPASS	YES: <input type="checkbox"/> NO: <input checked="" type="checkbox"/> WHAT: _____
	AVAILABILITY OF PLANS	YES: <input type="checkbox"/> NO: <input checked="" type="checkbox"/> DATE: _____
	AVAILABILITY OF DESIGN CALCS	YES: <input type="checkbox"/> NO: <input checked="" type="checkbox"/> DATE: _____
	AVAILABILITY OF EAP/LAST UPDATE	YES: <input type="checkbox"/> NO: <input checked="" type="checkbox"/> DATE: _____
	AVAILABILITY OF O&M MANUAL	YES: <input type="checkbox"/> NO: <input checked="" type="checkbox"/> DATE: _____
CARETAKER/OWNER AVAILABLE	YES: <input checked="" type="checkbox"/> NO: <input type="checkbox"/> DATE: _____	
CONFINED SPACE ENTRY REQUIRED	YES: <input type="checkbox"/> NO: <input checked="" type="checkbox"/> PURPOSE: _____	

ADDITIONAL COMMENTS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Primary Spillway

NAME OF DAM: Talbot Mills Dam STATE ID #: 4-9-31-1  
 INSPECTION DATE: 4/14/2009 & 5/22/2009 NID ID #: MA 00774

**PRIMARY SPILLWAY**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
SPILLWAY	SPILLWAY TYPE	Broad Crested Masonry - probably granite block construction (see note 1)			
	WEIR TYPE	N/A			
	SPILLWAY CONDITION	Presumed Good - No indications of instability			
	TRAINING WALLS	N/A - Small stone wall at left embankment			
	SPILLWAY CONTROLS AND CONDITION	None			
	UNUSUAL MOVEMENT	None observed			
	APPROACH AREA	Clear and unobstructed			
	DISCHARGE AREA	Clear - one tree growing among rocks immediately downstream of spillway			
	DEBRIS	No indications of debris upstream or downstream (see note 2)			
	WATER LEVEL AT TIME OF INSPECTION	Elevation 111.1 on 14 April 2009; 110.3 on 22 May 2009.			

ADDITIONAL COMMENTS: 1. At all inspection dates, the spillway was not visible due to continuous flow.  
2. Some small branches located in stilling basin  
 \_\_\_\_\_  
 \_\_\_\_\_

Auxiliary Spillway

NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: 4/14/2009 & 5/22/2009

NID ID #: MA 00774

**AUXILIARY SPILLWAY**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
SPILLWAY	SPILLWAY TYPE	Sluiceway at right of primary spillway; serves as intake for Faulkner Mills			
	WEIR TYPE	N/A			
	SPILLWAY CONDITION	Fair			
	TRAINING WALLS	Masonry Stone and concrete.			
	SPILLWAY CONTROLS AND CONDITION	Wood Gate - Non Functional			
	UNUSUAL MOVEMENT	None observed			
	APPROACH AREA	Clear, unobstructed.			
	DISCHARGE AREA	Discharge through Faulkner Mills Complex; Not inspected			
	DEBRIS	Minor debris (wood) in stilling basin			
	WATER LEVEL AT TIME OF INSPECTION	N/A			

ADDITIONAL COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Outlet Works

NAME OF DAM: <u>Talbot Mills Dam</u>	STATE ID #: <u>4-9-31-1</u>
INSPECTION DATE: <u>4/14/2009 &amp; 5/22/2009</u>	NID ID #: <u>MA 00774</u>

**OUTLET WORKS**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
OUTLET WORKS	TYPE	Note 1.			
	INTAKE STRUCTURE	Intake tunnel under Old Elm Street reportedly filled with concrete-no records.			
	TRASHRACK	N/A			
	PRIMARY CLOSURE	N/A			
	SECONDARY CLOSURE	N/A			
	CONDUIT	N/A			
	OUTLET STRUCTURE/HEADWALL	Outlet structure located within Talbot Mills complex - not inspected.			
	EROSION ALONG TOE OF DAM	None observed. Bedrock visible at channel bed			
	SEEPAGE/LEAKAGE	None observed.			
	DEBRIS/BLOCKAGE	Reportedly completely block by concrete infill - no records available.			
	UNUSUAL MOVEMENT	None observed.			
	DOWNSTREAM AREA	Not inspected.			
MISCELLANEOUS					

ADDITIONAL COMMENTS: 1. Five (5) manually operated wood gates at left of primary spillway-gates not operational. These gates formerly intake structure for the Talbot Mills complex. Also, a blocked low level outlet is located in the left spillway abutment. Some seepage observed through outlet. No gates visible at this outlet.

---

ConcreteMasonry Dams

NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: 4/14/2009 & 5/22/2009

NID ID #: MA 00774

**CONCRETE/MASONRY DAMS**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
GENERAL	TYPE				
	AVAILABILITY OF PLANS	None Available			
	AVAILABILITY OF DESIGN CALCS	None Available			
	PIEZOMETERS	None Available			
	OBSERVATION WELLS	None Available			
	INCLINOMETERS	None Available			
	SEEPAGE GALLERY	N/A			
	UNUSUAL MOVEMENT	None observed			

ADDITIONAL COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Upstream Face

NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: \_\_\_\_\_

NID ID #: MA 00774

**CONCRETE/MASONRY DAMS**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S FACE	TYPE				
	SURFACE CONDITIONS	Flat and level. No indications of seepage such as sinkholes or depressions,			
	CONDITIONS OF JOINTS	Ok; minor seepage at granite block abutment joints.			
	UNUSUAL MOVEMENT	None observed			
	ABUTMENT CONTACTS	Clean contact. No seepage observed.			

ADDITIONAL COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Downstream Face

NAME OF DAM: Talbot Mills Dam

STATE ID #: 4-9-31-1

INSPECTION DATE: 4/14/2009 & 5/22/200

NID ID #: MA 00774

**CONCRETE/MASONRY DAMS**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S FACE	TYPE				
	SURFACE CONDITIONS	see note 1			
	CONDITIONS OF JOINTS	see note 1			
	UNUSUAL MOVEMENT	see note 1			
	ABUTMENT CONTACTS	see note 1			
	DRAINS	see note 1			
	LEAKAGE	see note 1			

ADDITIONAL COMMENTS: 1. At all inspection dates, the spillway was not visible due to continuous flow.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Concrete Crest

NAME OF DAM: <u>Talbot Mills Dam</u>	STATE ID #: <u>4-9-31-1</u>
INSPECTION DATE: <u>4/14/2009 &amp; 5/22/200</u>	NID ID #: <u>MA 00774</u>

**CONCRETE/MASONRY DAMS**

AREA INSPECTED	CONDITION	OBSERVATIONS
CREST	TYPE	
	SURFACE CONDITIONS	Good condition. Concrete limited face wall at intake gate left of primary spillway.
	CONDITIONS OF JOINTS	No observed cracks or indications of seepage
	UNUSUAL MOVEMENT	None observed
	HORIZONTAL ALIGNMENT	Straight. No observed displacements.
	VERTICAL ALIGNMENT	Straight. No observed displacements.

ADDITIONAL COMMENTS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## **APPENDIX C**



COMMONWEALTH OF MASSACHUSETTS  
 EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS  
 DEPARTMENT OF ENVIRONMENTAL MANAGEMENT



131 BARNUM ROAD, BUILDING 3701, DEVENS, MA 01432  
 PHONE 978-772-4255 FAX 508-792-7718  
[www.state.ma.us/dem/](http://www.state.ma.us/dem/)

Aug 18 1999

CRT DEVELOPMENT  
 67 Faulkner Street  
 Billerica, MA 01821  
 Attn: Robert Martin

Argeo Paul Cellucci  
 GOVERNOR

08/10/99

Jane Swift  
 UEUTENANTGOVERNOR

RE: Talbot Mills Dam, 4-9-31-1

Bob Durand  
 SECRETARY

**NOTICE OF INSPECTION**

Peter C. Webber  
 COMMISSIONER

Dear Mr. Martin:

In accordance with MGL c 253, s 44-50 and 302 CMR 10.00, the DEM Office of Dam Safety completed a visual inspection of Talbot Mills Dam, located in North Billerica, of which CRT Development, A Limited Partnership, owns. The inspection was completed by one of our consulting Engineers in accordance with required inspection frequencies.

Based on inspection results, the run-of-the-river masonry dam is considered to be in FAIR condition, and has moderate operational or maintenance deficiencies. Based on the applicable design storm, the dam is hydraulically adequate. A copy of the 5/20/99-inspection report and checklist is enclosed.

A written response to this Notice, regarding maintenance, within 180-days is required. In addition, it is suggested that recommendations listed in the enclosed report be followed.

If you have any questions, comments, or need technical assistance, please call our office. Thank you.

Sincerely,

R. David Clark  
 Chief  
 Office of Dam Safety

RDC/mam

c:\demdams\documents\007741tr.doc



**Department of Environmental Management  
Office of Dam Safety**

CRT DEVELOPMENT  
57 Faulkner Street  
Billerica, MA 01821

**Owned Dam**

**Inspection/Evaluation Report**

**Dam Name:** Talbot Mills Dam

**Dam ID#:** 4-9-31-1

**Army Corp ID#:** MA 00774

**Town:** North Billerica

**Consultant:** Weston & Sampson Engineers, Inc.

**Date of Inspection:** May 20, 1989

## PREFACE

Weston & Sampson Engineers, Inc. has completed this dam evaluation study as part of its contract with the Commonwealth of Massachusetts, Department of Environmental Management, Office of Dam Safety (DEM) 1999 dam inspection program. The purpose of this study is to identify those dams that pose hazards to public safety, human life, or public property.

Our findings, conclusions, and recommendations are based primarily on visual observations made during our site visits, review of DEM files, and limited engineering analysis. Detailed field programs and engineering analysis such as topographic mapping, subsurface exploration programs, laboratory testing, and detailed engineering analysis are beyond the scope of this study.

Please note that our description of the general dam conditions is based on the visual observations of the dam surficial conditions made during our site visit and on our review of the available data provided by DEM. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability of the dam, removes the normal loading conditions on the dam and may obscure certain conditions, which might be detectable if inspected under the normal loading conditions of the dam.

Also note that the dam's integrity and stability depend on numerous and constantly changing internal and external conditions, and are evolutionary in nature. It is incorrect to assume that the current observations of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected and avoided.

Mohammed M. Kheirallah  
Professional Engineer



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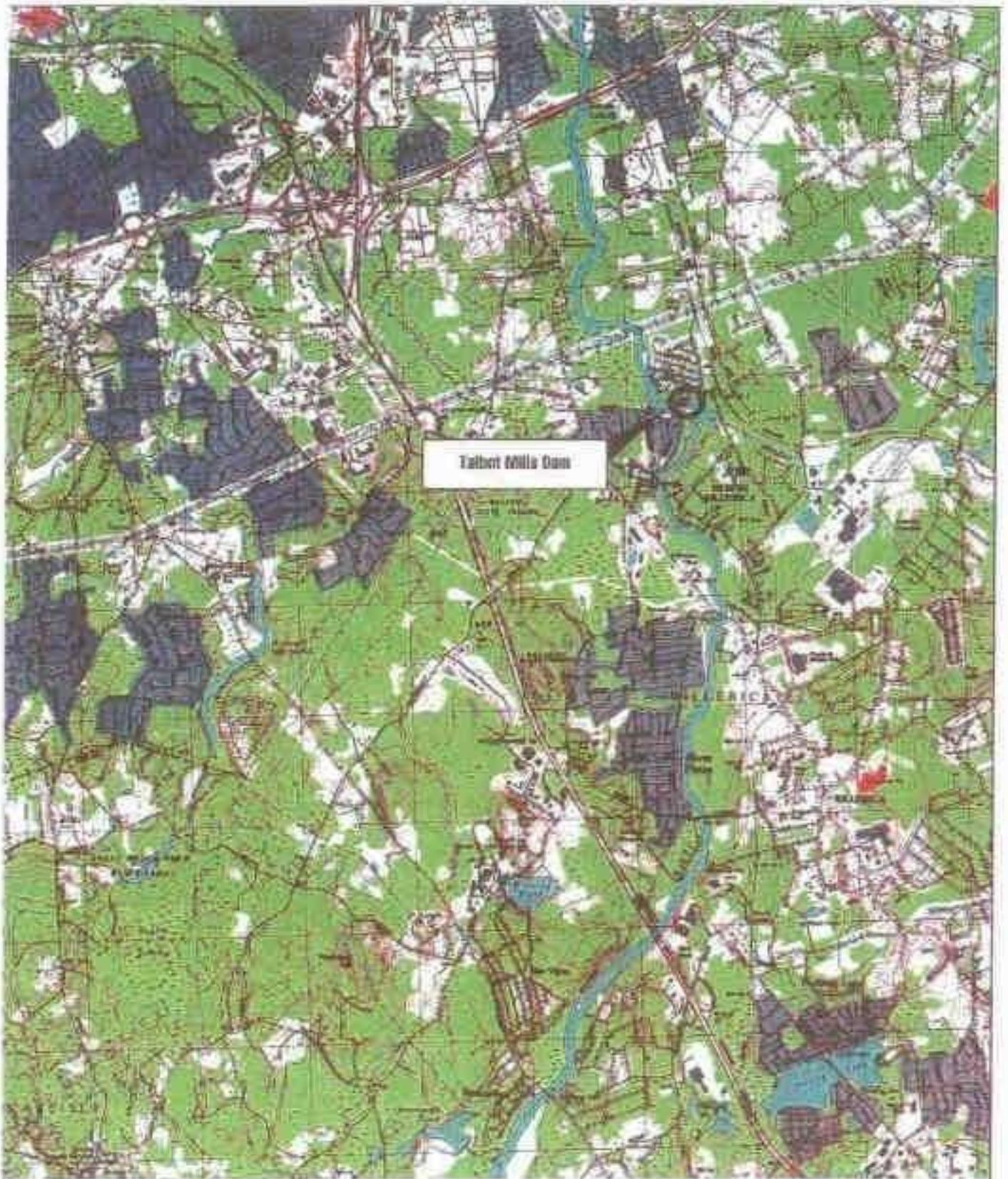


FIGURE 1  
TOWN OF NORTH BILLERICA, MASSACHUSETTS, TALBOT MILLS DAM  
LOCUS MAP

SOURCE: USGS 7.5 & 15 MINUTE SERIES, BILLERICA MASS. QUAD, 1981

## 1.0 DESCRIPTION OF PROJECT

### 1.1 General

This report summarizes Weston & Sampson Engineers, Inc., (WSE) observations, findings, and recommendations for Talbot Mills Dam in North Billerica, Massachusetts. Our findings and recommendations are based on field observations made during our site visit to the dam on May 20, 1999, review of prior studies, and experience with similar dams.

#### 1.1.1 Authority

The Commonwealth of Massachusetts, Department of Environmental Management, Office of Dam Safety (DEM) has engaged the services of WSE to complete a dam inspection study of Talbot Mills Dam in North Billerica, Massachusetts, as part of DEM's 1999 Dam Inspection Program. We have completed this study as part of our annual contract with DEM, and based on their verbal authorization.

#### 1.1.2 Purpose of Work

The main purpose of this study is to evaluate the current conditions of Talbot Mills Dam to identify the need for any immediate emergency measures to avoid any threat to public safety or the environment. The study will also be used in comparison with prior ones to monitor the dam conditions, and to identify any progressive deterioration that will require repairs.

As part of our study, we completed the following scope of services:

1. Site reconnaissance to observe and document surficial dam conditions and any other signs of seepage, failure, or movement in the dam and related structures. Prior to the site visit, we contacted the person in charge of dam safety, as identified by DEM.
2. Reviewed available data from DEM files to obtain information on the dam construction, maintenance, and operations.
3. Met with the dam safety officer to obtain information on the dam history and conditions.
4. Performed limited engineering analysis to confirm available data in prior studies.
5. Prepared this report summarizing our findings, conclusions, and recommendations.

### 1.2 Description of Project

#### 1.2.1 Location

Talbot Mills Dam is located in North Billerica, Middlesex County, Massachusetts. The dam is on the Concord River immediately upstream of the Faulkner Street Bridge. It is located at the following approximate coordinates on the Billerica, Massachusetts, USGS Quadrangle:

Latitude: 42° 35.5' N  
Longitude: 71° 17.04' W

### 1.2.2 Owner/Operator

~~\_\_\_\_\_~~ Talbot Mills Dam. Mr. Bill Martin, Engineer at Cambridge Tool Manufacturing Company, is the designated "dam caretaker."

### 1.2.3 Purpose of Dam

The dam was originally constructed to impound water for power and fire protection for the mills, and to divert water into the old Middlesex Canal that flowed toward Boston. Currently, the dam is used for recreational and flood control purposes.

### 1.2.4 Description of Dam and Appurtenances

The Talbot Mills Dam is located on the Concord River immediately upstream of the Faulkner Street Bridge in North Billerica, Massachusetts. The dam was originally constructed in the late 1850s to impound water for power and fire protection for the mills, and to divert water into the old Middlesex Canal that flowed toward Boston.

The dam is approximately 160 feet long with a maximum height of about 12.5 feet. It is an overflow or run-of-river type stone masonry structure apparently seated on bedrock. The spillway is a broad-crested weir 160 feet long and 6 feet wide with crest elevation about 2 feet lower than the top of the dam. A 13-foot wide concrete-lined sluiceway and gate are located in the southern abutment. Five (5) wooden gates are located about 100 feet upstream of the northern abutment contact. Two outlet structures located in the northern side of the dam appear to be permanently blocked.

On the southern end of the dam, there is a canal to Faulkner Mill, and on the northern end, there are old gates for the Talbot Mills Sluiceway. Prior DEM inspection reports describe a stilling basin downstream of the Talbot Mills Sluiceway, which is not visible from the road. There are also flow screens on the downstream canal, control gates in a locked position and a turbine, which has not been in operation since 1972.

### 1.2.5 Operations and Maintenance

There are no formal records kept on the operations and maintenance of this dam, nor are there standard operating procedures.

### 1.2.6 DEM Size Classification

Talbot Mills Dam has a maximum storage capacity of approximately 100 acre-feet and a maximum height of 15 feet. Although the dam was classified as small in size in prior reports, the dam meet the requirements of an INTERMEDIATE size dam as stated in Massachusetts's regulation 302 CMR 10.06.

### 1.2.7 DEM Hazard Classification

The possibility for loss of a few lives and appreciable economic damage that would occur to the Faulkner Street Bridge, Talbot Mill buildings, and possibly the wastewater treatment facility as a result of dam failure places the dam in the HIGH hazard category as defined in 302 CMR 10.06.



## 2.0 VISUAL INSPECTION

### 2.1 General Findings

#### 2.1.1 Dam

Ms. Jennifer S. Rivers of WSE visited Talbot Mills Dam on May 20, 1999, to observe the superficial condition of the dam. At the time of inspection there was approximately 9± inches of flow over the spillway (Photo Nos. 1&2).

Although we could not visually observe the spillway due to the running water, it appeared to be in fair/good condition with no obvious misalignment, displaced masonry, or other defects. The north side of the dam and associated abutment appeared to be in satisfactory condition, and there was virtually no flow through the outlet pipes for the old gates (Photo No. 3) on that side. The south side of the dam was repaired at some time in the past as evidenced by a concrete face which appears to be newer than the rest of the concrete used to build the dam. Leakage was visible at the bottom corner of the concrete face adjacent to the spillway section. The dry masonry, which comprises the southern wall of the dam is missing some stones.

The Faulkner Street Bridge is approximately 45 feet downstream of the dam. There is one tree and a few outcrops of bedrock immediately downstream of the spillway (Photo No. 2) which appears to pose no obstruction to the flow of water. The north abutment immediately downstream of the dam was eroded as a result of high flows that occurred in spring 1987 (Photo No. 4). The south-facing downstream wall is beginning to erode the bedrock on which Cambridge Tool Manufacturing building is located (Photo No. 5), and the bridge abutment support is also beginning to show signs of deterioration or scouring (Figure No. 6).

#### 2.1.2 Appurtenant Structures

The concrete lining of the sluiceway in the South abutment is severely weathered and deteriorated (Photo No. 4). The gates located upstream of the North abutment have been described in previous reports as being inoperable; at the time of inspection they were overgrown with vegetation and in a state of disrepair. The diversion into the old canal was not observed.

#### 2.1.3 Downstream Area

The downstream area of Talbot Mills Dam is a stone and concrete-lined channel for approximately 500 feet. Downstream of this portion of the dam, the Concord River flows in its natural state. There are several homes located on the Concord River immediately downstream of Talbot Mills Dam.

#### 2.1.4 Reservoir Area

There is only a slight impoundment upstream of the dam. Approximate dimensions are 300 ft in width and 200 feet in length.

### 2.2 Caretaker Interview

On May 20, 1999, a WSE representative met with Mr. Bill Martin, Engineer, at Cambridge Tool Manufacturing. There is no formal operator of this dam; however, he explained that he was

given the responsibility for it. He said that in 1987 or thereabouts, the Army Corps of Engineers called him and asked him to lower the gates for this dam to mitigate downstream flooding. The gates were not operational, so he told them he could not do so. Other than that he has no records for the dam itself.

## 2.3 Operation and Maintenance Procedures

### 2.3.1 Operational Procedures

There are no operation procedures in place for Talbot Mills Dam. According to Mr. Martin, once in 1998, during a particularly heavy storm event, he was contacted by the Army Corps of Engineers and asked to lower the gate to mitigate upstream flooding. The gate is fixed, however, and therefore could not be lowered.

### 2.3.2 Maintenance of Dam and Operating Facilities

There is no routine maintenance performed for this dam.

### 2.3.3 Emergency Warning System

There is no formal Emergency Warning System in place for this dam.

### 2.3.4 Emergency Action Plan

There is no formal Emergency Action Plan in place for this dam.

## 2.4 Hydraulic/Hydrologic Data

WSE used the Rational Method (see Appendix D) to calculate an approximate flow given a 100-year flood scenario. Approximately 1002 cfs of water will discharge from the Talbot Mills Dam to the Concord River in the event of such a flood.

## 2.5 Structural Stability/Overtopping Potential

### 2.5.1 Structural Stability

Although the dam spillway appears to be stable, we could not inspect the structural elements of the spillway due to the running water. The northern and southern ends of the dam also appear to be stable except for the missing stones in the southern end.

### 2.5.2 Overtopping Potential

Based on limited hydraulic analysis of Talbot Mills Dam utilizing the Rational Method, WSE calculated a flow of 1002 cfs given the 100-year flood event. Please note that this method is preliminary in nature and provides a crude estimate of the peak flow based on a simplified mathematical model.

Our analysis indicates that the spillway capacity is 6773 cfs, thus the dam is capable of passing the 100-year flood without significant potential for overtopping.

### 3.0 ASSESSMENTS, RECOMMENDATIONS, AND REMEDIAL MEASURES

#### 3.1 Assessments

The dam abutments and the spillway show no sign of misalignment, movement, or vertical settlement. The southern abutment walls are missing some stones. There is some vegetation overgrowth in both the southern and northern ends of the dam.

The gates at the intake structures are inoperable. The training walls downstream of the dam show signs of deterioration.

*Based on our field observations, review of prior reports, and experience with similar projects, it is our opinion that Tubed Mills Dam is in FAIR condition.*

#### 3.2 Recommendations

Based on our assessment of the dam condition, we recommend that DEM, within one year of receiving this report, engage the services of a professional engineer, licensed in the Commonwealth of Massachusetts, to complete the following:

1. Evaluate the structural integrity and complete a detailed stability analysis of the dam and primarily the spillway.
2. Complete a detailed Hydraulic & Hydrogeologic analysis of the dam.
3. Prepare an Emergency Action Plan for the dam.

#### 3.3 Remedial Measures

We recommend the implementation of the following remedial measures within six months of the date of this report. We believe that DEM staff could complete some or all of the measures:

1. Remove all vegetation from the dam abutments and training walls.
2. Repair the gates to have control over the water elevation in the pond.

#### 3.4 Alternatives

At this time there are no viable alternatives to the above-recommended work.

#### 3.5 Cost Estimation

The following itemized costs for recommendations are based upon the assumption that the work would be completed within one year of this report.

<u>Engineering Recommendations</u>	
Perform Stability Analysis	\$3,700
Perform H&H	3,600
Prepare EAP	<u>3,200</u>
Subtotal	\$10,500

<u>Remedial Measures</u>	
Clearing	\$2,200
Repair gates	<u>12,300</u>
Subtotal	\$14,500
<b>TOTAL</b>	<b>\$25,000</b>

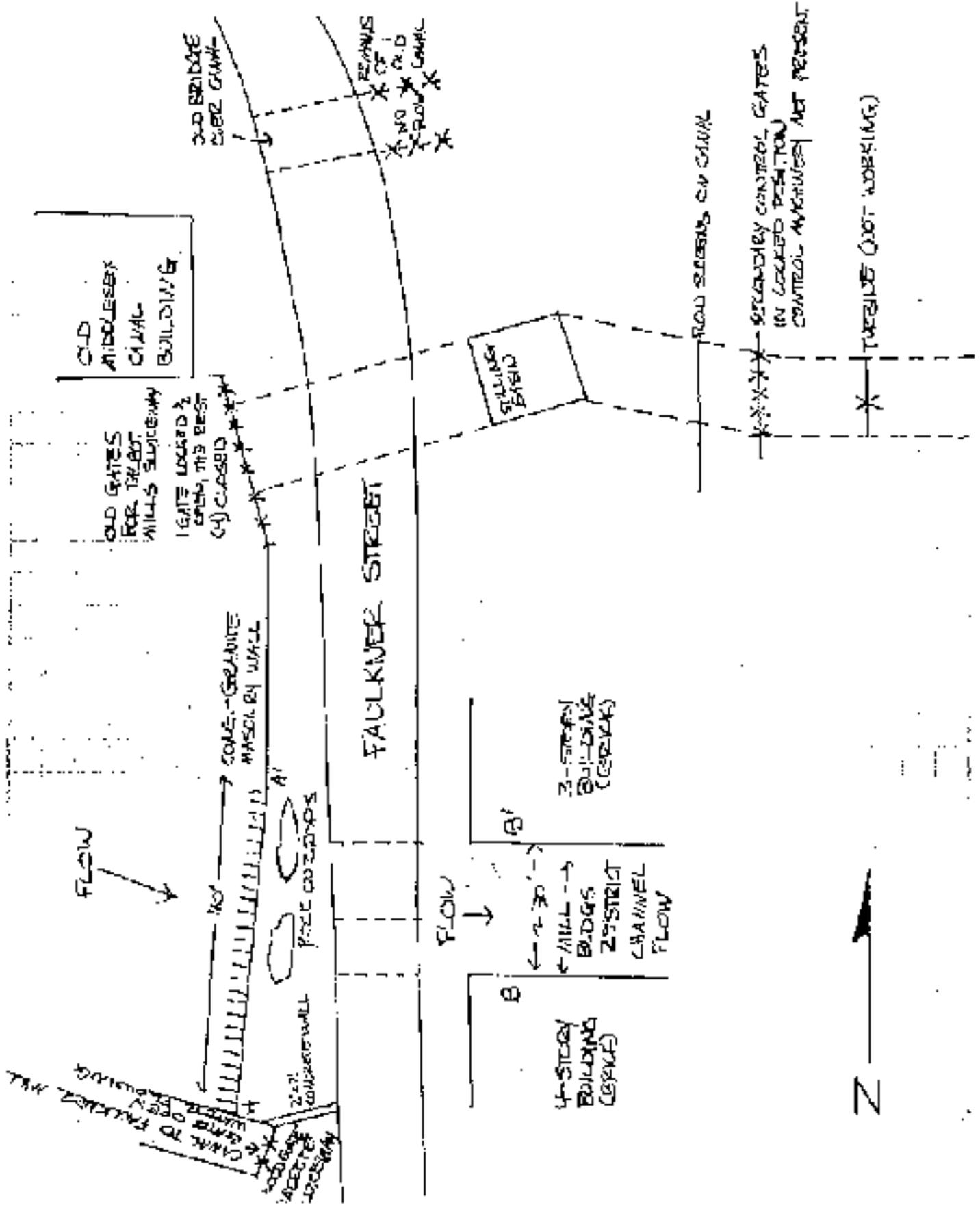
Please note that the above cost estimates are based on our understanding of the level of effort to complete the above-listed recommendations. These cost estimates may vary depending on the time the services are completed and the level of effort required to complete the services. Also, please note that these cost estimates do not include the total construction costs of the required repairs.

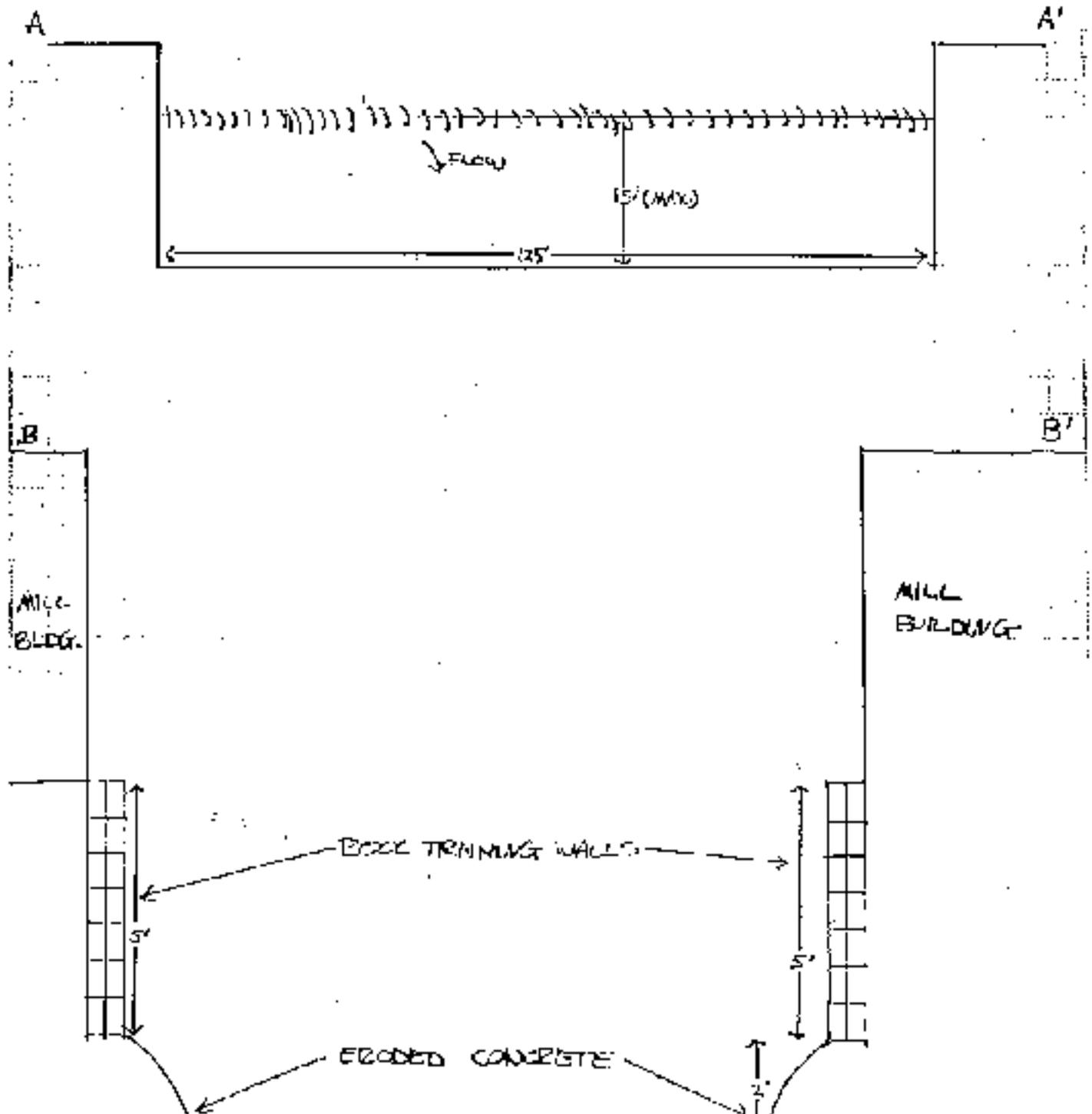
Talbot Mills Dam is considered to be in FAIR condition. If allowed to continue, the erosion of the right abutment could eventually affect the structural integrity of the dam and downstream highway bridge.

\\hpw\INVENTORY\DEM Dam\rep\1999\Billerica\Talbot\final rps.doc

**APPENDIX A**

**PLAN OF DAM AND AVAILABLE CONSTRUCTION DRAWINGS**





**APPENDIX B**

**PHOTOGRAPHS AND PHOTO LOCATIONS/DESCRIPTION**



Photo 1. Southeast-looking view of dam



Photo 2. Spillway

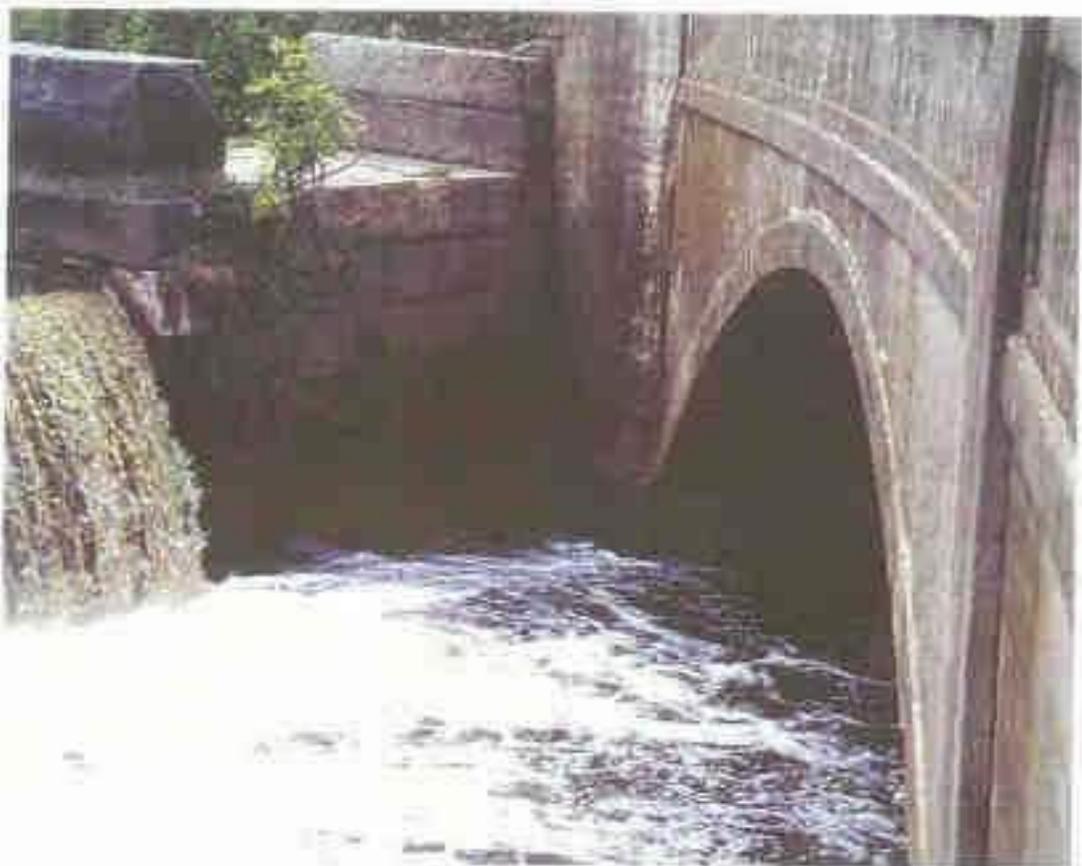


Photo 3. Outlet pipes for old gates



Photo 4. Training walls in downstream channel

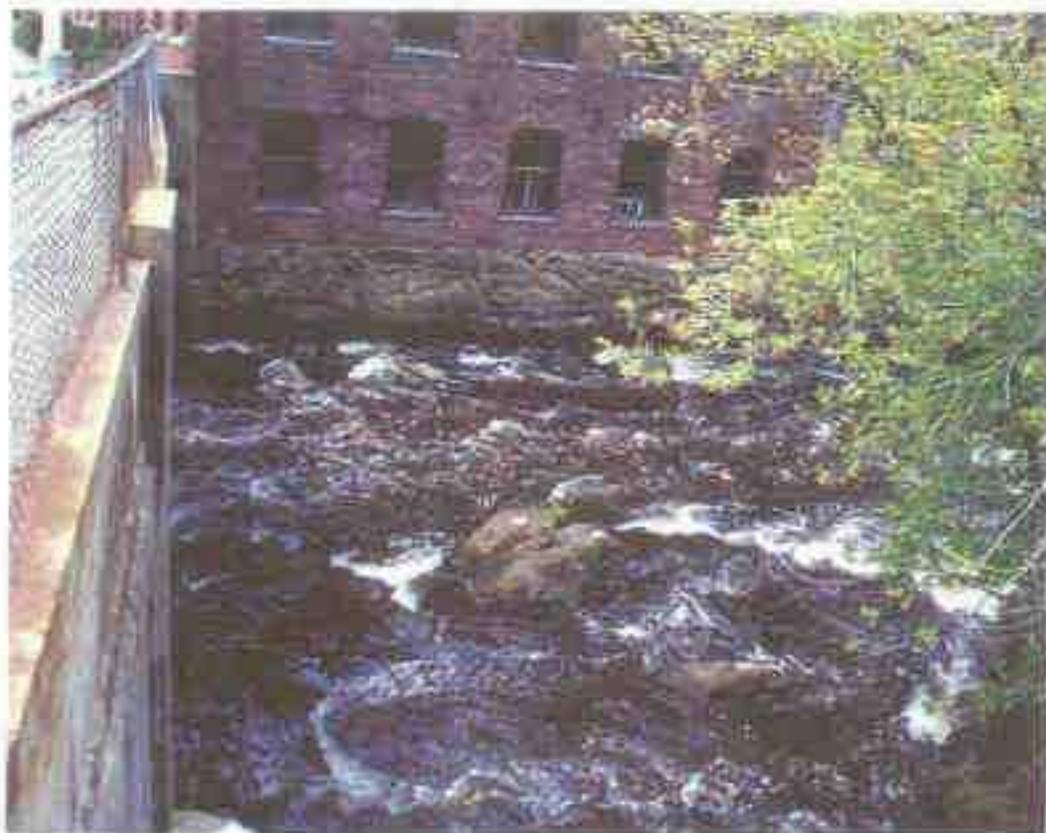
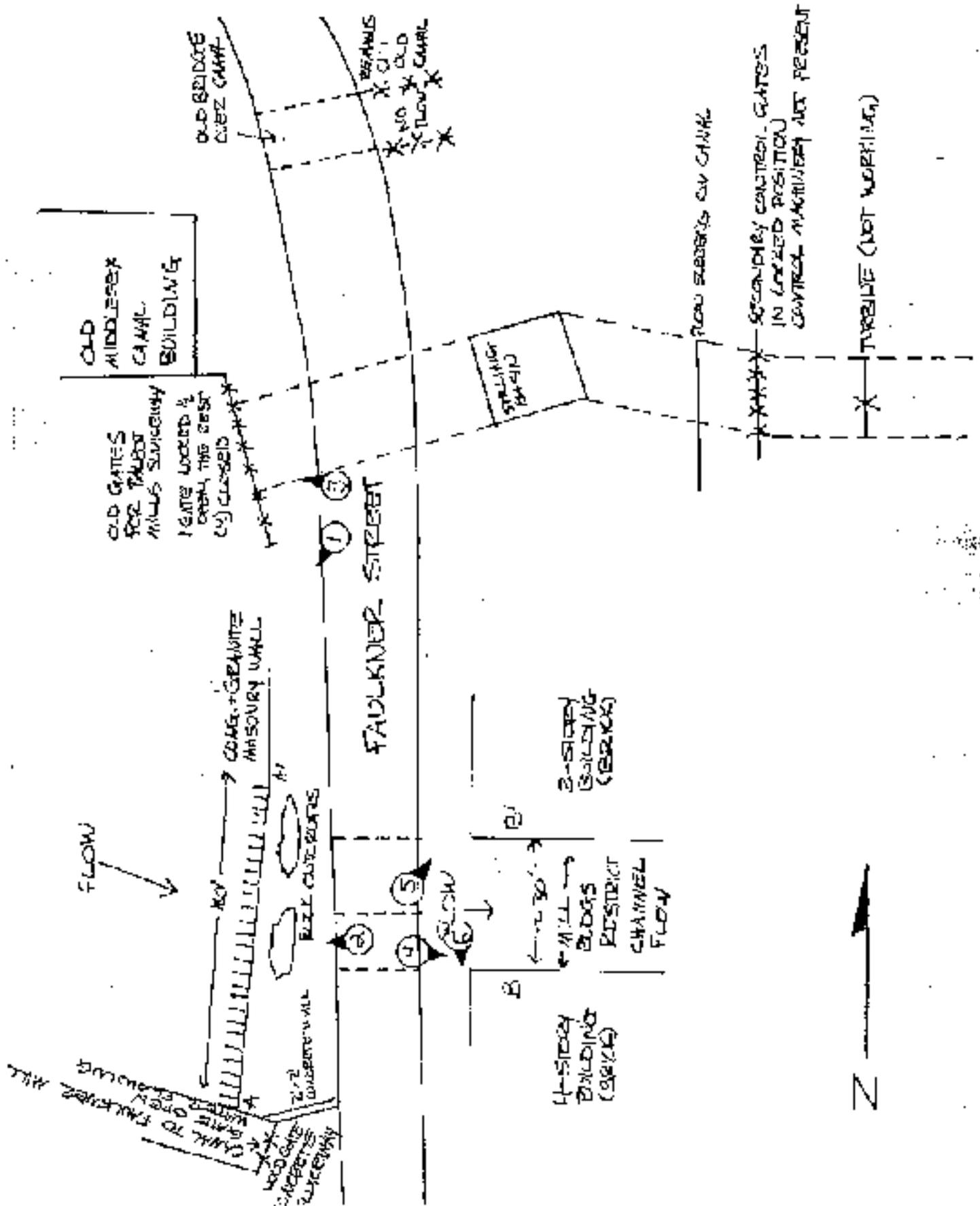


Photo 5. Mill building; downstream channel



Photo 6. Bridge abutment support



**APPENDIX C**  
**INSPECTION CHECKLIST**

**DAM INSPECTION CHECKLIST**

**MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL MANAGEMENT**

**DIVISION OF DAM SAFETY**

NAME OF DAM: Falout Mill Dam DEM ID NO: 4-9-31-1

LOCATION: Mills, Middlesex County ARMY CORP ID: MA D0774

DEM CLASSIFICATION DATA: Intermediate High

PHYSICAL DATA: Capacity: 12.5 ft 100+ acre-ft

LIQUATIONS: 114 years years years

**PERSONS PRESENT AT INSPECTION**

Jennifer S. Rivers Senior Hydrologist DEM

Bill R. Martin Engineer (CRT) DEM

DATE OF INSPECTION: May 20, 1989

WEATHER: cloudy, rainy

TEMPERATURE: 68°F

This is to certify that the above dam has been inspected and the following are the results of this inspection.

 07.01.99  
SUPERVISOR OF INSPECTING ENGINEER

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

NAME OF DAM: Tobalmina Dam ID NO: 4-031-1 INSPECTION DATE: May 20, 1960

# EMBANKMENT

1 of 2

AREA INSPECTED	ITEM NO.	CONDITION	CHECK / ACTION NEEDED		
			MONITOR	INVESTIGATE	REPAIR
GRASS	1	SURFACE CRACKING	OK		
	2	SHOULDER ANIMAL BURROW	POOR		
	3	LOW AREAS	POOR		
	4	HOMOGENEOUS VEGETATION	OK		
	5	WATER EROSION	POOR		
	6	VEGETATION CONDITION	OK		
SPRINKLE SLOPE	7				
	8				
	9	SLICE, SLOUGH, SCARP	POOR		
	10	SLOPE PROTECTION	OK		
SPRINKLE SLOPE	11	MISCHIEF, ANIMAL BURROW	POOR		
	12	EMBANKMENT CONTACT	OK		
	13	SEDSION	POOR		
	14	VEGETATION CONDITION	POOR OVERGROWN TRIPS		
	15				
	16				
ADDITIONAL COMMENTS REFER TO ITEM NO. IF APPLICABLE			OBSERVATIONS		

APPROPRIATE DAM SAFETY DISTRICTS HAVE BEEN ADVISED

NAME OF DAM: TRIBBLE MILE DAM ID NO: 44-01-1 INSPECTION DATE: May 21, 1957

# EMBANKMENT

2 of 2

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK FOR ACTION NEEDED	
				NONCR	URGENT
UPPER DAM SLOPE	17	WEST APPROXIMATE FLOW	12:30 P		
	18	SEEPAGE	1978		
	19	TOE OF CUTS	1958		
	20	TOE OF CUT	1958		
	21	TOE OF CUT	1958		
	22	TOE OF CUT	1958		
	23	TOE OF CUT	1958		
	24	TOE OF CUT	1958		
	25	TOE OF CUT	1958		
	26	TOE OF CUT	1958		
DOWN DAM SLOPE	27	TOE OF CUT	1958		
	28	TOE OF CUT	1958		
	29	TOE OF CUT	1958		
	30	TOE OF CUT	1958		
	31	TOE OF CUT	1958		
	32	TOE OF CUT	1958		
	33	TOE OF CUT	1958		
	34	TOE OF CUT	1958		
	35	TOE OF CUT	1958		
	36	TOE OF CUT	1958		
*ADDITIONAL COMMENTS: REFER TO TENDR. Y AFFILIATE					

UNIVERSITY OF CALIFORNIA, RIVERSIDE

NAME OF DAM: Tipton Mills Dam ID NO: 44-31-1 INSPECTION DATE: May 20, 1999

# DOWNSTREAM AREA AND MISC.

1 of 1

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK ( ) ACTION NEEDED	
				MONITOR	REPAIR
DOWNSTREAM AREA	36	SEWAGE TREATMENT PLANT	none		
	37	FOUNDATION BEHIND DAM	none		
	38	SL DE, SLOUGH, SCOUR	none		
	39	DRAINAGE SYSTEM	drain pipes		
	40				
	41				
MISCELLANEOUS	42	ROCKS NEAR HAZARD DESCRIPTION			
	43	DATE OF LAST EMERGENCY FLOOD	no		
	44	PROPERTY SLOPES	OK		
	45	RETAINING WALLS	substantial		
	46	SECURITY DEVICES	OK		
	47				
	48				
	49				
	50				
ADDITIONAL COMMENTS: REFER TO ITEM NO., IF APPLICABLE					

\*REPRODUCED FROM THE NATIONAL ARCHIVES AT COLLEGE PARK, MARYLAND

NAME OF DAM: \_\_\_\_\_ JO NO: 44-31-1 INSPECTION DATE: May 20, 1966

# SPILLWAYS

1 of 1

AREA INSPECTED	MEMO NO.	CONDITION	OBSERVATIONS	CHECK ACTION NEEDED		
				MONITOR	INVESTIGATE	REPAIR
EVALENS DAM	67	BLICE BLOWN BEAMT	none			
	68	LOCATION	none			X
	69	FEEDER DN 20-000001	none - see 210001 is the form of 210001 at 210001			X
	70	70-000001	small amount of copper in soil material collected in 200000 from 210001			
	71					
	72					
	73					
	74					
	75					
	76					
MCKENNA DAM	77	BLICEVALIS	OK			
	78	CHANNEL FLOOR	OK			
	79	BLICEVALIS ADJUTANT	OK			
	80	MCKENNA DAM	OK			
	81	ADJUTANT				
	82	DUST-AND AREA				
	83					
	84					
	85	ADJUTANT, INC	OK			
	86	DUST-AND AREA	OK			
MCKENNA DAM	87	STILL IN 210001	OK			
	88					
	89					
ADDITIONAL COMMENTS REFER TO MEMO, IF APPLICABLE						

NAME OF DRAIN: TADDESSI & DERM ID NO: 4-9-39-1 INSPECTION DATE: May 20, 1988

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK ACTION NEEDED		
				MONITOR	INVESTIGATE	REPAIR
OUTLET WORKS	70	HOUSE STAIN/GUARD	OK			
	71	TRASHTRAP	nb			
	72	STILING BASIN	ns			
	73	SP WINKY CHOWLP				
	74	SECONDARY C. OBLURE				
	75	CON. POK. MECH. ASHM				
	76	CITILET P PE	OK			
	77	OUTLET TOWER	ns			
	78	ERTON MFGS. JUMP TRIP	ns			
	79	SECPAGE	ns			
	80	PLUMBING MOUNTING	ns			
	81					
	82					
83						
ADDITIONAL COMMENTS: REFER TO DRAWING IF APPL CABLE						

THESE WORKS MUST BE COMPLETED WITHIN 30 DAYS OF THE DATE OF INSPECTION

NAME OF DAM: BEAUFORT DAM IURR: 4-3-73 INSPECTION DATE: May 29 1973

# CONCRETE/MASONRY DAMS

1 of 1

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK LIST ACTION NEEDED	
				MONITOR	INVESTIGATE
UPSTREAM FACE	88 SURFACE CRACKING	OK			
	89 JOINTS	OK			
	90 ANCHORAGE MOVEMENT	OK			
	91 SETTLEMENT AND CONTACTS	OK			
	92				
DOWNSTREAM CHANNEL	93 SURFACE CRACKING	OK			
	94 JOINTS	OK			
	95 ANCHORAGE MOVEMENT	OK			
	96 SETTLEMENT AND CONTACTS	OK			
	97				
	98				
	99				
	100				
	101				
	102				
CRACK	103 SURFACE CRACKING	OK			
	104 JOINTS	OK			
	105 ANCHORAGE MOVEMENT	OK			
	106 SETTLEMENT AND CONTACTS	OK			
	107				
ADDITIONAL COMMENTS: FORM REITERATED, IF APPLICABLE					

Approved: Richard L. ...

**APPENDIX D**  
**HYDROLOGIC DATA AND COMPUTATIONS**

Weston & Sampson ENGINEERS, INC.	PROJECT: DEM DAM INSPECTIONS TALBOT MILLS DAM	DATE: 05.08.99	PAGE: 1 of 1
		BY: JSR	
		CK BY: PMA	

- - Talbot Mills Dam  
North Billerica, MA

Peak Flow estimation using Rational Method\*\*

$Q_p = C \cdot I \cdot A$
---------------------------

where **C** is the runoff coefficient as estimated from Table 7-2 in *Hydrologic Analysis and Design* Richard H. McCuen, 1989 **0.31**

**Assumed "C" type soils, slope 6%+, and 1/2 acre residential lots
--

**A** is the area in acres **1243 acres**

**I** is the rainfall intensity in in/hr for the calculated time of concentration ( $T_c$ )- (see below)

$T_c = .007 \cdot (n \cdot L)^2 / P_2^2 \cdot S^4$

where **n** is assumed Manning roughness coefficient **0.05**  
**L** is the flow length **4350 ft**  
**P<sub>2</sub>** is 2-year, 24-hour rainfall = 0.135 in/hr \* 24 hours **3.24 in**  
 (see Boston intensity-duration-frequency chart, attached)  
**S** is slope of hydraulic grade, assumed to be **8 %**

$T_c = 0.873858142$  hours  
 $T_c = 1.000$  hour

Using this value, a recurrence interval of 100 years, and the intensity-duration-frequency chart for Boston, MA (see attached), we found the rainfall intensity, **i**, to be **2.6 in/hr**

Therefore,  
 $Q_p = 0.31 \cdot 2.6 \cdot 1243$   
 $Q_p = 1001.858$

$Q_p = 1002$ cfs
------------------

\*McCuen, R.H. (1989) Hydrologic Analysis and Design. Prentice Hall, Englewood Cliffs, NJ  
 ^This method was developed for and is intended for use in small, urban watersheds  
 \*\*These are preliminary calculations for estimation purposes only. A full hydrologic analysis is in order at this time

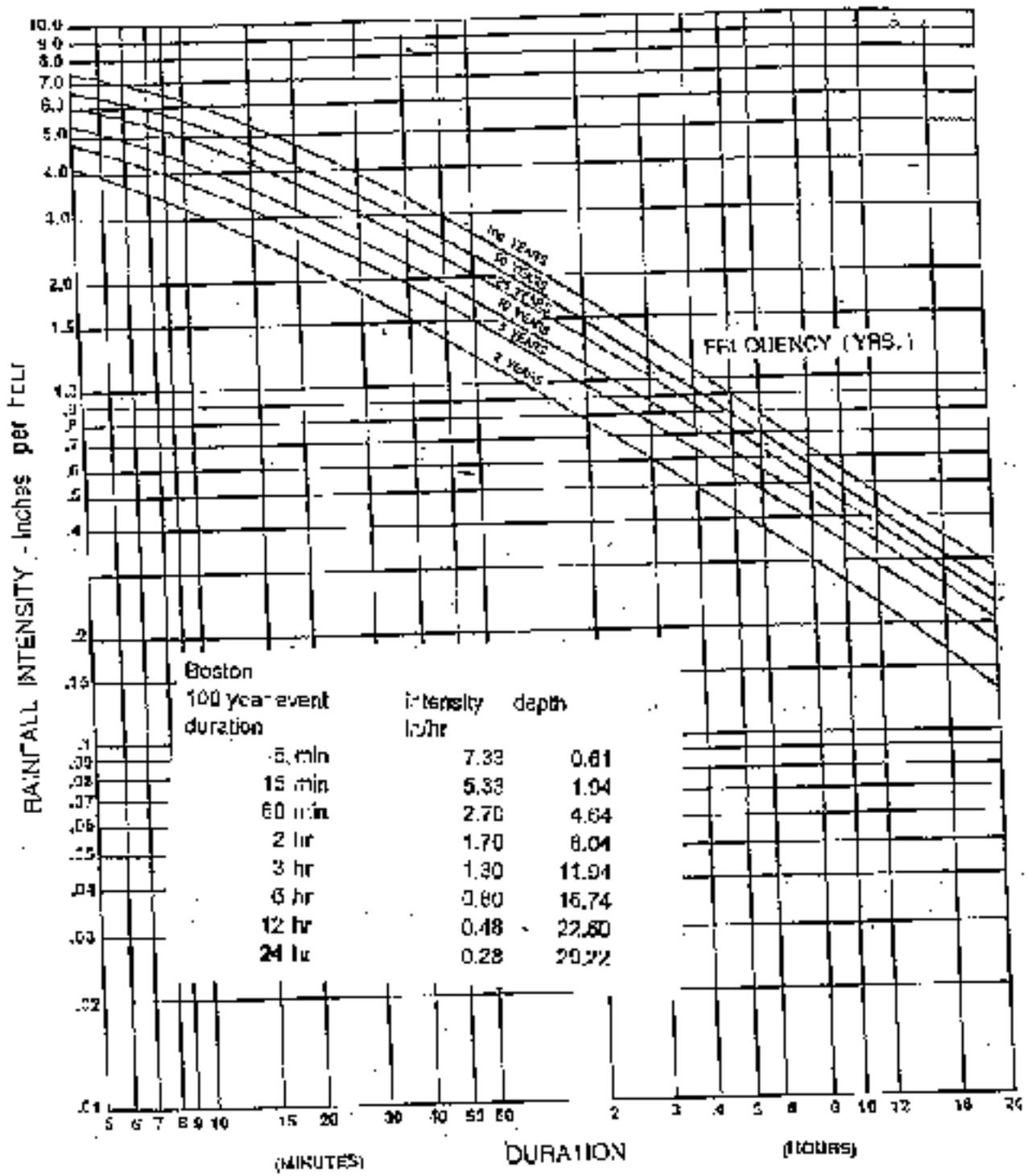


Figure 10-4. Intensity — Duration — Frequency Curve for Boston, MA

**APPENDIX E**  
**PREVIOUS INSPECTION REPORTS**

DEM files for the Talbot Mills Dam in North Billerica  
included the following inspection report:

Inspection/Evaluation Report  
O'Brien & Gere Engineers, Inc.  
November 17, 1987

**APPENDIX F**

**DAM SAFETY DETAIL SHEET**

# Department of Environmental Management DAM Detail

**National ID:** MA0074      **Item# Code:** 11gh      **USGS Quad:** Billerica      **Design:**  
**District #:** 4      **Size Class:** Intermediate      **Inspection Reg:**      **Main Level:**  
**County #:** 9      **Dam Type:** Gravity Masonry      **Inspection Cond:**      **Emerg. Plan:** NO  
**Town #:** 31      **Purpose:** Fire protection      **Last Insp. Date:**      **Embarkment:**  
**Dam #:** 1      **Year Comp:** 1950s      **Owner:**      **Concrete Condi:**  
**Dam Name:** Talbot Mill Dam      **Struct. Height:** 7.5 ft.      **DEM Inspection:**      **Low Level Capact:**  
**River:** Concord River      **Hydro. Height:** 12 ft.      **Next Inspection:**      **Low Level Outlet:**  
**Imp. Name:** Concord River      **Drain. Area:** 1243 acres      **Consultant:** Weston B. Sampson      **% Capacity:**  
**Basin:** 14b      **Normal Storage:** 100 acre-ft.      **Construction Date:**      **DEM Condition:** fair      **Repair Cost:** \$75,000  
**ERT DEVELOPMENT**      **Max. Storage:** 100 acre-ft.      **Activity Phase:** 1 rpt      **Key:**  
**67 Faulkner Street**      **Creast Length:** 120 ft.      **DEM Phase:** 1 rpt      **Permit:**  
**BILLERICA, MA 01821**      **Spill. Type:** stone masonry      **Insp 87:**      **Road:**  
**Phone:** [REDACTED]      **Spill. Width:** 5 ft.      **Insp 88:**      **Bridge:**  
**Owner Type:**      **Spill. Capacity:** 88% of BDF      **Insp 89:**      **No file:**  
**Contractor:** Bill Martin, Engineer      **Lat. Dec:** 42° 35.5' N      **Insp 97:**      **Registered:**  
**Cambridge Tooling Co.**      **Long. Dec:** 71° 17.04' W      **FERC License:**      **Compliance:**  
**Street:** 67 Faulkner St.      **Town:** North Billerica      **Last date changed:**

**Comment 1:**  
**Comment 2:**  
**Comment 3:**

EVALUATION FORM

DEM # 4-9-31-1

Dam Name Talbot Mills Dam

1. DESIGN 1  3 4 5  
 1 - unknown design  
 3 - some standard features  
 5 - state-of-the-art design

2. LEVEL OF MAINTENANCE 1  3 4 5  
 1 - no evidence of maintenance plan  
 3 - some level of maintenance work  
 5 - detailed, written report

3. EMERGENCY WARNING PLAN  2 3 4 5  
 1 - No plan/ideas for emergency response actions  
 3 - no plan, but well thought out  
 5 - detailed, written plan

4. EMBANKMENT 1 2 3 4 5  
 1 - evidence of piping and/or severe seepage  
 3 - serious seepage problem  
 5 - no evidence of seepage  
 Not Applicable

5. CONCRETE/MASONRY 1 2  4 5  
 1 - major cracks/severe leaks or deficiencies throughout  
 3 - significant deficiencies/erosion or minor cracks  
 5 - no deficiencies apparent

6. LOW-LEVEL OUTLET

A - CAPACITY 1  3 4 5  
 1 - insufficient  
 3 - sufficient capacity  
 5 - greater than necessary

B - CONDITION  2 3 4 5  
 1 - inoperable and requires replacement  
 2 - inoperable/repairs required  
 3 - operable but needs repair  
 4 - operable/maintenance needed  
 5 - good operational condition

7. SPILLWAY CAPACITY AS CAPACITY OF TEST FLOOD

	1	2	3	4	5
1 -					
2 -					
3 -					
4 -					
5 -					

8. GENERAL CONDITION

	1	2	3	4	5
1 -					
3 -					
5 -					

9. ESTIMATED COST FOR REPAIRS:  
 \$ 25,000

## **APPENDIX D**

## **COMMON DAM SAFETY DEFINITIONS**

For a comprehensive list of dam engineering terminology and definitions refer to 302 CMR 10.00 Dam Safety, or other references published by FERC, Department of the Interior - Bureau of Reclamation, or FEMA. Should discrepancies between definitions exist, those definitions included within 302 CMR 10.00 govern for dams located within the Commonwealth of Massachusetts.

### **Orientation**

Upstream - Shall mean the side of the dam that borders the impoundment.

Downstream - Shall mean the high side of the dam, the side opposite the upstream side.

Right - Shall mean the area to the right when looking in the downstream direction.

Left - Shall mean the area to the left when looking in the downstream direction.

### **Dam Components**

Dam - Shall mean any artificial barrier, including appurtenant works, which impounds or diverts water.

Embankment - Shall mean the fill material, usually earth or rock, placed with sloping sides, such that it forms a permanent barrier that impounds water.

Crest - Shall mean the top of the dam, usually provides a road or path across the dam.

Abutment - Shall mean that part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment.

Appurtenant Works - Shall mean structures, either in dams or separate therefrom, including but not be limited to, spillways; reservoirs and their rims; low level outlet works; and water conduits including tunnels, pipelines, or penstocks, either through the dams or their abutments.

Spillway - Shall mean a structure over or through which water flows are discharged. If the flow is controlled by gates or boards, it is a controlled spillway; if the fixed elevation of the spillway crest controls the level of the impoundment, it is an uncontrolled spillway.

### **Size Classification**

(as listed in Commonwealth of Massachusetts, 302 CMR 10.00 Dam Safety)

Large - structure with a height greater than 40 feet or a storage capacity greater than 1,000 acre-feet.

Intermediate - structure with a height between 15 and 40 feet or a storage capacity of 50 to 1,000 acre-feet.

Small - structure with a height between 6 and 15 feet and a storage capacity of 15 to 50 acre-feet.

Non-Jurisdictional - structure less than 6 feet in height or having a storage capacity of less than 15 acre-feet.

### **Hazard Classification**

(as listed in Commonwealth of Massachusetts, 302 CMR 10.00 Dam Safety)

High Hazard (Class I) - Shall mean dams located where failure will likely cause loss of life and serious damage to home(s), industrial or commercial facilities, important public utilities, main highway(s) or railroad(s).

Significant Hazard (Class II) - Shall mean dams located where failure may cause loss of life and damage to home(s), industrial or commercial facilities, secondary highway(s) or railroad(s), or cause the interruption of the use or service of relatively important facilities.

Low Hazard (Class III) - Dams located where failure may cause minimal property damage to others. Loss of life is not expected.

### **General**

EAP - Emergency Action Plan - Shall mean a predetermined plan of action to be taken to reduce the potential for property damage and/or loss of life in an area affected by an impending dam break.

O&M Manual - Operations and Maintenance Manual; Document identifying routine maintenance and operational procedures under normal and storm conditions.

Normal Pool - Shall mean the elevation of the impoundment during normal operating conditions.

Acre-foot - Shall mean a unit of volumetric measure that would cover one acre to a depth of one foot. It is equal to 43,560 cubic feet. One million U.S. gallons = 3.068 acre feet.

Height of Dam - Shall mean the vertical distance from the lowest portion of the natural ground, including any stream channel, along the downstream toe of the dam to the crest of the dam.

Spillway Design Flood (SDF) - Shall mean the flood used in the design of a dam and its

appurtenant works particularly for sizing the spillway and outlet works, and for determining maximum temporary storage and height of dam requirements.

### **Condition Rating**

Unsafe - Major structural, operational, and maintenance deficiencies exist under normal operating conditions.

Poor - Significant structural, operation and maintenance deficiencies are clearly recognized for normal loading conditions.

Fair - Significant operational and maintenance deficiencies, no structural deficiencies. Potential deficiencies exist under unusual loading conditions that may realistically occur. Can be used when uncertainties exist as to critical parameters.

Satisfactory - Minor operational and maintenance deficiencies. Infrequent hydrologic events would probably result in deficiencies.

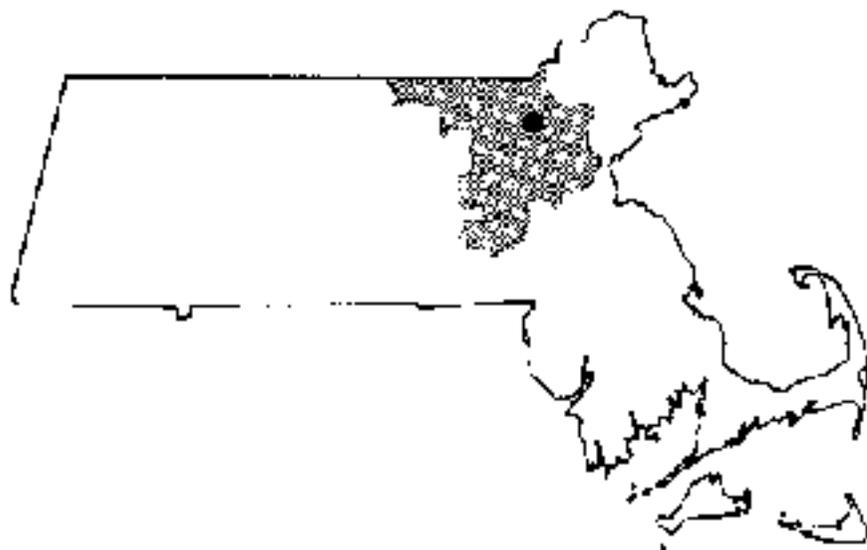
Good - No existing or potential deficiencies recognized. Safe performance is expected under all loading including SDF.

## **APPENDIX E**

# FLOOD INSURANCE STUDY



TOWN OF  
BILLERICA,  
MASSACHUSETTS  
MIDDLESEX COUNTY



FEBRUARY 5, 1985



Federal Emergency Management Agency

COMMUNITY NUMBER - 250183

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EXHIBITS

Exhibit 1 - Flood Profiles

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Shawsheen River.....	Panels 05P-06F
Jones Brook.....	Panels 07P-08F
Content Brook-Middlesex Canal.....	Panels 09P-11F
Lubber Brook.....	Panels 12P

Exhibit 2 - Flood Boundary and Floodway  
Map Index

Exhibit 3 - Flood Boundary and Floodway Map.....	Panels 250183 0001-0006
---	-------------------------

**PUBLISHED SEPARATELY:**

Flood Insurance Rate Map Index

Flood Insurance Rate Map.....	Panels 250183 0005-0010
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FLOOD INSURANCE STUDY  
TOWN OF BILLERICA, MASSACHUSETTS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Billerica, Middlesex County, Massachusetts, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1972. This study will allow Billerica to continue participation in the regular program of flood insurance by the Federal Emergency Management Agency (FEMA) with the most current data. Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these federally supported studies are based. These criteria take precedence over the minimum federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.2(d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for the determination and delineation of flood plains for this study were originally performed by Camp, Dresser and McKee, Inc. for the FEMA, under Contract No. H-3851. This work was completed in January 1978 and resulted in the publication of the Billerica Flood Insurance Study (Reference 1).

The hydrologic and hydraulic analyses for the determination and delineation of the Shawsheen River, Jones Brook, and Lubber Brook flood plains were performed by Schoenfeld Associates, Inc. for the FEMA, under Contract No. EMW-C-0280. The Shawsheen River was restudied to account for the flooding of the January 1979 event. Jones Brook was restudied because of channelization completed by the Town in the upper section of the study area. In addition, the flood plains and floodways for all streams studied in detail were delineated on photogrammetric maps obtained from the Town of Billerica (Reference 2). This work, which was completed in July 1983, covered all flooding sources affecting the Town of Billerica.

### 1.3 Coordination

Streams requiring a detailed study were identified at a meeting attended by representatives of the study contractor, the FEMA and the Town of Billerica on August 27, 1979.

During the course of the study, the following were contacted: the U.S. Army, Corps of Engineers (COE); the U.S. Geological Survey (USGS); the U.S. Soil Conservation Service (SCS); the Northern Middlesex Area Commission; the Bridge Design, Photogrammetric, and Waterways Sections of the Massachusetts Department of Public Works (MDPW); and the Director of Public Health and the Town Engineer of Billerica (Reference 1).

On July 26, 1984, the results of the study were reviewed at the final meeting attended by representatives of the study contractor, FEMA, and community officials. The study was acceptable to the community.

## 2.0 AREA STUDIED

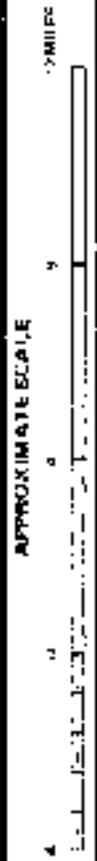
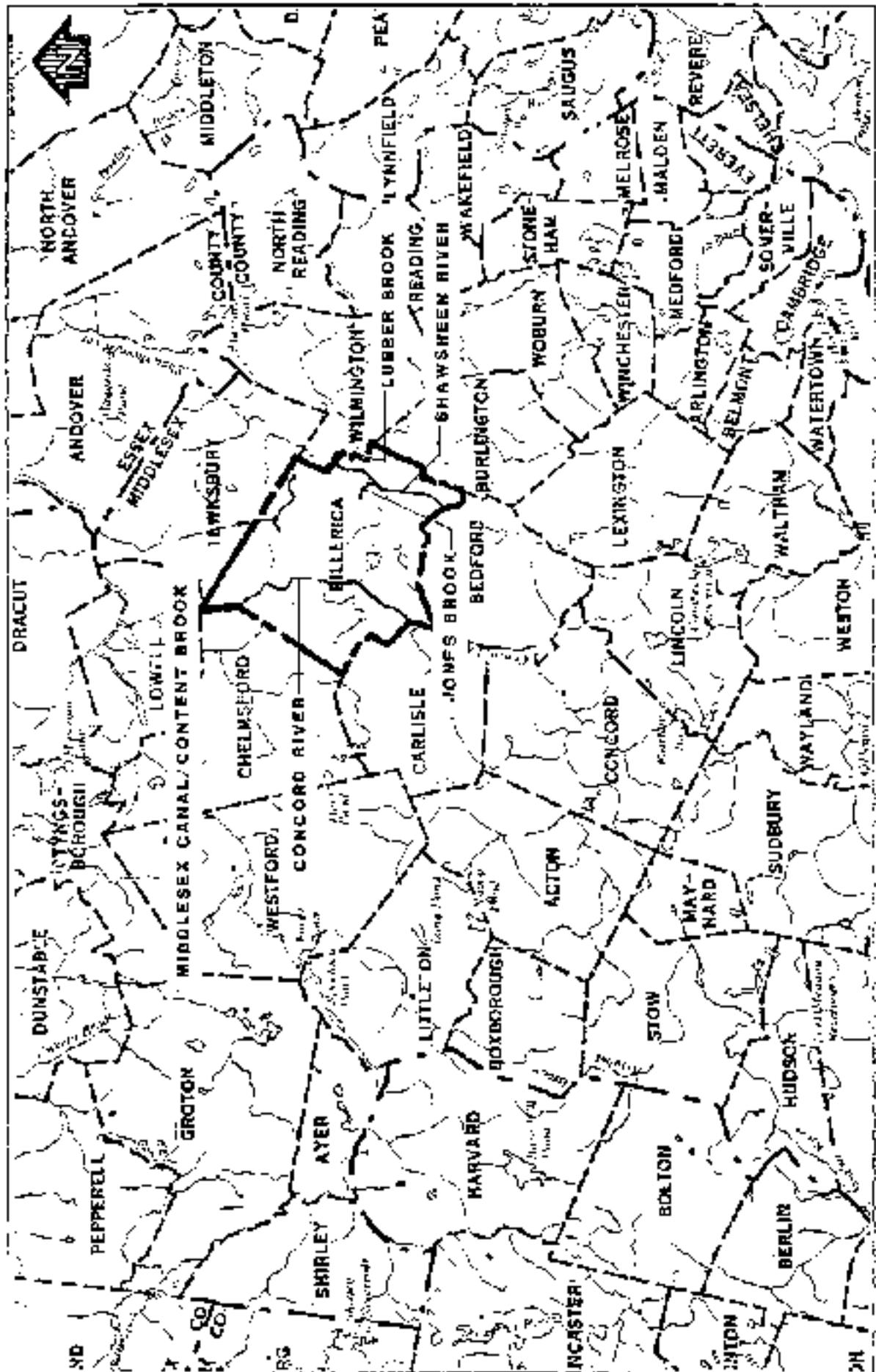
### 2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Billerica, Middlesex County, Massachusetts. The area of study is shown on the Vicinity Map (Figure 1).

The limits of the detailed and approximate studies in Billerica were determined by the FEMA with community and study contractor consultation at the meeting in August 1979.

The streams studied by detailed and approximate methods are listed below.

<u>Study Stream</u>	<u>Downstream Limit/ Upstream Limit</u>	<u>Study Method</u>
Concord River	Lowell Corporate Limits/ Bedford Corporate Limits	Detailed
Shawsheen River	Tewksbury Corporate Limits/ Bedford Corporate Limits	Detailed
Jones Brook	Confluence with Shawsheen River/ Approximately 780 feet Upstream of Baldwin Road	Detailed
Jones Brook	Approximately 780 feet Upstream of Baldwin Road/ Vicinity of Meadow Lark Way	Approximate



FEDERAL EMERGENCY MANAGEMENT AGENCY  
**TOWN OF BILLERICA, MA**  
 (MIDDLESEX COUNTY)

VICINITY MAP

FIGURE 1

<u>Study Stream</u>	<u>Downstream Limit/ Upstream Limit</u>	<u>Study Method</u>
Content Brook	Tewksbury Corporate Limits/ Confluence with Middlesex Canal	Detailed
Middlesex Canal	Confluence with Content Brook/ Pond Street	Detailed
Middlesex Canal	Pond Street/Iron Horse Park	Approximate
Lubber Brook	Tewksbury Corporate Limits/ Burlington Corporate Limits	Detailed
Webb Brook	Riverdale Road/Approximately 620 feet Upstream of Ravine Road	Approximate
Mill Brook	Confluence with Concord River/ Nutting Lake	Approximate
Nutting Lake	Entire Lake	Approximate
Winning Pond Tributary	Confluence with Concord River/ Winning Pond	
Winning Pond	Entire Pond	Approximate
Dolly Brook	Winning Pond/Approximately 4000 feet Upstream of Treble Cove Road	Approximate
Richardson Pond	Entire Pond	Approximate

Approximate methods of analyses were used to study those areas having a low development potential or a minimal flood hazard. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction for the next five years, through July 1988.

## 2.2 Community Description

The Town of Billerica is located in northern Middlesex County in northeastern Massachusetts 20 miles northwest of Boston. It is bordered by the City of Lowell and the Town of Tewksbury to the north, the Towns of Wilmington and Burlington to the east, the Town of Bedford to the south, and the Towns of Carlisle and Chelmsford to the west. The total land area is 25.56 square miles. According to the U.S. Census Bureau figures, the population has increased from 31,648 in 1970 to 36,719 in 1980 (Reference 3).

Billerica (first known as Shawsheen) was settled in 1637. In 1655, the town was incorporated as Billerikoyce (later, Billerikey). The town was primarily an agricultural village; apples, cherries, and strawberries were its major crops. The first saw and grist mill was built in 1660 by John Parker. In 1811, a woolen mill, the second of its kind in New England, began operations. The next important manufacturing enterprise, begun in 1830, was a leather-splitting mill. Other important industries which were established were sycamore (in 1836), cabinetmaking (in 1845), chemicals (in 1849), and glue (in 1867). The first library was built in 1772; the first post office was built in 1797. Billerica is now primarily a suburban residential community with some light industrial and manufacturing firms (Reference 1).

The town's topography is hilly with some flatland in the eastern and northeastern parts. Vegetative cover includes deciduous and coniferous trees in the hilly areas and scrub brush and wetland flora in the swampy areas and stream valleys (Reference 1).

The temperature for the Town of Billerica ranges from an average low of 24.9 degrees Fahrenheit (°F) in January to an average high of 70.7°F in July. The average annual precipitation is 42.8 inches (Reference 4).

The two major waterways in Billerica are the Concord and Shawsheen Rivers. The Concord River is formed by the confluence of the Assabet and Sudbury Rivers, approximately one mile northwest of the center of Concord. The river system is often referred to as the Sudbury-Assabet-Concord (S-A-C) river basin. The river flows sluggishly in a general northerly direction for approximately 16 miles and falls 62 feet over its course. Approximately 50 feet of the drop occurs at dams in the first mile of the river in Lowell. The total drainage area is approximately 406 square miles, of which 341 square miles are drained by the confluent rivers. The 11.3-mile reach of the Concord River from its confluence with the Assabet and Sudbury Rivers in Concord to North Billerica is controlled by the Talbot Mills Dam in North Billerica. The Concord River is of major significance to Billerica because it is the community's primary source of water (References 3 and 5).

The Shawsheen River begins near the Bedford-Lexington corporate limits at the confluence of Kilm Brook and an unnamed brook which drains Hanscom Air Force Base and flows northeasterly through Bedford, Billerica, Tewksbury, Andover, and North Andover, where it flows into the Merrimack River (Reference 6).

Jones Brook originates in Billerica and flows eastward into the Shawsheen River. Content Brook originates from Richardson Pond and flows eastward into the Shawsheen River in Tewksbury.

The Middlesex Canal, once used to move barges from Upper Mystic Lake in Winchester to the Concord River in Billerica, is now a fragmented series of channels with several sections no longer carrying water. The portion of the Middlesex Canal studied in detail in this Flood Insurance Study has become a tributary to Content Brook. Lubber Brook originates in Burlington and flows through Billerica and Wilmington where it joins the Ipswich River in the eastern part of Wilmington.

Although development within flood plain areas has occurred along the Concord and Shawsheen Rivers, it has generally consisted of the conversion of summer camps and cottages for year-round residence.

### 2.3 Principal Flood Problems

Each spring, low-lying areas along the Concord and Shawsheen Rivers are subjected to flooding caused by rains and snowmelt. Areas along the other streams studied are also subjected to local flooding because of inadequate protection afforded by existing culverts (Reference 1).

A review of the history of flooding in Billerica indicates that the main flood season for the Concord and Shawsheen Rivers is spring, when melting snows combine with spring rains. However, records for the area indicate that flooding can occur in any month when the variation in monthly precipitation increases more than 10 inches for the month, when the total precipitation for a single storm exceeds 4 inches in 36 hours, or when conditions prior to a storm are conducive to flooding (Reference 6).

There have been four major floods in the Concord River Basin in this century: 1936, 1955, 1968, and 1979. Two floods in 1886 and 1896 were recorded as equalling the magnitude of the 1936 flood.

The flood of March 1936 was the result of four distinct storms. The total precipitation between March 9 and March 22 for the Concord River watershed ranged from 6 to 8 inches. The snow cover in the watershed had a water content at the beginning of the period which averaged approximately 3 inches. The frozen ground and the warm temperatures which accompanied the rainfall combined to give the Concord River one of its greatest flood peaks (Reference 6).

The greatest flood occurring in the watershed was the result of Hurricane Diane on August 17, 1955. Previously, on August 12, another storm, Hurricane Connie, passed over the east coast and left the ground saturated. The Concord River watershed received an average of 2 to 3 inches during this period. Between August 17 and 20, the area received rainfall which

varied from approximately 7 inches in Lowell to more than 13 inches in the headwaters. Total rainfall averaged over 10 inches. The Concord River rose slowly but continuously to flood stage, beginning on August 19 and cresting on August 23. Damage in the area was relatively minor due to lack of development within the flood plain (Reference 6).

Another major storm occurred during March 1968, which is one of the wettest Marches on record. Most of the precipitation fell during two storms -- the first on March 12-13, the second on March 17-19. Snow cover in the Concord River watershed was above normal, with a water content up to 3 inches. Prior to the second storm, the snow had melted and saturated the wetlands surrounding the Concord River, producing the above normal streamflow. Combined with the unexpected heavy rainfall which began on March 17, severe flooding occurred. The peak flow at USGS gaging station in Lowell (01099500) actually exceeded that of the 1955 flood. However, at the Carlisle Road Bridge (State Route 225), which connects Bedford to Carlisle, the maximum flood level was 9 inches less than that experienced in 1955. In spite of this, flood damages were considerably higher due to the increased development in the flood plain (References 6 and 7).

The most recent flood occurred in January 1979. The month of January was an extremely wet one in eastern Massachusetts and the accumulated precipitation set a new record of over 10 inches (Reference 8). The culmination was the storm of January 24-25 when almost 4 inches of rain fell on the Concord River basin (Reference 9). Although the rainfall was not a record for a single event, it came at the worst possible time. The river and upstream reservoirs were already at very high stages as a result of three one-inch storms which occurred earlier in January when the ground was frozen. Most of the rain fell on Thursday, January 25. On Friday, January 26, the Concord River began to flood. The river continued to rise until it reached a peak of 9.5 feet above normal in Billerica in the early morning hours of Monday, January 29. It then began to recede slowly with a drop of approximately one foot measured on Tuesday afternoon (Reference 10).

The 1979 flood was the maximum recorded event on the Shawheen River, with a discharge of 1,000 cfs was recorded at the USGS gage near Wilmington (01100600). This discharge approximated a 50-year frequency event on the Shawheen River (Reference 11).

The storm of 1979 caused more damage than any previous storm, partly due to intensity and existing conditions but also due to increased development in flood plain and wetland areas. Billerica was especially hard-hit, where over 100 families were evacuated from their homes and over 30 roads were flooded (Reference 10).

The information below presents the relative flood heights at the Carlisle Road (State Route 225) bridge for the ten major floods in the Concord River basin, in order of magnitude.

Flood Heights on the Concord River (Reference 6)

Order No.	Date of Crest	Estimated Elevation at Carlisle Road Bridge**	Peak Discharge at Lowell (cfs)***
1	August 23, 1955	119.4	4,540
2	January 26, 1979*	119.3	3,400
3	March 20, 1936	119.2	6,000
4	March 27, 1968	118.7	4,900
5	July 25, 1938	118.1	3,790
6	September 15, 1954	117.5	3,340
7	September 24, 1938	117.3	3,210
8	March 24, 1948	117.3	3,200
9	January 30, 1955	117.2	3,120
10	April 18, 1936	117.0	2,970

\*Reference 11

\*\*The Carlisle Road Bridge is located one mile upstream of the Bedford/Billerica/Carlisle corporate limits.

\*\*\*The Lowell gage is located 9.75 miles downstream of the Bedford/Billerica/Carlisle corporate limits.

Velocities of water during a 100-year flood on the Concord River would be approximately 2.0 feet per second in the main channel and about 0.4 feet per second over the flood plain. For the Shawsheen River, velocities would be somewhat greater than 4 feet per second in the main channel and about 0.3 feet per second over the bank. During the 1936 and 1955 floods, it is estimated that velocities in the channel of the Concord River ranged up to 1.9 feet per second. Overbank velocities ranged up to 0.3 feet per second. These flood velocities are not considered hazardous (Reference 6).

The duration of flooding for most of the Concord River is generally sustained due to the large drainage area, shallow channel slopes, and wide meadow flood storage areas. Records indicate that the 1936 flood remained higher than elevation 118 at the Carlisle Road Bridge for more than eleven days. Hurricane Diane occurred on August 19 and 20, 1955, but the Concord River did not crest until late on August 22, with water levels remaining above elevation 118 for over three days. The Shawsheen River, on the other hand, rises fairly rapidly and crests within 36 to 48 hours after the time of maximum precipitation over the watershed (Reference 6).

There is no recorded flood information for Jones, Lubber and Content Brooks and the Middlesex Canal.

#### 2.4 Flood Protection Measures

There are no existing or proposed flood control structures in Billerica. A local protection project to the south in the Saxonville section of Framingham was recently constructed along the Sudbury River approximately 15 miles upstream of its confluence with the Assabet River. This project benefits mainly the Upper Sudbury watershed. Flood retention structures have also been constructed upstream on the Assabet River. Their effect on lowering Concord River flood elevations, however, is debatable (Reference 6).

In the past it has been proposed that an adjustable gate be installed at the Talbot Mills Dam in North Billerica. This would allow further management of the Sudbury and Concord Rivers during heavy flooding. Low flow augmentation techniques could also be used. Opponents of the gate argue that it would conflict with other water uses and would interfere with the normal flooding cycle which is essential to wildlife along the river. It has been suggested, however, that the gate be used only when abnormal elevations are expected and not for the normal flooding cycle (Reference 12).

Nonstructural flood protection measures include Section 7.0 of Billerica's zoning by-laws, which states that no building or structure intended for occupancy, either continuous or intermittent, can be erected or placed in the flood plain district unless a special permit is granted by the Board of Appeals. Section 7.1.1 requires that special permit requisites be approved by the Board of Health prior to submission to the building inspector. Section 7.3.1 lists four criteria which must be met prior to granting a special permit: sewage and drainage plans must be approved by the Board of Health; access to structures must be provided at an elevation high enough to insure that the structures can be maintained safely at all times; spaces contemplated for use must be elevated at least two feet above the expected water level during flood events and fill and foundations must be installed in a manner safe from erosion and undermining; and the use of the premises must not endanger the health and safety of the occupants thereof or of other land in the flood plain. Section 7.4.1 requires that no land be filled or paved except with the approval of the Board of Appeals (Reference 13).

Section 3.1 of the regulations of the Board of Health provides that no structure within the flood plain can be constructed, located, expanded, converted, subdivided, or altered. In addition, no encroachments, including fill, new construction, substantial improvements to existing structures, or other development, are permitted unless a variance is granted by a majority vote of the Board of Health (Reference 14).

Other nonstructural measures of flood protection are also being utilized to aid in the prevention of future flood damage. Chapter 131, Section 40 (310 CMR 10.00) of the General Laws of the Commonwealth of Massachusetts (most recently revised on April 1, 1983) is commonly referred to as the Wetlands Protection Act. The law gives the responsibility for issuing permits to remove, fill, dredge or alter wetlands to the local conservation commission. The commission has to determine if an area on which a permit is requested "is significant to public or private water supply, to the ground water supply, to flood control, to storm damage prevention, to prevention of pollution, to protection of land containing shellfish, or to the protection of fisheries." After a public hearing, the commission can impose such conditions as will contribute to the protection of these interests. The Department of Environmental Quality Engineering (DEQE) may also make a determination after a review of the commission's order. Conditions imposed by the DEQE supersede conditions imposed by the commission. Detailed rules and regulations concerning the administration of this act have been promulgated by the DEQE.

Section 40 now requires a conservation commission, if requested, to make a determination of whether a particular parcel of land is a wetland and governed by the Wetlands Protection Act. It also contains definitions of terms to aid this determination.

Chapter 131, Section 40A of the Acts of 1968, as amended by Chapter 782 of the Acts of 1972, gives the commissioner of the Department of Environmental Management the authority to protect inland wetlands and flood plains by establishing encroachment lines "for the purpose of preserving and promoting the public safety, private property, wildlife, fisheries, water resources, flood plain areas and agriculture." The commissioner may adopt orders regulating, restricting or prohibiting the altering or polluting of inland wetlands by designating lines with which no obstruction or encroachment would be permitted without prior approval. These restrictions require notifications to each land owner affected, public hearings, and approval by the town.

Section 40A was further amended by Chapter 818 by defining "inland wetlands" to include the definition of "freshwater wetlands" as set forth in Section 40 as "that portion of any bank which touches any inland waters or any freshwater wetland, and any freshwater wetland subject to flooding."

### 3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the

average during any 10, 50, 100, or 500 year period (recurrence intervals), have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10, 50, 100, and 500 year floods, have a 10, 2, 1 and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50 year period is about 40 percent (four in ten), and for any 90 year period, the risk increases to about 60 percent (six in ten). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be updated periodically to reflect future changes.

### 3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the community.

Because some of the watercourses studied in Billerica were un-gaged, a method developed by the SCS for un-gaged watersheds was used (References 15 and 16). This method is based on soil types, type of land cover, and surface roughness. The soil cover-land use complex is given a curve number from which storm runoff and peak flow can be determined. This procedure was used to develop flows on Gortchit and Jones Brooks and Middlesex Canal.

Floodflows for Lubber Brook were determined using a regional method developed by the USGS which gives consideration to the size of the watershed and the slope of the main channel. (Reference 17).

Floodflow frequency analysis for the Shawsheen River was based on records (1963-1980) at the USGS gaging station (01100600) in Wilmington. The station is located on the right bank at the downstream side of the bridge on State Route 129, at the Billerica-Wilmington corporate limits. The Shawsheen River has a drainage area of 35.3 square miles at the gaging station. The frequency analysis was based on a fitted log-Pearson Type III distribution (Reference 18).

In order to determine flood discharges on the Concord River, it was necessary to determine and route flows on the Assabet and Sudbury Rivers, which unite to form the Concord River. Because the Assabet and Sudbury Rivers are gaged, a log-

Pearson Type III analysis (Reference 1) was made. The Assabet River gage (No. 01097000) has been operated by the USGS since 1941. It is approximately 15 miles upstream from Billerica in Maynard. The Sudbury River gage (No. 01097500) has been operated by the USGS since 1875; it is approximately 23 miles upstream from Billerica in Framingham Center. Hydrographs that were established at the headwaters of the Concord River were routed downstream with the calculated flows being increased because of the contributions from the additional drainage areas and being reduced because of the increase in available storage capacity along the banks of the river. The routed flows were further modified based on data from the USGS gage (No. 01099500) operated since 1936, located downstream from Billerica in Lowell, Massachusetts. Resultant flow data were used as discharges for the 10-, 50-, 100-, and 500-year floods (Reference 1).

A summary of drainage area-peak discharge relationships for each stream studied in detail is shown in Table 1.

Table 1 - Summary of Discharges

Flooding Source and Location	Drainage Area Sq. Mi.	Peak Discharges (cfs)			
		10 Yr.	50 Yr.	100 Yr.	500 Yr.
<b>CONCORD RIVER</b>					
At Downstream Corporate Limits	373	3,105	4,924	5,995	8,870
At Talbot Hill Dam	370	2,940	4,660	5,675	8,395
At U.S. Route 2 Bridge	367	2,885	4,577	5,575	8,245
<b>SHAWSHIEN RIVER</b>					
At State Road (SR 179)	96.5	1,115	1,825	2,200	3,285
Above Confluence with Jones Brook	99.0	1,040	1,710	2,050	3,070
At Boston Road (SR 9A)	31.2	1,020	1,550	1,555	2,950
At Bedford/Billerica Corporate Limits	27.7	1,000	1,500	1,500	2,660
<b>CONTENT BROOK</b>					
At Corporate Limits	5.5	205	370	455	585
At Gray Street	4.9	150	330	400	520
<b>MIDDLESEX CANAL</b>					
Just Upstream of Confluence with Content Brook	2.2	95	175	210	275

Table 1 - Summary of Discharges  
(Continued)

<u>Flooding Source and Location</u>	Drainage Area Sq. Mi.	<u>Peak Discharges (cfs)</u>			
		<u>10 Yr.</u>	<u>50 Yr.</u>	<u>100 Yr.</u>	<u>500 Yr.</u>
<b>JONES BROOK</b>					
At Confluence with Shawsheen River	1.7	215	380	450	540
At Golf Course Culvert	1.6	195	355	425	510
At Baldwin Road	1.3	160	290	345	415
<b>LUBBER BROOK</b>					
At Billerica/Wilmington Corporate Limits	1.3	63	106	129	200
At Billerica/Burlington Corporate Limits	0.7	47	80	98	153

### 3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sections studied in detail in Billerica were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the flood sources.

Water-surface elevations of floods of the selected recurrence intervals for all streams studied by detailed methods were computed using the DOE HEC-2 step-backwater computer program (Reference 19).

Cross sections for backwater analyses of the study streams were field surveyed and spaced at specific intervals along the river channel, so that hydraulic properties would be accurately modeled by the computer. Sections were interpolated between surveyed sections where necessary. These interpolated sections were prepared from survey data and data from topographic maps (Reference 2).

The below-water sections were obtained by field measurement. All bridges, dams, and culverts were field checked to obtain elevation data and structural geometry.

Locations of selected cross sections used in hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map.

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations of the streams and flood plain areas. They are as follows:

<u>Stream</u>	Manning's "n" Value	
	<u>Channel</u>	<u>Overbank</u>
Concord River	0.035 to 0.077	0.125
Shawsheen River	0.045	0.110
Content Brook	0.030 to 0.045	0.060 to 0.110
Middlesex Canal	0.030 to 0.045	0.060 to 0.110
Jones Brook	0.030 to 0.040	0.110
Lubber Brook	0.030 to 0.040	0.110

The acceptability of all assumed hydraulic factors, cross sections and hydraulic structure data for the Concord and Shawsheen Rivers was checked by computations that duplicated historic flood water profiles.

Water surface elevations of floods of the selected recurrence intervals were computed through use of the COE HEC-2 step-backwater computer program (Reference 19). Starting water surface elevations on the Concord River were developed from a rating curve for the Wessit River Company Dam in Lowell. Starting water surface elevations on the Shawsheen River and Content Brook were taken from the Tewksbury Flood Insurance Study (Reference 20). Starting water surface elevations on the Middlesex Canal were developed considering the canal a continuation of Content Brook. Starting water surface elevations on Jones Brook were developed using the slope-area method. Starting water surface elevations on Lubber Brook were taken from a rating curve developed for the dam just upstream of Shawsheen Road in Wilmington. Flood profiles were drawn showing computed water surface elevations for floods of the selected recurrence intervals. All elevations are referenced from the National Geodetic Vertical Datum of 1929 (NGVD), formerly referred to as the Sea Level Datum of 1929; elevation reference marks used in this study are shown on the maps.

Due to the meandering nature of the Shawsheen River, the distance between cross sections will not always agree between the map and the profile.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

#### 4.3 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

#### 4.1. Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FEMA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and the 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using photogrammetric maps at a scale of 1:4,800 with a contour interval of 2 feet (Reference 2). In cases where the 100- and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

For the streams studied by approximate methods, the boundaries of the 100-year flood were developed from normal depth calculations and the photogrammetric maps referenced above.

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map. Small areas within the flood boundaries may lie above the flood elevations, and therefore, may not be subject to flooding. Owing to limitations of the map scale and/or lack of detailed topographic data, such areas are not shown.

#### 4.2. Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood can be carried without substantial increases in flood heights. Minimum standards of the FEMA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as a minimum standard that can be adopted or that can be used as a basis for additional studies.

The floodways for this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 2).

Downstream portions of both the Concord and Shawsheen Rivers have floodway widths extending beyond the corporate limits. Also, a portion of Jones Brook is affected by backwater from its confluence with the Shawsheen River. This condition is footnoted in the Floodway Data Table (Table 2).

As shown on the Flood Boundary and Floodway Map (Exhibit 3), the floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water surface elevation of the 100-year flood more than 1.0 foot at any point. This allowable increase considers only the hydraulic response of the stream and its flood plain to any encroachment. The increase in the water surface elevation is a result of the 100-year flood discharge flowing through a smaller flood plain area. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

One aspect of floodway and flood plain encroachment is sometimes overlooked and more often neglected: the cumulative effect of encroachment on flood discharge magnitude. Generally, as encroachment occurs, temporary storage areas are lost, velocities increase, and the magnitude of the discharge increases. As floodwaters move downstream, that increase can become more significant. The combined effect of a narrower flood plain and greater discharge can, due to hydraulic effects alone, produce a flood stage that exceeds the anticipated 100-year flood.

The FEMA does not encourage the filling of the floodway fringe area. Local officials should be aware that even a 1-foot rise in the water-surface elevation can cause flooding in areas which would have received little or no flooding if such filling had not taken place. Careful consideration of the economic and human dislocation which will be caused by a rise in flood heights should be made before filling is allowed. Large quantities of fill in the fringe area could also disrupt the flood plain ecosystem, causing a major impact on local environmental resources.

FLOODING SOURCE		FLOODWAY				BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE	
					(FEET NGVD)	(FEET NGVD)	(FEET NGVD)		
CONCORD RIVER									
A	2,050	385/250 <sup>2</sup>	5,556	3.1	106.5	106.5	107.5	1.0	
B	4,750	238	3,642	3.6	106.6	106.6	107.6	1.0	
C	9,050	161	2,092	2.9	107.0	107.0	108.0	1.0	
D	9,600	217	3,155	3.9	107.7	107.7	108.2	1.0	
E	10,140	495	740	8.1	108.5	108.5	108.5	0.0	
F	11,610	190	2,634	3.1	104.8	104.8	105.8	1.0	
G	13,050	220	1,559	3.6	115.0	115.0	116.0	1.0	
H	14,065	134	1,662	3.4	113.8	113.8	115.8	0.7	
I	17,145	220	2,941	3.9	116.2	116.2	117.4	0.8	
J	17,625	243	1,564	3.6	116.7	116.7	117.7	0.7	
K	17,935	280	2,427	2.4	116.5	116.5	117.7	0.7	
L	19,830	263	3,120	3.8	116.8	116.8	117.5	0.7	
M	22,060	293	3,581	3.5	117.0	117.0	117.7	0.7	
N	24,405	224	1,308	4.3	117.7	117.7	117.9	0.7	
O	25,655	250	3,417	3.6	117.9	117.9	118.5	0.6	
P	26,725	210	1,737	3.2	117.9	117.9	118.5	0.6	
Q	28,175	167	1,883	2.9	118.7	118.7	118.8	0.0	
R	28,725	327	4,804	3.1	118.5	118.5	119.0	0.5	
S	34,435	139	1,924	2.9	119.0	119.0	119.7	0.7	
T	36,665	971	10,608	0.5	119.3	119.3	120.0	0.7	

1-foot Above Certificate Limit  
<sup>2</sup> width/width of the corporate limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**TOWN OF BILERICA, MA.**  
 ( MIDDLESEX CO. )

**FLOODWAY DATA**  
**CONCORD RIVER**

FLOODING SOURCE		FLOODWAY				BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY FLOODWAY (FEET MVD)	WITH FLOODWAY (FEET MVD)	INCREASE	
Shawsheen River								
A	0 <sup>1</sup>	220/210 <sup>2</sup>	858	2.9	98.3	98.3	0.9	
B	815 <sup>1</sup>	230/215 <sup>2</sup>	1,515	1.2	95.9	95.9	0.9	
C	1,155 <sup>1</sup>	297/152	377	5.0	97.1	97.0	0.9	
D	1,580 <sup>1</sup>	180/115 <sup>2</sup>	1,563	1.3	92.3	92.6	0.3	
E	2,200 <sup>1</sup>	157/242	393	3.7	92.3	92.7	0.4	
F	2,370 <sup>1</sup>	597/202	337	5.5	92.3	92.7	0.4	
G	2,320 <sup>1</sup>	407/252	233	5.2	92.3	92.7	0.4	
H	2,580 <sup>1</sup>	1507/382	3,345	0.9	97.3	97.5	0.2	
I	4,450 <sup>1</sup>	330/152	3,784	0.5	97.3	97.6	0.3	
J	6,550 <sup>1</sup>	250	2,551	0.7	97.2	97.4	0.4	
K	10,740 <sup>1</sup>	250	2,345	0.7	97.6	98.2	0.6	
L	12,470 <sup>1</sup>	190	1,578	1.2	97.7	98.5	0.8	
M	15,340 <sup>1</sup>	182	2,048	1.0	97.9	98.8	0.9	
N	17,340 <sup>1</sup>	300	2,418	0.5	98.1	99.0	0.9	
O	17,450 <sup>1</sup>	100	548	3.1	98.1	99.0	0.9	
P	16,260 <sup>1</sup>	350	5,379	0.6	99.0	99.3	0.3	
Jones Brook								
A	975 <sup>2</sup>	50	190	2.6	97.8	94.1 <sup>2</sup>	1.0	
B	1,800 <sup>2</sup>	60	185	2.7	97.8	96.1 <sup>4</sup>	0.5	
C	2,500 <sup>2</sup>	60	137	5.3	98.3	99.0	0.7	
D	3,250 <sup>2</sup>	60	159	2.8	101.9	102.3	0.4	
E	3,750 <sup>2</sup>	50	180	2.2	106.7	105.0	0.5	
F	4,340 <sup>2</sup>	100	373	1.1	105.0	105.6	0.6	
G	4,580 <sup>2</sup>	150	528	0.7	105.1	105.7	0.6	
H	5,220 <sup>2</sup>	15	88	3.5	107.5	107.6	0.0	
I	5,150 <sup>2</sup>	10	213	1.5	108.5	108.8	0.4	

<sup>1</sup>Foot Above Corporate Limits

<sup>2</sup>Feet Above Confluence With Shawsheen River

<sup>3</sup>Width/Width Within Corporate Limits

<sup>4</sup>Elevation computed without consideration of backwater effects

Prof. Shawsheen River

FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF BILLERICA, MA.**  
MIDDLESEX CO.1

**FLOODWAY DATA**

**SHAWSHEEN RIVER AND JONES BROOK**

TABLE 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET MVD)	WITH FLOODWAY	INCREASE
Content Brook								
A	150	9	39	11.7	94.0	94.0	94.0	0.0
B	210	11	72	6.3	97.9	97.9	97.9	0.0
C	1,800	8	37	12.3	98.7	98.7	98.7	0.0
D	2,575	183	1,032	0.4	-0.6	-0.6	-0.6	0.2
E	3,510	15	180	2.8	-0.6	-0.6	-0.6	0.3
F	3,840	7	35	13.0	-0.2	-0.2	-0.2	0.0
G	4,160	225	1,613	0.3	-0.3	-0.3	-0.3	0.2
H	5,125	40	77	5.2	-0.3	-0.3	-0.3	0.1
I	5,865	163	1,285	0.3	-0.6	-0.6	-0.6	0.7
J	6,260	14	70	3.5	-0.6	-0.6	-0.6	0.7
Middlesex Canal								
K	6,300	25	70	3.5	106.9	106.9	107.6	0.7
L	1,265	20	81	3.0	108.2	108.2	108.7	0.5
M	9,075	23	94	2.2	109.3	109.3	109.9	0.6
N	9,050	20	100	2.1	109.5	109.5	110.1	0.6
O	10,495	20	99	2.1	109.7	109.7	110.4	0.7
Lubber Brook								
A	0	100	501	0.3	103.2	103.2	106.2	1.0
B	1,320	100	462	0.3	103.2	103.2	106.2	1.0
C	1,965	100	371	0.4	103.8	103.8	104.3	0.5
D	3,410	100/75	178	0.7	103.8	103.8	104.3	0.5
E	4,495	100/50	169	0.6	104.1	104.1	105.0	0.9
F	5,070	100/50	157	0.6	104.2	104.2	105.1	0.9

1 Feet Above Corporate Limits  
2 Within/With Corporate Limits

TABLE 2

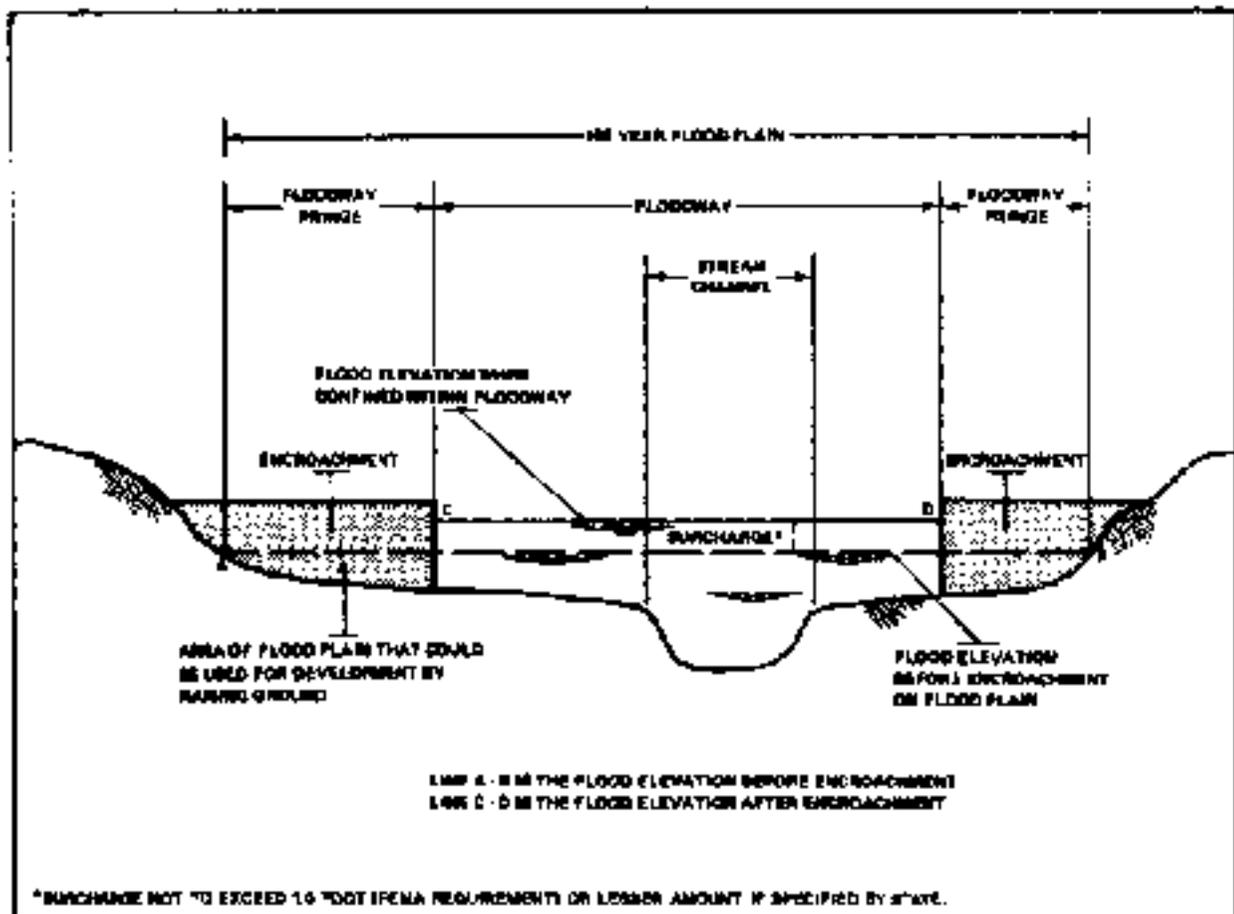
FEDERAL EMERGENCY MANAGEMENT AGENCY  
**TOWN OF BILLERICA, MA.**  
(MIDDLESEX CO.)

**FLOODWAY DATA**

**CONTENT BROOK, MIDDLESEX CANAL AND LUBBER BROOK**

Communities are encouraged by the FEMA to adopt wider, more restrictive floodways and to minimize the amount of fill allowed in the fringe areas. Such actions also meet the intent of the Massachusetts Wetlands Protection Act (Massachusetts General Laws, Chapter 131, Section 40), which was previously described in Section 2.4.

In order to achieve a unified flood plain and wetlands management program, numerous Massachusetts communities have adopted local zoning by-laws, ordinances, subdivision regulations, and local board of health regulations augmenting the minimum requirements of the National Flood Insurance Program and the Massachusetts Wetlands Protection Act. The FEMA encourages the use of this Flood Insurance Study as the technical basis for adoption of a broader, more encompassing local flood plain management program than is required to meet the minimum standards of the National Flood Insurance Program.



FLOODWAY SCHEMATIC

Figure 2

## 5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FEMA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (EHFs), and flood insurance zone designations for each significant flooding source affecting the Town of Billerica.

### 5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

<u>Average Difference Between 10- and 100-Year Floods</u>	<u>Variation</u>
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

Fifteen reaches meeting the above criteria were required for the flooding sources of Billerica. These include one each on Lubber Brook and Middlesex Canal, two on Jones Brook, three each on the Concord River and the Shawshoek River and five on Content Brook. The locations of the reaches are shown on the Flood Profiles.

### 5.2 Flood Hazard Factors (EHFs)

The Flood Hazard Factor is used to correlate flood information with insurance rate tables. Correlations between property damages from floods and their assigned EHF's are used to set actuarial insurance premium rate tables based on EHF's from 005 to 200.

The EHF for a reach is the average weighted difference between the 10- and 100-year flood water surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between the water surface elevations of the 10- and 100-year floods is 0.7 foot, the EHF is 005; if the difference is 1.4 feet, the EHF is 015; if the difference is 5.0 feet, the EHF is 050. When the difference between the 10- and 100-year flood water surface elevations is greater than 10.0 feet, the accuracy for the EHF is to the nearest foot.

### 5.3 Flood Insurance Zones

After the determination of reaches and their respective FHEs, the entire incorporated area of Billerica was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

- Zone A: Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods, no base flood elevations shown or FHEs determined.
- Zones A1, A2, A3, A5, A6, A7, A8, A11: Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones assigned according to FHEs.
- Zone B: Areas between the Special Flood Hazard Areas and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; or, areas subject to 100-year flooding from sources with drainage areas of less than one square mile. Zone B is not subdivided.
- Zone C: Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHEs, flood insurance zones, and base flood elevations for each source studied in detail in the community.

### 5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Town of Billerica is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FEMA.

FLOODING SOURCE	FANED <sup>1</sup>	ELEVATION DIFFERENCE <sup>2</sup> BETWEEN 1% (100-YEAR) FLOOD AND 0.2% (500-YEAR)			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION <sup>3</sup> (FEET NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
Concord River Reach 1 Reach 2 Reach 3	0005	-3.4	-1.2	3.1	035	A7	Varies Varies Varies
	0005	2.4	-0.8	2.0	025	A5	
	0005	3.3	-1.1	2.5	035	A7	
Shawsheen River Reach 2 Reach 2 Reach 3	0010	1.3	0.5	1.1	015	A5	Varies Varies Varies
	0010	-5.5	1.5	2.2	055	A11	
	0010	5.7	0.4	1.5	035	A7	
Jones Brook Reach 1 Reach 3	0010	1.0	-0.1	0.8	010	A2	Varies Varies
	0010	-1.6	0.2	0.4	015	A3	
Concord Brook Reach 1 Reach 2 Reach 3 Reach 4 Reach 5	0010	-3.9	-1.3	1.2	040	A8	Varies Varies Varies Varies Varies
	0010	-3.0	-1.1	0.6	030	A6	
	0010	-2.3	-0.8	0.7	025	A5	
	0005, 0010	2.8	-0.8	1.3	030	A6	
	0005, 0010	3.2	-1.3	1.6	035	A7	
Middlesex Canal Reach 1	0005	1.4	-0.5	0.9	015	A3	Varies Varies
	0010	0.3	-0.1	0.2	005	A1	

<sup>1</sup>Flood Insurance Rate Map Panel

<sup>2</sup>Weighted Average - See Map

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**TOWN OF BILLERICA, MA.**  
(MIDDLESEX CO.)

**FLOOD INSURANCE ZONE DATA**  
**CONCORD RIVER, SHAWSHEEN RIVER, JONES BROOK, CONCORD**  
**BROOK, MIDDLESEX CANAL AND LUBBER BROOK**

## 6.0 OTHER STUDIES

The communities adjoining Billerica are the City of Lowell and the Towns of Tewksbury, Wilmington, Burlington, Bedford, Carlisle and Chelmsford. The Flood Insurance Studies for each of these communities agree with this study at their respective corporate limits (References 20-26) except as noted herein.

There are some discrepancies between this study and the Lowell Flood Insurance Study with respect to floodflows and elevations on the Concord River, because the study contractor used more current information regarding dam construction in the upper reaches of the watershed and a different methodology in flood-discharge development (Reference 1). The Lowell study is presently being revised (Reference 21). The floodflows and elevations of the upper reaches of the Concord River in Lowell will be used in the updated version. This will result in agreement at the Billerica-Lowell corporate limits.

In the Carlisle Flood Insurance Study (Reference 25) Pages Brook was studied by detailed methods. This work included the establishment of a floodway. Pages Brook enters Billerica within the Concord River flood plain in the extreme southern portion of Billerica and, therefore, was not studied in the Billerica Flood Insurance Study. Thus, although no floodway is shown in this study for Pages Brook, the overall flooding data are in agreement with the Carlisle Flood Insurance Study.

In 1968, a Flood Plain Information report was published for the Concord and Shawshen Rivers in Bedford (Reference 6). Since that time, however, additional data have been made available for better flood frequency-discharge analysis.

Although the starting water surface elevations for the Shawshen River were taken from the Tewksbury Flood Insurance Study, the flows used in this study were developed using a longer period of record. Therefore, the flows of the river at the Billerica/Tewksbury corporate limits used in this study are not in agreement with those in the Tewksbury Flood Insurance Study.

In 1971, flood plain maps were prepared using the 2-foot contour maps prepared for the Town of Billerica (Reference 2). These maps delineate flood boundaries of the rivers and streams in the town as well as in other floodprone areas. The information on those maps is not compatible with the information in this Flood Insurance Study. The methodology used in preparing the maps was empirical and used ideal culvert sizes in computing backwater profiles; the methodology used in this Flood Insurance Study was analytical and used existing culvert sizes (Reference 1).

This study is authoritative for purposes of the National Flood Insurance Program, and the data presented here either supersede or are compatible with previous determinations.

## 7.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, Region I Office, John W. McCormack Post Office and Courthouse Building, Post Office Square, Boston, Massachusetts 02109.

## 8.0 BIBLIOGRAPHY AND REFERENCES

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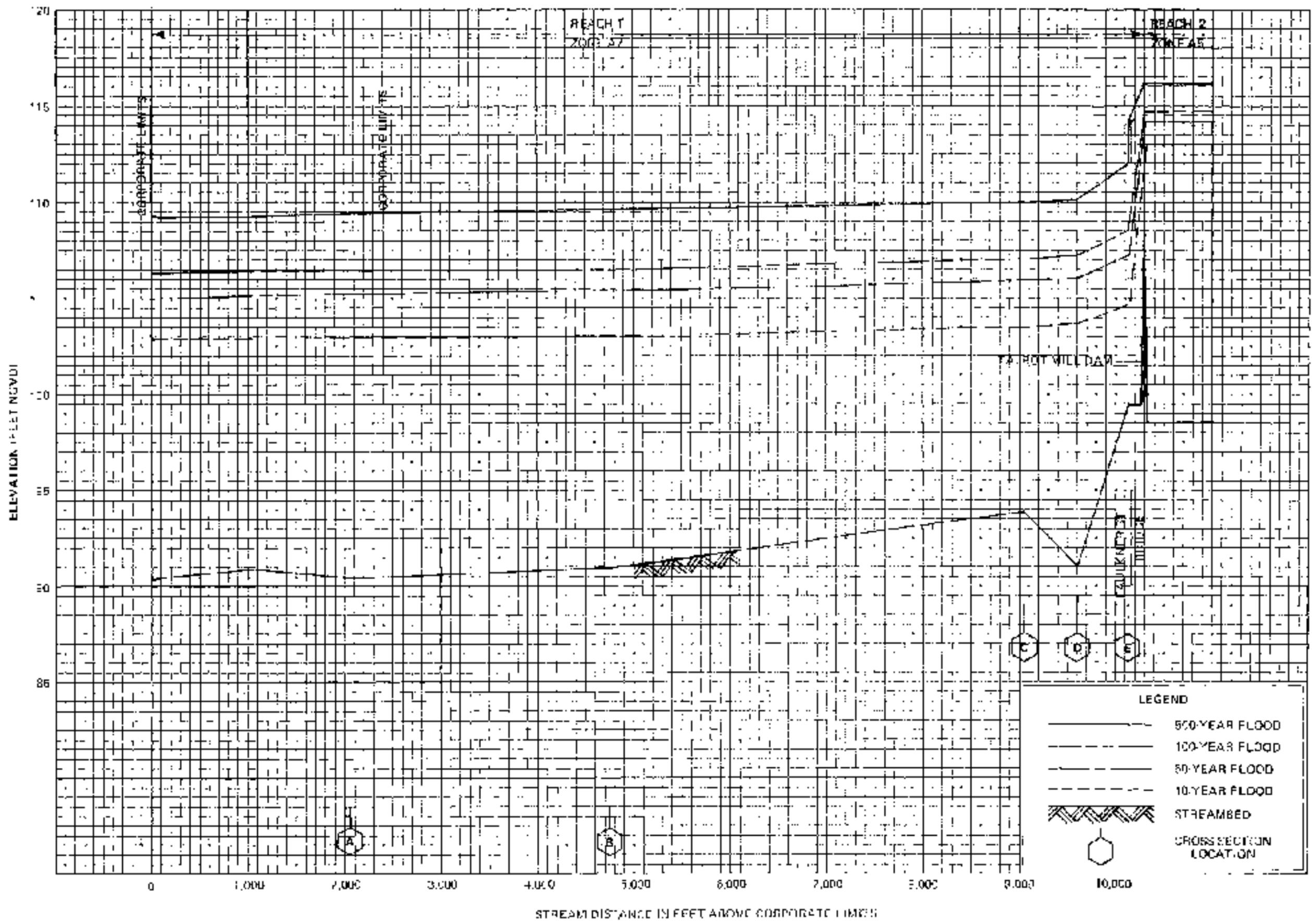
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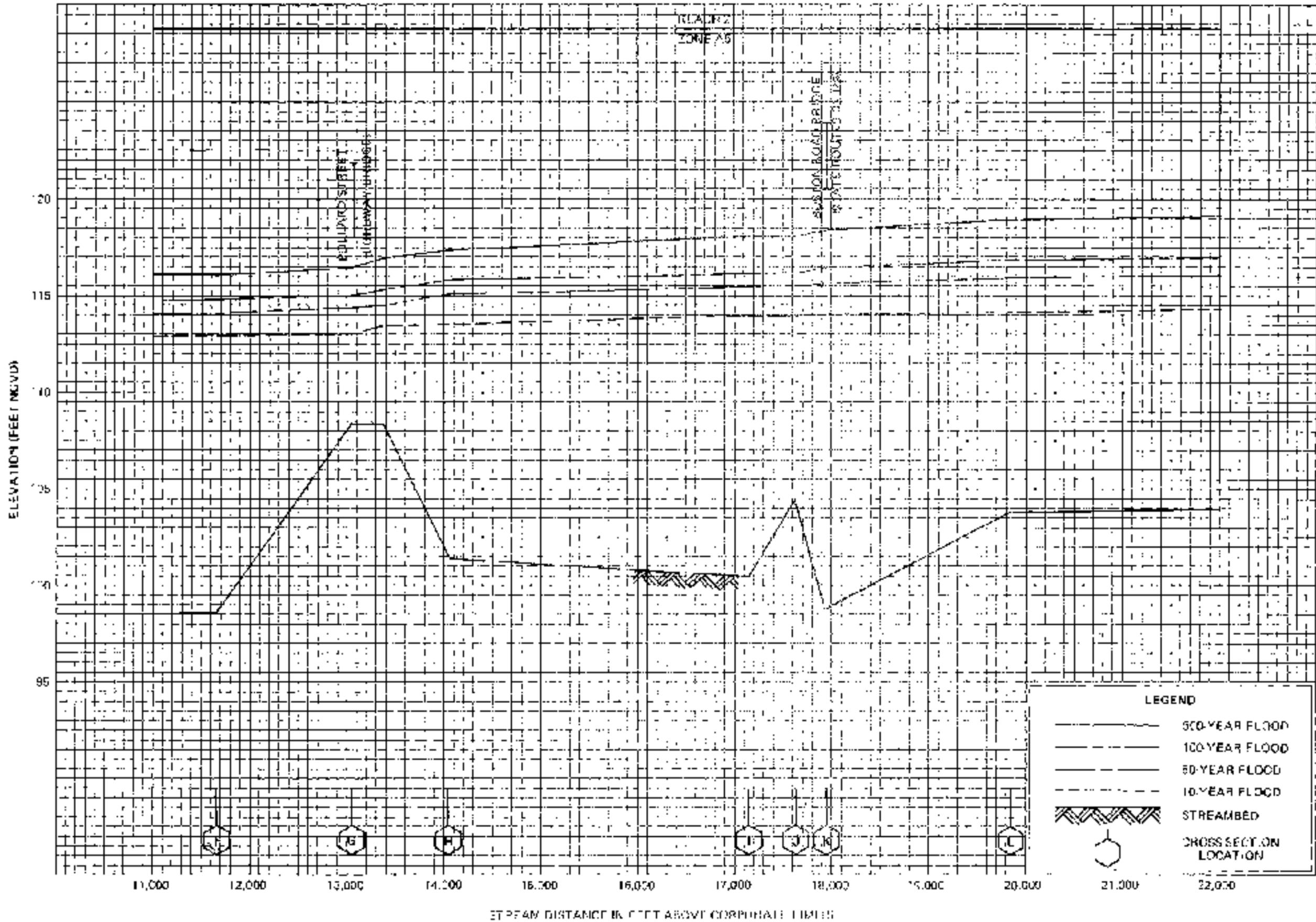
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**FLOOD PROFILES**  
**CONCORD RIVER**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**TOWN OF BILLERICA, MA**  
MIDDLESEX CO.,



**LEGEND**

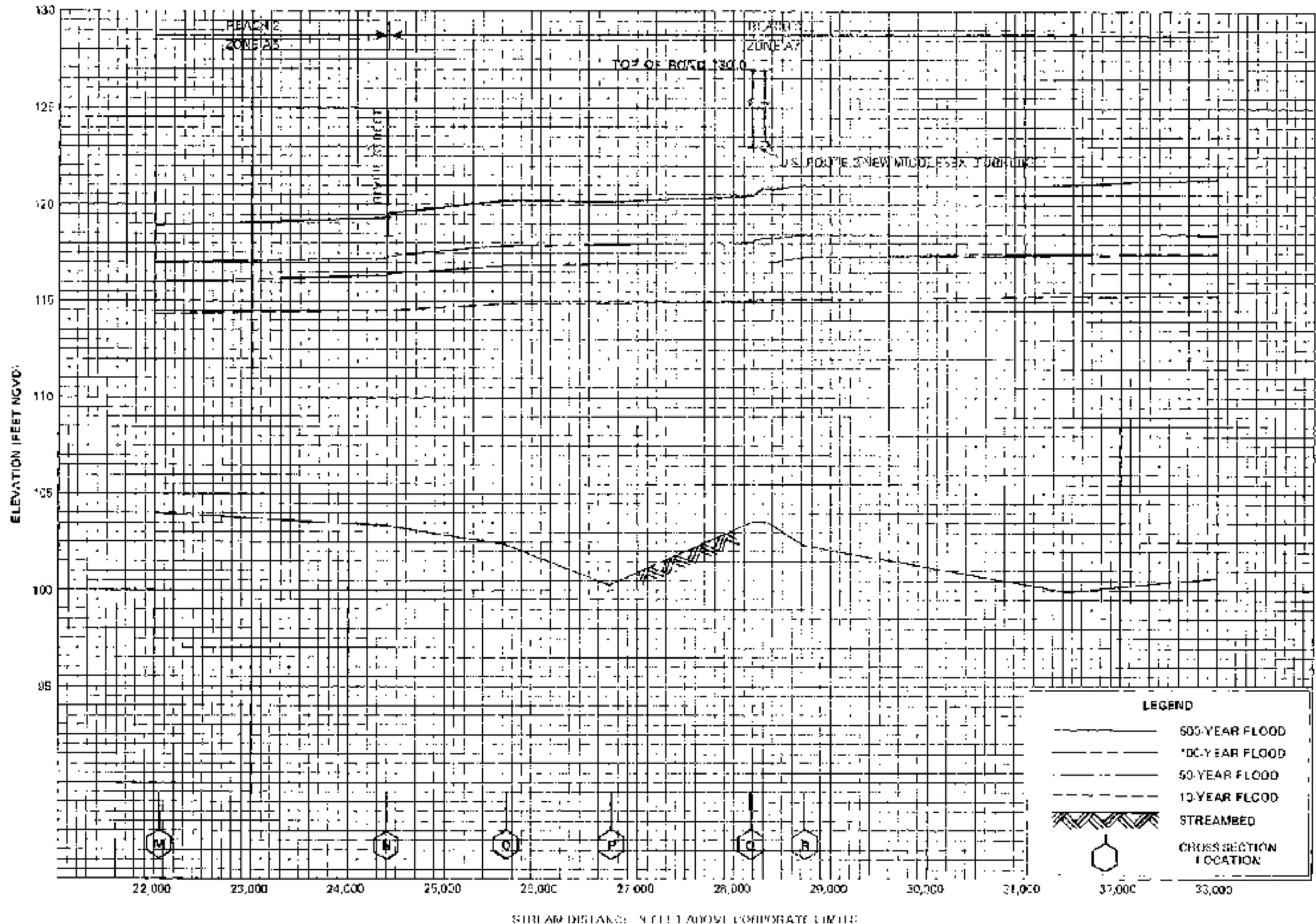
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	100-YEAR FLOOD
	50-YEAR FLOOD
	10-YEAR FLOOD
	STREAMBED
	CROSS SECTION LOCATION

**FLOOD PROFILES**

**CONCORD RIVER**

FEDERAL EMERGENCY MANAGEMENT AGENCY

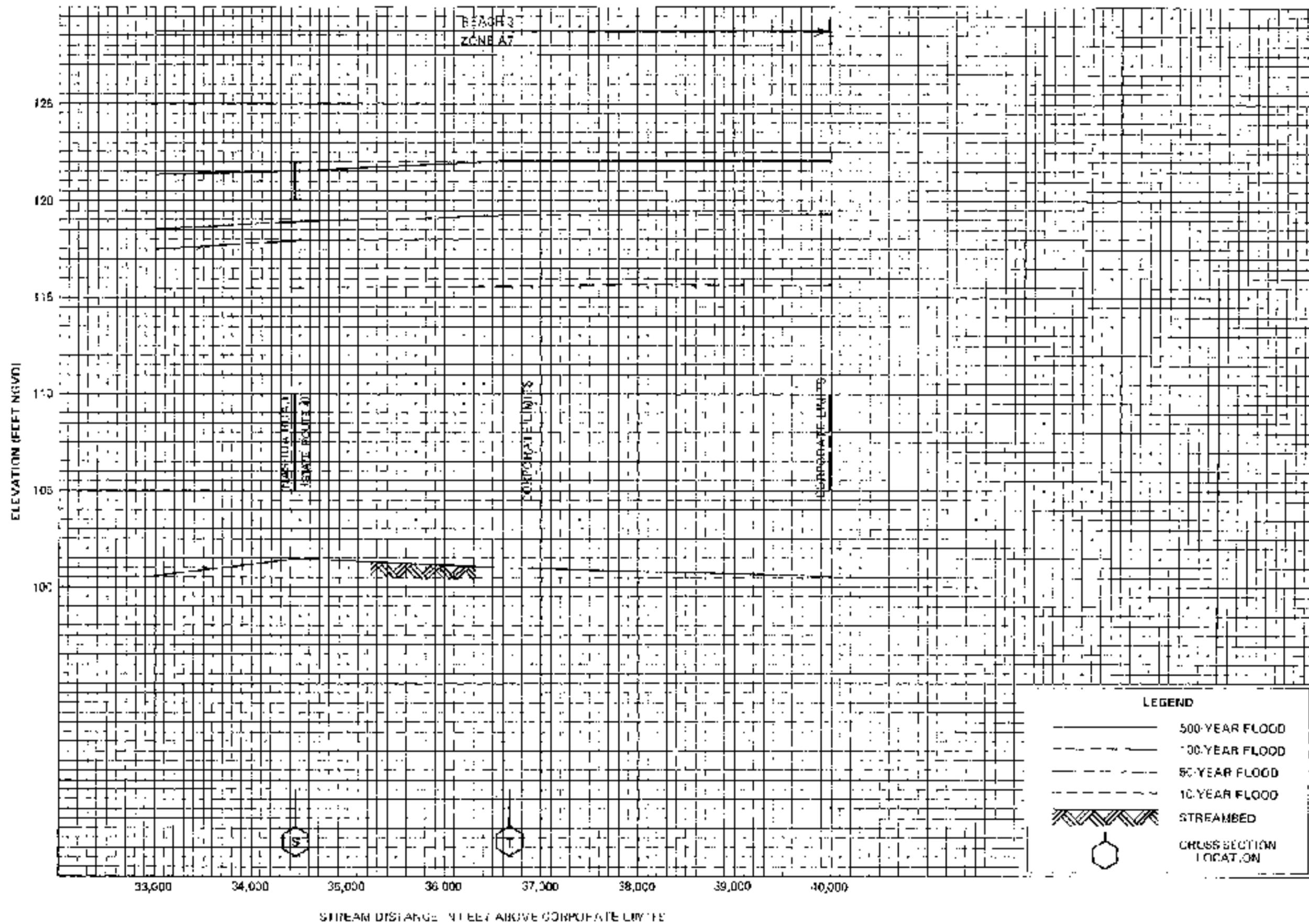
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 (MIDDLESEX CO.)



**FLOOD PROFILES**  
**CONCORD RIVER**

FEDERAL EMERGENCY MANAGEMENT AGENCY

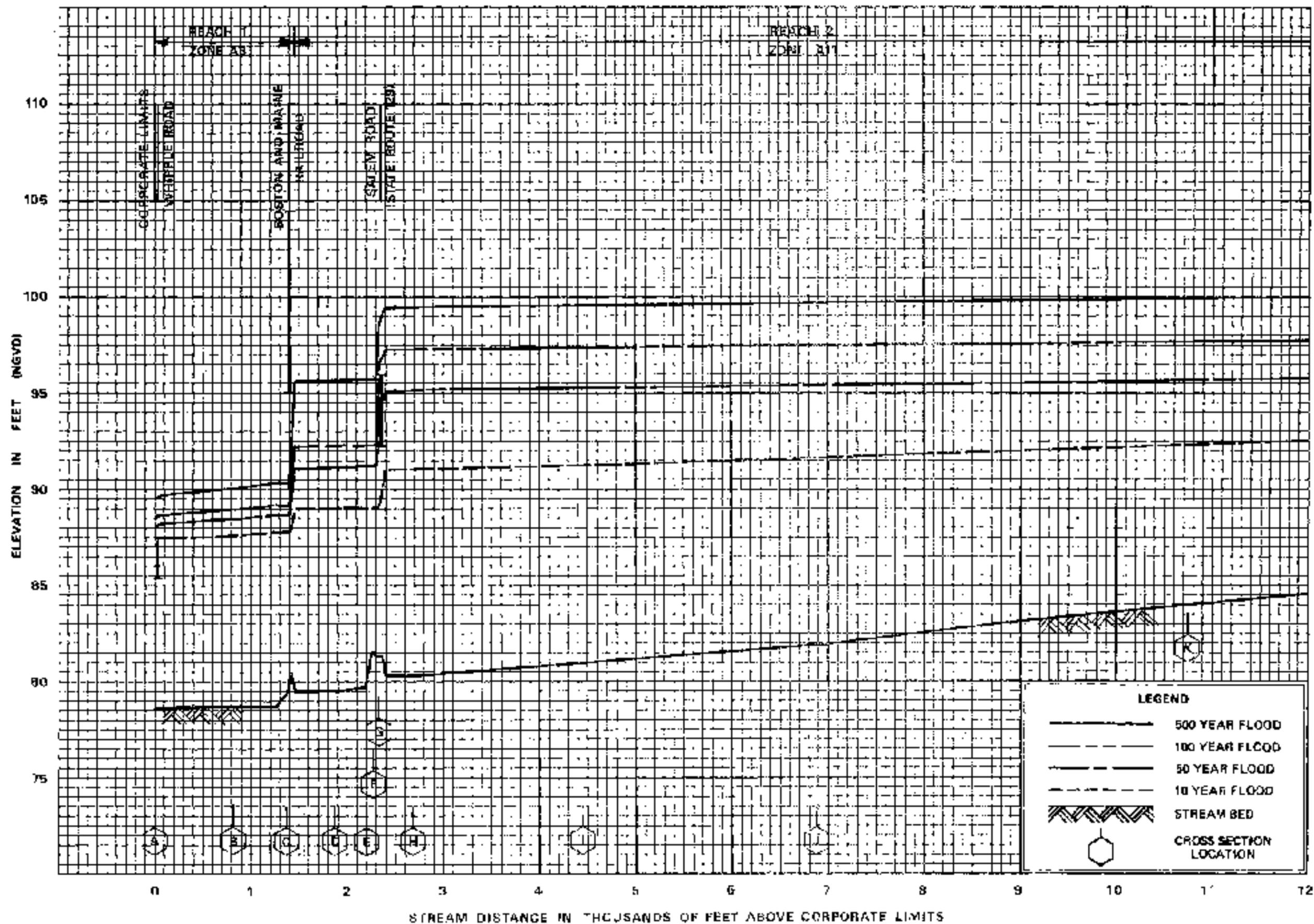
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(MIDDLESEX COUNTY)



FLOOD PROFILES  
CONCORD RIVER

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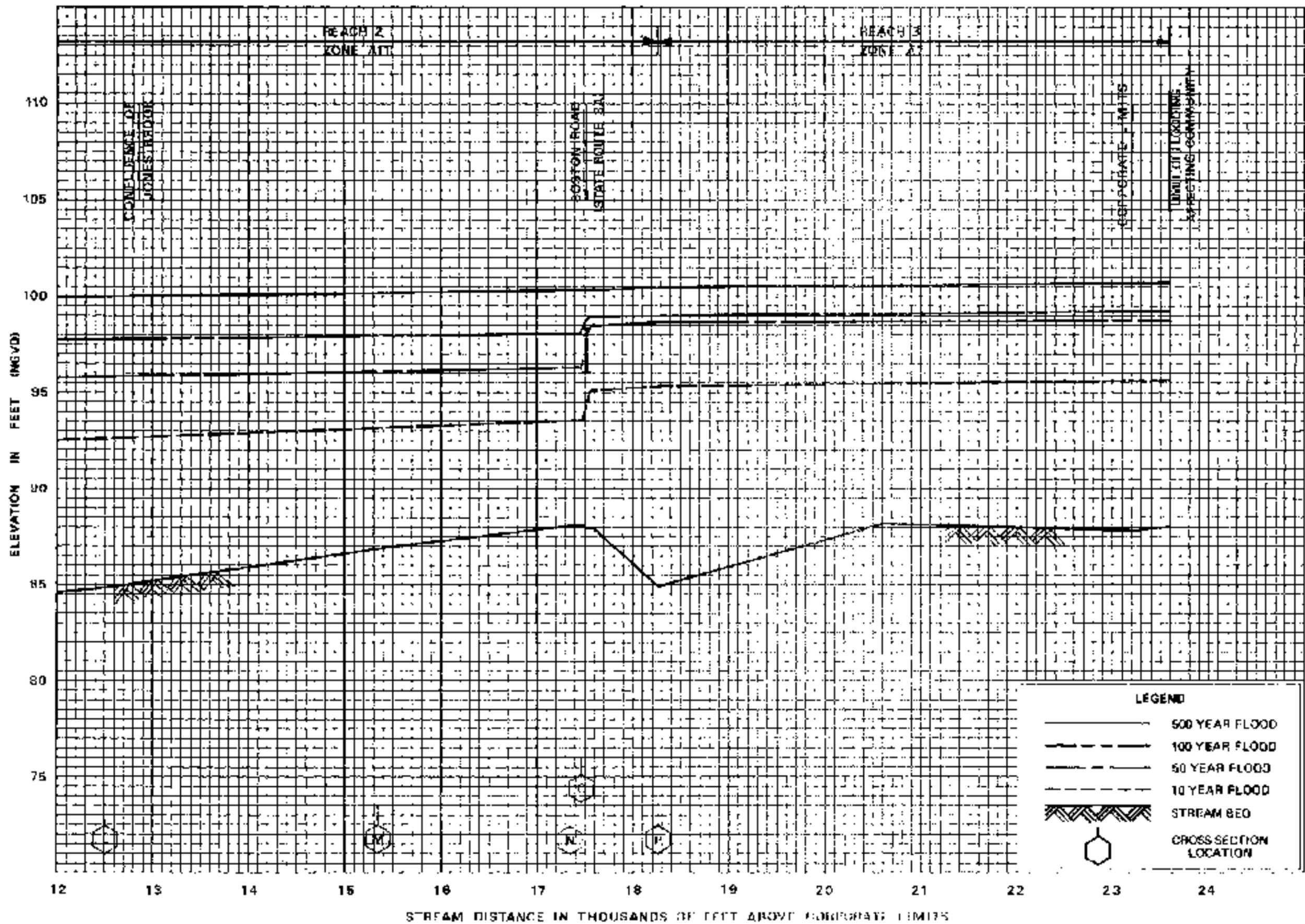
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(MIDDLESEX CO.)



**FLOOD PROFILES**  
**SNAWSHEEN RIVER**

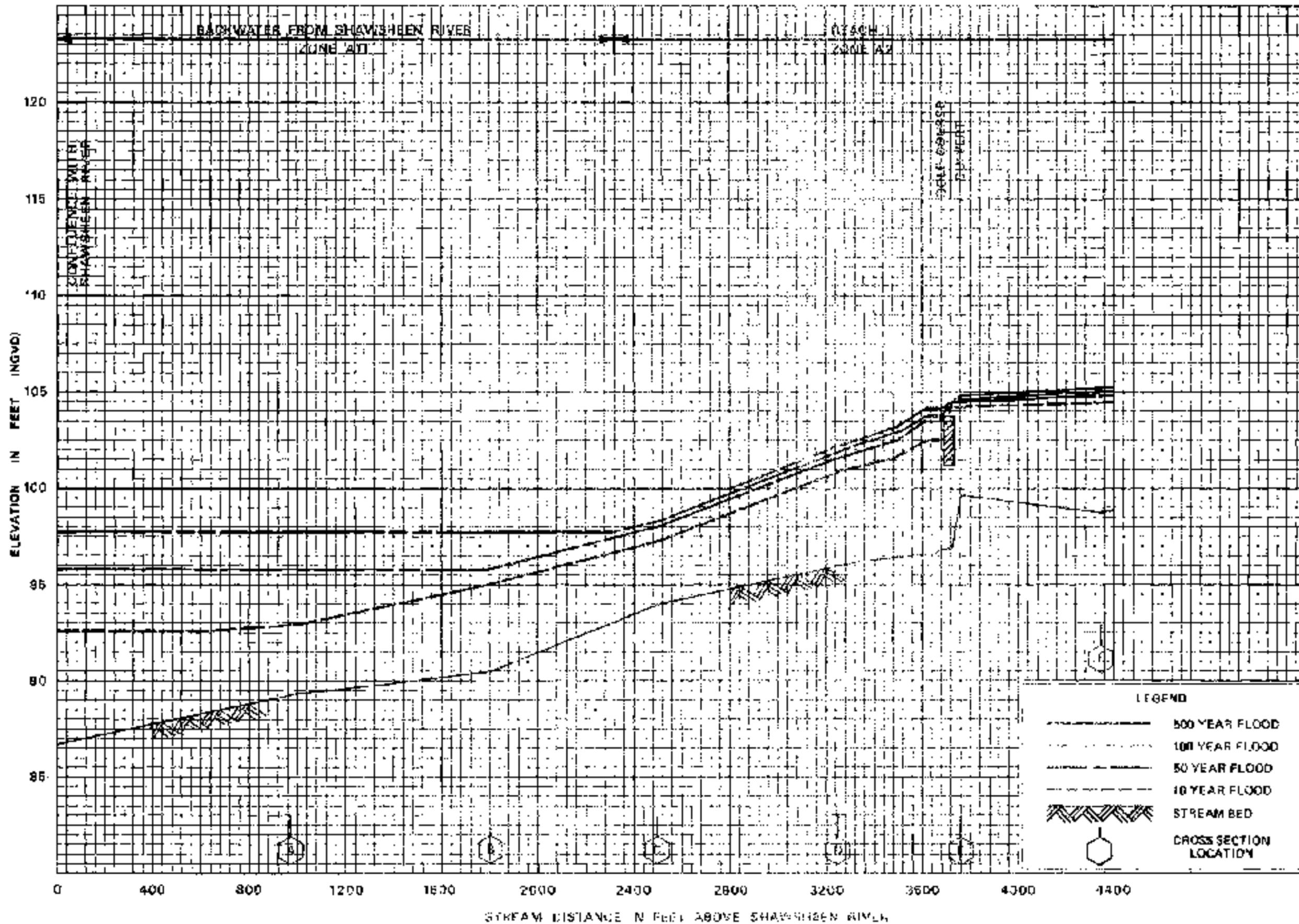
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**TOWN OF BILLERICA, MA**  
(MIDDLESEX CO.)



**FLOOD PROFILES**  
**SHAWSHEEN RIVER**

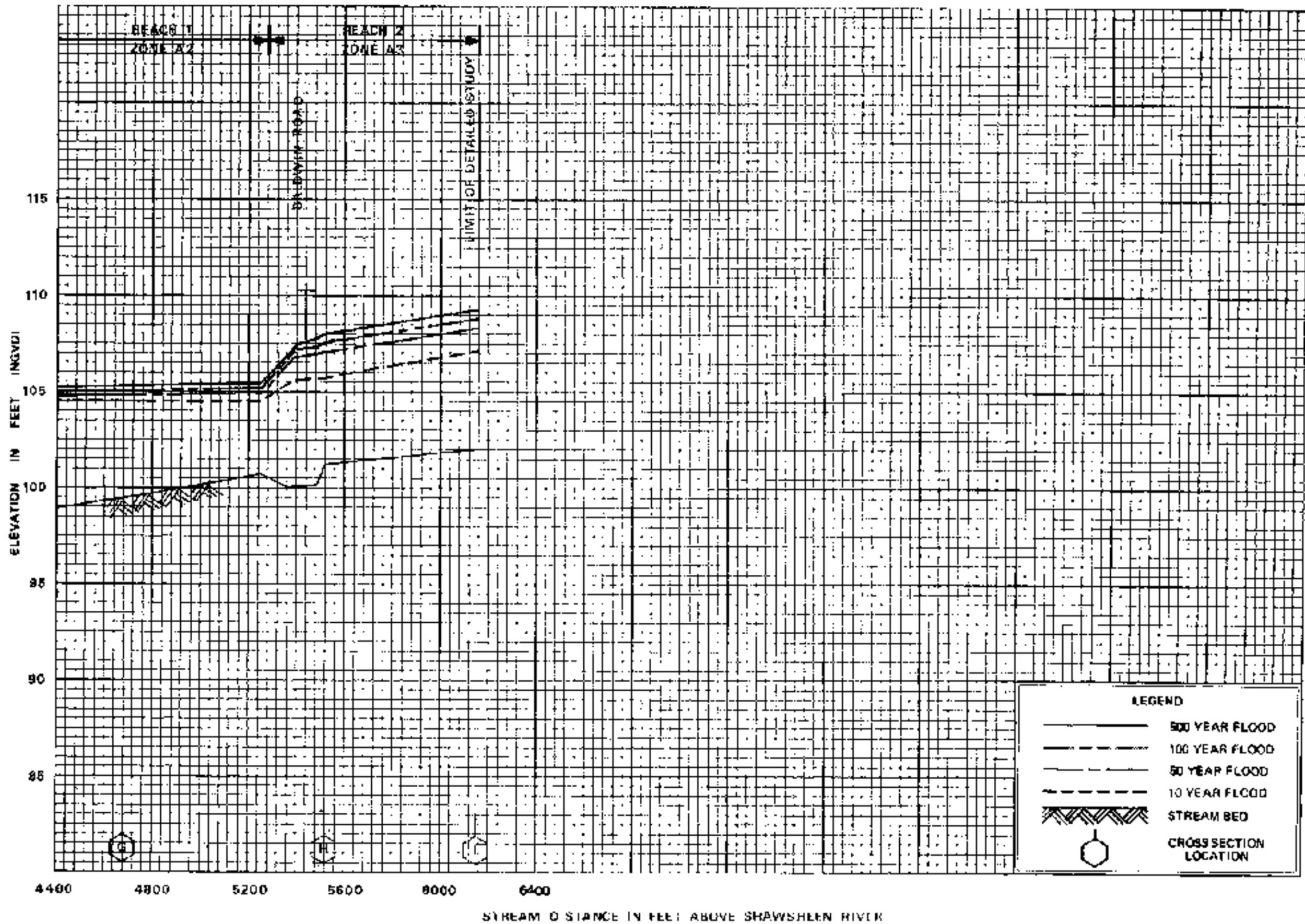
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**TOWN OF BILLERICA, MA**  
(MIDDLESEX CO.)



**FLOOD PROFILES**  
**JONES BROOK**

FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF BILLERICA, MA**  
 (MIDDLESEX CO.)



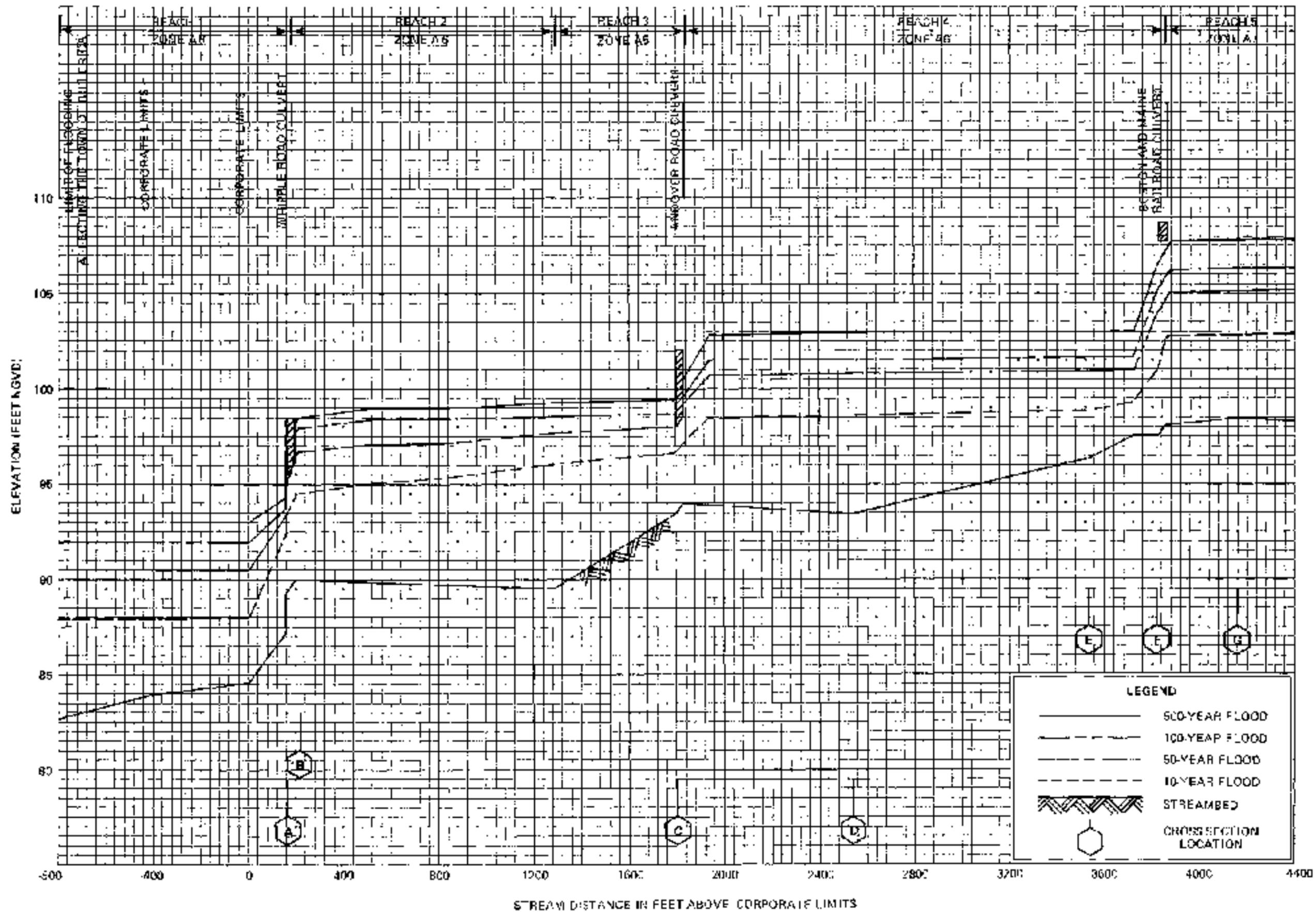
LEGEND	
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	100 YEAR FLOOD
	50 YEAR FLOOD
	10 YEAR FLOOD
	STREAM BED
	CROSS SECTION LOCATION

**FLOOD PROFILES**

**JONES BROOK**

FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF BILLERICA, MA**  
(MIDDLESEX CO.)

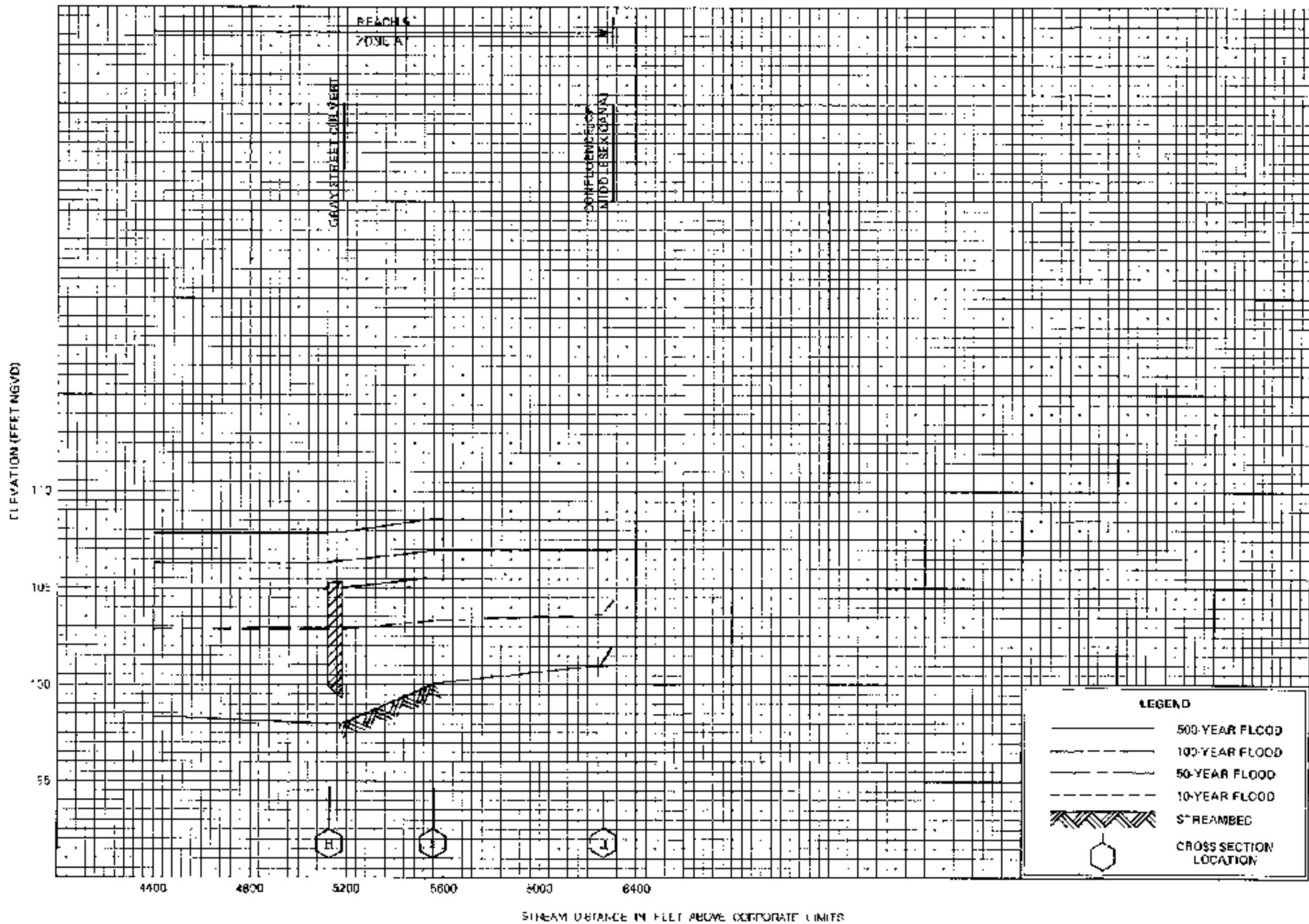


LEGEND	
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	50-YEAR FLOOD
	10-YEAR FLOOD
	STREAMBED
	CROSS SECTION LOCATION

**FLOOD PROFILES**  
**CONTENT BROOK**

FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF BILLERICA, MA**  
MIDDLESEX CO.

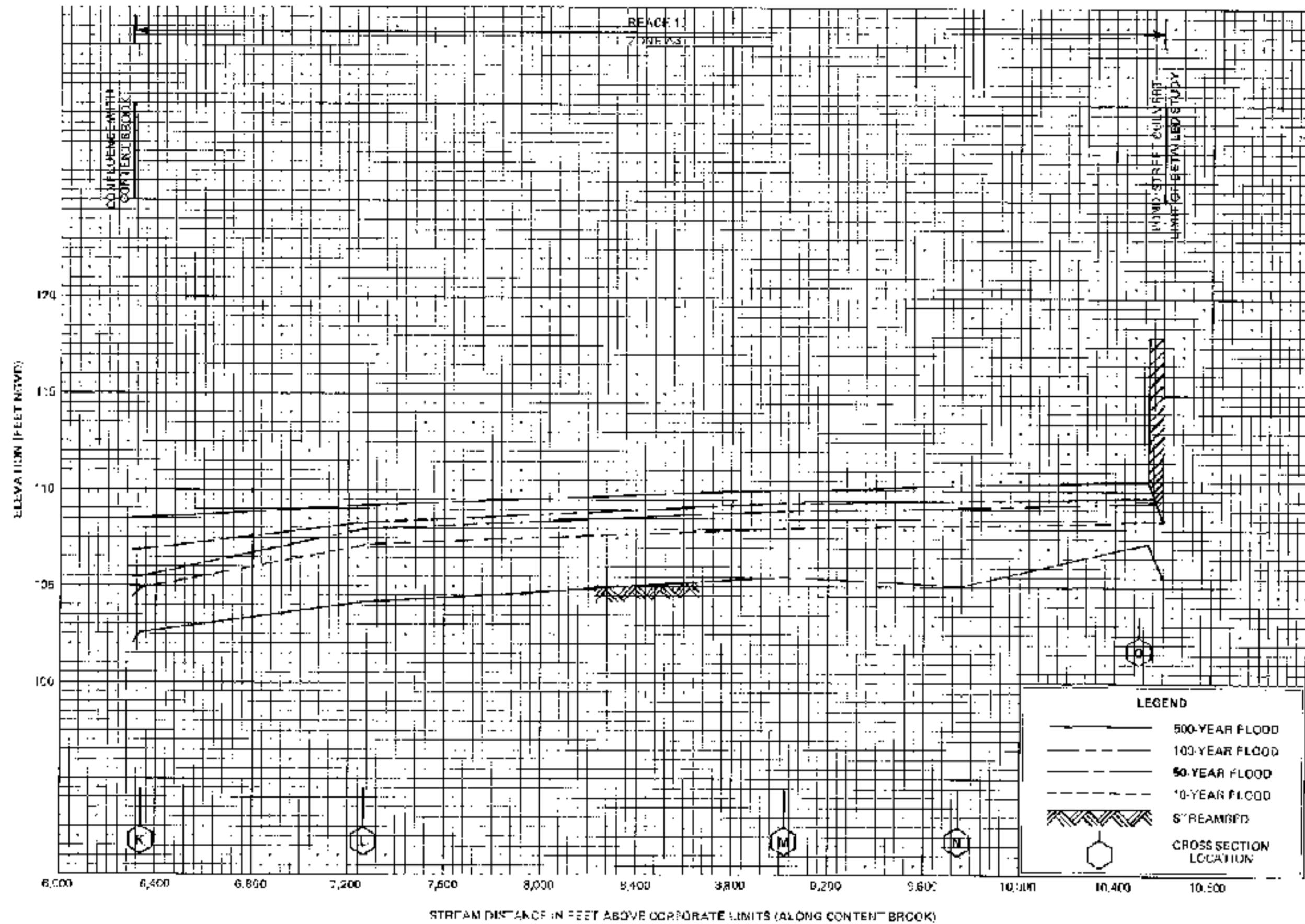


FEDERAL EMERGENCY MANAGEMENT AGENCY

FLOOD PROFILES

CONTENT BROOK

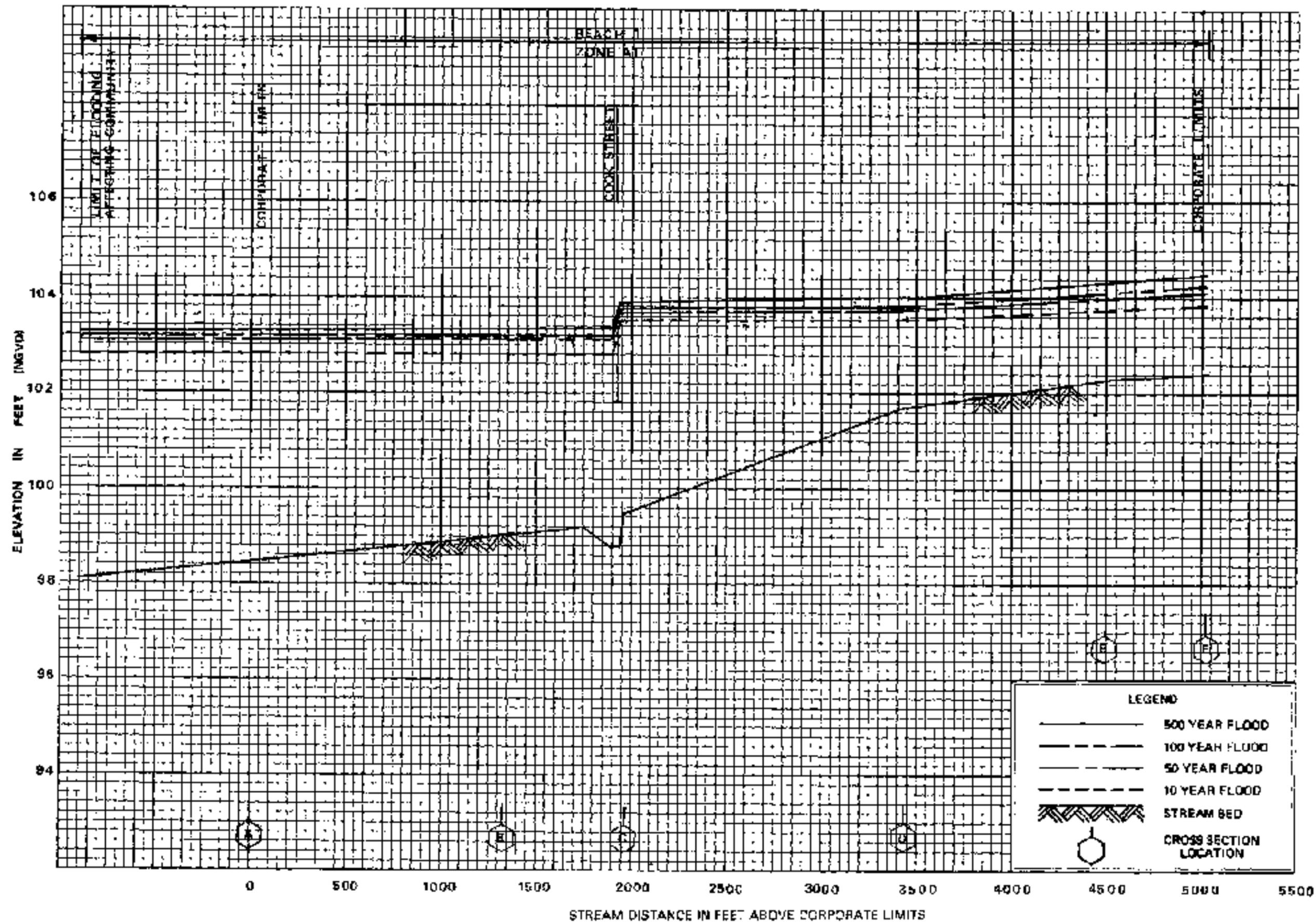
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(MIDDLESEX CO.)



**FLOOD PROFILES**  
**MIDDLESEX CANAL**

FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF BILLERICA, MA**  
(MIDDLESEX CO.)



**FLOOD PROFILES**  
**LUBBER BROOK**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**TOWN OF BILLERICA, MA**  
(MIDDLESEX CO.)

## **Appendix F**

Project TRUST MILL DAM - NORTH BILBOUCA  
 Project No. 2092445 Sheet No. 1 of 1  
 Calculated By (Signature) Date 5-4-2009  
 Checked By \_\_\_\_\_ Date \_\_\_\_\_  
 Subject \_\_\_\_\_ Scale \_\_\_\_\_

Geotechnical Consultants, Inc.  
 201 Boston Post Road West  
 Marlborough, MA 01752  
 (508) 449-0900 FAX (508) 233-2325

SPILLWAY CAPACITY CHECK.

- REFERENCES: 1. USACE EM-110-2-1603  
HYDRAULIC DESIGN OF SPILLWAYS  
 2. FEMA - FLOOD INSURANCE STUDY 1985  
TOWN OF BILBOUCA, MA.

PERTINENT DATA

DESIGN FLOOD - 100YR EVENT  
 REQUIRED DISCHARGE - 5675 CFS (per FEMA Study)  
 SPILLWAY TYPE - BOARD BENT  
 SPILLWAY LENGTH - 127' (NOT INCL ROY @ ABUTMENTS)  
 SPILLWAY CREST - EL 109.7 FT  
 CHANNEL UPSTREAM - EL 98.5 FT  
 100YR FLOOD LEVEL - EL 114.7 FT (per FEMA Study)

DESIGN HEAD: 114.7 - 109.7 = H<sub>d</sub> = 5.0 FT

APPROACH CHANNEL X-SECT:

$(114.7 - 98.5) \times 127 = 2057 \text{ sq ft}$

APPROACH CHANNEL VELOCITY

$V_{0.5} = \frac{5675 \text{ CFS}}{2057 \text{ sq ft}} = 2.75 \text{ ft/sec}$

$\frac{V_{0.5}^2}{2g} = \frac{(2.75 \frac{\text{ft}}{\text{sec}})^2}{(2)(32.2 \frac{\text{ft}}{\text{sec}^2})} = 0.12 \text{ FT SMALL!}$

TOTAL ENERGY HEAD:  $H_e = 5.0 + 0.12 = \underline{\underline{5.12 \text{ FT}}}$

Project TALBOT MILLS DAM - NORTH BILLOREDA  
Project No. 2092945 Sheet No. 2 OF 2  
Calculated By (Signature) Date 5-4-2009  
Checked By \_\_\_\_\_ Date \_\_\_\_\_  
Subject \_\_\_\_\_ Scale \_\_\_\_\_

Geotechnical Consultants, Inc.  
201 Boston Post Road West  
Marlborough, MA 01752  
(508) 229-1000 FAX (508) 229-2279

SPILLWAY CAPACITY CHECK (CONT.)

COMPUTE:  $\frac{H_u}{H_d} = \frac{5.12 \text{ ft}}{5.05 \text{ ft}} = 1.02$  OK

COMPUTE:  $\frac{y_1}{H_u} = \frac{10.7 \text{ ft} - 10.5 \text{ ft}}{5.0 \text{ ft}} = 0.04$  OK

DETERMINE DISCHARGE COEFFICIENT

REFER TO PLATE 3-4  $C = 4.1$

COMPUTE SPILLWAY DISCHARGE CAPACITY

SPILLWAY LENGTH = 127'

$$Q_s = C L H_u^{1.5} = (4.1)(127 \text{ ft})(5.12 \text{ ft})^{1.5} = \underline{\underline{6,632 \text{ cfs}}}$$

ESTIMATE CAPACITY AT SPILLWAY ABUTMENTS

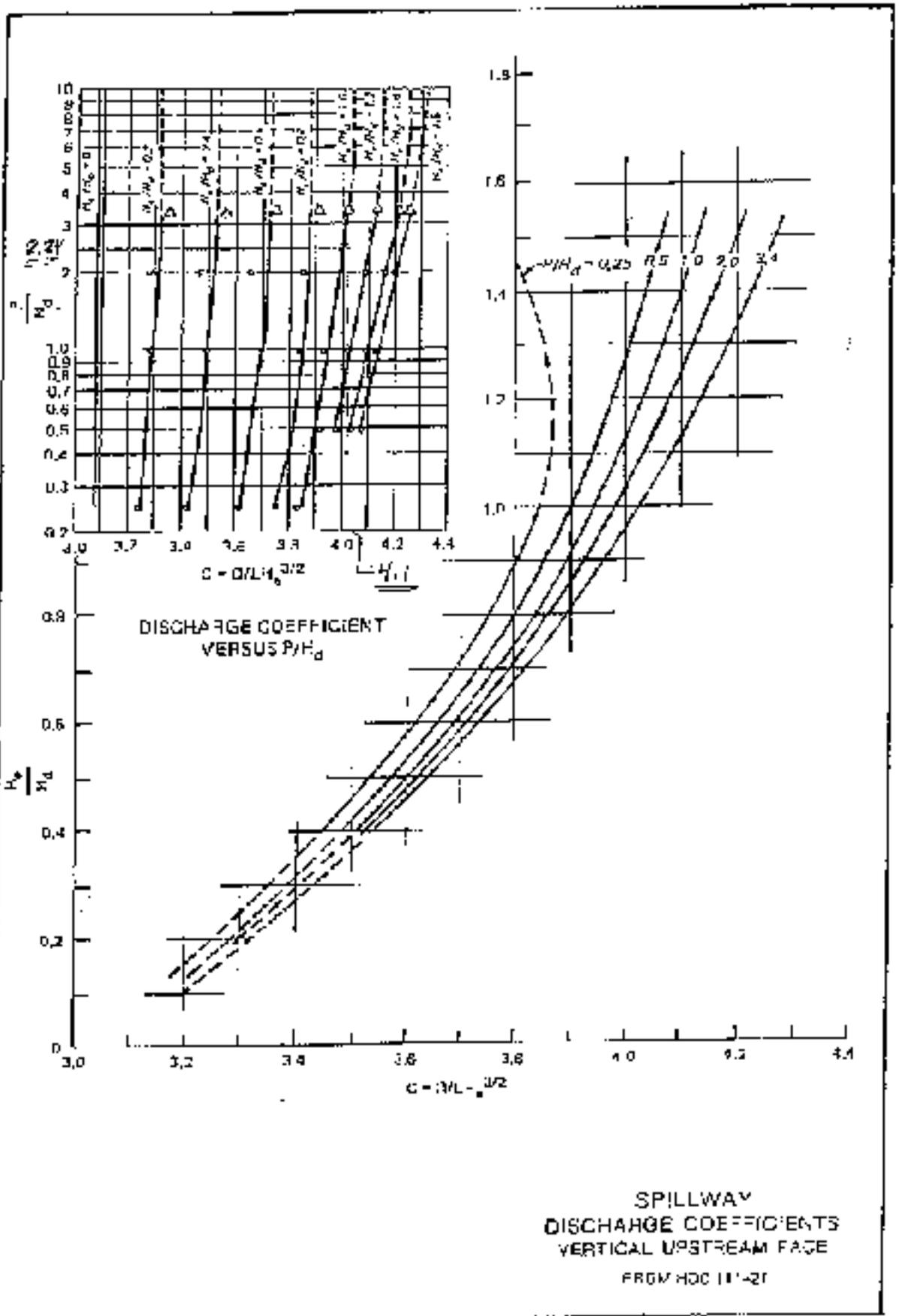
LENGTH: LEFT = 14' RIGHT = 13' TOT L = 27'

$$H_{ca} = 11.7 - 11.5 \text{ ft} = 0.2 \text{ ft}$$

$$Q_a = (4.0)(27 \text{ ft})(0.2 \text{ ft})^{1.5} = \underline{\underline{6.20 \text{ cfs}}}$$

$$Q_{TOTAL} = 6,650 \text{ cfs} > 5675 \text{ cfs}$$

OK



## **APPENDIX G**



**Talbot Mills Dam**

67 Faulkner Street  
Billerica, MA 01862

Inquiry Number: 2465969.1  
April 13, 2009

## The EDR Aerial Photo Decade Package

# EDR Aerial Photo Decade Package

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDRs professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

**When delivered electronically by EDR, the aerial photo images included with this report are for ONE TIME USE ONLY. Further reproduction of these aerial photo images is prohibited without permission from EDR. For more information contact your EDR Account Executive.**

***Thank you for your business.***  
Please contact EDR at 1-800-352-0050  
with any questions or comments.

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**Date EDR Searched Historical Sources:**

Aerial Photography April 13, 2009

**Target Property:**

67 Faulkner Street

Billerica, MA 01862

<u>Year</u>	<u>Scale</u>	<u>Details</u>	<u>Source</u>
1938	Aerial Photograph. Scale: 1"=750'	Panel #: 2442071-E3/Flight Date: November 10, 1938	EDR
1952	Aerial Photograph. Scale: 1"=500'	Panel #: 2442071-E3/Flight Date: July 07, 1952	EDR
1963	Aerial Photograph. Scale: 1"=750'	Panel #: 2442071-E3/Flight Date: April 27, 1963	EDR
1978	Aerial Photograph. Scale: 1"=750'	Panel #: 2442071-E3/Flight Date: May 12, 1978	EDR
1980	Aerial Photograph. Scale: 1"=750'	Panel #: 2442071-E3/Flight Date: October 10, 1980	EDR
1986	Aerial Photograph. Scale: 1"=1000'	Panel #: 2442071-E3/Flight Date: March 30, 1986	EDR
1995	Aerial Photograph. Scale: 1"=750'	Panel #: 2442071-E3/Flight Date: March 29, 1995	EDR
2006	Aerial Photograph. Scale: 1"=502'	Flight Year: 2006	EDR



**INQUIRY #:** 2465969.1

**YEAR:** 1938

| = 750'





**INQUIRY #:** 2465969.1

**YEAR:** 1952

| = 500'



21



INQUIRY #: 2465969.1

YEAR: 1963

| = 750'





**INQUIRY #:** 2465969.1

**YEAR:** 1978

| = 750'





**INQUIRY #:** 2465969.1

**YEAR:** 1980

| = 750'





**INQUIRY #:** 2465969.1

**YEAR:** 1986

| = 1000'





**INQUIRY #:** 2465969.1

**YEAR:** 1995

| = 750'





**INQUIRY #:** 2465969.1

**YEAR:** 2006

| = 502'





June 2, 2009

Department of Conservation and Recreation  
251 Causeway Street, Suite 600  
Boston, MA 02114-2119

**Attention:** Mr. Richard K. Sullivan, Jr., Commissioner

**RE: Application to Change Hazard Classification  
Talbot Mills Dam - North Billerica, Massachusetts  
National Inventory of Dam ID #: MA 00774  
GCI Project No. 2092945**

Dear Mr. Sullivan:

On behalf of the dam Owner, CRT Development Realty, LLC, and in accordance with 302 CMR 10.06 (6), please find attached an *APPLICATION TO CHANGE HAZARD CLASSIFICATION OF DAM* for the Talbot Mills Dam (NID ID #: MA 00774) located in North Billerica, Massachusetts.

**Background**

In 1999, an dam evaluation study was completed for Talbot Mills Dam for the Commonwealth of Massachusetts, Department of Environmental Management, Office of Dam Safety (DEM). Based on the information contained in that report, the Talbot Mills Dam is currently classified as an Intermediate sized, High (Class III) Hazard potential structure. In 2002, the laws governing dams in Massachusetts were amended and the basis for determining the size and hazard potential were clarified.

The hazard classification was based solely on subjective information regarding potential damage to downstream structures. However, the information contained in the 1999 report and used to make this determination is inconsistent and inaccurate. No dam breach analysis or flood study was completed in support of the hazard classification. The sole criteria regarding hazard classification, as stated in Section 1.2.7 entitled *DEM Hazard Classification* of the 1999 report, follows:

*“The possibility for loss of a few lives and appreciable economic damage that would occur to the Faulkner Street Bridge, Talbot Mill buildings, and possibly the wastewater treatment facility as a result of dam failure places the dam in the HIGH hazard category as defined in 302 CMR 10.06.”*

Recently, Geotechnical Consultants, Inc., on behalf of the dam owner, completed a Phase I inspection of the Talbot Mills Dam. The inspection was conducted on various dates between 26 January 2009 and 22 May 2009 and a copy of the report was sent to the Office of Dam Safety. As part of this study, a topographic survey was completed to provide a basis for some of the pertinent engineering data used to evaluate this dam.

In general, the Talbot Mills Dam was found to be in fair condition primarily due to the lack of any operation or maintenance plan. Structurally, we found no indications of instability or seepage which comprise the integrity of the dam and appurtenant structures. The spillway appears to be adequately sized for the Spillway Design Flood (SDF); a 100-year storm event presuming the dam is re-classified as a Significant Hazard structure.

### **Hazard Potential Classification**

Hazard Potential Classifications are defined in section 10.06 of 302 CMR 10.00 as follows:

High Hazard (Class I):	Dams located where failure will likely cause loss of life and serious damage to home(s), industrial or commercial facilities, important public utilities, main highway(s) or railroad(s).
Significant Hazard (Class II)	Dams located where failure may cause loss of life and damage home(s), industrial or commercial facilities, secondary highway(s) or railroad(s) or cause interruption of use or service of relatively important facilities.
Low Hazard (Class III):	Dams located where failure may cause minimal property damage to others. Loss of life is not expected.

Further, section 10.06 (c) provides additional guidance regarding hazard potential.

*Potential damage to habitable structures will be considered minor when habitable structures are not within the direct path of the probable flood wave produced upon failure of a dam or where such structures will experience:*

- 1. no more than 2.0 feet incremental rise of flood water above the lowest ground elevation adjacent to the outside foundation walls; or*
- 2. no more than 2.0 feet incremental rise of flood water above the lowest habitable floor elevation of the structure; the lower of the two elevations governing.*



### **Dam Break Analysis and Evaluation for Potential Damage**

As part of the recently completed evaluation by Geotechnical Consultants, Inc., a dam break analysis was performed to determine the incremental increase in flooding downstream of the dam and evaluate the severity of any potential damage. The dam break analysis was performed using the U.S. Army Corps of Engineers' *River Analysis System* (HEC-RAS) Version 4.0 March 2008. A copy of selected output from the simulation is attached for reference.

Information regarding the existing topography and conditions in the immediate vicinity of the dam was obtained from the survey made by Eaglebrook Engineering Associates, LLC in April 2009. A copy of the *Site Plan*, drawing EX-1 dated April 20, 2009 is attached as Figure 2. in the Phase I Inspection Report.

Information regarding the hydrology of the river was obtained from Federal Emergency Management Agency (FEMA), *Flood Insurance Study*, Town of Billerica, Massachusetts, Middlesex County; dated February 8, 1985. Topography and locations of structures downstream of the dam and mill complexes were determined based on information obtained from the Massachusetts Geographic Information System.

Also attached for your review is a portion of a Federal Insurance Rate Map (FIRMETTE M2501830005C). As shown on the map, the area downstream of the dam and north of the Talbot and Faulkner Mills complexes is a wide flood plain designated as a Zone A7. Our review of recent aerial photographs and a canvass of the neighborhood indicates there are no buildings or other structures, with the exception of the Faulkner Street Bridge, within the direct path of the probable flood wave produced upon failure of the dam. The downstream area and flood plain are shown on the Aerial Photo Map attached as Figure 1.

The Faulkner Street Bridge is immediately downstream of the Talbot Mills Dam. Faulkner Street (or Old Elm Street) is a secondary road in North Billerica, Massachusetts and carries limited traffic. The bridge is constructed as a double concrete arch structure founded directly on bedrock. No significant indications of scour at the bridge pier or abutments were observed during our inspections. As a result, the potential risk of damage which may be sustained by the bridge due to a failure of the dam is low.

Both the Talbot Mills and Faulkner Mills complexes are located downstream of the dam on the left and right embankments of the river, respectively. Based on our assessment, the potential risk of loss of life is considered low and consistent with a Significant Hazard classification.

The dam break analysis prepared using HEC-RAS postulates a dam breach in the masonry



**Application to Change Hazard Classification**  
**Talbot Mills Dam - North Billerica, Massachusetts**  
**National Inventory of Dam ID #: MA 00774**  
**GCI Project No. 2092945**  
**June 2, 2009**  
**Page 4**

spillway as the most likely mode of failure. The resulting unsteady flow analysis shows only a small increase in flood height in the areas downstream of the dam due to a dam breach. Based on the simulation, the incremental increase in flood elevation is approximately 0.2 feet; considerably less than the 2.0 foot incremental rise of flood water offered as guidance regarding hazard potential presented in section 10.06 of 302 CMR 10.00. The FEMA study describes the overall drainage basin as “sluggish” and, given the extent of the flood plain downstream of the dam, the small computed incremental increase in flood elevation is consistent with the FEMA characterization.

The Billerica Treatment Plant is located at 70 Letchworth Avenue in North Billerica, Massachusetts and is shown on the attached Figure 1. According to the FIRM map, the plant is located in a Zone C; an area outside the 100-year and 500-year flood plains. As a result, the risk of damage to the treatment plant due to a dam breach is considered extremely low.

**Dam Hazard Re-Classification**

Based on our evaluation and in accordance with Department of Conservation and Recreation classification procedures, under Commonwealth of Massachusetts dam safety rules and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, it is our opinion the Talbot Mills Dam should be classified as a Significant Hazard (Class II) structure.

On behalf of our client, CRT Development Realty, LLC, we request the attached application to change hazard classification be favorably reviewed. Should you have any questions, or require additional information, please do not hesitate to contact this office.

Sincerely,  
**GEOTECHNICAL CONSULTANTS, INC.**

Richard Pizzi, P.E.

RP/prr

cc: Mr. Robert Martin (with enclosures)  
Mr. William Martin (with enclosures)  
Mr. John Davagian (with enclosures)





# APPLICATION TO CHANGE HAZARD CLASSIFICATION OF DAM

In accordance with 302 CMR 10.06 (6) Hazard Reconsideration. An owner may at any time request the Commissioner to reconsider the hazard determination. The owner's request must be filed by a registered professional civil engineer, specifying the findings and analyses with which the owner disagrees. The Commissioner will issue a written decision to the owner and the registered professional civil engineer within 30 days of receipt of a request for hazard reconsideration, and such decision shall be final and binding upon the parties.

(This form and supporting information must be attached to a letter from the dam owner's registered professional civil engineer on the engineering firm's letterhead.)

**Dam Name:** TALBOT MILLS DAM **Date:** 2 June 2009

**National Inventory of Dams ID Number:** MA 00774

**Dam Location (City or Town):** Billerica, Massachusetts

**Owner(s) Name and Address:** CRT Development Realty, LLC  
6 Nicholas Circle  
Andover, MA 01810-4278

### Fill in Part A or Part B

#### PART A: Application to Raise Hazard Classification (e.g., from Significant to High)

**Current Hazard Classification:** \_\_\_\_\_  
(as listed in DCR Office of Dam Safety Database)

**Proposed Hazard Classification:** \_\_\_\_\_

**Reason for Change:**  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Attach any applicable supporting information.

**PART B: Application to Reduce Hazard Classification (e.g., from High to Significant, High to Low or Significant to Low.)**

**Current Hazard Classification:** High Hazard  
(as listed in DCR Office of Dam Safety Database)

**Proposed Hazard Classification:** Significant Hazard

**Applicant must submit engineering studies to justify the change in Hazard Class. Indicate the studies that accompany this application:**

- Hydrologic / Hydraulic Analyses
- Dam Breach / Inundation Analyses
- Incremental Damage Assessment
- Other \_\_\_\_\_

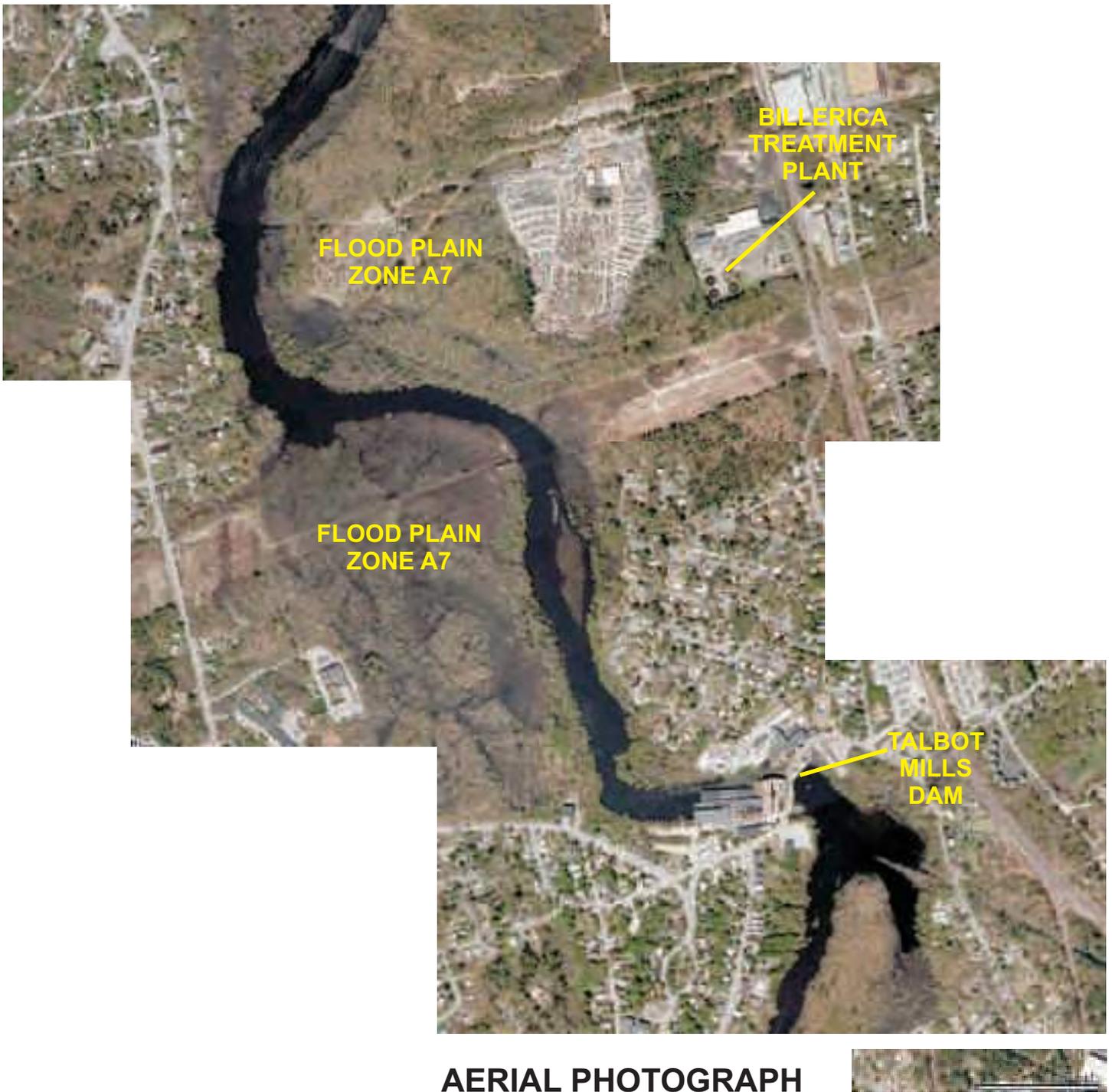
**Reason for**

**Change:** The previous dam inspection report was completed in 1999 and contained inaccurate and incomplete information.

The hazard classification was based solely on subjective information regarding potential damage to downstream structures. No dam breach analysis was completed. Since the issuance of this report and classification, the governing regulations have been amended to clarify the nature of the hazards and assist in determining an appropriate hazard classification.

\_\_\_\_\_





**AERIAL PHOTOGRAPH  
TALBOT MILLS DAM  
NORTH BILLERICA, MA  
NID ID# Ma00774**

TALBOTMILLSDAM.rep

HEC-RAS Version 4.0.0 March 2008  
U.S. Army Corps of Engineers  
Hydrologic Engineering Center  
609 Second Street  
Davis, California

```

X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X  X      X
X      X  X          X          X  X      X  X      X
XXXXXXXX XXXX      X          XXX XXXX      XXXXXX      XXXX
X      X  X          X          X  X      X  X      X
X      X  X          X      X      X  X      X  X      X
X      X  XXXXXX      XXXX      X      X      X  X      XXXXXX

```

PROJECT DATA

Project Title: TALBOT MILLS DAM  
Project File : TALBOTMILLSDAM.prj  
Run Date and Time: 6/2/2009 11:05:44 AM

Project in English units

Project Description:  
DAM BREACH ANALYSIS

GCI#2092945  
PROJECT: TALBOT MILLS DAM

PLAN DATA

Plan Title: TALBOT002  
Plan File : C:\Documents and Settings\Carlos Luna\HEC RAS PROJECTS\TALBOT  
DAM\TALBOTMILLSDAM.p01

Geometry Title: TALBOT001  
Geometry File : C:\Documents and Settings\Carlos Luna\HEC RAS  
PROJECTS\TALBOT DAM\TALBOTMILLSDAM.g01

Flow Title :  
Flow File :

Plan Summary Information:

Number of: Cross Sections	=	10	Multiple Openings	=	0
Culverts	=	0	Inline Structures	=	1
Bridges	=	0	Lateral Structures	=	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary  
Conveyance Calculation Method: At breaks in n values only

Friction Slope Method: Average Conveyance  
 Computational Flow Regime: Subcritical Flow

TALBOTMILLSDAM.rep  
 Average Conveyance  
 Subcritical Flow

GEOMETRY DATA

Geometry Title: TALBOT001  
 Geometry File : C:\Documents and Settings\Carlos Luna\HEC RAS PROJECTS\TALBOT DAM\TALBOTMILLSDAM.g01

CROSS SECTION

RIVER: CONCORD  
 REACH: TALBOT MILL RS: 14045

INPUT

Description:

Station Elevation Data num= 10  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-100	119	0	115.8	17	102.605	17.78	102	22	101.949
67	101.4	110	101.924	116.22	102	134	115.8	250	119

Manning's n Values num= 3  

Sta	n Val	Sta	n Val	Sta	n Val
-100	.04	0	.03	134	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
0	134	995	995	995		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

Right OB	E.G. Elev (ft)	116.19	Element	Left OB	Channel
0.040	Vel Head (ft)	0.18	wt. n-Val.	0.040	0.030
995.00	w.s. Elev (ft)	116.01	Reach Len. (ft)	995.00	995.00
0.79	Crit w.s. (ft)		Flow Area (sq ft)	0.68	1661.32
0.79	E.G. Slope (ft/ft)	0.000183	Area (sq ft)	0.68	1661.32
0.09	Q Total (cfs)	5700.00	Flow (cfs)	0.08	5699.84
7.56	Top width (ft)	148.08	Top width (ft)	6.52	134.00
0.11	Vel Total (ft/s)	3.43	Avg. Vel. (ft/s)	0.11	3.43
0.10	Max Chl Dpth (ft)	14.61	Hydr. Depth (ft)	0.10	12.40
6.5	Conv. Total (cfs)	421195.5	Conv. (cfs)	5.6	421183.4
7.56	Length wtd. (ft)	995.00	wetted Per. (ft)	6.52	143.46
0.00	Min Ch El (ft)	101.40	Shear (lb/sq ft)	0.00	0.13
0.00	Alpha	1.00	Stream Power (lb/ft s)	0.00	0.45
1.19	Frctn Loss (ft)	0.23	Cum Volume (acre-ft)	1.20	211.59

C & E Loss (ft)	TALBOTMILLSDAM.rep	65.65	59.07
27.08	Cum SA (acres)		

CROSS SECTION OUTPUT Profile #01JUN2009 1200

E.G. Elev (ft)	115.45	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.21	wt. n-val.		0.030
W.S. Elev (ft)	115.24	Reach Len. (ft)	995.00	995.00
995.00				
Crit W.S. (ft)		Flow Area (sq ft)		1558.45
E.G. Slope (ft/ft)	0.000223	Area (sq ft)		1558.45
Q Total (cfs)	5700.00	Flow (cfs)		5700.00
Top width (ft)	132.55	Top width (ft)		132.55
Vel Total (ft/s)	3.66	Avg. Vel. (ft/s)		3.66
Max Chl Dpth (ft)	13.84	Hydr. Depth (ft)		11.76
Conv. Total (cfs)	381882.3	Conv. (cfs)		381882.3
Length wtd. (ft)	995.00	wetted Per. (ft)		141.63
Min Ch El (ft)	101.40	Shear (lb/sq ft)		0.15
Alpha	1.00	Stream Power (lb/ft s)		0.56
Frctn Loss (ft)	0.30	Cum Volume (acre-ft)		190.14
C & E Loss (ft)		Cum SA (acres)	61.37	59.03
23.50				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #01JUN2009 1600

E.G. Elev (ft)	115.31	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.21	wt. n-val.		0.030
W.S. Elev (ft)	115.10	Reach Len. (ft)	995.00	995.00
995.00				
Crit W.S. (ft)		Flow Area (sq ft)		1539.67
E.G. Slope (ft/ft)	0.000231	Area (sq ft)		1539.67
Q Total (cfs)	5700.00	Flow (cfs)		5700.00
Top width (ft)	132.19	Top width (ft)		132.19

Vel Total (ft/s)	3.70	Avg. Vel. (ft/s)	3.70
Max Chl Dpth (ft)	13.70	Hydr. Depth (ft)	11.65
Conv. Total (cfs)	375059.8	Conv. (cfs)	375059.8
Length wtd. (ft)	995.00	wetted Per. (ft)	141.17
Min Ch El (ft)	101.40	Shear (lb/sq ft)	0.16
Alpha	1.00	Stream Power (lb/ft s)	0.58
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)	187.71
C & E Loss (ft)		Cum SA (acres)	57.09
16.36			58.99

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #02JUN2009 1200

E.G. Elev (ft)	116.04	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.19	wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	115.85	Reach Len. (ft)	995.00	995.00
995.00				
Crit w.s. (ft)		Flow Area (sq ft)	0.04	1640.48
0.05				
E.G. Slope (ft/ft)	0.000191	Area (sq ft)	0.04	1640.48
0.05				
Q Total (cfs)	5700.00	Flow (cfs)	0.00	5700.00
0.00				
Top Width (ft)	137.58	Top Width (ft)	1.66	134.00
1.92				
Vel Total (ft/s)	3.47	Avg. Vel. (ft/s)	0.05	3.47
0.05				
Max Chl Dpth (ft)	14.45	Hydr. Depth (ft)	0.03	12.24
0.03				
Conv. Total (cfs)	412416.4	Conv. (cfs)	0.1	412416.1
0.2				
Length wtd. (ft)	995.00	wetted Per. (ft)	1.66	143.46
1.93				
Min Ch El (ft)	101.40	Shear (lb/sq ft)	0.00	0.14
0.00				
Alpha	1.00	Stream Power (lb/ft s)	0.00	0.47
0.00				
Frctn Loss (ft)	0.56	Cum Volume (acre-ft)	0.00	93.18
0.00				
C & E Loss (ft)		Cum SA (acres)	0.02	41.89
0.02				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.  
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: CONCORD  
 REACH: TALBOT MILL RS: 13050

INPUT

Description:

Station Elevation Data		num= 9	
Sta	Elev	Sta	Elev
-100	118	0	115
238	108.597	239.85	108.6
		240	115
		340	118

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
-100	.04	0	.03
		240	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	0	240		1380	1380		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

	E.G. Elev (ft)	115.93	Element	Left OB	Channel
Right OB					
Vel Head (ft)	0.15		wt. n-val.	0.040	0.030
0.040					
W.S. Elev (ft)	115.79		Reach Len. (ft)	1380.00	1380.00
1380.00					
Crit w.s. (ft)			Flow Area (sq ft)	10.29	1747.60
10.29					
E.G. slope (ft/ft)	0.000294		Area (sq ft)	10.29	1747.60
10.29					
Q Total (cfs)	5399.24		Flow (cfs)	3.52	5392.21
3.52					
Top width (ft)	292.38		Top width (ft)	26.19	240.00
26.19					
Vel Total (ft/s)	3.05		Avg. vel. (ft/s)	0.34	3.09
0.34					
Max Chl Dpth (ft)	7.39		Hydr. Depth (ft)	0.39	7.28
0.39					
Conv. Total (cfs)	314772.4		Conv. (cfs)	205.0	314362.5
205.0					
Length wtd. (ft)	1380.00		wetted Per. (ft)	26.20	252.50
26.20					
Min Ch El (ft)	108.40		Shear (lb/sq ft)	0.01	0.13
0.01					
Alpha	1.02		Stream Power (lb/ft s)	0.00	0.39
0.00					
Frctn Loss (ft)	0.12		Cum Volume (acre-ft)	1.08	172.66
1.07					
C & E Loss (ft)			Cum SA (acres)	65.28	54.80
26.70					

TALBOTMILLSDAM.rep

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #01JUN2009 1200

E.G. Elev (ft)	115.07	Element	Left OB	Channel
Right OB Vel Head (ft)	0.19	wt. n-Val.		0.030
W.S. Elev (ft)	114.88	Reach Len. (ft)	1380.00	1380.00
1380.00 Crit w.s. (ft)		Flow Area (sq ft)		1531.05
E.G. Slope (ft/ft)	0.000439	Area (sq ft)		1531.05
Q Total (cfs)	5287.46	Flow (cfs)		5287.46
Top width (ft)	239.99	Top width (ft)		239.99
Vel Total (ft/s)	3.45	Avg. Vel. (ft/s)		3.45
Max Chl Dpth (ft)	6.48	Hydr. Depth (ft)		6.38
Conv. Total (cfs)	252315.0	Conv. (cfs)		252315.0
Length wtd. (ft)	1380.00	wetted Per. (ft)		252.27
Min Ch El (ft)	108.40	Shear (lb/sq ft)		0.17
Alpha	1.00	Stream Power (lb/ft s)		0.57
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)		154.86
C & E Loss (ft)		Cum SA (acres)	61.37	54.78
23.50				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #01JUN2009 1600

E.G. Elev (ft)	114.89	Element	Left OB	Channel
Right OB Vel Head (ft)	0.24	wt. n-Val.		0.030
W.S. Elev (ft)	114.65	Reach Len. (ft)	1380.00	1380.00
1380.00 Crit w.s. (ft)		Flow Area (sq ft)		1475.39
E.G. Slope (ft/ft)	0.000596	Area (sq ft)		1475.39
Q Total (cfs)	5798.59	Flow (cfs)		5798.59
Top width (ft)	239.98	Top width (ft)		239.98

TALBOTMILLSDAM.rep

Vel Total (ft/s)	3.93	Avg. Vel. (ft/s)	3.93
Max Chl Dpth (ft)	6.25	Hydr. Depth (ft)	6.15
Conv. Total (cfs)	237505.9	Conv. (cfs)	237505.9
Length Wtd. (ft)	1380.00	wetted Per. (ft)	251.81
Min Ch El (ft)	108.40	Shear (lb/sq ft)	0.22
Alpha	1.00	Stream Power (lb/ft s)	0.86
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)	153.27
C & E Loss (ft)	16.36	Cum SA (acres)	57.09 54.74

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #02JUN2009 1200

E.G. Elev (ft)	112.42	Element	Left OB	Channel
Right OB Vel Head (ft)	1.10	wt. n-val.		0.030
W.S. Elev (ft)	111.32	Reach Len. (ft)	1380.00	1380.00
1380.00 Crit w.s. (ft)		Flow Area (sq ft)		677.30
E.G. slope (ft/ft)	0.007445	Area (sq ft)		677.30
Q Total (cfs)	5699.31	Flow (cfs)		5699.31
Top width (ft)	239.83	Top width (ft)		239.83
Vel Total (ft/s)	8.41	Avg. Vel. (ft/s)		8.41
Max Chl Dpth (ft)	2.92	Hydr. Depth (ft)		2.82
Conv. Total (cfs)	66051.7	Conv. (cfs)		66051.7
Length Wtd. (ft)	1380.00	wetted Per. (ft)		245.15
Min Ch El (ft)	108.40	Shear (lb/sq ft)		1.28
Alpha	1.00	Stream Power (lb/ft s)		10.81
Frctn Loss (ft)	2.61	Cum Volume (acre-ft)		66.71
C & E Loss (ft)		Cum SA (acres)		37.62

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for

additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than

0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross

section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: CONCORD

REACH: TALBOT MILL

RS: 11670

INPUT

Description:

Station Elevation Data

num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-150	120	-50	118	0	114.8	28.4	99	95	98.4
161.6	99	190	114.8	245	118	300	120		

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-150	.04	0	.03	190	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	0	190		1490	1490		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

		Element	Left OB	Channel
E.G. Elev (ft)	115.75			
Right OB				
Vel Head (ft)	0.05	wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	115.70	Reach Len. (ft)	1490.00	1490.00
1490.00				
Crit w.s. (ft)		Flow Area (sq ft)	6.36	2764.66
7.00				
E.G. slope (ft/ft)	0.000038	Area (sq ft)	6.36	2764.66
7.00				
Q Total (cfs)	4868.69	Flow (cfs)	0.85	4866.90
0.94				
Top width (ft)	219.60	Top width (ft)	14.10	190.00
15.51				
Vel Total (ft/s)	1.75	Avg. Vel. (ft/s)	0.13	1.76
0.13				
Max Chl Dpth (ft)	17.30	Hydr. Depth (ft)	0.45	14.55
0.45				
Conv. Total (cfs)	793769.4	Conv. (cfs)	138.8	793478.0
152.7				
Length wtd. (ft)	1490.00	wetted Per. (ft)	14.13	198.20
15.53				
Min Ch El (ft)	98.40	Shear (lb/sq ft)	0.00	0.03
0.00				
Alpha	1.01	Stream Power (lb/ft s)	0.00	0.06
0.00				
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	0.81	101.19
0.79				
C & E Loss (ft)		Cum SA (acres)	64.64	47.99
26.04				

TALBOTMILLSDAM.rep

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #01JUN2009 1200

		Element	Left OB	Channel
E.G. Elev (ft)	114.68			
Right OB				
Vel Head (ft)	0.05	wt. n-val.		0.030
W.S. Elev (ft)	114.63	Reach Len. (ft)	1490.00	1490.00
1490.00				
Crit w.s. (ft)		Flow Area (sq ft)		2560.67
E.G. slope (ft/ft)	0.000045	Area (sq ft)		2560.67
Q Total (cfs)	4673.42	Flow (cfs)		4673.42
Top width (ft)	189.38	Top width (ft)		189.38
vel Total (ft/s)	1.83	Avg. vel. (ft/s)		1.83
Max Chl Dpth (ft)	16.23	Hydr. Depth (ft)		13.52
Conv. Total (cfs)	699985.4	Conv. (cfs)		699985.4
Length wtd. (ft)	1490.00	wetted Per. (ft)		197.50
Min Ch El (ft)	98.40	Shear (lb/sq ft)		0.04
Alpha	1.00	Stream Power (lb/ft s)		0.07
Frctn Loss (ft)	0.04	Cum volume (acre-ft)		90.04
C & E Loss (ft)		Cum SA (acres)	61.37	47.98
23.50				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #01JUN2009 1600

		Element	Left OB	Channel
E.G. Elev (ft)	114.41			
Right OB				
Vel Head (ft)	0.09	wt. n-val.		0.030
W.S. Elev (ft)	114.32	Reach Len. (ft)	1490.00	1490.00
1490.00				
Crit w.s. (ft)		Flow Area (sq ft)		2502.30
E.G. slope (ft/ft)	0.000078	Area (sq ft)		2502.30
Q Total (cfs)	5978.56	Flow (cfs)		5978.56

TALBOTMILLSDAM.rep			
Top width (ft)	188.27	Top width (ft)	188.27
Vel Total (ft/s)	2.39	Avg. Vel. (ft/s)	2.39
Max Chl Dpth (ft)	15.92	Hydr. Depth (ft)	13.29
Conv. Total (cfs)	676502.6	Conv. (cfs)	676502.6
Length wtd. (ft)	1490.00	Wetted Per. (ft)	196.23
Min Ch El (ft)	98.40	Shear (lb/sq ft)	0.06
Alpha	1.00	Stream Power (lb/ft s)	0.15
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	90.27
C & E Loss (ft)	16.36	Cum SA (acres)	57.09
			47.96

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #02JUN2009 1200

Right OB				
E.G. Elev (ft)	106.70	Element	Left OB	Channel
Vel Head (ft)	0.41	wt. n-Val.		0.030
W.S. Elev (ft)	106.29	Reach Len. (ft)	1490.00	1490.00
Crit W.S. (ft)		Flow Area (sq ft)		1106.07
E.G. Slope (ft/ft)	0.000844	Area (sq ft)		1106.07
Q Total (cfs)	5701.83	Flow (cfs)		5701.83
Top width (ft)	159.40	Top width (ft)		159.40
Vel Total (ft/s)	5.16	Avg. Vel. (ft/s)		5.16
Max Chl Dpth (ft)	7.89	Hydr. Depth (ft)		6.94
Conv. Total (cfs)	196211.7	Conv. (cfs)		196211.7
Length wtd. (ft)	1490.00	Wetted Per. (ft)		163.18
Min Ch El (ft)	98.40	Shear (lb/sq ft)		0.36
Alpha	1.00	Stream Power (lb/ft s)		1.84
Frctn Loss (ft)	0.83	Cum Volume (acre-ft)		38.46
C & E Loss (ft)		Cum SA (acres)		31.29

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

TALBOTMILLSDAM.rep

is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: CONCORD  
 REACH: TALBOT MILL RS: 10190

INPUT

Description: TALBOT MILL DAM  
 Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-100	117	0	114.8	25	114.8	25	98.5	107	98.5
189	98.5	189	114.8	215	114.8	300	117		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-100	.03	25	.02	189	.03

Bank Sta: Left 25 Right 189 Lengths: Left Channel 50 Right 50 Coeff Contr. .1 Expan. .3

CROSS SECTION OUTPUT Profile #Max WS

Parameter	Value	Element	Left OB	Channel
E.G. Elev (ft)	115.74			
Right OB				
Vel Head (ft)	0.04	wt. n-val.	0.030	0.020
0.030				
W.S. Elev (ft)	115.70	Reach Len. (ft)	50.00	50.00
50.00				
Crit w.s. (ft)	101.26	Flow Area (sq ft)	41.23	2821.59
39.34				
E.G. Slope (ft/ft)	0.000012	Area (sq ft)	41.23	2821.59
39.34				
Q Total (cfs)	4295.15	Flow (cfs)	5.16	4284.96
5.04				
Top width (ft)	291.09	Top width (ft)	66.13	164.00
60.96				
Vel Total (ft/s)	1.48	Avg. Vel. (ft/s)	0.13	1.52
0.13				
Max Chl Dpth (ft)	17.20	Hydr. Depth (ft)	0.62	17.20
0.65				
Conv. Total (cfs)	1240978.0	Conv. (cfs)	1490.0	1238033.0
1455.0				
Length wtd. (ft)	50.00	wetted Per. (ft)	66.14	196.60
60.97				
Min Ch El (ft)	98.50	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.05	Stream Power (lb/ft s)	0.00	0.02
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		5.64
C & E Loss (ft)		Cum SA (acres)	63.27	41.93
24.73				

CROSS SECTION OUTPUT Profile #01JUN2009 1200

TALBOTMILLSDAM.rep				
		Element	Left OB	Channel
E.G. Elev (ft)	114.60			
Right OB Vel Head (ft)	0.04	wt. n-val.		0.020
W.S. Elev (ft)	114.56	Reach Len. (ft)	50.00	50.00
50.00 Crit w.s. (ft)	101.19	Flow Area (sq ft)		2634.25
E.G. Slope (ft/ft)	0.000014	Area (sq ft)		2634.25
Q Total (cfs)	4118.42	Flow (cfs)		4118.42
Top width (ft)	164.00	Top width (ft)		164.00
Vel Total (ft/s)	1.56	Avg. Vel. (ft/s)		1.56
Max Chl Dpth (ft)	16.06	Hydr. Depth (ft)		16.06
Conv. Total (cfs)	1105872.0	Conv. (cfs)		1105872.0
Length wtd. (ft)	50.00	wetted Per. (ft)		196.13
Min Ch El (ft)	98.50	Shear (lb/sq ft)		0.01
Alpha	1.00	Stream Power (lb/ft s)		0.02
Frctn Loss (ft)		Cum Volume (acre-ft)		1.20
C & E Loss (ft)	23.50	Cum SA (acres)	61.37	41.93

CROSS SECTION OUTPUT Profile #01JUN2009 1600

		Element	Left OB	Channel
E.G. Elev (ft)	114.32			
Right OB Vel Head (ft)	0.09	wt. n-val.		0.020
W.S. Elev (ft)	114.23	Reach Len. (ft)	50.00	50.00
50.00 Crit w.s. (ft)	102.01	Flow Area (sq ft)		2580.05
E.G. Slope (ft/ft)	0.000033	Area (sq ft)		2580.05
Q Total (cfs)	6152.10	Flow (cfs)		6152.10
Top width (ft)	164.00	Top width (ft)		164.00
Vel Total (ft/s)	2.38	Avg. Vel. (ft/s)		2.38
Max Chl Dpth (ft)	15.73	Hydr. Depth (ft)		15.73
Conv. Total (cfs)	1070616.0	Conv. (cfs)		1070616.0
Length wtd. (ft)	50.00	wetted Per. (ft)		195.46
Min Ch El (ft)	98.50	Shear (lb/sq ft)		0.03
Alpha	1.00	Stream Power (lb/ft s)		0.06
Frctn Loss (ft)		Cum Volume (acre-ft)		3.34

TALBOTMILLSDAM.rep

C & E Loss (ft) 16.36 Cum SA (acres) 57.09 41.93

CROSS SECTION OUTPUT Profile #02JUN2009 1200

E.G. Elev (ft)	105.78	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.40	Wt. n-Val.		0.020
W.S. Elev (ft)	105.38	Reach Len. (ft)	50.00	50.00
50.00				
Crit w.s. (ft)	101.84	Flow Area (sq ft)		1128.99
E.G. slope (ft/ft)	0.000394	Area (sq ft)		1128.99
Q Total (cfs)	5706.61	Flow (cfs)		5706.61
Top width (ft)	164.00	Top width (ft)		164.00
Vel Total (ft/s)	5.05	Avg. Vel. (ft/s)		5.05
Max Chl Dpth (ft)	6.88	Hydr. Depth (ft)		6.88
Conv. Total (cfs)	287661.0	Conv. (cfs)		287661.0
Length wtd. (ft)	50.00	wetted Per. (ft)		177.77
Min Ch El (ft)	98.50	Shear (lb/sq ft)		0.16
Alpha	1.00	Stream Power (lb/ft s)		0.79
Frctn Loss (ft)		Cum Volume (acre-ft)		0.23
C & E Loss (ft)		Cum SA (acres)		25.76

INLINE STRUCTURE

RIVER: CONCORD  
 REACH: TALBOT MILL RS: 10185

INPUT

Description:

Distance from Upstream XS = 5  
 Deck/Roadway width = 12  
 Weir Coefficient = 2.6  
 Weir Embankment Coordinates num = 6

Sta	Elev								
25	111.4	42	111.4	42	109.7	169	109.7	169	111.4
189	111.6								

Upstream Embankment side slope = 3.5 horiz. to 1.0 vertical  
 Downstream Embankment side slope = 3.5 horiz. to 1.0 vertical  
 Maximum allowable submergence for weir flow = .98  
 Elevation at which weir flow begins =  
 Weir crest shape = Broad Crested

TALBOTMILLSDAM.rep

INLINE STRUCTURE OUTPUT Profile #Max WS Inl Struct:

E.G. Elev (ft)	115.69	Q Gates (cfs)	
W.S. Elev (ft)	115.66	Q Gate Group (cfs)	0.00
Q Total (cfs)	4295.15	Gate Open Ht (ft)	115.53
Q Weir (cfs)	4295.15	Gate #Open	
Weir Flow Area (sq ft)	6877.32	Gate Area (sq ft)	1.00
Weir Sta Lft (ft)	-100.00	Gate Submerg	0.00
Weir Sta Rgt (ft)	300.00	Gate Invert (ft)	0.00
Weir Max Depth (ft)	17.19	Gate Weir Coef	0.000
Weir Avg Depth (ft)	17.19		
Weir Coef	2.600	Q Breach (cfs)	
Weir Submerg	1.00	Breach Avg Velocity (ft/s)	
Min El Weir Flow (ft)	98.51	Breach Flow Area (sq ft)	
wr Top width (ft)	400.00		

INLINE STRUCTURE OUTPUT Profile #01JUN2009 1200 Inl Struct:

E.G. Elev (ft)	114.60	Q Gates (cfs)	
W.S. Elev (ft)	114.56	Q Gate Group (cfs)	0.78
Q Total (cfs)	4118.42	Gate Open Ht (ft)	5164.93
Q Weir (cfs)	4118.42	Gate #Open	233
Weir Flow Area (sq ft)	738.84	Gate Area (sq ft)	4884.05
Weir Sta Lft (ft)	25.00	Gate Submerg	47.79
Weir Sta Rgt (ft)	189.00	Gate Invert (ft)	550.00
Weir Max Depth (ft)	4.90	Gate Weir Coef	550.000
Weir Avg Depth (ft)	4.51		
Weir Coef	2.600	Q Breach (cfs)	
Weir Submerg	0.00	Breach Avg Velocity (ft/s)	
Min El Weir Flow (ft)	109.71	Breach Flow Area (sq ft)	
wr Top width (ft)	164.00		

INLINE STRUCTURE OUTPUT Profile #01JUN2009 1600 Inl Struct:

E.G. Elev (ft)	109.58	Q Gates (cfs)	
W.S. Elev (ft)	109.40	Q Gate Group (cfs)	1.83
Q Total (cfs)	6152.10	Gate Open Ht (ft)	3375.93
Q Weir (cfs)	6152.10	Gate #Open	6
Weir Flow Area (sq ft)	3779.65	Gate Area (sq ft)	3368.52
Weir Sta Lft (ft)	-100.00	Gate Submerg	1.08
Weir Sta Rgt (ft)	300.00	Gate Invert (ft)	550.00
Weir Max Depth (ft)	9.45	Gate Weir Coef	550.000
Weir Avg Depth (ft)	9.45		
Weir Coef	2.600	Q Breach (cfs)	
Weir Submerg	1.00	Breach Avg Velocity (ft/s)	
Min El Weir Flow (ft)	100.15	Breach Flow Area (sq ft)	
wr Top width (ft)	400.00		

INLINE STRUCTURE OUTPUT Profile #02JUN2009 1200 Inl Struct:

E.G. Elev (ft)	105.78	Q Gates (cfs)	
W.S. Elev (ft)	105.38	Q Gate Group (cfs)	158.94
Q Total (cfs)	5706.61	Gate Open Ht (ft)	36.02
Q Weir (cfs)		Gate #Open	
Weir Flow Area (sq ft)		Gate Area (sq ft)	36.02
Weir Sta Lft (ft)		Gate Submerg	
Weir Sta Rgt (ft)		Gate Invert (ft)	550.00
Weir Max Depth (ft)		Gate Weir Coef	550.000

TALBOTMILLSDAM.rep

Weir Avg Depth (ft)  
 Weir Coef 2.600 Q Breach (cfs)  
 Weir Submerg Breach Avg Velocity (ft/s)  
 Min El Weir Flow (ft) 98.51 Breach Flow Area (sq ft)  
 Wr Top Wdth (ft)

CROSS SECTION

RIVER: CONCORD  
 REACH: TALBOT MILL RS: 10140

INPUT

Description:

Station Elevation Data num= 9  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-100	116	-20	115	0	108.5	12.78	99.9	47.5	99.4
82.22	99.9	95	108.5	100	115	200	117		

Manning's n Values num= 3  

Sta	n Val	Sta	n Val	Sta	n Val
-100	.04	0	.025	95	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 0 95 540 540 540 .1 .3

CROSS SECTION OUTPUT Profile #Max WS

Parameter	Value	Element	Left OB	Channel
E.G. Elev (ft)	115.67			
Right OB				
Vel Head (ft)	0.14	wt. n-val.	0.040	0.025
0.040				
W.S. Elev (ft)	115.53	Reach Len. (ft)	540.00	540.00
540.00				
Crit w.s. (ft)		Flow Area (sq ft)	86.86	1392.34
25.94				
E.G. Slope (ft/ft)	0.000079	Area (sq ft)	86.86	1392.34
25.94				
Q Total (cfs)	4295.15	Flow (cfs)	35.38	4252.72
7.05				
Top width (ft)	188.95	Top width (ft)	62.43	95.00
31.52				
Vel Total (ft/s)	2.85	Avg. vel. (ft/s)	0.41	3.05
0.27				
Max Chl Dpth (ft)	16.13	Hydr. Depth (ft)	1.39	14.66
0.82				
Conv. Total (cfs)	482914.4	Conv. (cfs)	3977.6	478143.8
793.1				
Length wtd. (ft)	540.00	wetted Per. (ft)	63.47	100.26
34.73				
Min Ch El (ft)	99.40	Shear (lb/sq ft)	0.01	0.07
0.00				
Alpha	1.13	Stream Power (lb/ft s)	0.00	0.21
0.00				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	161.32	642.89
35.43				
C & E Loss (ft)		Cum SA (acres)	63.19	41.79
24.68				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

## CROSS SECTION OUTPUT Profile #01JUN2009 1200

E.G. Elev (ft)	109.79	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.40	wt. n-val.	0.040	0.025
0.040				
W.S. Elev (ft)	109.38	Reach Len. (ft)	540.00	540.00
540.00				
Crit w.s. (ft)		Flow Area (sq ft)	1.20	808.25
0.30				
E.G. slope (ft/ft)	0.000455	Area (sq ft)	1.20	808.25
0.30				
Q Total (cfs)	4118.42	Flow (cfs)	0.53	4117.79
0.10				
Top width (ft)	98.39	Top width (ft)	2.71	95.00
0.68				
Vel Total (ft/s)	5.09	Avg. Vel. (ft/s)	0.44	5.09
0.33				
Max Chl Dpth (ft)	9.98	Hydr. Depth (ft)	0.44	8.51
0.44				
Conv. Total (cfs)	193179.2	Conv. (cfs)	24.9	193149.6
4.6				
Length wtd. (ft)	540.00	wetted Per. (ft)	2.85	100.26
1.11				
Min Ch El (ft)	99.40	shear (lb/sq ft)	0.01	0.23
0.01				
Alpha	1.00	Stream Power (lb/ft s)	0.01	1.17
0.00				
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	154.14	542.55
30.50				
C & E Loss (ft)		Cum SA (acres)	61.37	41.79
23.50				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

## CROSS SECTION OUTPUT Profile #01JUN2009 1600

E.G. Elev (ft)	109.56	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.15	wt. n-val.		0.025
W.S. Elev (ft)	108.41	Reach Len. (ft)	540.00	540.00
540.00				
Crit w.s. (ft)		Flow Area (sq ft)		716.30
E.G. slope (ft/ft)	0.001511	Area (sq ft)		716.30
Q Total (cfs)	6152.10	Flow (cfs)		6152.10
Top width (ft)	94.74	Top width (ft)		94.74

	TALBOTMILLSDAM.rep		
Vel Total (ft/s)	8.59	Avg. Vel. (ft/s)	8.59
Max Chl Dpth (ft)	9.01	Hydr. Depth (ft)	7.56
Conv. Total (cfs)	158258.5	Conv. (cfs)	158258.5
Length wtd. (ft)	540.00	wetted Per. (ft)	99.95
Min Ch El (ft)	99.40	Shear (lb/sq ft)	0.68
Alpha	1.00	Stream Power (lb/ft s)	5.81
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	102.27
12.95			515.29
C & E Loss (ft)		Cum SA (acres)	57.09
16.36			41.78

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #02JUN2009 1200

E.G. Elev (ft)	2536863.00	Element	Left OB	Channel
Right OB				
Vel Head (ft)	2536764.00	wt. n-val.		0.025
W.S. Elev (ft)	99.48	Reach Len. (ft)	540.00	540.00
540.00				
Crit w.s. (ft)	105.38	Flow Area (sq ft)		0.45
E.G. Slope (ft/ft)	3370533.000000	Area (sq ft)		
0.45				
Q Total (cfs)	5706.61	Flow (cfs)		5706.61
Top width (ft)	11.14	Top width (ft)		11.14
Vel Total (ft/s)	12781.53	Avg. Vel. (ft/s)		12781.53
Max Chl Dpth (ft)	0.08	Hydr. Depth (ft)		0.04
Conv. Total (cfs)	3.1	Conv. (cfs)		3.1
Length wtd. (ft)	540.00	wetted Per. (ft)		11.14
Min Ch El (ft)	99.40	Shear (lb/sq ft)		8435478.00
Alpha	1.00	Stream Power (lb/ft s)		
107818300000.00				
Frctn Loss (ft)	174872300.00	Cum Volume (acre-ft)		
84.20				
C & E Loss (ft)		Cum SA (acres)		25.66

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.  
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: CONCORD  
 REACH: TALBOT MILL RS: 9600

INPUT

Description:

Station Elevation Data		num=		9					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-100	116	-50	115	0	107.2	22.25	92	108.5	90.8
194.75	92	217	107.2	225	114.5	250	116		

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
-100	.04	0	.03	217	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	0	217		550	550		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

			Left OB	Channel
E.G. Elev (ft)	115.60	Element		
Right OB				
Vel Head (ft)	0.01	wt. n-val.	0.040	0.030
0.040				
W.S. Elev (ft)	115.59	Reach Len. (ft)	550.00	550.00
550.00				
Crit w.s. (ft)		Flow Area (sq ft)	233.10	4884.05
47.79				
E.G. slope (ft/ft)	0.000005	Area (sq ft)	233.10	4884.05
47.79				
Q Total (cfs)	4037.01	Flow (cfs)	37.62	3994.11
5.28				
Top width (ft)	322.58	Top width (ft)	79.43	217.00
26.14				
Vel Total (ft/s)	0.78	Avg. vel. (ft/s)	0.16	0.82
0.11				
Max Chl Dpth (ft)	24.79	Hydr. Depth (ft)	2.93	22.51
1.83				
Conv. Total (cfs)	1894744.0	Conv. (cfs)	17658.1	1874610.0
2476.1				
Length wtd. (ft)	550.00	wetted Per. (ft)	80.05	226.41
29.01				
Min Ch El (ft)	90.80	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.08	Stream Power (lb/ft s)	0.00	0.00
0.00				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	159.34	603.98
34.97				
C & E Loss (ft)		Cum SA (acres)	62.31	39.85

24.32

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.  
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #01JUN2009 1200

E.G. Elev (ft)	109.49	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	109.47	Reach Len. (ft)	550.00	550.00
550.00				
Crit w.s. (ft)		Flow Area (sq ft)	16.46	3555.42
2.81				
E.G. Slope (ft/ft)	0.000014	Area (sq ft)	16.46	3555.42
2.81				
Q Total (cfs)	4150.05	Flow (cfs)	2.48	4147.22
0.35				
Top width (ft)	234.01	Top width (ft)	14.53	217.00
2.48				
Vel Total (ft/s)	1.16	Avg. Vel. (ft/s)	0.15	1.17
0.12				
Max Chl Dpth (ft)	18.67	Hydr. Depth (ft)	1.13	16.38
1.13				
Conv. Total (cfs)	1105076.0	Conv. (cfs)	659.1	1104324.0
92.8				
Length wtd. (ft)	550.00	wetted Per. (ft)	14.70	226.41
3.36				
Min Ch El (ft)	90.80	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.01	Stream Power (lb/ft s)	0.00	0.02
0.00				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	154.04	515.50
30.48				
C & E Loss (ft)		Cum SA (acres)	61.26	39.85
23.48				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #01JUN2009 1600

E.G. Elev (ft)	108.68	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	108.63	Reach Len. (ft)	550.00	550.00
550.00				
Crit w.s. (ft)		Flow Area (sq ft)	6.53	3373.38

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1.12				
E.G. slope (ft/ft)	0.000037	Area (sq ft)	6.53	3373.38
1.12				
Q Total (cfs)	6149.98	Flow (cfs)	1.17	6148.65
0.16				
Top width (ft)	227.71	Top width (ft)	9.15	217.00
1.56				
Vel Total (ft/s)	1.82	Avg. Vel. (ft/s)	0.18	1.82
0.15				
Max Chl Dpth (ft)	17.83	Hydr. Depth (ft)	0.71	15.55
0.71				
Conv. Total (cfs)	1011923.0	Conv. (cfs)	192.1	1011704.0
27.1				
Length Wtd. (ft)	550.00	wetted Per. (ft)	9.26	226.41
2.12				
Min Ch El (ft)	90.80	Shear (lb/sq ft)	0.00	0.03
0.00				
Alpha	1.00	Stream Power (lb/ft s)	0.00	0.06
0.00				
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	102.23	489.94
12.94				
C & E Loss (ft)		Cum SA (acres)	57.03	39.85
16.35				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #02JUN2009 1200

E.G. Elev (ft)	149381.60	Element	Left OB	Channel
Right OB				
Vel Head (ft)	149290.60	wt. n-val.		0.030
W.S. Elev (ft)	90.96	Reach Len. (ft)	550.00	550.00
550.00				
Crit w.s. (ft)	94.62	Flow Area (sq ft)		1.84
E.G. slope (ft/ft)	113548.300000	Area (sq ft)		
1.84				
Q Total (cfs)	5716.99	Flow (cfs)		5716.99
Top width (ft)	23.02	Top width (ft)		23.02
Vel Total (ft/s)	3100.70	Avg. Vel. (ft/s)		3100.70
Max Chl Dpth (ft)	0.16	Hydr. Depth (ft)		0.08
Conv. Total (cfs)	17.0	Conv. (cfs)		17.0
Length Wtd. (ft)	550.00	wetted Per. (ft)		23.03
Min Ch El (ft)	90.80	Shear (lb/sq ft)		567631.60
Alpha	1.00	Stream Power (lb/ft s)		
1760053000.00				
Frctn Loss (ft)	107316000.00	Cum Volume (acre-ft)		
84.18				
C & E Loss (ft)		Cum SA (acres)		25.45

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: CONCORD  
 REACH: TALBOT MILL RS: 9050

INPUT

Description:

Station	Elevation	Data	num=	10	Sta	Elev	Sta	Elev	Sta	Elev
-200	118	0	107	.08	94.01	.1	94.01	80.5	94	
160.91	94.01	160.92	94.01	161	107	411	119	622	118	

Manning's n	Values	num=	3	Sta	n Val	Sta	n Val
-200	.04	0	.03	161	.04		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	0	161		2050	2050		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

	E.G. Elev (ft)		Element	Left OB	Channel
Right OB	109.46				
Vel Head (ft)	0.04		wt. n-Val.	0.040	0.030
0.040					
w.s. Elev (ft)	109.42		Reach Len. (ft)	2050.00	2050.00
2050.00					
Crit w.s. (ft)			Flow Area (sq ft)	53.10	2480.28
60.85					
E.G. Slope (ft/ft)	0.000037		Area (sq ft)	53.10	2480.28
60.85					
Q Total (cfs)	4196.39		Flow (cfs)	13.53	4167.36
15.50					
Top Width (ft)	255.30		Top width (ft)	43.94	161.00
50.35					
Vel Total (ft/s)	1.62		Avg. Vel. (ft/s)	0.25	1.68
0.25					
Max Chl Dpth (ft)	15.42		Hydr. Depth (ft)	1.21	15.41
1.21					
Conv. Total (cfs)	693594.6		Conv. (cfs)	2235.8	688796.3
2562.5					
Length wtd. (ft)	2050.00		wetted Per. (ft)	44.01	186.82
50.41					
Min Ch El (ft)	94.00		Shear (lb/sq ft)	0.00	0.03
0.00					
Alpha	1.07		Stream Power (lb/ft s)	0.00	0.05

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0.00				
Frctn Loss (ft)	0.05	Cum volume (acre-ft)	157.53	557.49
34.29				
C & E Loss (ft)		Cum SA (acres)	61.53	37.47
23.84				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #01JUN2009 1200

E.G. Elev (ft)	109.46	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	wt. n-val.	0.040	0.030
0.040				
W.S. Elev (ft)	109.42	Reach Len. (ft)	2050.00	2050.00
2050.00				
Crit w.s. (ft)		Flow Area (sq ft)	53.10	2480.28
60.85				
E.G. slope (ft/ft)	0.000037	Area (sq ft)	53.10	2480.28
60.85				
Q Total (cfs)	4196.39	Flow (cfs)	13.53	4167.36
15.50				
Top width (ft)	255.30	Top width (ft)	43.94	161.00
50.35				
Vel Total (ft/s)	1.62	Avg. vel. (ft/s)	0.25	1.68
0.25				
Max Chl Dpth (ft)	15.42	Hydr. Depth (ft)	1.21	15.41
1.21				
Conv. Total (cfs)	693594.6	Conv. (cfs)	2235.8	688796.3
2562.5				
Length wtd. (ft)	2050.00	wetted Per. (ft)	44.01	186.82
50.41				
Min Ch El (ft)	94.00	Shear (lb/sq ft)	0.00	0.03
0.00				
Alpha	1.07	Stream Power (lb/ft s)	0.00	0.05
0.00				
Frctn Loss (ft)	0.05	Cum volume (acre-ft)	153.60	477.40
30.07				
C & E Loss (ft)		Cum SA (acres)	60.89	37.47
23.15				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #01JUN2009 1600

E.G. Elev (ft)	108.64	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.11	wt. n-val.	0.040	0.030
0.040				
W.S. Elev (ft)	108.54	Reach Len. (ft)	2050.00	2050.00
2050.00				

TALBOTMILLSDAM.rep				
Crit w.s. (ft)		Flow Area (sq ft)	21.51	2338.79
24.64				
E.G. Slope (ft/ft)	0.000096	Area (sq ft)	21.51	2338.79
24.64				
Q Total (cfs)	6146.54	Flow (cfs)	6.58	6132.42
7.54				
Top width (ft)	221.01	Top width (ft)	27.97	161.00
32.04				
Vel Total (ft/s)	2.58	Avg. Vel. (ft/s)	0.31	2.62
0.31				
Max Chl Dpth (ft)	14.54	Hydr. Depth (ft)	0.77	14.53
0.77				
Conv. Total (cfs)	626000.4	Conv. (cfs)	670.0	624562.6
767.8				
Length wtd. (ft)	2050.00	wetted Per. (ft)	28.01	186.82
32.08				
Min Ch El (ft)	94.00	Shear (lb/sq ft)	0.00	0.08
0.00				
Alpha	1.03	Stream Power (lb/ft s)	0.00	0.20
0.00				
Frctn Loss (ft)	0.12	Cum Volume (acre-ft)	102.06	453.88
12.78				
C & E Loss (ft)		Cum SA (acres)	56.80	37.47
16.14				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #02JUN2009 1200

E.G. Elev (ft)	68336.79	Element	Left OB	Channel
Right OB				
Vel Head (ft)	68242.77	wt. n-Val.		0.030
w.s. Elev (ft)	94.02	Reach Len. (ft)	2050.00	2050.00
2050.00				
Crit w.s. (ft)	97.40	Flow Area (sq ft)		2.73
E.G. Slope (ft/ft)	409867.800000	Area (sq ft)		
2.73				
Q Total (cfs)	5732.50	Flow (cfs)		5732.50
Top width (ft)	160.84	Top width (ft)		160.84
Vel Total (ft/s)	2096.39	Avg. Vel. (ft/s)		2096.39
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)		0.02
Conv. Total (cfs)	9.0	Conv. (cfs)		9.0
Length wtd. (ft)	2050.00	wetted Per. (ft)		160.86
Min Ch El (ft)	94.00	Shear (lb/sq ft)		434961.10
Alpha	1.00	Stream Power (lb/ft s)		
911846300.00				
Frctn Loss (ft)	1.96	Cum Volume (acre-ft)		84.16

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: CONCORD  
REACH: TALBOT MILL RS: 7000

INPUT

Description: GCI - Topo Map

Station Elevation Data		num= 9		Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-1500	115	-1000	107	0	106	6	94.01	106	94		
208	94.01	214	107	471	109	622	118				

Manning's n Values		num= 3		Sta	n val	Sta	n val
-1500	.04	0	.03	214	.04		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	0	214		2250	2250		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

		Element	Left OB	Channel
E.G. Elev (ft)	109.35			
Right OB				
Vel Head (ft)	0.02	wt. n-val.	0.040	0.030
0.040				
W.S. Elev (ft)	109.33	Reach Len. (ft)	2250.00	2250.00
2250.00				
Crit w.s. (ft)		Flow Area (sq ft)	2999.88	3204.59
342.78				
E.G. Slope (ft/ft)	0.000019	Area (sq ft)	2999.88	3204.59
342.78				
Q Total (cfs)	5045.99	Flow (cfs)	931.59	4047.48
66.93				
Top width (ft)	1622.18	Top width (ft)	1145.64	214.00
262.54				
Vel Total (ft/s)	0.77	Avg. vel. (ft/s)	0.31	1.26
0.20				
Max Chl Dpth (ft)	15.33	Hydr. Depth (ft)	2.62	14.97
1.31				
Conv. Total (cfs)	1146735.0	Conv. (cfs)	211709.0	919815.8
15210.3				
Length wtd. (ft)	2250.00	wetted Per. (ft)	1145.66	229.72
262.56				
Min Ch El (ft)	94.00	Shear (lb/sq ft)	0.00	0.02
0.00				

		TALBOTMILLSDAM.rep		
Alpha	2.19	Stream Power (lb/ft s)	0.00	0.02
0.00				
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	85.69	423.72
24.79				
C & E Loss (ft)		Cum SA (acres)	33.54	28.64
16.47				

CROSS SECTION OUTPUT Profile #01JUN2009 1200

E.G. Elev (ft)	109.35	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-val.	0.040	0.030
0.040				
W.S. Elev (ft)	109.33	Reach Len. (ft)	2250.00	2250.00
2250.00				
Crit w.s. (ft)		Flow Area (sq ft)	2999.88	3204.59
342.78				
E.G. slope (ft/ft)	0.000019	Area (sq ft)	2999.88	3204.59
342.78				
Q Total (cfs)	5045.99	Flow (cfs)	931.59	4047.48
66.93				
Top width (ft)	1622.18	Top width (ft)	1145.64	214.00
262.54				
Vel Total (ft/s)	0.77	Avg. Vel. (ft/s)	0.31	1.26
0.20				
Max Chl Dpth (ft)	15.33	Hydr. Depth (ft)	2.62	14.97
1.31				
Conv. Total (cfs)	1146735.0	Conv. (cfs)	211709.0	919815.8
15210.3				
Length wtd. (ft)	2250.00	wetted Per. (ft)	1145.66	229.72
262.56				
Min Ch El (ft)	94.00	Shear (lb/sq ft)	0.00	0.02
0.00				
Alpha	2.19	Stream Power (lb/ft s)	0.00	0.02
0.00				
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	81.76	343.63
20.58				
C & E Loss (ft)		Cum SA (acres)	32.90	28.64
15.79				

CROSS SECTION OUTPUT Profile #01JUN2009 1600

E.G. Elev (ft)	108.49	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	wt. n-val.	0.040	0.030
0.040				
W.S. Elev (ft)	108.45	Reach Len. (ft)	2250.00	2250.00
2250.00				
Crit w.s. (ft)		Flow Area (sq ft)	2015.48	3016.19
135.05				
E.G. slope (ft/ft)	0.000041	Area (sq ft)	2015.48	3016.19
135.05				
Q Total (cfs)	6088.41	Flow (cfs)	723.92	5338.49
25.99				
Top width (ft)	1490.91	Top width (ft)	1090.61	214.00
186.30				
Vel Total (ft/s)	1.18	Avg. Vel. (ft/s)	0.36	1.77

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0.19				
Max Chl Dpth (ft)	14.45	Hydr. Depth (ft)	1.85	14.09
0.72				
Conv. Total (cfs)	948261.8	Conv. (cfs)	112750.1	831463.4
4048.2				
Length wtd. (ft)	2250.00	Wetted Per. (ft)	1090.63	229.72
186.30				
Min Ch El (ft)	94.00	Shear (lb/sq ft)	0.00	0.03
0.00				
Alpha	1.99	Stream Power (lb/ft s)	0.00	0.06
0.00				
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	54.12	327.88
9.02				
C & E Loss (ft)		Cum SA (acres)	30.47	28.64
11.00				

CROSS SECTION OUTPUT Profile #02JUN2009 1200

E.G. Elev (ft)	102.30	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.10	wt. n-Val.		0.030
W.S. Elev (ft)	102.20	Reach Len. (ft)	2250.00	2250.00
2250.00				
Crit w.s. (ft)		Flow Area (sq ft)		1687.73
E.G. Slope (ft/ft)	0.000177	Area (sq ft)		1687.73
Q Total (cfs)	4324.75	Flow (cfs)		4324.75
Top width (ft)	209.88	Top width (ft)		209.88
Vel Total (ft/s)	2.56	Avg. Vel. (ft/s)		2.56
Max Chl Dpth (ft)	8.20	Hydr. Depth (ft)		8.04
Conv. Total (cfs)	324981.5	Conv. (cfs)		324981.5
Length wtd. (ft)	2250.00	Wetted Per. (ft)		220.18
Min Ch El (ft)	94.00	Shear (lb/sq ft)		0.08
Alpha	1.00	Stream Power (lb/ft s)		0.22
Frctn Loss (ft)	1.11	Cum Volume (acre-ft)		44.38
C & E Loss (ft)		Cum SA (acres)		15.57

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross

section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: CONCORD  
 REACH: TALBOT MILL RS: 4750

INPUT

Description:

Station Elevation Data		num= 7							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-200	116	0	106.6	4.54	91.3	119	91	233.46	91.3
238	106.6	738	115						

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
-200	.04	0	.03	238	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	0	238		2700	2700	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

			Left OB	Channel
E.G. Elev (ft)	109.25	Element		
Right OB				
Vel Head (ft)	0.03	wt. n-val.	0.040	0.030
0.040				
W.S. Elev (ft)	109.22	Reach Len. (ft)	2700.00	2700.00
2700.00				
Crit w.s. (ft)		Flow Area (sq ft)	72.77	4228.77
203.60				
E.G. slope (ft/ft)	0.000021	Area (sq ft)	72.77	4228.77
203.60				
Q Total (cfs)	6162.92	Flow (cfs)	14.70	6107.04
41.17				
Top width (ft)	449.33	Top width (ft)	55.65	238.00
155.68				
Vel Total (ft/s)	1.37	Avg. vel. (ft/s)	0.20	1.44
0.20				
Max Chl Dpth (ft)	18.22	Hydr. Depth (ft)	1.31	17.77
1.31				
Conv. Total (cfs)	1353950.0	Conv. (cfs)	3230.6	1341676.0
9043.7				
Length wtd. (ft)	2700.00	wetted Per. (ft)	55.71	260.84
155.71				
Min Ch El (ft)	91.00	Shear (lb/sq ft)	0.00	0.02
0.00				
Alpha	1.10	Stream Power (lb/ft s)	0.00	0.03
0.00				
Frctn Loss (ft)	0.09	Cum volume (acre-ft)	6.34	231.74
10.68				
C & E Loss (ft)		Cum SA (acres)	2.52	16.97
5.67				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than

0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and

previous cross section. This may indicate the need for additional cross sections.

## CROSS SECTION OUTPUT Profile #01JUN2009 1200

		Element	Left OB	Channel
E.G. Elev (ft)	109.25			
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	109.22	Reach Len. (ft)	2700.00	2700.00
2700.00				
Crit w.s. (ft)		Flow Area (sq ft)	72.77	4228.77
203.60				
E.G. slope (ft/ft)	0.000021	Area (sq ft)	72.77	4228.77
203.60				
Q Total (cfs)	6162.92	Flow (cfs)	14.70	6107.04
41.17				
Top width (ft)	449.33	Top width (ft)	55.65	238.00
155.68				
Vel Total (ft/s)	1.37	Avg. Vel. (ft/s)	0.20	1.44
0.20				
Max Chl Dpth (ft)	18.22	Hydr. Depth (ft)	1.31	17.77
1.31				
Conv. Total (cfs)	1353950.0	Conv. (cfs)	3230.6	1341676.0
9043.7				
Length wtd. (ft)	2700.00	wetted Per. (ft)	55.71	260.84
155.71				
Min Ch El (ft)	91.00	Shear (lb/sq ft)	0.00	0.02
0.00				
Alpha	1.10	Stream Power (lb/ft s)	0.00	0.03
0.00				
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)	2.40	151.65
6.47				
C & E Loss (ft)		Cum SA (acres)	1.87	16.97
4.99				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

## CROSS SECTION OUTPUT Profile #01JUN2009 1600

		Element	Left OB	Channel
E.G. Elev (ft)	108.42			
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	108.38	Reach Len. (ft)	2700.00	2700.00
2700.00				
Crit w.s. (ft)		Flow Area (sq ft)	33.80	4030.49
94.55				
E.G. slope (ft/ft)	0.000023	Area (sq ft)	33.80	4030.49
94.55				

TALBOTMILLSDAM.rep				
Q Total (cfs)	6017.18	Flow (cfs)	5.62	5995.81
15.75				
Top width (ft)	382.02	Top width (ft)	37.92	238.00
106.10				
Vel Total (ft/s)	1.45	Avg. Vel. (ft/s)	0.17	1.49
0.17				
Max Chl Dpth (ft)	17.38	Hydr. Depth (ft)	0.89	16.93
0.89				
Conv. Total (cfs)	1242890.0	Conv. (cfs)	1161.8	1238476.0
3252.5				
Length Wtd. (ft)	2700.00	wetted Per. (ft)	37.97	260.84
106.11				
Min Ch El (ft)	91.00	Shear (lb/sq ft)	0.00	0.02
0.00				
Alpha	1.05	Stream Power (lb/ft s)	0.00	0.03
0.00				
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)	1.20	145.88
3.09				
C & E Loss (ft)		Cum SA (acres)	1.33	16.97
3.45				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #02JUN2009 1200

E.G. Elev (ft)	3185.53	Element	Left OB	Channel
Right OB				
Vel Head (ft)	3094.40	wt. n-val.		0.030
W.S. Elev (ft)	91.13	Reach Len. (ft)	2700.00	2700.00
2700.00				
Crit W.S. (ft)	92.85	Flow Area (sq ft)		6.47
E.G. slope (ft/ft)	3102.387000	Area (sq ft)		6.47
Q Total (cfs)	2886.36	Flow (cfs)		2886.36
Top width (ft)	99.34	Top width (ft)		99.34
Vel Total (ft/s)	446.41	Avg. Vel. (ft/s)		446.41
Max Chl Dpth (ft)	0.13	Hydr. Depth (ft)		0.07
Conv. Total (cfs)	51.8	Conv. (cfs)		51.8
Length Wtd. (ft)	2700.00	wetted Per. (ft)		99.34
Min Ch El (ft)	91.00	Shear (lb/sq ft)		12606.75
Alpha	1.00	Stream Power (lb/ft s)		5627745.00

Frctn Loss (ft) 5829015.00 Cum Volume (acre-ft) 0.62  
 C & E Loss (ft) Cum SA (acres) 7.58

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.  
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: CONCORD  
 REACH: TALBOT MILL RS: 2050

INPUT

Description:

Station Elevation Data		num= 9		Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
Sta	Elev	Sta	Elev	-500	110	-250	107	-25	106.5	0	106
192.5	90.4	347.25	90.8	385	105	635	109			37.75	90.8

Manning's n Values		num= 3		Sta	n Val	Sta	n Val	Sta	n Val
Sta	n Val	Sta	n Val	-500	.04	37.75	.03	347.25	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	37.75	347.25		2050	2050		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

	E.G. Elev (ft)	101.14	Element	Left OB	Channel
Right OB	Vel Head (ft)	0.05	wt. n-Val.	0.040	0.030
0.040	w.s. Elev (ft)	101.10	Reach Len. (ft)		
	Crit w.s. (ft)	92.85	Flow Area (sq ft)	131.66	3248.82
140.94	E.G. Slope (ft/ft)	0.000056	Area (sq ft)	131.66	3248.82
140.94	Q Total (cfs)	6000.00	Flow (cfs)	104.00	5784.01
111.99	Top width (ft)	362.45	Top width (ft)	25.57	309.50
27.37	Vel Total (ft/s)	1.70	Avg. Vel. (ft/s)	0.79	1.78
0.79	Max Chl Dpth (ft)	10.70	Hydr. Depth (ft)	5.15	10.50
5.15	Conv. Total (cfs)	800259.1	Conv. (cfs)	13870.8	771451.7
14936.6	Length wtd. (ft)		Wetted Per. (ft)	27.57	309.50
29.25					

TALBOTMILLSDAM.rep				
Min Ch El (ft)	90.40	Shear (lb/sq ft)	0.02	0.04
0.02				
Alpha	1.06	Stream Power (lb/ft s)	0.01	0.07
0.01				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

CROSS SECTION OUTPUT Profile #01JUN2009 1200

E.G. Elev (ft)	93.99	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.24	wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	92.75	Reach Len. (ft)		
Crit w.s. (ft)	92.85	Flow Area (sq ft)	4.71	664.55
5.04				
E.G. slope (ft/ft)	0.011848	Area (sq ft)	4.71	664.55
5.04				
Q Total (cfs)	6000.00	Flow (cfs)	17.79	5963.06
19.15				
Top width (ft)	319.51	Top width (ft)	4.84	309.50
5.18				
Vel Total (ft/s)	8.90	Avg. Vel. (ft/s)	3.78	8.97
3.80				
Max Chl Dpth (ft)	2.35	Hydr. Depth (ft)	0.97	2.15
0.97				
Conv. Total (cfs)	55122.4	Conv. (cfs)	163.4	54783.0
176.0				
Length wtd. (ft)		wetted Per. (ft)	5.21	309.50
5.53				
Min Ch El (ft)	90.40	Shear (lb/sq ft)	0.67	1.59
0.67				
Alpha	1.01	Stream Power (lb/ft s)	2.52	14.25
2.56				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

CROSS SECTION OUTPUT Profile #01JUN2009 1600

E.G. Elev (ft)	93.99	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.20	wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	92.79	Reach Len. (ft)		
Crit w.s. (ft)	92.85	Flow Area (sq ft)	4.90	676.72
5.25				
E.G. slope (ft/ft)	0.011149	Area (sq ft)	4.90	676.72
5.25				
Q Total (cfs)	6000.00	Flow (cfs)	18.20	5962.20
19.60				
Top width (ft)	319.71	Top width (ft)	4.93	309.50

TALBOTMILLSDAM.rep

5.28				
Vel Total (ft/s)	8.74	Avg. Vel. (ft/s)	3.71	8.81
3.74				
Max Chl Dpth (ft)	2.39	Hydr. Depth (ft)	0.99	2.19
0.99				
Conv. Total (cfs)	56823.6	Conv. (cfs)	172.4	56465.6
185.6				
Length Wtd. (ft)		Wetted Per. (ft)	5.32	309.50
5.64				
Min Ch El (ft)	90.40	Shear (lb/sq ft)	0.64	1.52
0.65				
Alpha	1.01	Stream Power (lb/ft s)	2.38	13.41
2.42				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

CROSS SECTION OUTPUT Profile #02JUN2009 1200

E.G. Elev (ft)	3099.20	Element	Left OB	Channel
Right OB				
Vel Head (ft)	3008.61	wt. n-Val.		0.030
w.s. Elev (ft)	90.59	Reach Len. (ft)		
Crit w.s. (ft)	92.85	Flow Area (sq ft)		13.63
E.G. Slope (ft/ft)	1851.720000	Area (sq ft)		13.63
Q Total (cfs)	6000.00	Flow (cfs)		6000.00
Top width (ft)	145.24	Top width (ft)		145.24
Vel Total (ft/s)	440.18	Avg. Vel. (ft/s)		440.18
Max Chl Dpth (ft)	0.19	Hydr. Depth (ft)		0.09
Conv. Total (cfs)	139.4	Conv. (cfs)		139.4
Length Wtd. (ft)		Wetted Per. (ft)		145.24
Min Ch El (ft)	90.40	Shear (lb/sq ft)		10849.64
Alpha	1.00	Stream Power (lb/ft s)		4775748.00
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

STORAGE AREA: TALBOT MILL  
Volume Method : Rating Curve

Elevation	Volume
98.4	0
110	110

## SUMMARY OF MANNING'S N VALUES

River: CONCORD

Reach	River Sta.	n1	n2	n3
TALBOT MILL	14045	.04	.03	.04
TALBOT MILL	13050	.04	.03	.04
TALBOT MILL	11670	.04	.03	.04
TALBOT MILL	10190	.03	.02	.03
TALBOT MILL	10185	Inl Struct		
TALBOT MILL	10140	.04	.025	.04
TALBOT MILL	9600	.04	.03	.04
TALBOT MILL	9050	.04	.03	.04
TALBOT MILL	7000	.04	.03	.04
TALBOT MILL	4750	.04	.03	.04
TALBOT MILL	2050	.04	.03	.04

## SUMMARY OF REACH LENGTHS

River: CONCORD

Reach	River Sta.	Left	Channel	Right
TALBOT MILL	14045	995	995	995
TALBOT MILL	13050	1380	1380	1380
TALBOT MILL	11670	1490	1490	1490
TALBOT MILL	10190	50	50	50
TALBOT MILL	10185	Inl Struct		
TALBOT MILL	10140	540	540	540
TALBOT MILL	9600	550	550	550
TALBOT MILL	9050	2050	2050	2050
TALBOT MILL	7000	2250	2250	2250
TALBOT MILL	4750	2700	2700	2700
TALBOT MILL	2050	2050	2050	2050

## SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: CONCORD

Reach	River Sta.	Contr.	Expan.
TALBOT MILL	14045	.1	.3
TALBOT MILL	13050	.1	.3
TALBOT MILL	11670	.1	.3
TALBOT MILL	10190	.1	.3
TALBOT MILL	10185	Inl Struct	
TALBOT MILL	10140	.1	.3
TALBOT MILL	9600	.1	.3
TALBOT MILL	9050	.1	.3
TALBOT MILL	7000	.1	.3
TALBOT MILL	4750	.1	.3
TALBOT MILL	2050	.1	.3

TALBOTMILLSDAM.rep

Profile Output Table - Standard Table 1

Reach Crit W.S. # Ch1	River Sta E.G. Elev	Profile E.G. Slope	Vel Chnl	Q Total Flow Area	Min Ch El Top width	W.S. Elev	Elev Froude
(ft)	(ft)	(ft/ft)	(ft/s)	(cfs) (sq ft)	(ft) (ft)	(ft)	(ft)
TALBOT MILL	14045	Max WS		5700.00	101.40	116.01	
0.17	116.19	0.000183	3.43	1662.79	148.08		
TALBOT MILL	14045	01JUN2009	1200	5700.00	101.40	115.24	
0.19	115.45	0.000223	3.66	1558.45	132.55		
TALBOT MILL	14045	01JUN2009	1600	5700.00	101.40	115.10	
0.19	115.31	0.000231	3.70	1539.67	132.19		
TALBOT MILL	14045	02JUN2009	1200	5700.00	101.40	115.85	
0.18	116.04	0.000191	3.47	1640.58	137.58		
TALBOT MILL	13050	Max WS		5399.24	108.40	115.79	
0.20	115.93	0.000294	3.09	1768.17	292.38		
TALBOT MILL	13050	01JUN2009	1200	5287.46	108.40	114.88	
0.24	115.07	0.000439	3.45	1531.05	239.99		
TALBOT MILL	13050	01JUN2009	1600	5798.59	108.40	114.65	
0.28	114.89	0.000596	3.93	1475.39	239.98		
TALBOT MILL	13050	02JUN2009	1200	5699.31	108.40	111.32	
0.88	112.42	0.007445	8.41	677.30	239.83		
TALBOT MILL	11670	Max WS		4868.69	98.40	115.70	
0.08	115.75	0.000038	1.76	2778.01	219.60		
TALBOT MILL	11670	01JUN2009	1200	4673.42	98.40	114.63	
0.09	114.68	0.000045	1.83	2560.67	189.38		
TALBOT MILL	11670	01JUN2009	1600	5978.56	98.40	114.32	
0.12	114.41	0.000078	2.39	2502.30	188.27		
TALBOT MILL	11670	02JUN2009	1200	5701.83	98.40	106.29	
0.34	106.70	0.000844	5.16	1106.07	159.40		
TALBOT MILL	10190	Max WS		4295.15	98.50	115.70	
101.26	115.74	0.000012	1.52	2902.15	291.09		
0.06							

TALBOTMILLSDAM.rep									
TALBOT MILL	10190	01JUN2009	1200	4118.42	98.50	114.56			
101.19	114.60	0.000014		2634.25	164.00				
0.07				1.56					
TALBOT MILL	10190	01JUN2009	1600	6152.10	98.50	114.23			
102.01	114.32	0.000033		2580.05	164.00				
0.11									
TALBOT MILL	10190	02JUN2009	1200	5706.61	98.50	105.38			
101.84	105.78	0.000394		1128.99	164.00				
0.34									

TALBOT MILL 10185 Inl struct

TALBOT MILL	10140	Max WS		4295.15	99.40	115.53			
101.14	115.67	0.000079		1505.14	188.95				
0.14				3.05					
TALBOT MILL	10140	01JUN2009	1200	4118.42	99.40	109.38			
109.79		0.000455		809.75	98.39				
0.31									
TALBOT MILL	10140	01JUN2009	1600	6152.10	99.40	108.41			
109.56		0.001511		716.30	94.74				
0.55									
TALBOT MILL	10140	02JUN2009	1200	5706.61	99.40	99.48			
105.38	2536863.00	3370533.000000	12781.53	0.45	11.14				
11249.25									

TALBOT MILL	9600	Max WS		4037.01	90.80	115.59			
101.03	115.60	0.000005		5164.93	322.58				
0.03				0.82					
TALBOT MILL	9600	01JUN2009	1200	4150.05	90.80	109.47			
109.49		0.000014		3574.69	234.01				
0.05									
TALBOT MILL	9600	01JUN2009	1600	6149.98	90.80	108.63			
108.68		0.000037		3381.02	227.71				
0.08									
TALBOT MILL	9600	02JUN2009	1200	5716.99	90.80	90.96			
94.62	149381.60	113548.300000	3100.70	1.84	23.02				
1930.92									

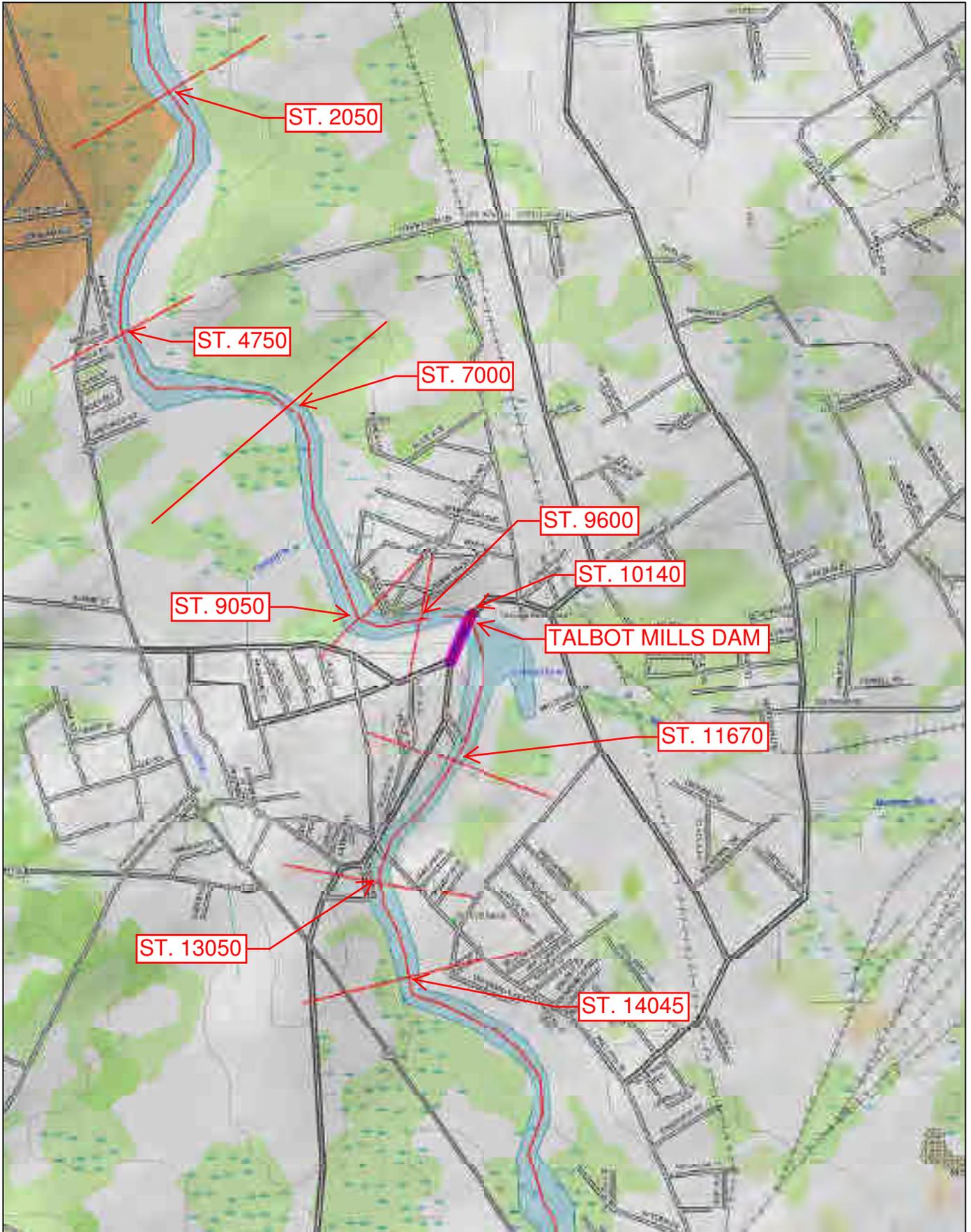
TALBOT MILL	9050	Max WS		4196.39	94.00	109.42			
101.08	109.46	0.000037		2594.23	255.30				
0.08				1.68					
TALBOT MILL	9050	01JUN2009	1200	4196.39	94.00	109.42			
109.46		0.000037		2594.23	255.30				
0.08									
TALBOT MILL	9050	01JUN2009	1600	6146.54	94.00	108.54			
108.64		0.000096		2384.94	221.01				
0.12									
TALBOT MILL	9050	02JUN2009	1200	5732.50	94.00	94.02			
97.40	68336.79	409867.800000	2096.39	2.73	160.84				
2833.38									

TALBOTMILLSDAM.rep									
TALBOT MILL	7000		Max WS		5045.99	94.00		109.33	
0.06	109.35		0.000019	1.26	6547.25	1622.18			
TALBOT MILL	7000		01JUN2009 1200		5045.99	94.00		109.33	
0.06	109.35		0.000019	1.26	6547.25	1622.18			
TALBOT MILL	7000		01JUN2009 1600		6088.41	94.00		108.45	
0.08	108.49		0.000041	1.77	5166.72	1490.91			
TALBOT MILL	7000		02JUN2009 1200		4324.75	94.00		102.20	
0.16	102.30		0.000177	2.56	1687.73	209.88			
TALBOT MILL	4750		Max WS		6162.92	91.00		109.22	
0.06	109.25		0.000021	1.44	4505.14	449.33			
TALBOT MILL	4750		01JUN2009 1200		6162.92	91.00		109.22	
0.06	109.25		0.000021	1.44	4505.14	449.33			
TALBOT MILL	4750		01JUN2009 1600		6017.18	91.00		108.38	
0.06	108.42		0.000023	1.49	4158.84	382.02			
TALBOT MILL	4750		02JUN2009 1200		2886.36	91.00		91.13	
308.35	92.85	3185.53	3102.387000	446.41	6.47	99.34			
TALBOT MILL	2050		Max WS		6000.00	90.40		101.10	
0.10	92.85	101.14	0.000056	1.78	3521.42	362.45			
TALBOT MILL	2050		01JUN2009 1200		6000.00	90.40		92.75	
1.08	92.85	93.99	0.011848	8.97	674.30	319.51			
TALBOT MILL	2050		01JUN2009 1600		6000.00	90.40		92.79	
1.05	92.85	93.99	0.011149	8.81	686.87	319.71			
TALBOT MILL	2050		02JUN2009 1200		6000.00	90.40		90.59	
253.21	92.85	3099.20	1851.720000	440.18	13.63	145.24			

Profile Output Table - Inline Structure

Reach Weir	Q Gates	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Q Total (cfs)	Q
TALBOT MILL		10185	Max WS	115.69	115.66	4295.15	
4295.15							
TALBOT MILL		10185	01JUN2009 1200	114.60	114.56	4118.42	
4118.42							
TALBOT MILL		10185	01JUN2009 1600	109.58	109.40	6152.10	
6152.10							
TALBOT MILL		10185	02JUN2009 1200	105.78	105.38	5706.61	

TALBOTMILLSDAM.rep

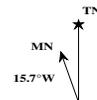
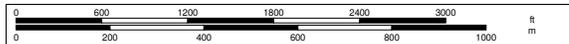


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 PROJECT: TALBOT MILLS DAM  
 GCI#2092945

Scale 1 : 16,000

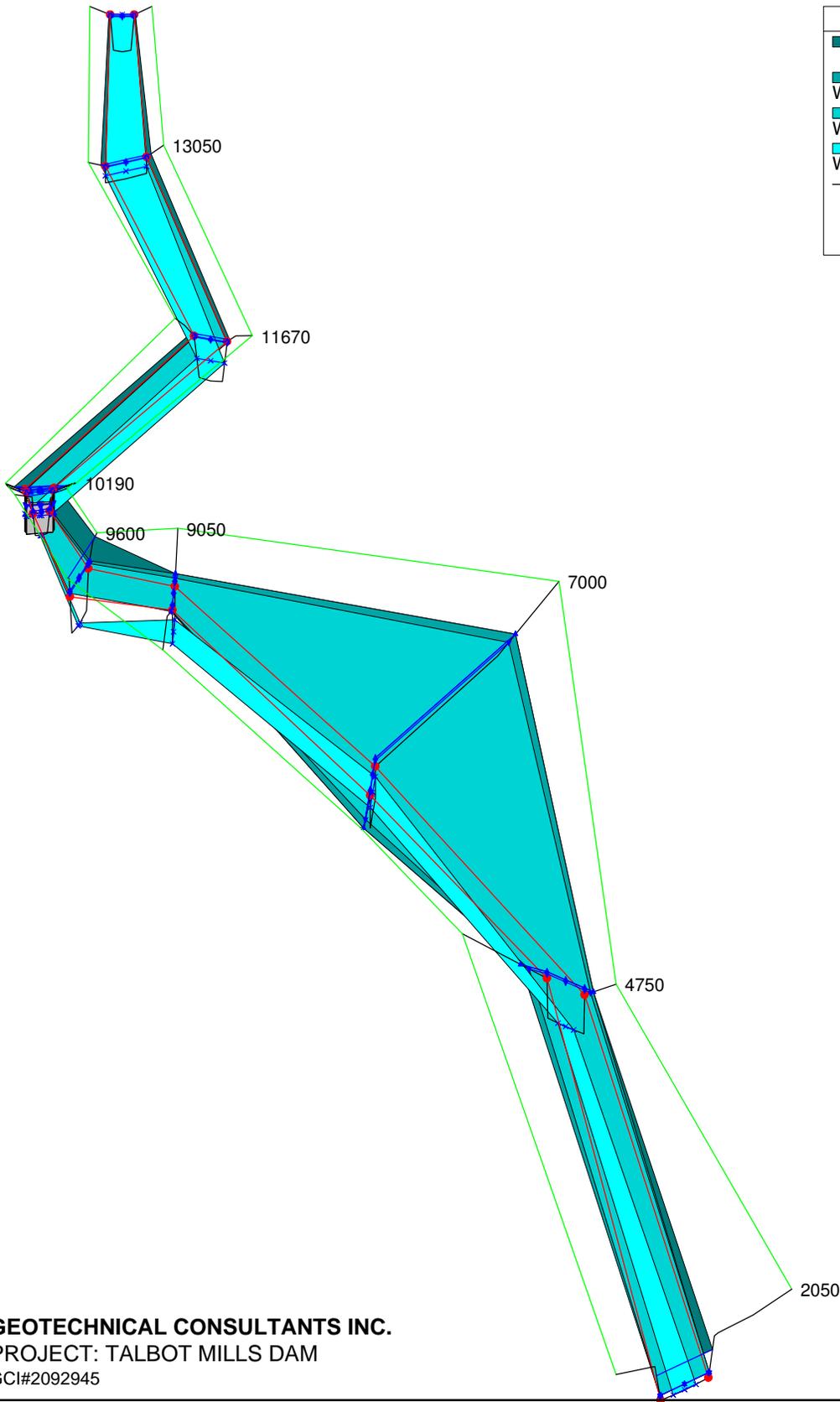
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TALBOT MILLS DAM ORTODIMENSIONAL VIEW SIMULATION

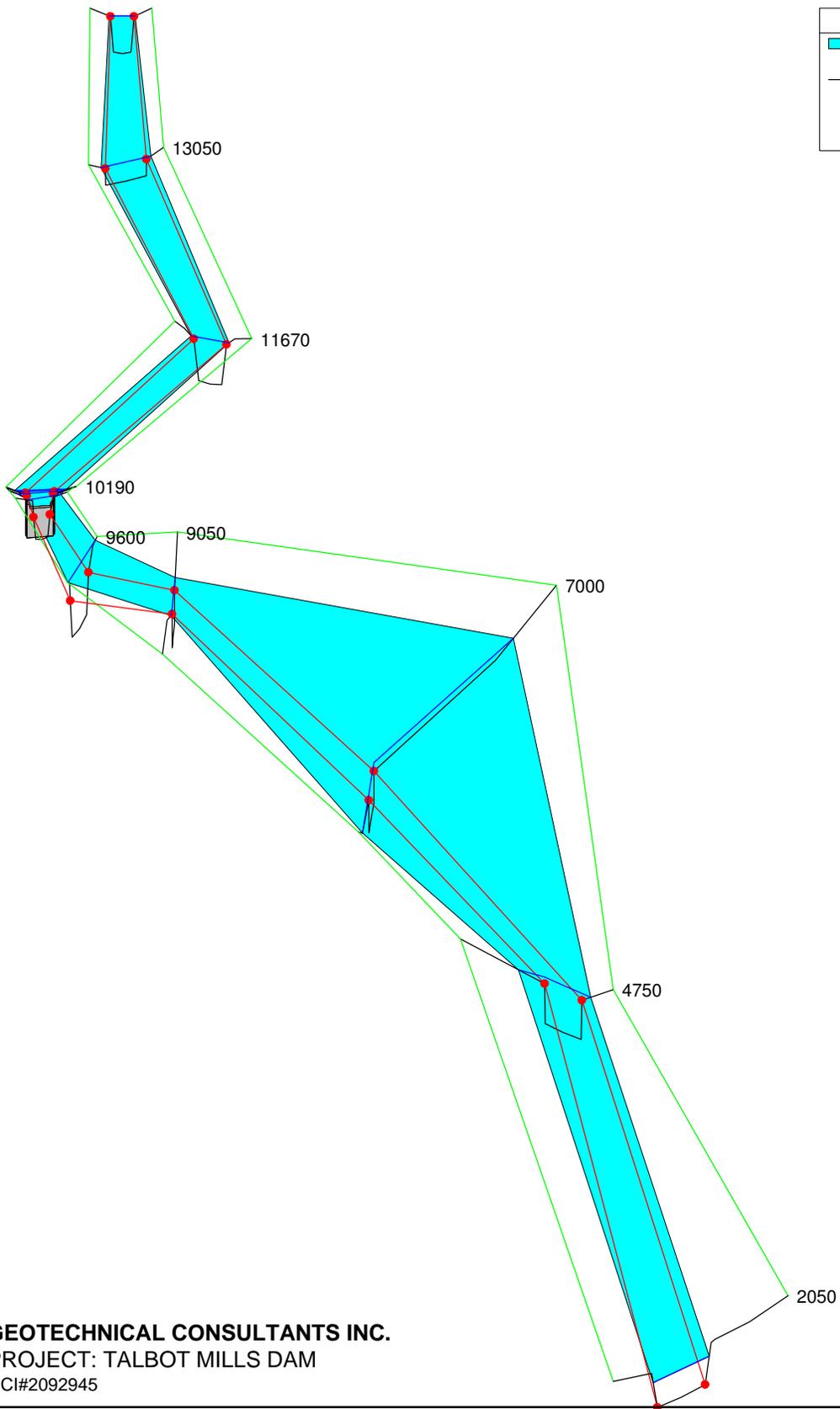
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	WS 01JUN2009 1200
	WS 01JUN2009 1600
	WS 02JUN2009 1200
	Bank Sta



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PROJECT: TALBOT MILLS DAM  
GCI#2092945

TALBOT MILLS DAM ORTODIMENSIONAL VIEW SIMULATION

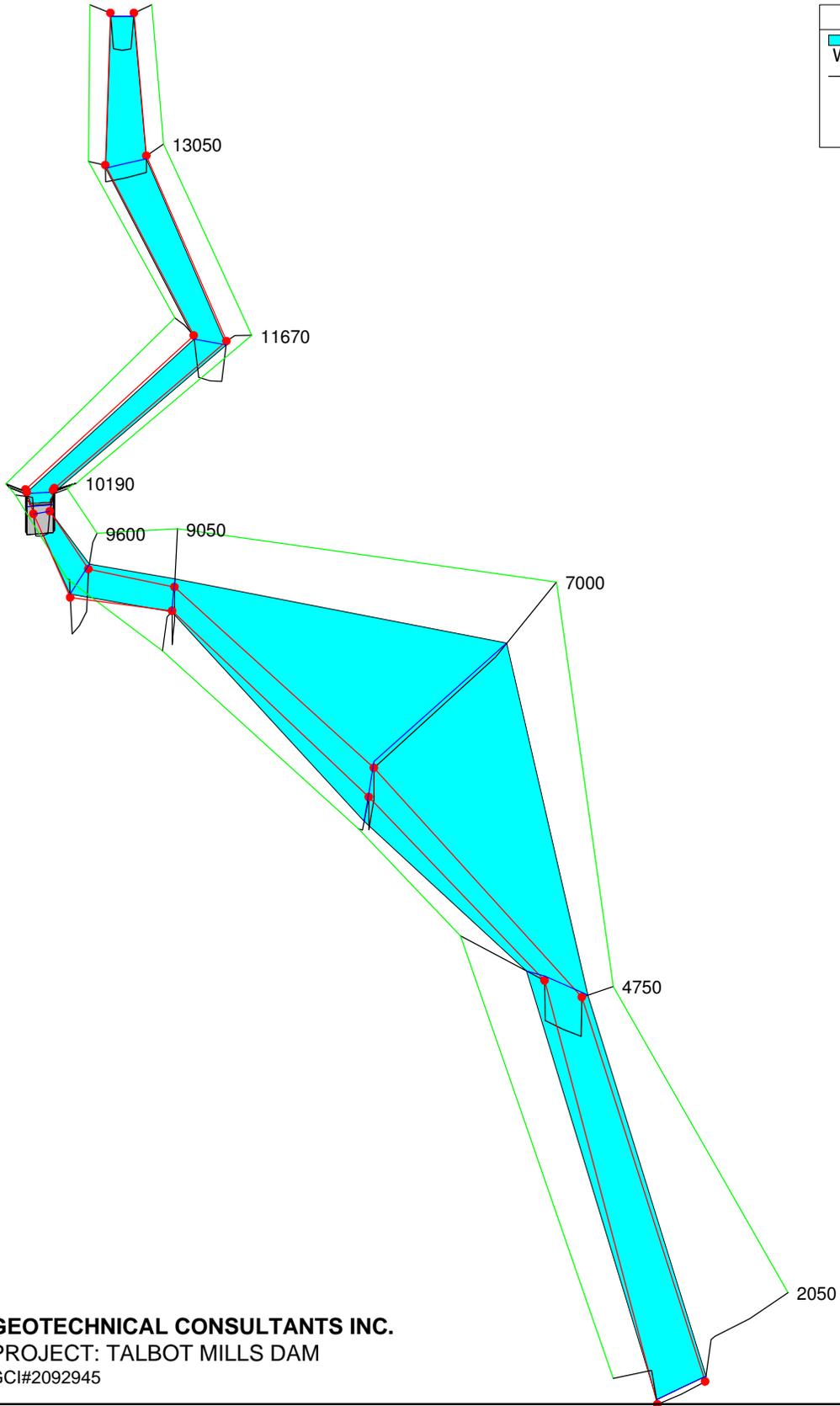
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	WS Max WS
	Bank Sta



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GCI#2092945

TALBOT MILLS DAM ORTODIMENSIONAL VIEW SIMULATION

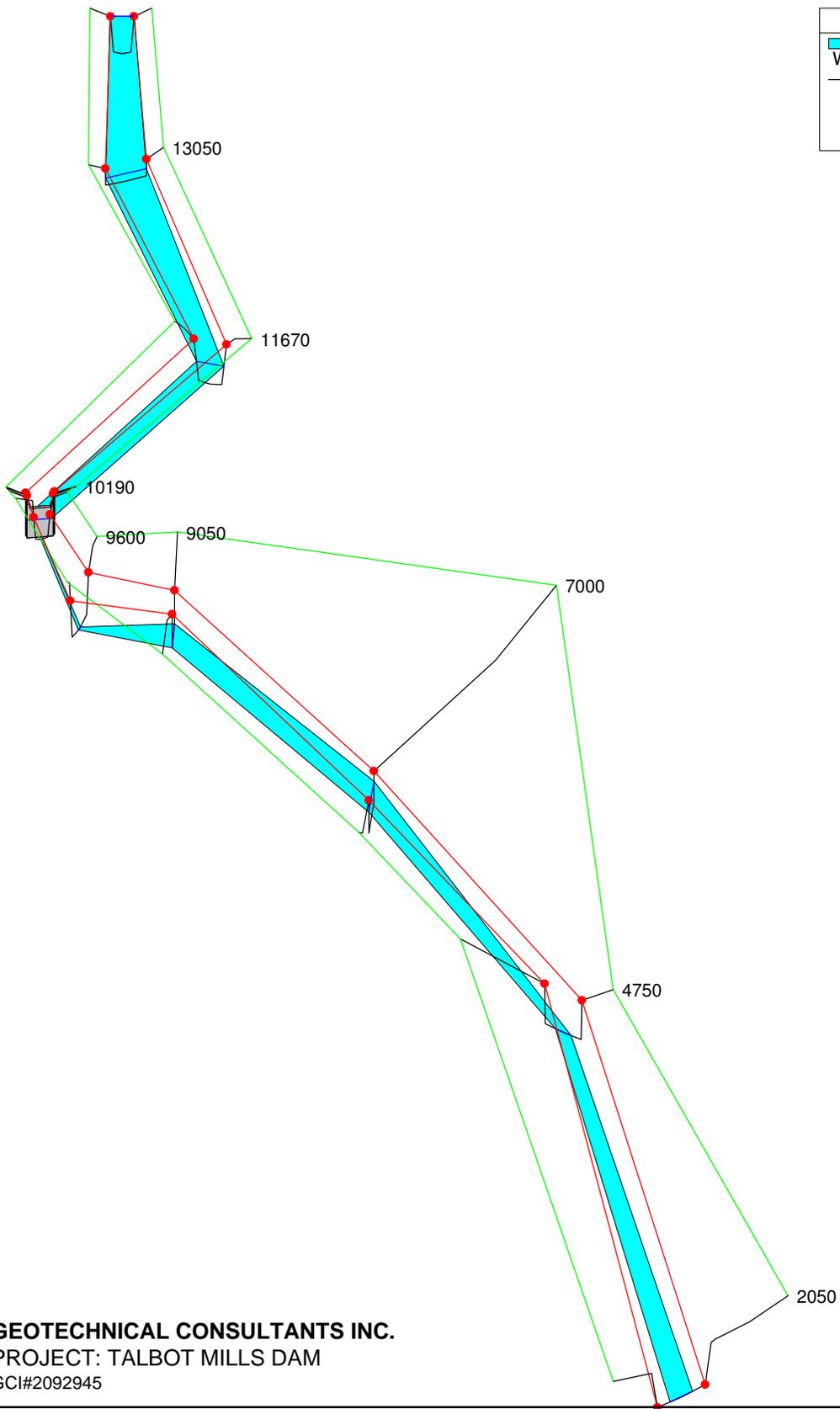
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	Ground
	Bank Sta



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GCI#2092945

TALBOT MILLS DAM ORTODIMENSIONAL VIEW SIMULATION

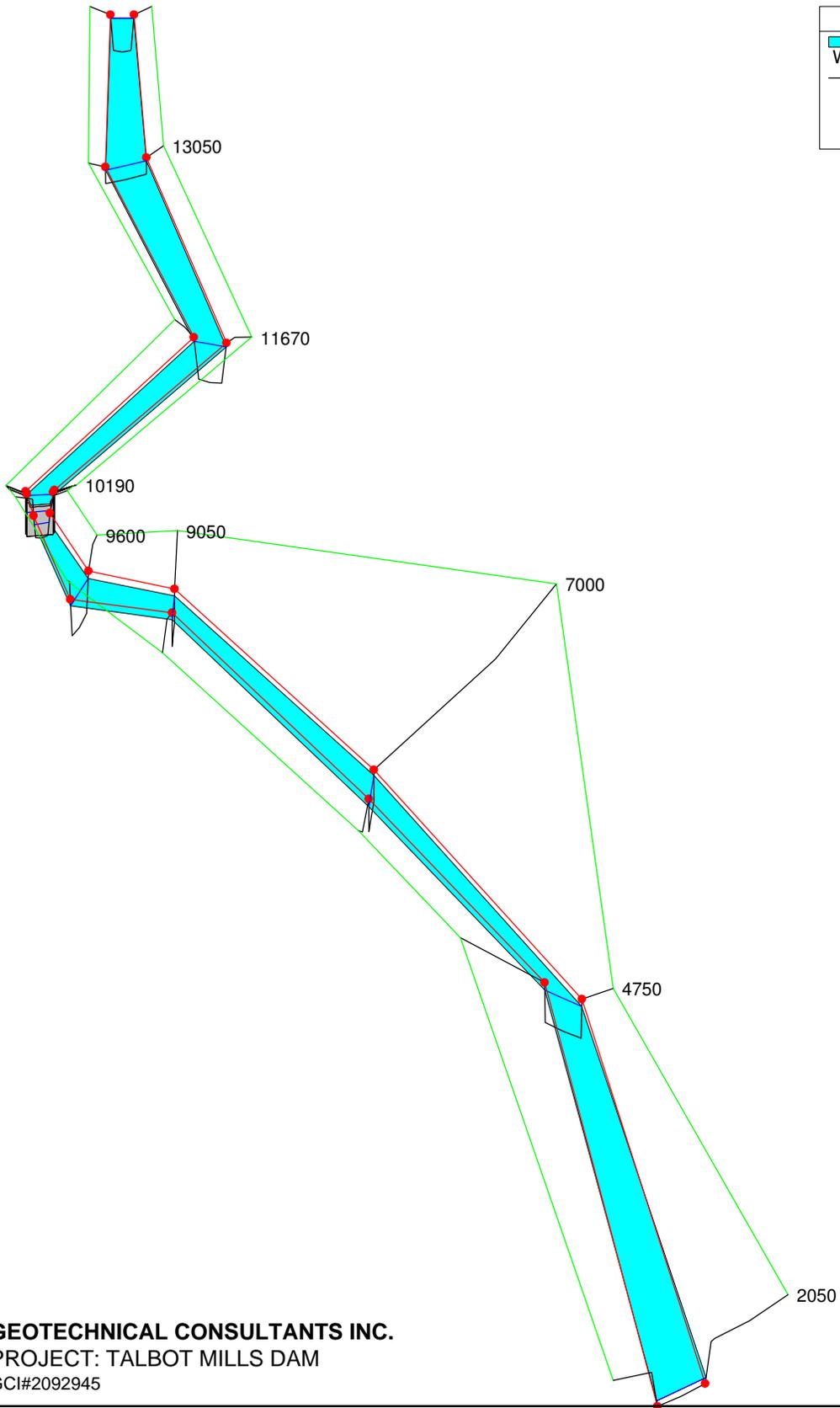
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	WS 02JUN2009 1200
	Ground
	Bank Sta



**GEOTECHNICAL CONSULTANTS INC.**  
PROJECT: TALBOT MILLS DAM  
GCI#2092945

TALBOT MILLS DAM ORTODIMENSIONAL VIEW SIMULATION

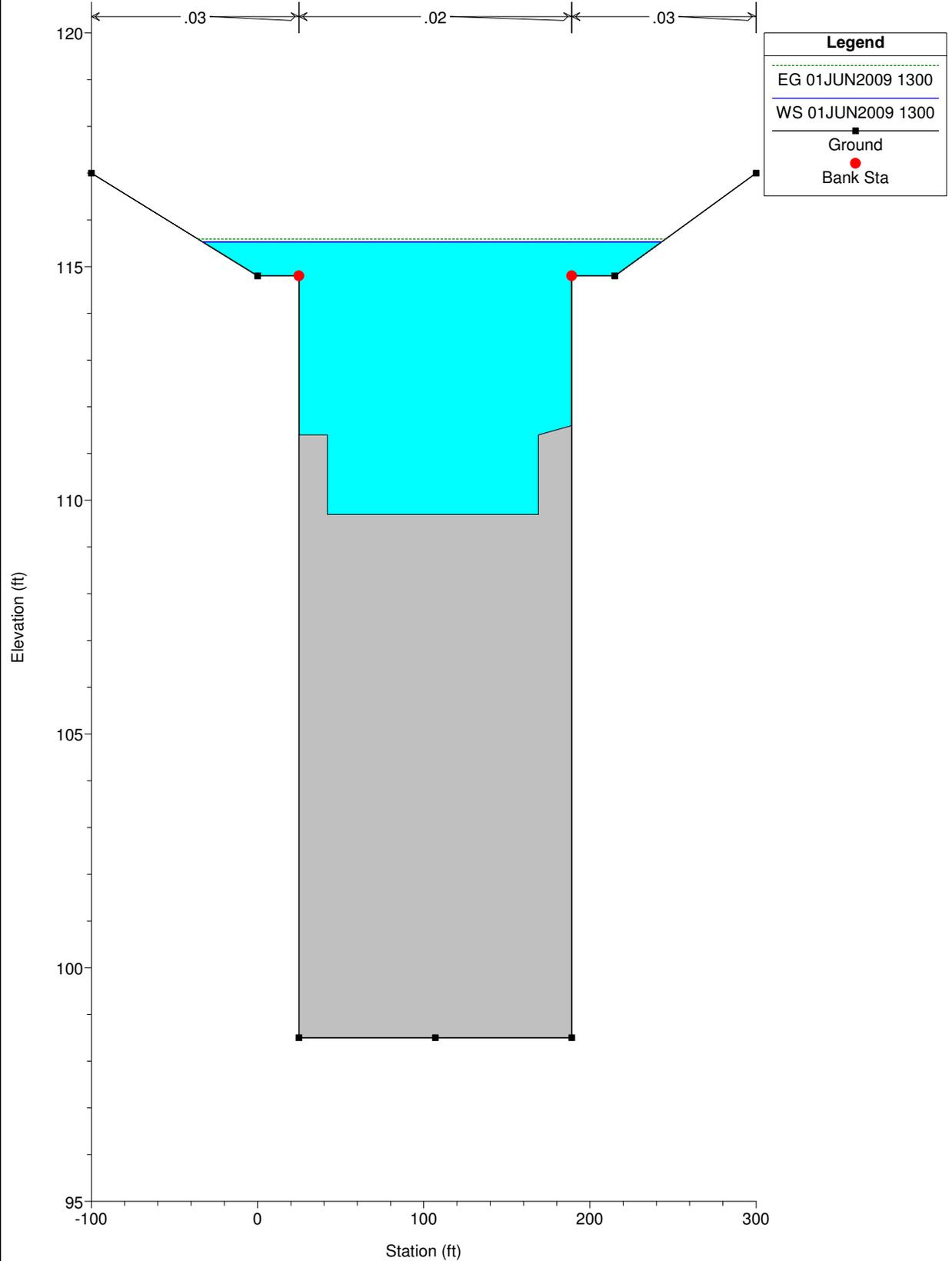
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	Ground
	Bank Sta



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PROJECT: TALBOT MILLS DAM  
GCI#2092945

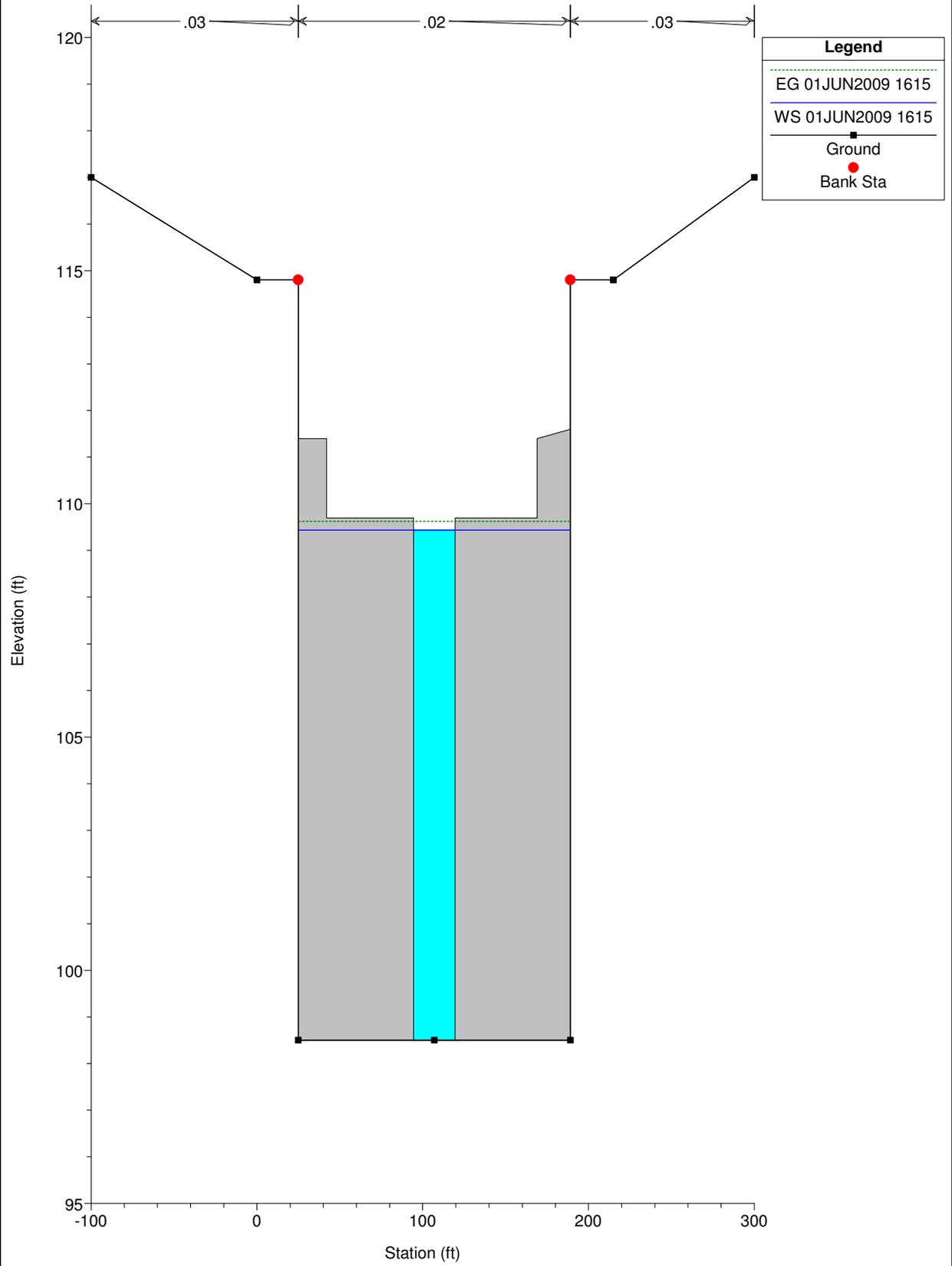
# TALBOT MILLS DAM SECTION

REGULATORY FLOOD - NO BREACH



# TALBOT MILLS DAM SECTION

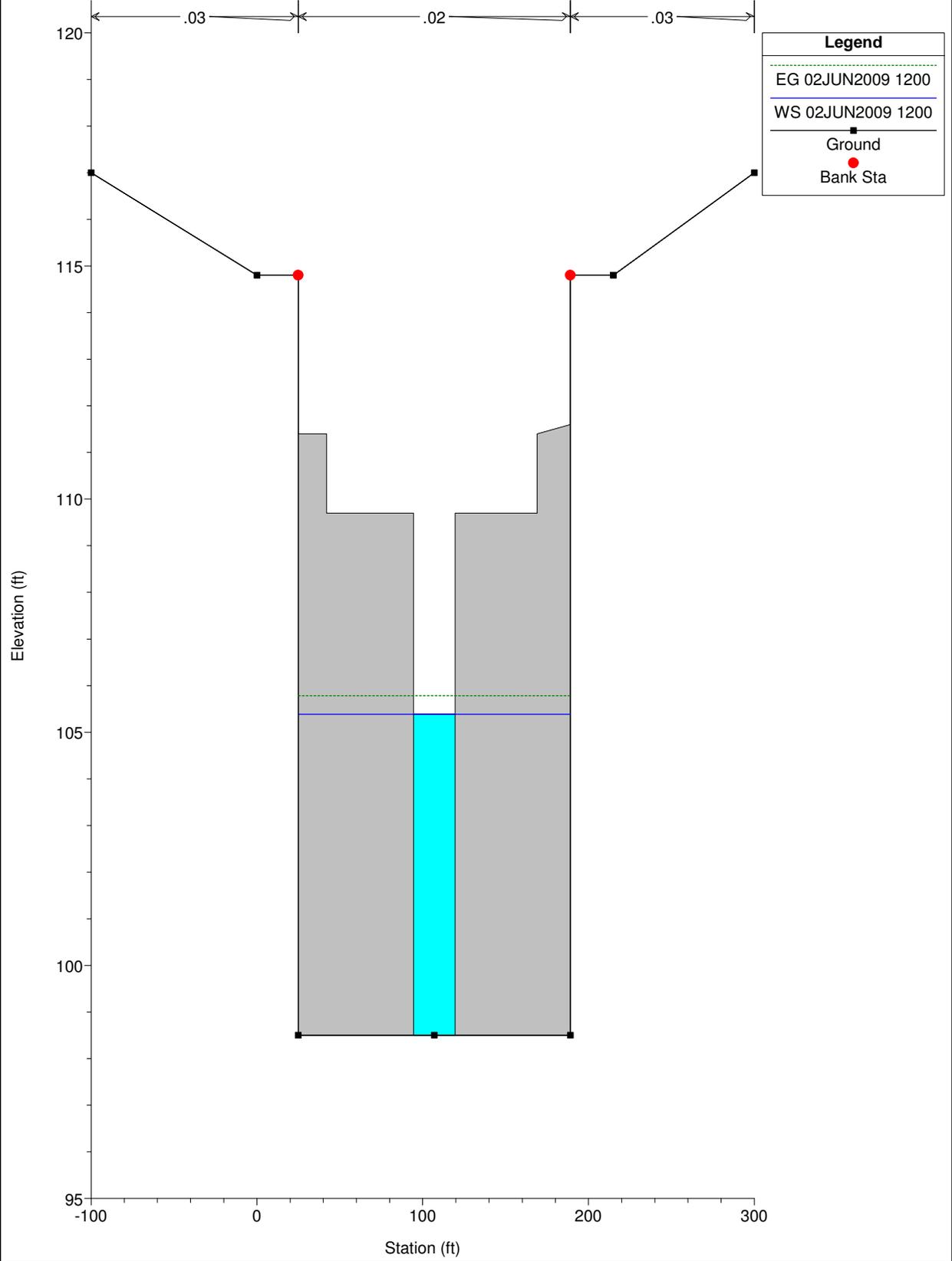
REGULATORY FLOOD - W/ BREACH

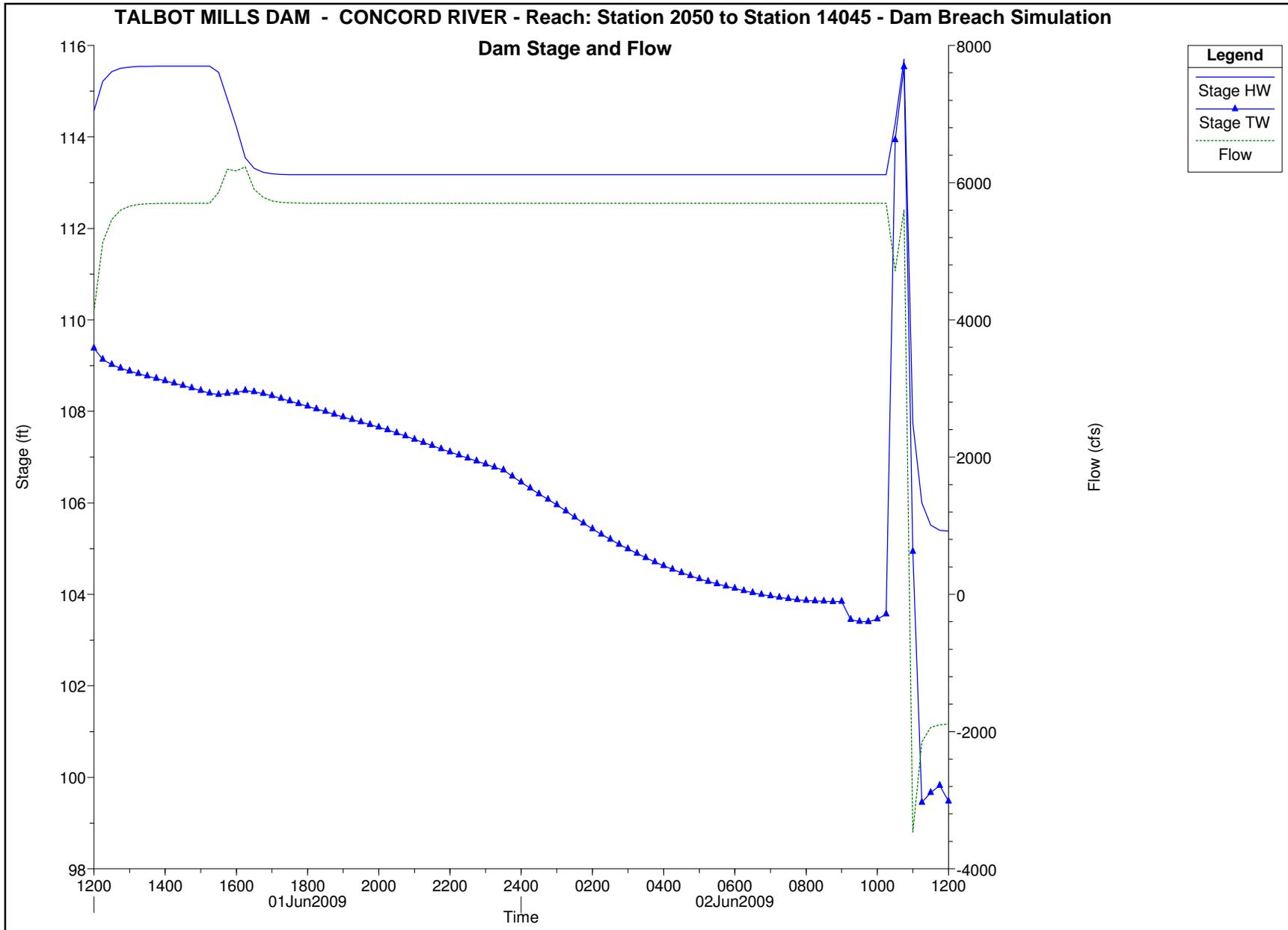


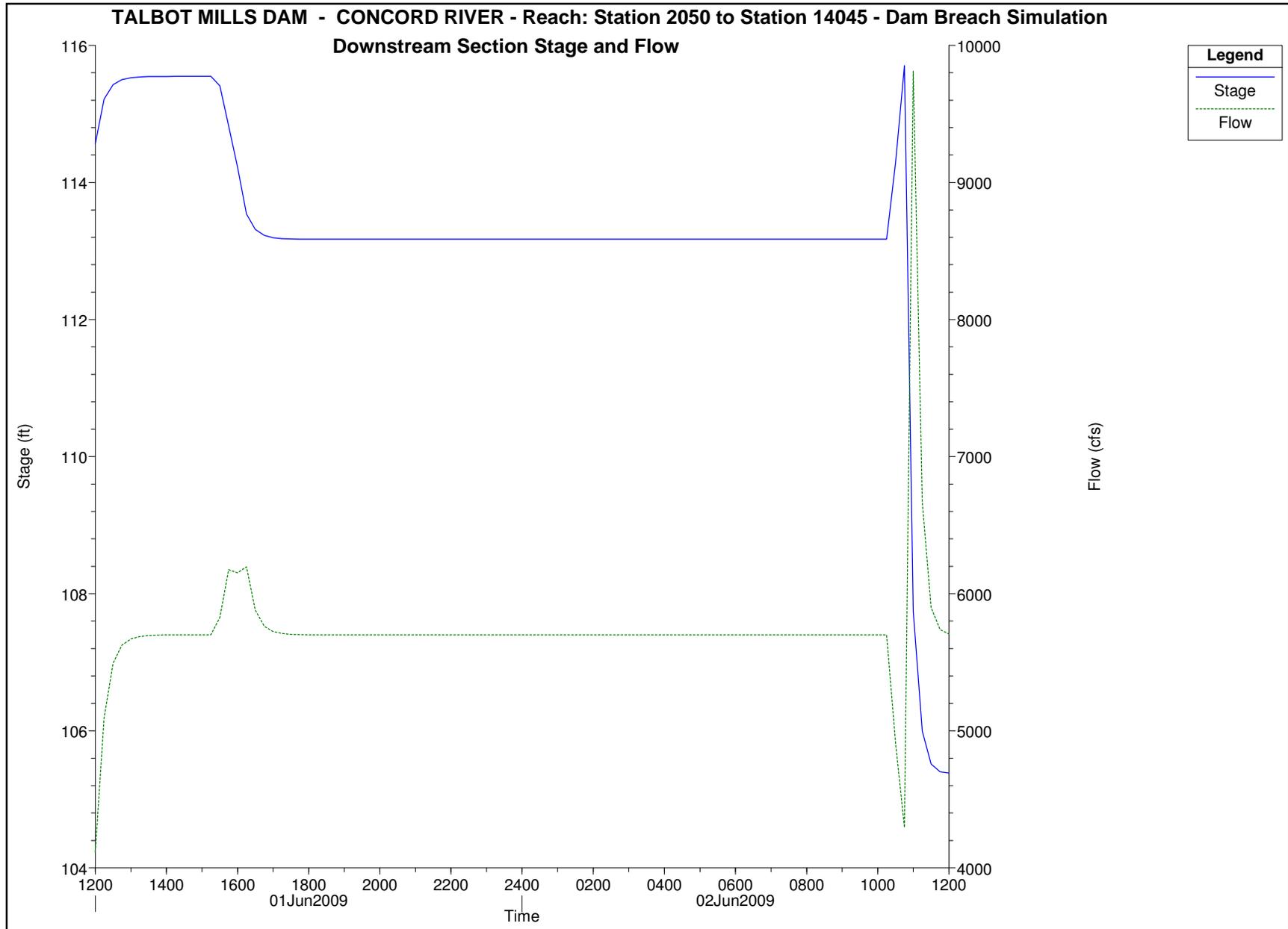


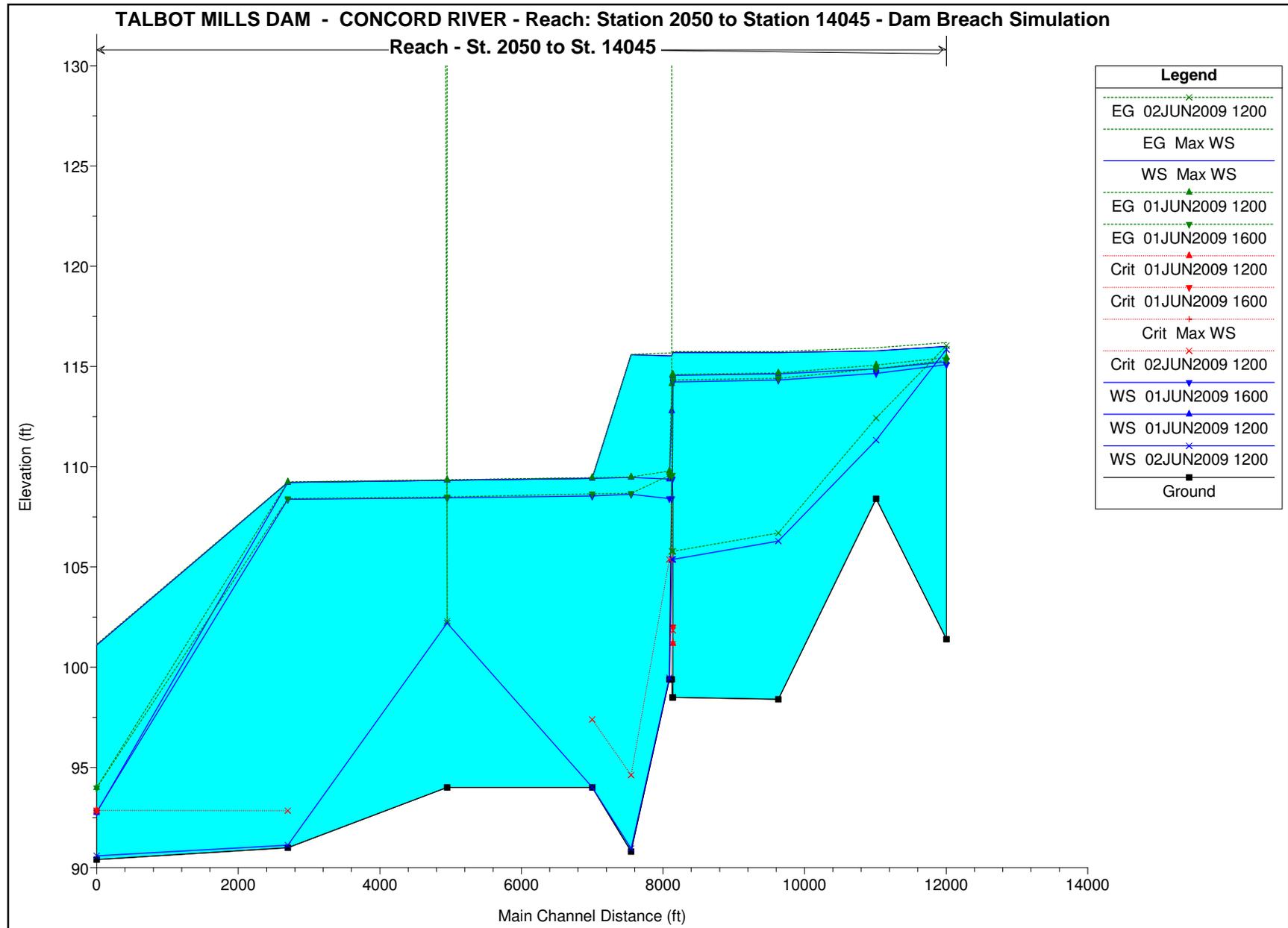
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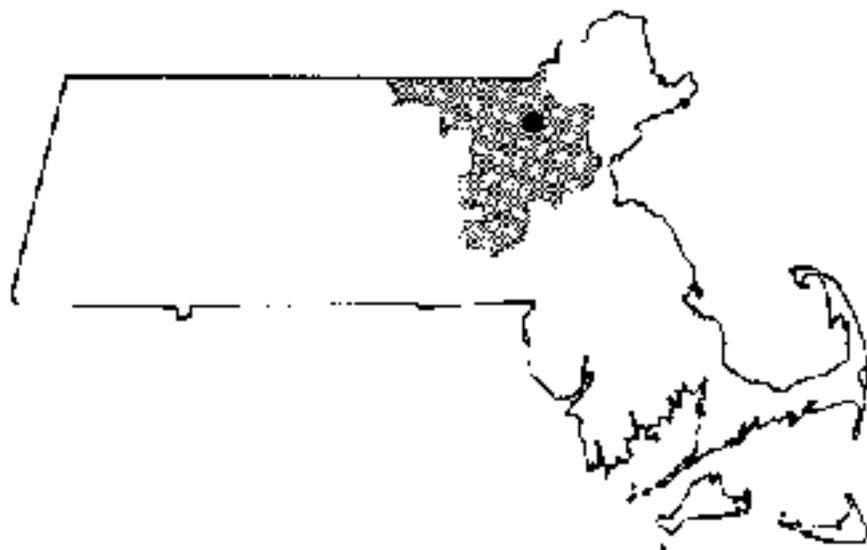




# FLOOD INSURANCE STUDY



TOWN OF  
BILLERICA,  
MASSACHUSETTS  
MIDDLESEX COUNTY



FEBRUARY 5, 1985



Federal Emergency Management Agency

COMMUNITY NUMBER - 250183

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FLOOD INSURANCE STUDY  
TOWN OF BILLERICA, MASSACHUSETTS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Billerica, Middlesex County, Massachusetts, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1972. This study will allow Billerica to continue participation in the regular program of flood insurance by the Federal Emergency Management Agency (FEMA) with the most current data. Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these federally supported studies are based. These criteria take precedence over the minimum federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.2(d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for the determination and delineation of flood plains for this study were originally performed by Camp, Dresser and McKee, Inc. for the FEMA, under Contract No. H-3851. This work was completed in January 1978 and resulted in the publication of the Billerica Flood Insurance Study (Reference 1).

The hydrologic and hydraulic analyses for the determination and delineation of the Shawsheen River, Jones Brook, and Lubber Brook flood plains were performed by Schoenfeld Associates, Inc. for the FEMA, under Contract No. EMW-C-0280. The Shawsheen River was restudied to account for the flooding of the January 1979 event. Jones Brook was restudied because of channelization completed by the Town in the upper section of the study area. In addition, the flood plains and floodways for all streams studied in detail were delineated on photogrammetric maps obtained from the Town of Billerica (Reference 2). This work, which was completed in July 1983, covered all flooding sources affecting the Town of Billerica.

### 1.3 Coordination

Streams requiring a detailed study were identified at a meeting attended by representatives of the study contractor, the FEMA and the Town of Billerica on August 27, 1979.

During the course of the study, the following were contacted: the U.S. Army, Corps of Engineers (COE); the U.S. Geological Survey (USGS); the U.S. Soil Conservation Service (SCS); the Northern Middlesex Area Commission; the Bridge Design, Photogrammetric, and Waterways Sections of the Massachusetts Department of Public Works (MDPW); and the Director of Public Health and the Town Engineer of Billerica (Reference 1).

On July 26, 1984, the results of the study were reviewed at the final meeting attended by representatives of the study contractor, FEMA, and community officials. The study was acceptable to the community.

## 2.0 AREA STUDIED

### 2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Billerica, Middlesex County, Massachusetts. The area of study is shown on the Vicinity Map (Figure 1).

The limits of the detailed and approximate studies in Billerica were determined by the FEMA with community and study contractor consultation at the meeting in August 1979.

The streams studied by detailed and approximate methods are listed below.

<u>Study Stream</u>	<u>Downstream Limit/ Upstream Limit</u>	<u>Study Method</u>
Concord River	Lowell Corporate Limits/ Bedford Corporate Limits	Detailed
Shawsheen River	Tewksbury Corporate Limits/ Bedford Corporate Limits	Detailed
Jones Brook	Confluence with Shawsheen River/ Approximately 180 feet Upstream of Baldwin Road	Detailed
Jones Brook	Approximately 180 feet Upstream of Baldwin Road/ Vicinity of Meadow Lark Way	Approximate



<u>Study Stream</u>	<u>Downstream Limit/ Upstream Limit</u>	<u>Study Method</u>
Content Brook	Tewksbury Corporate Limits/ Confluence with Middlesex Canal	Detailed
Middlesex Canal	Confluence with Content Brook/ Pond Street	Detailed
Middlesex Canal	Pond Street/Iron Horse Park	Approximate
Lubber Brook	Tewksbury Corporate Limits/ Burlington Corporate Limits	Detailed
Webb Brook	Riverdale Road/Approximately 620 feet Upstream of Ravine Road	Approximate
Mill Brook	Confluence with Concord River/ Nutting Lake	Approximate
Nutting Lake	Entire Lake	Approximate
Winning Pond Tributary	Confluence with Concord River/ Winning Pond	
Winning Pond	Entire Pond	Approximate
Dolly Brook	Winning Pond/Approximately 4000 feet Upstream of Treble Cove Road	Approximate
Richardson Pond	Entire Pond	Approximate

Approximate methods of analyses were used to study those areas having a low development potential or a minimal flood hazard. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction for the next five years, through July 1988.

## 2.2 Community Description

The Town of Billerica is located in northern Middlesex County in northeastern Massachusetts 20 miles northwest of Boston. It is bordered by the City of Lowell and the Town of Tewksbury to the north, the Towns of Wilmington and Burlington to the east, the Town of Bedford to the south, and the Towns of Carlisle and Chelmsford to the west. The total land area is 25.56 square miles. According to the U.S. Census Bureau figures, the population has increased from 31,648 in 1970 to 36,719 in 1980 (Reference 3).

Billerica (first known as Shawsheen) was settled in 1637. In 1655, the town was incorporated as Billerikoyce (later, Billerikey). The town was primarily an agricultural village; apples, cherries, and strawberries were its major crops. The first saw and grist mill was built in 1660 by John Parker. In 1811, a woolen mill, the second of its kind in New England, began operations. The next important manufacturing enterprise, begun in 1830, was a leather-splitting mill. Other important industries which were established were sycamore (in 1836), cabinetmaking (in 1845), chemicals (in 1849), and glue (in 1867). The first library was built in 1772; the first post office was built in 1797. Billerica is now primarily a suburban residential community with some light industrial and manufacturing firms (Reference 1).

The town's topography is hilly with some flatland in the eastern and northeastern parts. Vegetative cover includes deciduous and coniferous trees in the hilly areas and scrub brush and wetland flora in the swampy areas and stream valleys (Reference 1).

The temperature for the Town of Billerica ranges from an average low of 24.9 degrees Fahrenheit (°F) in January to an average high of 70.7°F in July. The average annual precipitation is 42.8 inches (Reference 4).

The two major waterways in Billerica are the Concord and Shawsheen Rivers. The Concord River is formed by the confluence of the Assabet and Sudbury Rivers, approximately one mile northwest of the center of Concord. The river system is often referred to as the Sudbury-Assabet-Concord (S-A-C) river basin. The river flows sluggishly in a general northerly direction for approximately 16 miles and falls 62 feet over its course. Approximately 50 feet of the drop occurs at dams in the first mile of the river in Lowell. The total drainage area is approximately 406 square miles, of which 341 square miles are drained by the confluent rivers. The 11.3-mile reach of the Concord River from its confluence with the Assabet and Sudbury Rivers in Concord to North Billerica is controlled by the Talbot Mills Dam in North Billerica. The Concord River is of major significance to Billerica because it is the community's primary source of water (References 3 and 5).

The Shawsheen River begins near the Bedford-Lexington corporate limits at the confluence of Kilm Brook and an unnamed brook which drains Hanscom Air Force Base and flows northeasterly through Bedford, Billerica, Tewksbury, Andover, and North Andover, where it flows into the Merrimack River (Reference 6).

Jones Brook originates in Billerica and flows eastward into the Shawsheen River. Content Brook originates from Richardson Pond and flows eastward into the Shawsheen River in Tewksbury.

The Middlesex Canal, once used to move barges from Upper Mystic Lake in Winchester to the Concord River in Billerica, is now a fragmented series of channels with several sections no longer carrying water. The portion of the Middlesex Canal studied in detail in this Flood Insurance Study has become a tributary to Content Brook. Lubber Brook originates in Burlington and flows through Billerica and Wilmington where it joins the Ipswich River in the eastern part of Wilmington.

Although development within flood plain areas has occurred along the Concord and Shawsheen Rivers, it has generally consisted of the conversion of summer camps and cottages for year-round residence.

### 2.3 Principal Flood Problems

Each spring, low-lying areas along the Concord and Shawsheen Rivers are subjected to flooding caused by rains and snowmelt. Areas along the other streams studied are also subjected to local flooding because of inadequate protection afforded by existing culverts (Reference 1).

A review of the history of flooding in Billerica indicates that the main flood season for the Concord and Shawsheen Rivers is spring, when melting snows combine with spring rains. However, records for the area indicate that flooding can occur in any month when the variation in monthly precipitation increases more than 10 inches for the month, when the total precipitation for a single storm exceeds 4 inches in 36 hours, or when conditions prior to a storm are conducive to flooding (Reference 6).

There have been four major floods in the Concord River Basin in this century: 1936, 1955, 1968, and 1979. Two floods in 1886 and 1896 were recorded as equalling the magnitude of the 1936 flood.

The flood of March 1936 was the result of four distinct storms. The total precipitation between March 9 and March 22 for the Concord River watershed ranged from 6 to 8 inches. The snow cover in the watershed had a water content at the beginning of the period which averaged approximately 3 inches. The frozen ground and the warm temperatures which accompanied the rainfall combined to give the Concord River one of its greatest flood peaks (Reference 6).

The greatest flood occurring in the watershed was the result of Hurricane Diane on August 17, 1955. Previously, on August 12, another storm, Hurricane Connie, passed over the east coast and left the ground saturated. The Concord River watershed received an average of 2 to 3 inches during this period. Between August 17 and 20, the area received rainfall which

varied from approximately 7 inches in Lowell to more than 13 inches in the headwaters. Total rainfall averaged over 10 inches. The Concord River rose slowly but continuously to flood stage, beginning on August 19 and cresting on August 23. Damage in the area was relatively minor due to lack of development within the flood plain (Reference 6).

Another major storm occurred during March 1968, which is one of the wettest Marches on record. Most of the precipitation fell during two storms -- the first on March 12-13, the second on March 17-19. Snow cover in the Concord River watershed was above normal, with a water content up to 3 inches. Prior to the second storm, the snow had melted and saturated the wetlands surrounding the Concord River, producing the above normal streamflow. Combined with the unexpected heavy rainfall which began on March 17, severe flooding occurred. The peak flow at USGS gaging station in Lowell (01099500) actually exceeded that of the 1955 flood. However, at the Carlisle Road Bridge (State Route 225), which connects Bedford to Carlisle, the maximum flood level was 9 inches less than that experienced in 1955. In spite of this, flood damages were considerably higher due to the increased development in the flood plain (References 6 and 7).

The most recent flood occurred in January 1979. The month of January was an extremely wet one in eastern Massachusetts and the accumulated precipitation set a new record of over 10 inches (Reference 8). The culmination was the storm of January 24-25 when almost 4 inches of rain fell on the Concord River basin (Reference 9). Although the rainfall was not a record for a single event, it came at the worst possible time. The river and upstream reservoirs were already at very high stages as a result of three one-inch storms which occurred earlier in January when the ground was frozen. Most of the rain fell on Thursday, January 25. On Friday, January 26, the Concord River began to flood. The river continued to rise until it reached a peak of 9.5 feet above normal in Billerica in the early morning hours of Monday, January 29. It then began to recede slowly with a drop of approximately one foot measured on Tuesday afternoon (Reference 10).

The 1979 flood was the maximum recorded event on the Shawheen River, with a discharge of 1,000 cfs was recorded at the USGS gage near Wilmington (01100600). This discharge approximated a 50-year frequency event on the Shawheen River (Reference 11).

The storm of 1979 caused more damage than any previous storm, partly due to intensity and existing conditions but also due to increased development in flood plain and wetland areas. Billerica was especially hard-hit, where over 100 families were evacuated from their homes and over 30 roads were flooded (Reference 10).

The information below presents the relative flood heights at the Carlisle Road (State Route 225) bridge for the ten major floods in the Concord River basin, in order of magnitude.

Flood Heights on the Concord River (Reference 6)

Order No.	Date of Crest	Estimated Elevation at Carlisle Road Bridge**	Peak Discharge at Lowell (cfs)***
1	August 23, 1955	119.4	4,540
2	January 26, 1979*	119.3	3,400
3	March 20, 1936	119.2	6,000
4	March 27, 1968	118.7	4,900
5	July 25, 1938	118.1	3,790
6	September 15, 1954	117.5	3,340
7	September 24, 1938	117.3	3,210
8	March 24, 1948	117.3	3,200
9	January 30, 1955	117.2	3,120
10	April 18, 1936	117.0	2,970

\*Reference 11

\*\*The Carlisle Road Bridge is located one mile upstream of the Bedford/Billerica/Carlisle corporate limits.

\*\*\*The Lowell gage is located 9.75 miles downstream of the Bedford/Billerica/Carlisle corporate limits.

Velocities of water during a 100-year flood on the Concord River would be approximately 2.0 feet per second in the main channel and about 0.4 feet per second over the flood plain. For the Shawsheen River, velocities would be somewhat greater than 4 feet per second in the main channel and about 0.3 feet per second over the bank. During the 1936 and 1955 floods, it is estimated that velocities in the channel of the Concord River ranged up to 1.9 feet per second. Overbank velocities ranged up to 0.3 feet per second. These flood velocities are not considered hazardous (Reference 6).

The duration of flooding for most of the Concord River is generally sustained due to the large drainage area, shallow channel slopes, and wide meadow flood storage areas. Records indicate that the 1936 flood remained higher than elevation 118 at the Carlisle Road Bridge for more than eleven days. Hurricane Diane occurred on August 19 and 20, 1955, but the Concord River did not crest until late on August 22, with water levels remaining above elevation 118 for over three days. The Shawsheen River, on the other hand, rises fairly rapidly and crests within 36 to 48 hours after the time of maximum precipitation over the watershed (Reference 6).

There is no recorded flood information for Jones, Lubber and Content Brooks and the Middlesex Canal.

#### 2.4 Flood Protection Measures

There are no existing or proposed flood control structures in Billerica. A local protection project to the south in the Saxonville section of Framingham was recently constructed along the Sudbury River approximately 15 miles upstream of its confluence with the Assabet River. This project benefits mainly the Upper Sudbury watershed. Flood retention structures have also been constructed upstream on the Assabet River. Their effect on lowering Concord River flood elevations, however, is debatable (Reference 6).

In the past it has been proposed that an adjustable gate be installed at the Talbot Mills Dam in North Billerica. This would allow further management of the Sudbury and Concord Rivers during heavy flooding. Low flow augmentation techniques could also be used. Opponents of the gate argue that it would conflict with other water uses and would interfere with the normal flooding cycle which is essential to wildlife along the river. It has been suggested, however, that the gate be used only when abnormal elevations are expected and not for the normal flooding cycle (Reference 12).

Nonstructural flood protection measures include Section 7.0 of Billerica's zoning by-laws, which states that no building or structure intended for occupancy, either continuous or intermittent, can be erected or placed in the flood plain district unless a special permit is granted by the Board of Appeals. Section 7.1.1 requires that special permit requisites be approved by the Board of Health prior to submission to the building inspector. Section 7.3.1 lists four criteria which must be met prior to granting a special permit: sewage and drainage plans must be approved by the Board of Health; access to structures must be provided at an elevation high enough to insure that the structures can be maintained safely at all times; spaces contemplated for use must be elevated at least two feet above the expected water level during flood events and fill and foundations must be installed in a manner safe from erosion and undermining; and the use of the premises must not endanger the health and safety of the occupants thereof or of other land in the flood plain. Section 7.4.1 requires that no land be filled or paved except with the approval of the Board of Appeals (Reference 13).

Section 3.1 of the regulations of the Board of Health provides that no structure within the flood plain can be constructed, located, expanded, converted, subdivided, or altered. In addition, no encroachments, including fill, new construction, substantial improvements to existing structures, or other development, are permitted unless a variance is granted by a majority vote of the Board of Health (Reference 14).

Other nonstructural measures of flood protection are also being utilized to aid in the prevention of future flood damage. Chapter 131, Section 40 (310 CMR 10.00) of the General Laws of the Commonwealth of Massachusetts (most recently revised on April 1, 1983) is commonly referred to as the Wetlands Protection Act. The law gives the responsibility for issuing permits to remove, fill, dredge or alter wetlands to the local conservation commission. The commission has to determine if an area on which a permit is requested "is significant to public or private water supply, to the ground water supply, to flood control, to storm damage prevention, to prevention of pollution, to protection of land containing shellfish, or to the protection of fisheries." After a public hearing, the commission can impose such conditions as will contribute to the protection of these interests. The Department of Environmental Quality Engineering (DEQE) may also make a determination after a review of the commission's order. Conditions imposed by the DEQE supersede conditions imposed by the commission. Detailed rules and regulations concerning the administration of this act have been promulgated by the DEQE.

Section 40 now requires a conservation commission, if requested, to make a determination of whether a particular parcel of land is a wetland and governed by the Wetlands Protection Act. It also contains definitions of terms to aid this determination.

Chapter 131, Section 40A of the Acts of 1968, as amended by Chapter 782 of the Acts of 1972, gives the commissioner of the Department of Environmental Management the authority to protect inland wetlands and flood plains by establishing encroachment lines "for the purpose of preserving and promoting the public safety, private property, wildlife, fisheries, water resources, flood plain areas and agriculture." The commissioner may adopt orders regulating, restricting or prohibiting the altering or polluting of inland wetlands by designating lines with which no obstruction or encroachment would be permitted without prior approval. These restrictions require notifications to each land owner affected, public hearings, and approval by the town.

Section 40A was further amended by Chapter 818 by defining "inland wetlands" to include the definition of "freshwater wetlands" as set forth in Section 40 as "that portion of any bank which touches any inland waters or any freshwater wetland, and any freshwater wetland subject to flooding."

### 3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the

average during any 10, 50, 100, or 500 year period (recurrence intervals), have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10, 50, 100, and 500 year floods, have a 10, 2, 1 and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50 year period is about 40 percent (four in ten), and for any 90 year period, the risk increases to about 60 percent (six in ten). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be updated periodically to reflect future changes.

### 3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the community.

Because some of the watercourses studied in Billerica were ungaged, a method developed by the SCS for ungaged watersheds was used (References 15 and 16). This method is based on soil types, type of land cover, and surface roughness. The soil cover-land use complex is given a curve number from which storm runoff and peak flow can be determined. This procedure was used to develop flows on Gontent and Jones Brooks and Middlesex Canal.

Floodflows for Lubber Brook were determined using a regional method developed by the USGS which gives consideration to the size of the watershed and the slope of the main channel. (Reference 17).

Floodflow frequency analysis for the Shawsheen River was based on records (1963-1980) at the USGS gaging station (01100600) in Wilmington. The station is located on the right bank at the downstream side of the bridge on State Route 129, at the Billerica-Wilmington corporate limits. The Shawsheen River has a drainage area of 35.3 square miles at the gaging station. The frequency analysis was based on a fitted log-Pearson Type III distribution (Reference 18).

In order to determine flood discharges on the Concord River, it was necessary to determine and route flows on the Assabet and Sudbury Rivers, which unite to form the Concord River. Because the Assabet and Sudbury Rivers are gaged, a log-

Pearson Type III analysis (Reference 1) was made. The Assabet River gage (No. 01097000) has been operated by the USGS since 1941. It is approximately 15 miles upstream from Billerica in Maynard. The Sudbury River gage (No. 01097500) has been operated by the USGS since 1875; it is approximately 23 miles upstream from Billerica in Framingham Center. Hydrographs that were established at the headwaters of the Concord River were routed downstream with the calculated flows being increased because of the contributions from the additional drainage areas and being reduced because of the increase in available storage capacity along the banks of the river. The routed flows were further modified based on data from the USGS gage (No. 01099500) operated since 1936, located downstream from Billerica in Lowell, Massachusetts. Resultant flow data were used as discharges for the 10-, 50-, 100-, and 500-year floods (Reference 1).

A summary of drainage area-peak discharge relationships for each stream studied in detail is shown in Table 1.

Table 1 - Summary of Discharges

Flooding Source and Location	Drainage Area Sq. Mi.	Peak Discharges (cfs)			
		10 Yr.	50 Yr.	100 Yr.	500 Yr.
<b>CONCORD RIVER</b>					
At Downstream Corporate Limits	373	3,105	4,924	5,995	8,870
At Talbot Hill Dam	370	2,940	4,660	5,675	8,395
At U.S. Route 2 Bridge	367	2,885	4,577	5,575	8,245
<b>SHAWSHIEN RIVER</b>					
At State Road (SR 179)	36.5	1,115	1,825	2,200	3,285
Above Confluence with Jones Brook	39.0	1,040	1,710	2,050	3,070
At Boston Road (SR 9A)	31.2	1,020	1,650	1,985	2,960
At Bedford/Billerica Corporate Limits	27.7	1,000	1,500	1,800	2,660
<b>CONTENT BROOK</b>					
At Corporate Limits	5.5	205	370	455	585
At Gray Street	4.9	180	330	400	520
<b>MIDDLESEX CANAL</b>					
Just Upstream of Confluence with Content Brook	2.2	85	175	210	275

Table 1 - Summary of Discharges  
(Continued)

<u>Flooding Source and Location</u>	<u>Drainage Area Sq. Mi.</u>	<u>Peak Discharges (cfs)</u>			
		<u>10 Yr.</u>	<u>50 Yr.</u>	<u>100 Yr.</u>	<u>500 Yr.</u>
<b>JONES BROOK</b>					
At Confluence with Shawsheen River	1.7	215	380	450	540
At Golf Course Culvert	1.6	195	355	425	510
At Baldwin Road	1.3	160	290	345	415
<b>LUBBER BROOK</b>					
At Billerica/Wilmington Corporate Limits	1.3	63	106	129	200
At Billerica/Burlington Corporate Limits	0.7	47	80	98	153

### 3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sections studied in detail in Billerica were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the flood sources.

Water-surface elevations of floods of the selected recurrence intervals for all streams studied by detailed methods were computed using the DOE HEC-2 step-backwater computer program (Reference 19).

Cross sections for backwater analyses of the study streams were field surveyed and spaced at specific intervals along the river channel, so that hydraulic properties would be accurately modeled by the computer. Sections were interpolated between surveyed sections where necessary. These interpolated sections were prepared from survey data and data from topographic maps (Reference 2).

The below-water sections were obtained by field measurement. All bridges, dams, and culverts were field checked to obtain elevation data and structural geometry.

Locations of selected cross sections used in hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map.

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations of the streams and flood plain areas. They are as follows:

<u>Stream</u>	Manning's "n" Value	
	<u>Channel</u>	<u>Overbank</u>
Concord River	0.035 to 0.077	0.125
Shawsheen River	0.045	0.110
Content Brook	0.030 to 0.045	0.060 to 0.110
Middlesex Canal	0.030 to 0.045	0.060 to 0.110
Jones Brook	0.030 to 0.040	0.110
Lubber Brook	0.030 to 0.040	0.110

The acceptability of all assumed hydraulic factors, cross sections and hydraulic structure data for the Concord and Shawsheen Rivers was checked by computations that duplicated historic flood water profiles.

Water surface elevations of floods of the selected recurrence intervals were computed through use of the COE HEC-2 step-backwater computer program (Reference 19). Starting water surface elevations on the Concord River were developed from a rating curve for the Wessit River Company Dam in Lowell. Starting water surface elevations on the Shawsheen River and Content Brook were taken from the Tewksbury Flood Insurance Study (Reference 20). Starting water surface elevations on the Middlesex Canal were developed considering the canal a continuation of Content Brook. Starting water surface elevations on Jones Brook were developed using the slope-area method. Starting water surface elevations on Lubber Brook were taken from a rating curve developed for the dam just upstream of Shawsheen Road in Wilmington. Flood profiles were drawn showing computed water surface elevations for floods of the selected recurrence intervals. All elevations are referenced from the National Geodetic Vertical Datum of 1929 (NGVD), formerly referred to as the Sea Level Datum of 1929; elevation reference marks used in this study are shown on the maps.

Due to the meandering nature of the Shawsheen River, the distance between cross sections will not always agree between the map and the profile.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

#### 4.3 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

#### 4.1. Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FEMA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and the 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using photogrammetric maps at a scale of 1:4,800 with a contour interval of 2 feet (Reference 2). In cases where the 100- and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

For the streams studied by approximate methods, the boundaries of the 100-year flood were developed from normal depth calculations and the photogrammetric maps referenced above.

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map. Small areas within the flood boundaries may lie above the flood elevations, and therefore, may not be subject to flooding. Owing to limitations of the map scale and/or lack of detailed topographic data, such areas are not shown.

#### 4.2. Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood can be carried without substantial increases in flood heights. Minimum standards of the FEMA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as a minimum standard that can be adopted or that can be used as a basis for additional studies.

The floodways for this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 2).

Downstream portions of both the Concord and Shawsheen Rivers have floodway widths extending beyond the corporate limits. Also, a portion of Jones Brook is affected by backwater from its confluence with the Shawsheen River. This condition is footnoted in the Floodway Data Table (Table 2).

As shown on the Flood Boundary and Floodway Map (Exhibit 3), the floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water surface elevation of the 100-year flood more than 1.0 foot at any point. This allowable increase considers only the hydraulic response of the stream and its flood plain to any encroachment. The increase in the water surface elevation is a result of the 100-year flood discharge flowing through a smaller flood plain area. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

One aspect of floodway and flood plain encroachment is sometimes overlooked and more often neglected: the cumulative effect of encroachment on flood discharge magnitude. Generally, as encroachment occurs, temporary storage areas are lost, velocities increase, and the magnitude of the discharge increases. As floodwaters move downstream, that increase can become more significant. The combined effect of a narrower flood plain and greater discharge can, due to hydraulic effects alone, produce a flood stage that exceeds the anticipated 100-year flood.

The FEMA does not encourage the filling of the floodway fringe area. Local officials should be aware that even a 1-foot rise in the water-surface elevation can cause flooding in areas which would have received little or no flooding if such filling had not taken place. Careful consideration of the economic and human dislocation which will be caused by a rise in flood heights should be made before filling is allowed. Large quantities of fill in the fringe area could also disrupt the flood plain ecosystem, causing a major impact on local environmental resources.

FLOODING SOURCE		FLOODWAY				BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE	
					(FEET NGVD)	(FEET NGVD)	(FEET NGVD)		
CONCORD RIVER									
A	2,050	385/250 <sup>2</sup>	5,556	3.1	106.5	106.5	107.5	1.0	
B	4,750	238	3,642	3.6	106.6	106.6	107.6	1.0	
C	9,050	161	2,092	2.9	107.0	107.0	108.0	1.0	
D	9,600	217	3,155	3.9	107.7	107.7	108.2	1.0	
E	10,140	495	740	8.1	108.5	108.5	108.5	0.0	
F	11,610	190	2,634	2.1	114.8	114.8	115.8	1.0	
G	13,050	220	1,559	3.6	115.0	115.0	116.0	1.0	
H	14,065	134	1,662	3.4	115.8	115.8	116.8	0.7	
I	17,145	220	2,941	3.9	116.2	116.2	117.4	0.8	
J	17,625	243	1,564	3.6	116.7	116.7	117.7	0.7	
K	17,935	280	2,427	2.4	116.5	116.5	117.7	0.7	
L	19,830	263	3,120	3.8	116.8	116.8	117.5	0.7	
M	22,060	293	3,581	3.5	117.0	117.0	117.7	0.7	
N	24,405	224	1,308	4.3	117.7	117.7	117.9	0.7	
O	25,655	250	3,417	3.6	117.9	117.9	118.5	0.6	
P	26,725	210	1,737	3.2	117.9	117.9	118.5	0.6	
Q	28,175	167	1,883	2.9	118.7	118.7	118.8	0.0	
R	28,725	327	4,804	3.1	118.5	118.5	119.0	0.5	
S	34,435	139	1,924	2.9	119.0	119.0	119.7	0.7	
T	36,665	971	10,608	0.5	119.3	119.3	120.0	0.7	

1-foot Above Certificate Limit      2 width/width of the corporate limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**TOWN OF BILERICA, MA.**  
 ( MIDDLESEX CO. )

**FLOODWAY DATA**  
**CONCORD RIVER**

FLOODING SOURCE		FLOODWAY				BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY FLOODWAY (FEET MVD)	MITIGATION FLOODWAY (FEET MVD)	WITH FLOODWAY	INCREASE
Shawsheen River								
A	0 <sup>1</sup>	220/210 <sup>2</sup>	858	2.9	98.3	98.3	99.2	0.9
B	815 <sup>1</sup>	230/215 <sup>2</sup>	1,515	1.2	95.9	95.9	97.8	0.9
C	1,155 <sup>1</sup>	297/152	377	5.0	97.1	97.1	97.0	0.9
D	1,580 <sup>1</sup>	180/115 <sup>2</sup>	1,563	1.3	92.3	92.3	92.6	0.3
E	2,200 <sup>1</sup>	157/242	595	3.7	92.3	92.3	92.7	0.4
F	2,370 <sup>1</sup>	597/202	337	5.5	92.3	92.3	92.7	0.4
G	2,320 <sup>1</sup>	407/252	233	5.2	92.3	92.3	92.7	0.4
H	2,580 <sup>1</sup>	1507/382	3,345	0.9	97.3	97.3	97.5	0.2
I	4,450 <sup>1</sup>	330/152	3,784	0.5	97.3	97.3	97.6	0.3
J	6,550 <sup>1</sup>	250	2,551	0.7	97.2	97.2	97.8	0.4
K	10,740 <sup>1</sup>	250	2,345	0.7	97.6	97.6	98.2	0.6
L	12,470 <sup>1</sup>	190	1,578	1.2	97.7	97.7	98.5	0.8
M	15,340 <sup>1</sup>	182	2,048	1.0	97.9	97.9	98.8	0.9
N	17,340 <sup>1</sup>	300	2,418	0.5	98.1	98.1	99.0	0.9
O	17,450 <sup>1</sup>	100	548	3.1	98.1	98.1	99.0	0.9
P	18,260 <sup>1</sup>	350	5,379	0.6	99.0	99.0	99.3	0.3
Jones Brook								
A	975 <sup>2</sup>	50	190	2.6	97.8	94.1 <sup>2</sup>	95.1	1.0
B	1,800 <sup>2</sup>	60	185	2.7	97.8	96.1 <sup>4</sup>	96.6	0.5
C	2,500 <sup>2</sup>	60	137	5.3	98.3	98.3	99.0	0.7
D	3,250 <sup>2</sup>	60	159	2.8	101.9	101.9	102.3	0.4
E	3,750 <sup>2</sup>	50	180	2.2	106.7	106.7	105.0	0.5
F	4,340 <sup>2</sup>	100	373	1.1	105.0	105.0	105.6	0.6
G	4,580 <sup>2</sup>	150	528	0.7	105.1	105.1	105.7	0.6
H	5,220 <sup>2</sup>	15	88	3.5	107.5	107.6	107.6	0.0
I	5,150 <sup>2</sup>	10	215	1.5	108.5	108.8	109.2	0.4

<sup>1</sup>Foot Above Corporate Limits <sup>2</sup>Width/Width Within Corporate Limits

<sup>3</sup>Feet Above Confluence With Shawsheen River <sup>4</sup>Elevation computed without consideration of Backwater Effects

Prof. Shawsheen River

FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF BILLERICA, MA.**  
MIDDLESEX CO.1

**FLOODWAY DATA**

**SHAWSHEEN RIVER AND JONES BROOK**

TABLE 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET MVD)	WITH FLOODWAY	INCREASE
Content Brook								
A	150	9	39	11.7	94.0	94.0	94.0	0.0
B	210	11	72	6.3	97.9	97.9	97.9	0.0
C	1,800	8	37	12.3	98.7	98.7	98.7	0.0
D	2,575	183	1,032	0.4	-0.6	-0.6	-0.6	0.2
E	3,510	15	180	2.8	-0.6	-0.6	-0.6	0.3
F	3,840	7	35	13.0	-0.2	-0.2	-0.2	0.0
G	4,160	225	1,613	0.3	-0.3	-0.3	-0.3	0.2
H	5,125	40	77	5.2	-0.3	-0.3	-0.3	0.1
I	5,865	163	1,285	0.3	-0.6	-0.6	-0.6	0.7
J	6,260	14	70	3.5	-0.6	-0.6	-0.6	0.7
Middlesex Canal								
K	6,300	25	70	3.5	106.9	106.9	107.6	0.7
L	1,265	20	81	3.0	108.2	108.2	108.7	0.5
M	9,075	23	94	2.2	109.3	109.3	109.9	0.6
N	9,050	20	100	2.1	109.5	109.5	110.1	0.6
O	10,495	20	99	2.1	109.7	109.7	110.4	0.7
Lubber Brook								
A	0	100	501	0.3	103.2	103.2	106.2	1.0
B	1,320	100	462	0.3	103.2	103.2	106.2	1.0
C	1,965	100	371	0.4	103.8	103.8	104.3	0.5
D	3,410	100/75	178	0.7	103.8	103.8	104.3	0.5
E	4,495	100/75	169	0.6	104.1	104.1	105.0	0.9
F	5,070	100/55	157	0.6	104.2	104.2	105.1	0.9

1 Feet Above Corporate Limits  
2 Within/With Corporate Limits

TABLE 2

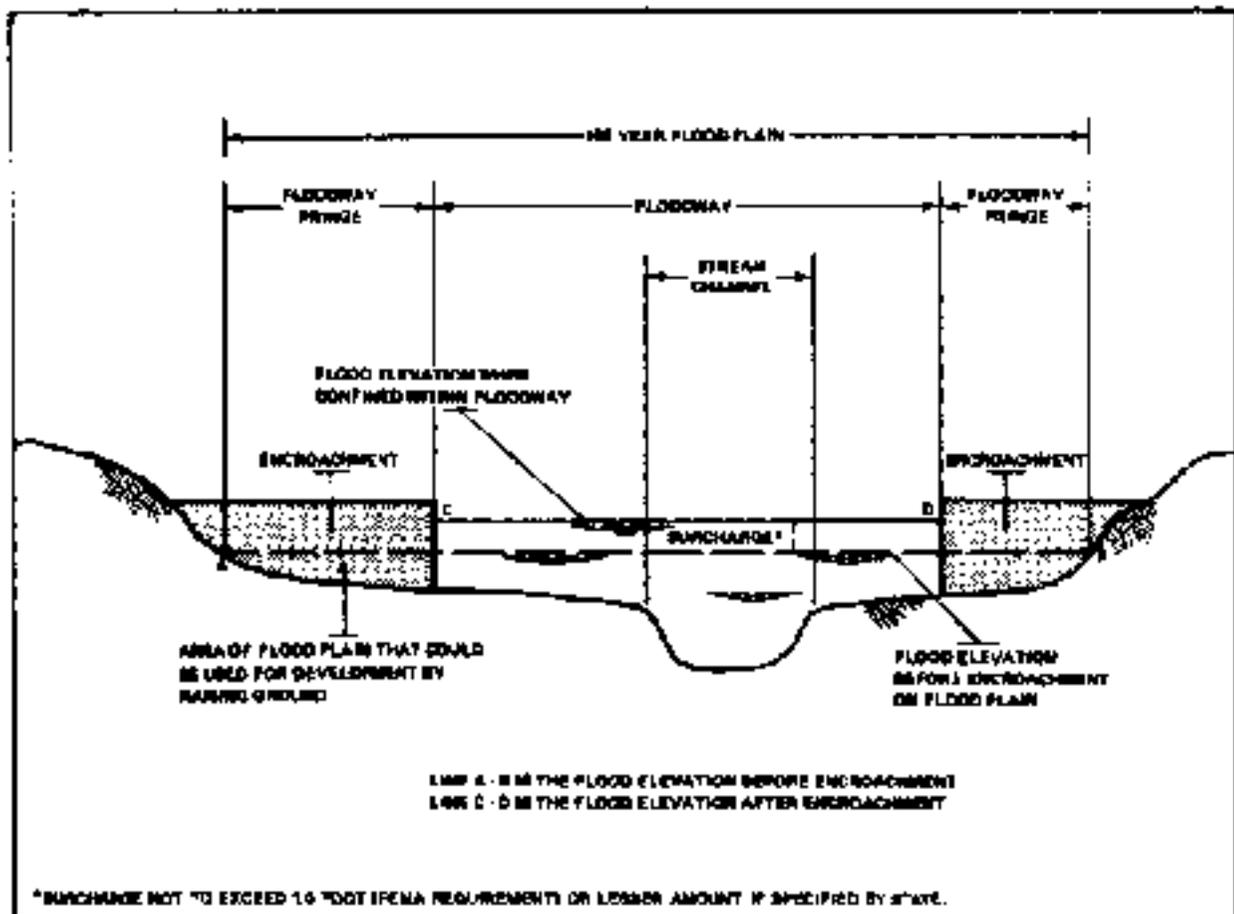
FEDERAL EMERGENCY MANAGEMENT AGENCY  
**TOWN OF BILLERICA, MA.**  
(MIDDLESEX CO.)

**FLOODWAY DATA**

**CONTENT BROOK, MIDDLESEX CANAL AND LUBBER BROOK**

Communities are encouraged by the FEMA to adopt wider, more restrictive floodways and to minimize the amount of fill allowed in the fringe areas. Such actions also meet the intent of the Massachusetts Wetlands Protection Act (Massachusetts General Laws, Chapter 131, Section 40), which was previously described in Section 2.4.

In order to achieve a unified flood plain and wetlands management program, numerous Massachusetts communities have adopted local zoning by-laws, ordinances, subdivision regulations, and local board of health regulations augmenting the minimum requirements of the National Flood Insurance Program and the Massachusetts Wetlands Protection Act. The FEMA encourages the use of this Flood Insurance Study as the technical basis for adoption of a broader, more encompassing local flood plain management program than is required to meet the minimum standards of the National Flood Insurance Program.



FLOODWAY SCHEMATIC

Figure 2

## 5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FEMA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (EHFs), and flood insurance zone designations for each significant flooding source affecting the Town of Billerica.

### 5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

<u>Average Difference Between 10- and 100-Year Floods</u>	<u>Variation</u>
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

Fifteen reaches meeting the above criteria were required for the flooding sources of Billerica. These include one each on Lubber Brook and Middlesex Canal, two on Jones Brook, three each on the Concord River and the Shawshoek River and five on Content Brook. The locations of the reaches are shown on the Flood Profiles.

### 5.2 Flood Hazard Factors (EHFs)

The Flood Hazard Factor is used to correlate flood information with insurance rate tables. Correlations between property damages from floods and their assigned EHF's are used to set actuarial insurance premium rate tables based on EHF's from 005 to 200.

The EHF for a reach is the average weighted difference between the 10- and 100-year flood water surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between the water surface elevations of the 10- and 100-year floods is 0.7 foot, the EHF is 005; if the difference is 1.4 feet, the EHF is 015; if the difference is 5.0 feet, the EHF is 050. When the difference between the 10- and 100-year flood water surface elevations is greater than 10.0 feet, the accuracy for the EHF is to the nearest foot.

### 5.3 Flood Insurance Zones

After the determination of reaches and their respective FHEs, the entire incorporated area of Billerica was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHEs determined.
Zones A1, A2, A3, A5, A6, A7, A8, A11:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones assigned according to FHEs.
Zone B:	Areas between the Special Flood Hazard Areas and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; or, areas subject to 100-year flooding from sources with drainage areas of less than one square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHEs, flood insurance zones, and base flood elevations for each source studied in detail in the community.

### 5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Town of Billerica is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FEMA.

FLOODING SOURCE	FANED <sup>1</sup>	ELEVATION DIFFERENCE <sup>2</sup> BETWEEN 1% (100-YEAR) FLOOD AND 0.2% (500-YEAR)			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION <sup>3</sup> (FEET NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
		Concord River Reach 1 Reach 2 Reach 3	0005 0005 0005	-3.4 2.4 3.3			
Shawsheen River Reach 1 Reach 2 Reach 3	0010 0010 0010	1.3 -5.5 5.7	0.5 1.5 0.4	1.1 2.2 1.5	015 055 055	A5 A11 A7	Varies Varies Varies
Jones Brook Reach 1 Reach 2	0010 0010	1.0 -1.6	-0.1 0.2	0.8 0.4	010 015	A2 A3	Varies Varies
Concord Brook Reach 1 Reach 2 Reach 3 Reach 4 Reach 5	0010 0010 0010 0005, 0010 0005, 0010	-3.9 -3.0 -2.3 2.8 3.2	-1.3 -1.1 -0.8 -0.8 -1.3	1.2 0.6 0.7 1.3 1.6	040 030 025 030 035	A8 A6 A5 A6 A7	Varies Varies Varies Varies Varies
Middlesex Canal Reach 1	0005	1.4	-0.5	0.9	015	A3	Varies
Lubber Brook Reach 1	0010	0.3	-0.1	0.2	005	A1	Varies

<sup>1</sup>Flood Insurance Rate Map Panel

<sup>2</sup>Weighted Average - See Map

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**TOWN OF BILLERICA, MA.**  
(MIDDLESEX CO.)

**FLOOD INSURANCE ZONE DATA**  
**CONCORD RIVER, SHAWSHEEN RIVER, JONES BROOK, CONCORD**  
**BROOK, MIDDLESEX CANAL AND LUBBER BROOK**

## 6.0 OTHER STUDIES

The communities adjoining Billerica are the City of Lowell and the Towns of Tewksbury, Wilmington, Burlington, Bedford, Carlisle and Chelmsford. The Flood Insurance Studies for each of these communities agree with this study at their respective corporate limits (References 20-26) except as noted herein.

There are some discrepancies between this study and the Lowell Flood Insurance Study with respect to floodflows and elevations on the Concord River, because the study contractor used more current information regarding dam construction in the upper reaches of the watershed and a different methodology in flood-discharge development (Reference 1). The Lowell study is presently being revised (Reference 21). The floodflows and elevations of the upper reaches of the Concord River in Lowell will be used in the updated version. This will result in agreement at the Billerica-Lowell corporate limits.

In the Carlisle Flood Insurance Study (Reference 25) Pages Brook was studied by detailed methods. This work included the establishment of a floodway. Pages Brook enters Billerica within the Concord River flood plain in the extreme southern portion of Billerica and, therefore, was not studied in the Billerica Flood Insurance Study. Thus, although no floodway is shown in this study for Pages Brook, the overall flooding data are in agreement with the Carlisle Flood Insurance Study.

In 1968, a Flood Plain Information report was published for the Concord and Shawshen Rivers in Bedford (Reference 6). Since that time, however, additional data have been made available for better flood frequency-discharge analysis.

Although the starting water surface elevations for the Shawshen River were taken from the Tewksbury Flood Insurance Study, the flows used in this study were developed using a longer period of record. Therefore, the flows of the river at the Billerica/Tewksbury corporate limits used in this study are not in agreement with those in the Tewksbury Flood Insurance Study.

In 1971, flood plain maps were prepared using the 2-foot contour maps prepared for the Town of Billerica (Reference 2). These maps delineate flood boundaries of the rivers and streams in the town as well as in other floodprone areas. The information on those maps is not compatible with the information in this Flood Insurance Study. The methodology used in preparing the maps was empirical and used ideal culvert sizes in computing backwater profiles; the methodology used in this Flood Insurance Study was analytical and used existing culvert sizes (Reference 1).

This study is authoritative for purposes of the National Flood Insurance Program, and the data presented here either supersede or are compatible with previous determinations.

## 7.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, Region I Office, John W. McCormack Post Office and Courthouse Building, Post Office Square, Boston, Massachusetts 02109.

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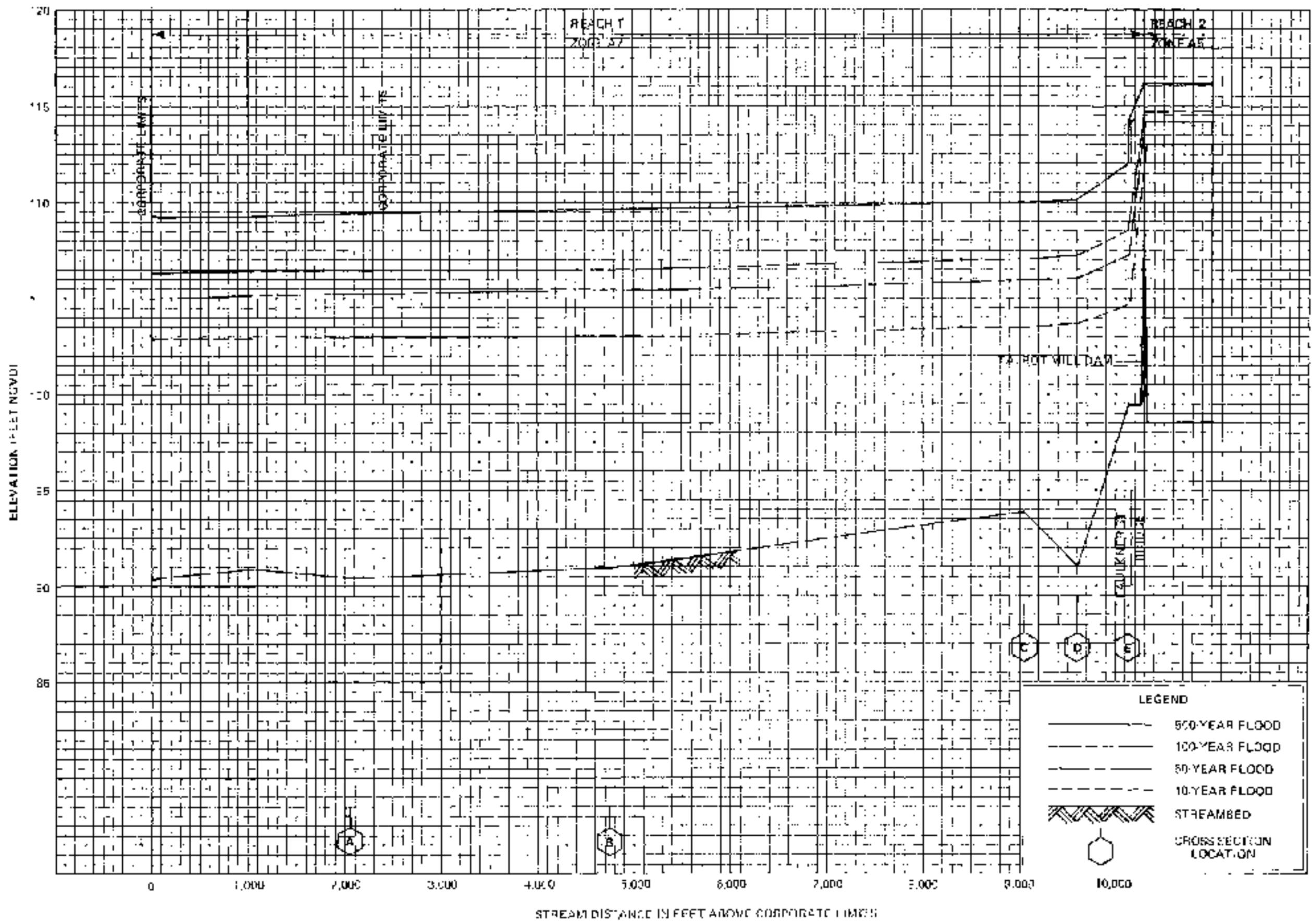
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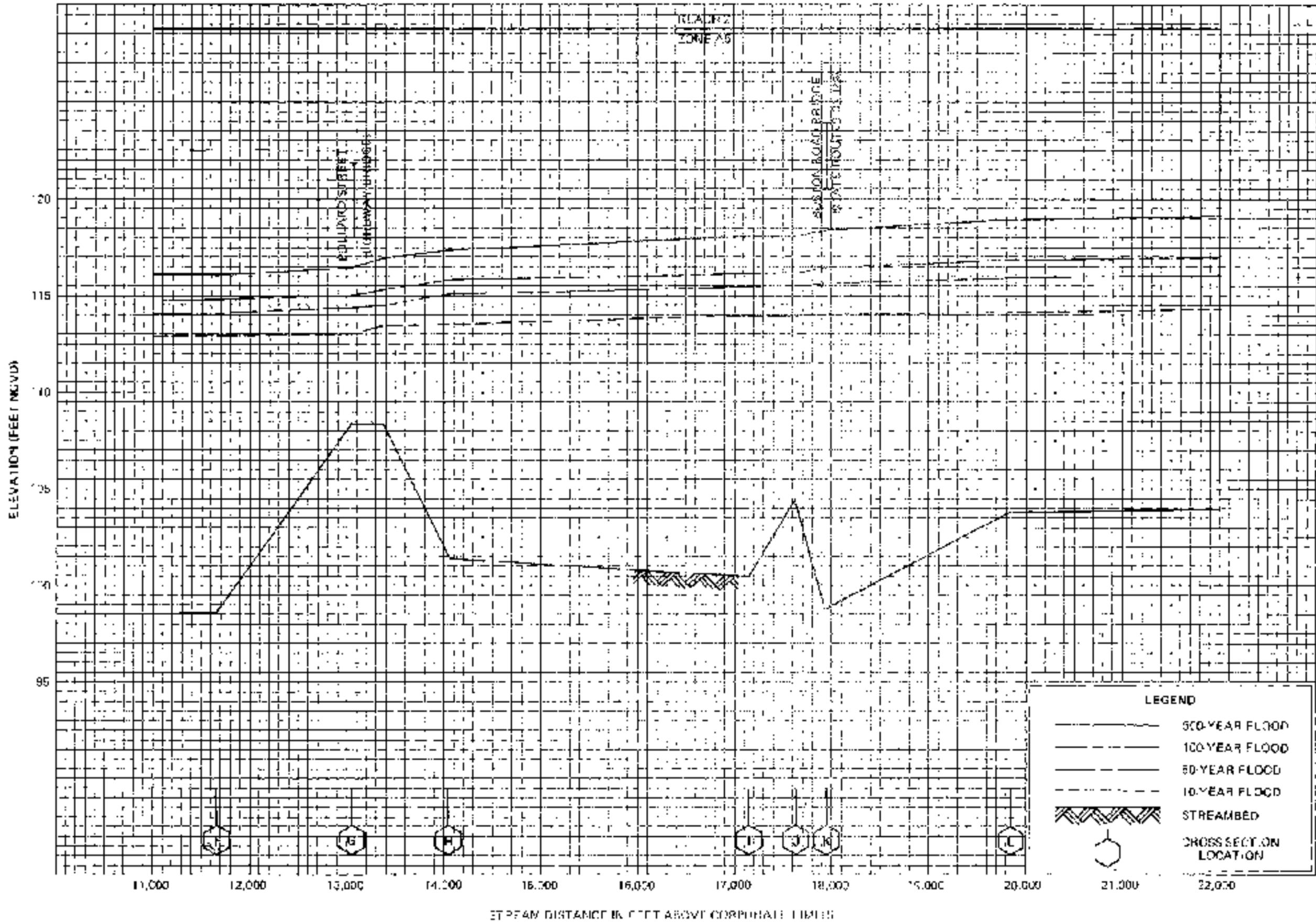
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**FLOOD PROFILES**  
**CONCORD RIVER**

FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF BILLERICA, MA**  
MIDDLESEX CO.



**LEGEND**

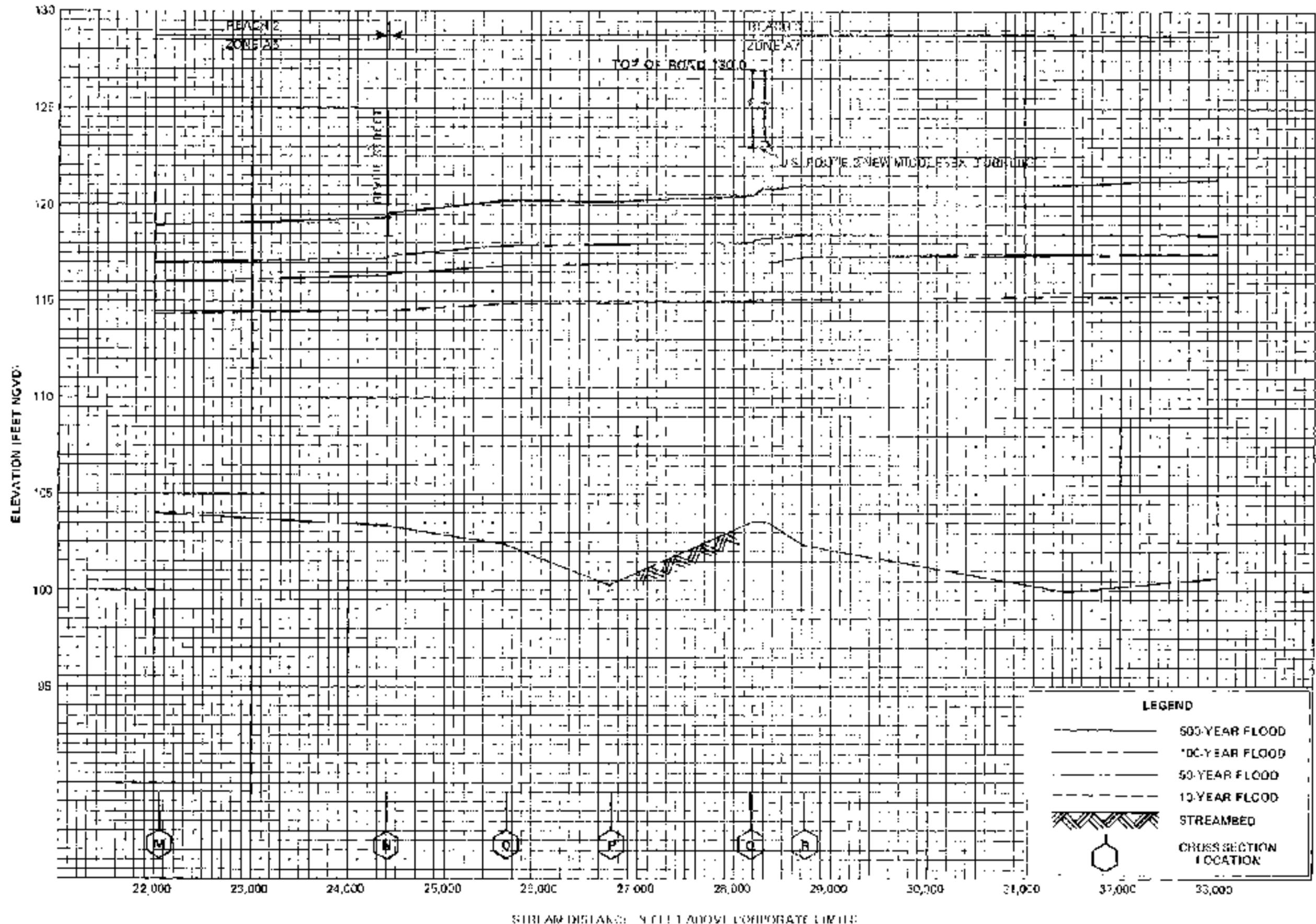
	500-YEAR FLOOD
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	50-YEAR FLOOD
	10-YEAR FLOOD
	STREAMBED
	CROSS SECTION LOCATION

**FLOOD PROFILES**

**CONCORD RIVER**

FEDERAL EMERGENCY MANAGEMENT AGENCY

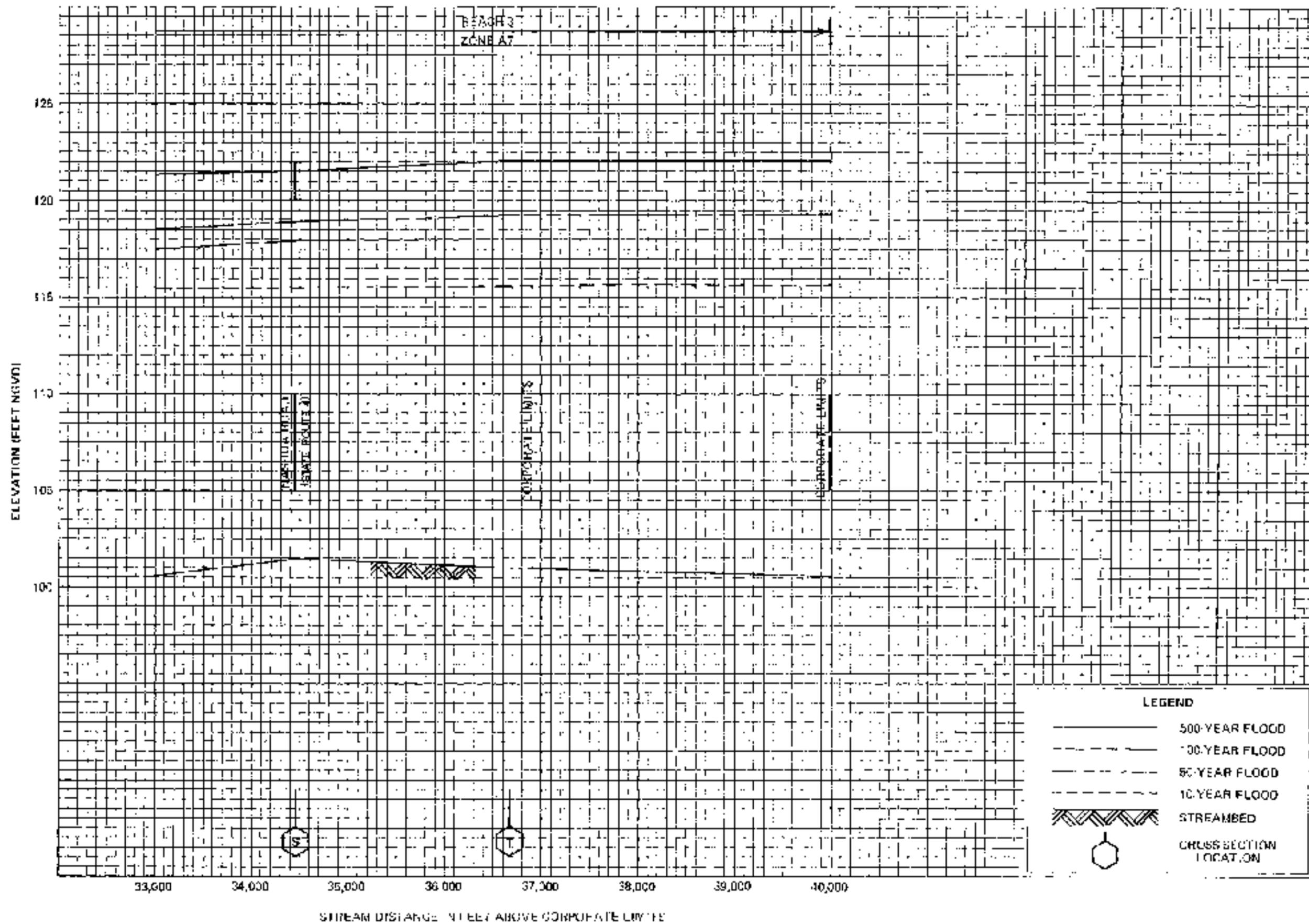
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 (MIDDLESEX CO.)



**FLOOD PROFILES**  
**CONCORD RIVER**

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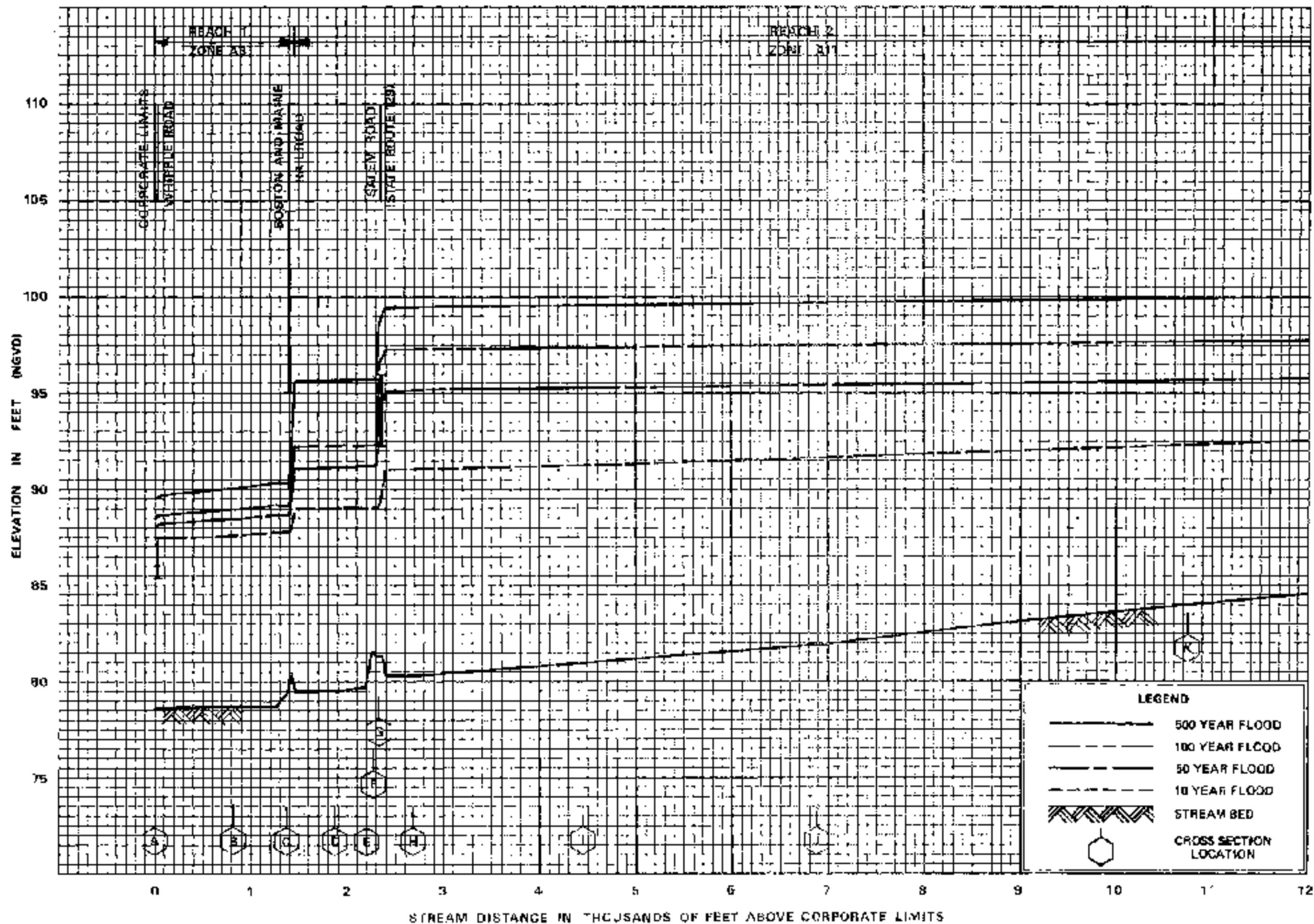
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(MIDDLESEX COUNTY)



**FLOOD PROFILES  
CONCORD RIVER**

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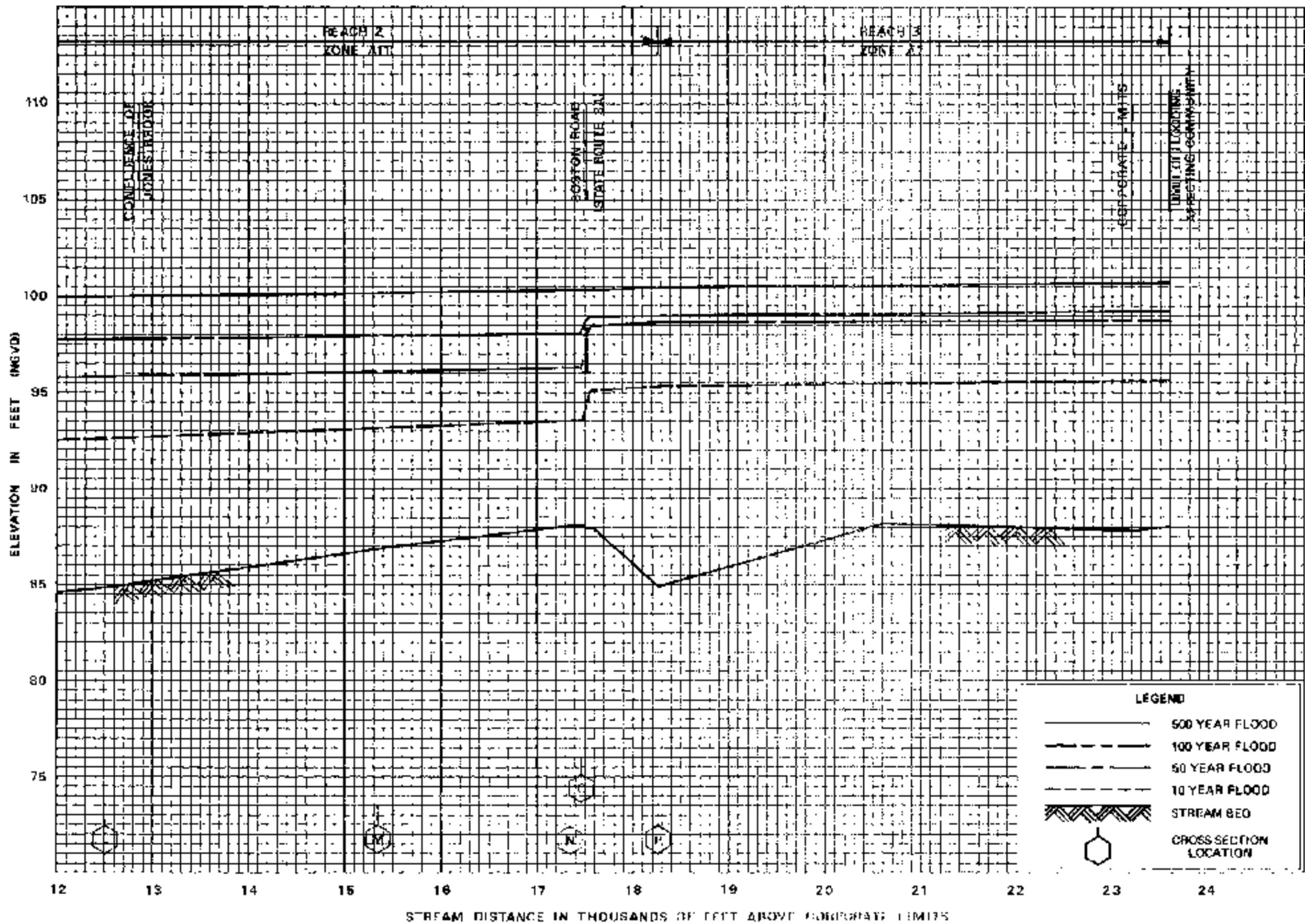
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(MIDDLESEX CO.)



**FLOOD PROFILES**  
**SNAWSHEEN RIVER**

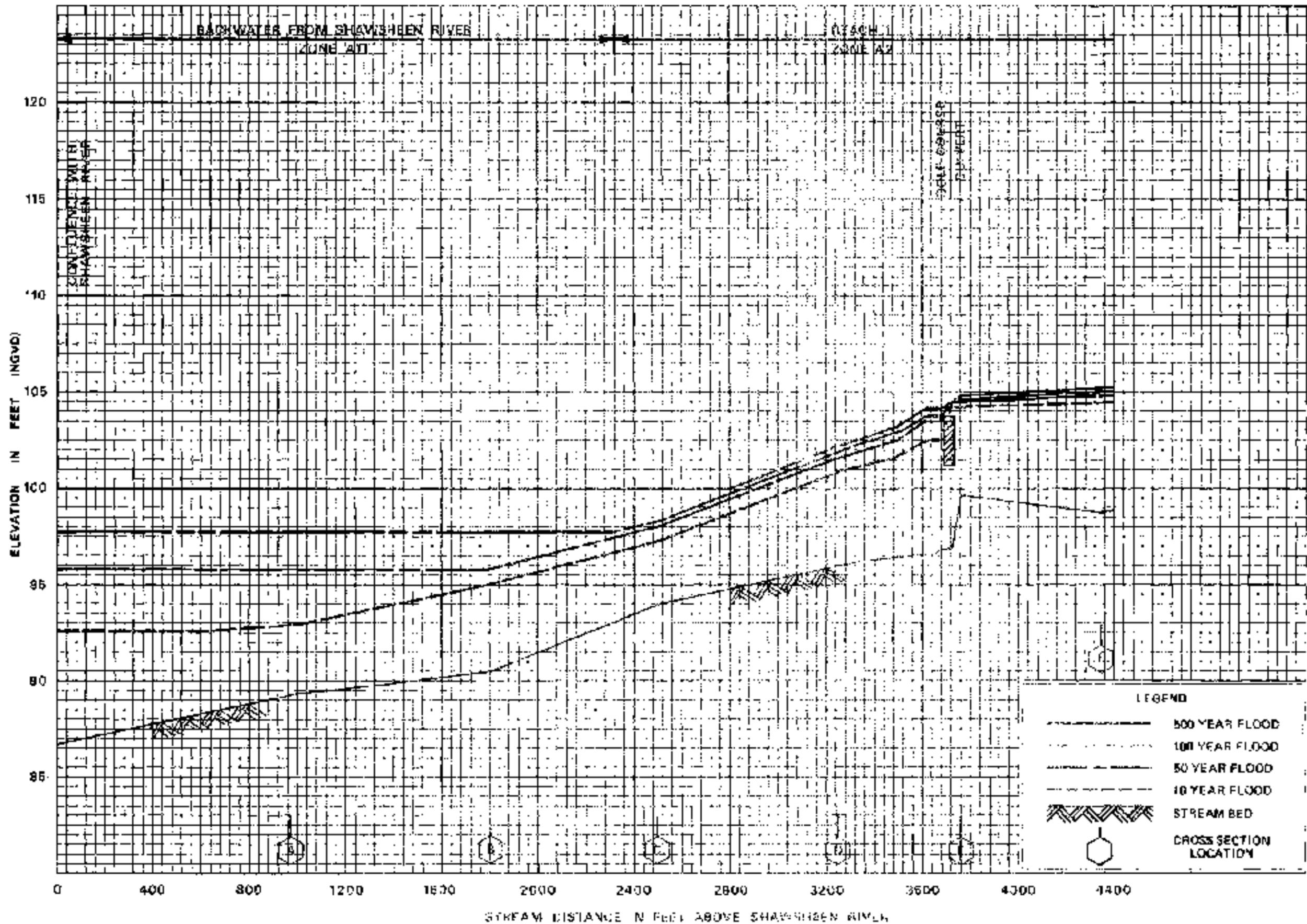
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**TOWN OF BILLERICA, MA**  
(MIDDLESEX CO.)



**FLOOD PROFILES**  
**SHAWSHEEN RIVER**

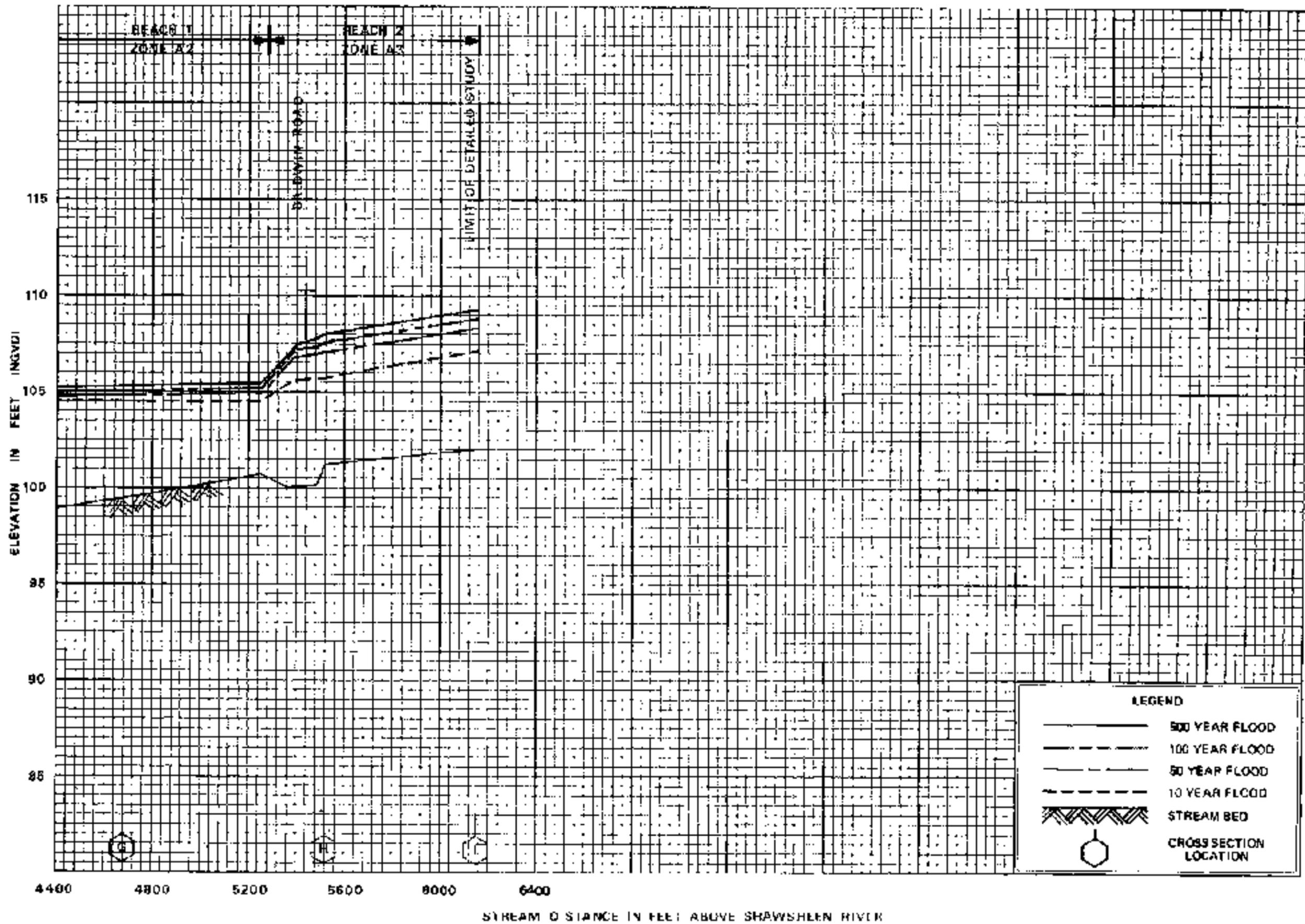
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**TOWN OF BILLERICA, MA**  
(MIDDLESEX CO.)



**FLOOD PROFILES**  
**JONES BROOK**

FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF BILLERICA, MA**  
 (MIDDLESEX CO.)



LEGEND	
	500 YEAR FLOOD
	100 YEAR FLOOD
	50 YEAR FLOOD
	10 YEAR FLOOD
	STREAM BED
	CROSS SECTION LOCATION

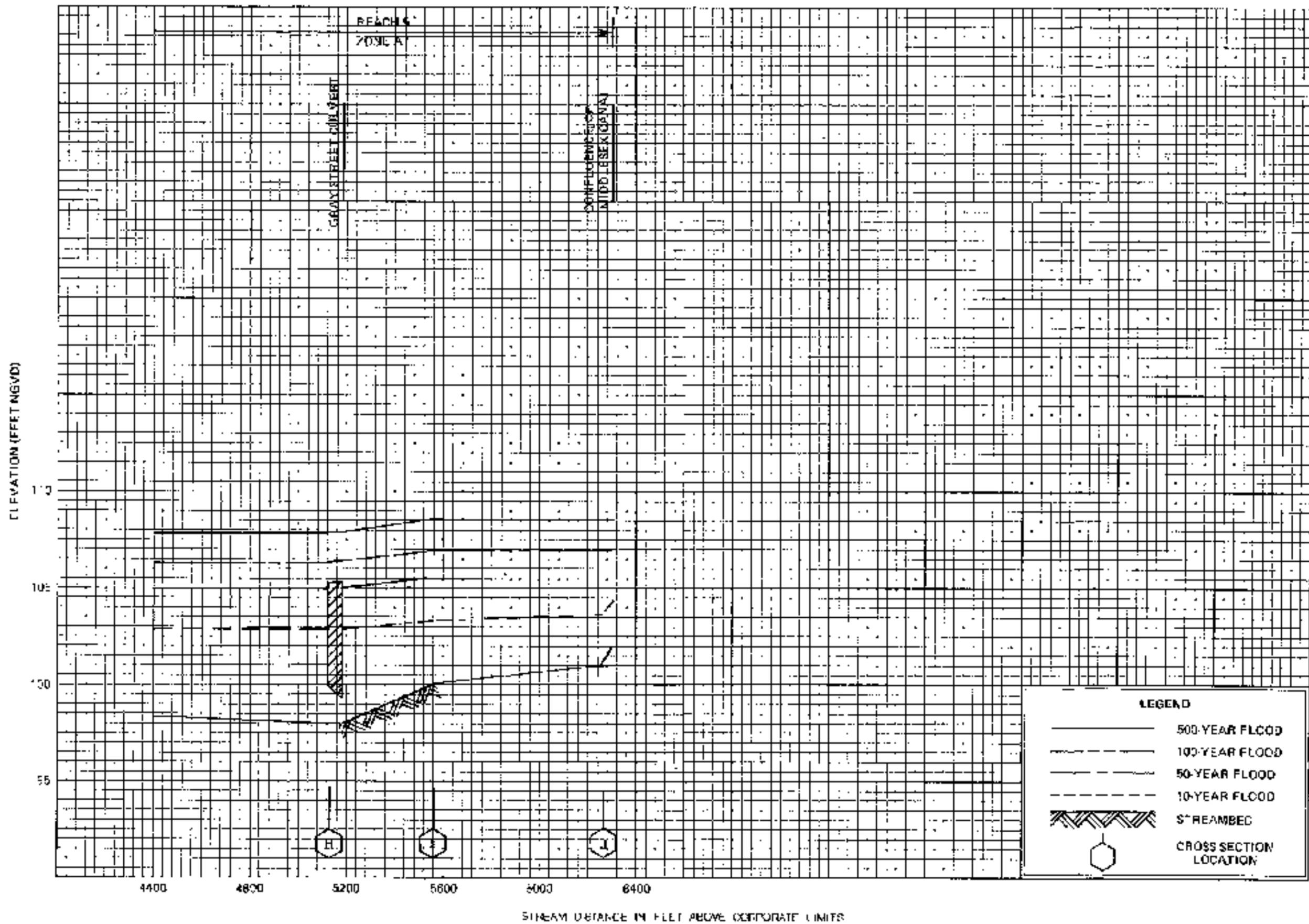
**FLOOD PROFILES**

**JONES BROOK**

FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF BILLERICA, MA**  
(MIDDLESEX CO.)

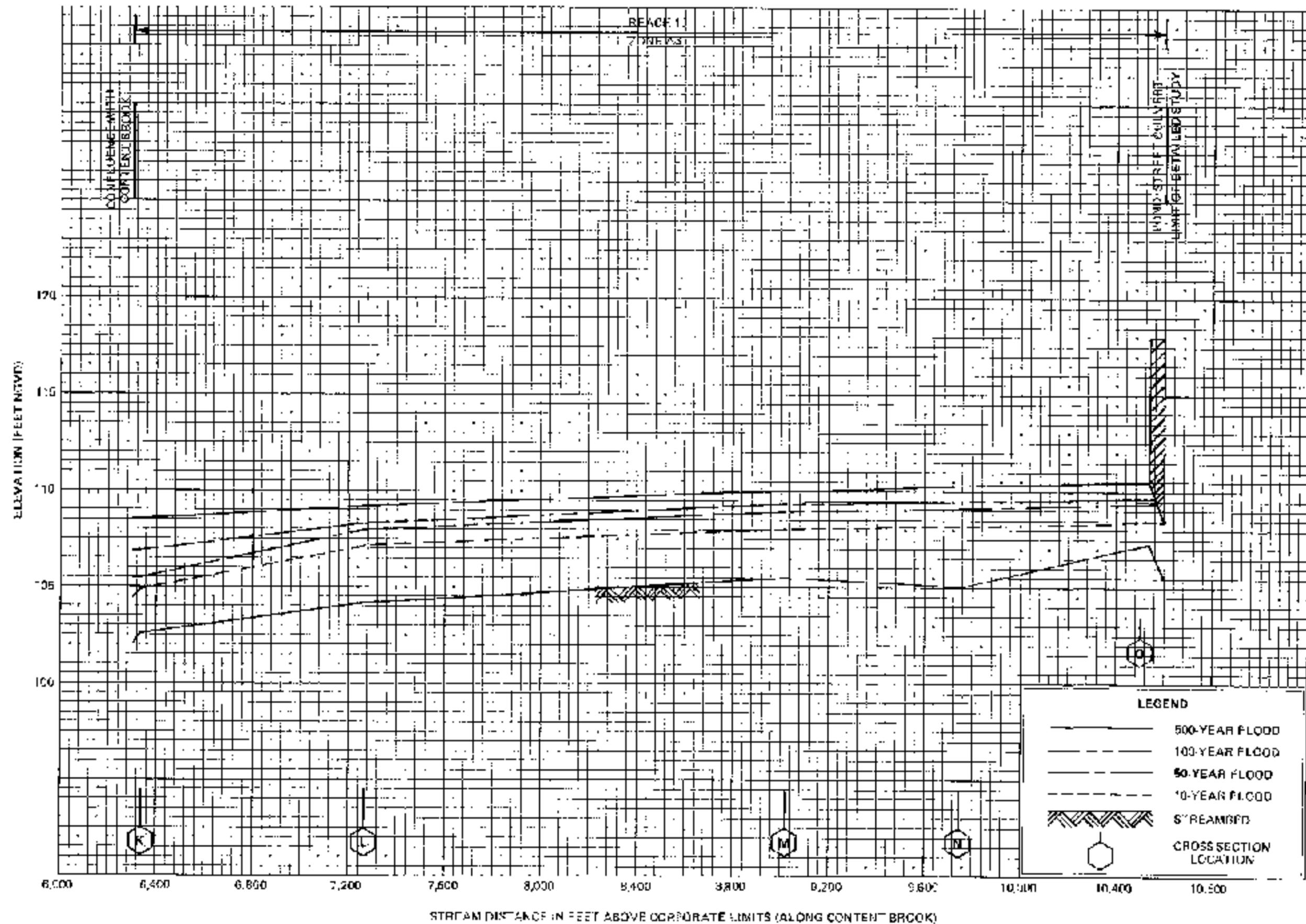




**FLOOD PROFILES**  
**CONTENT BROOK**

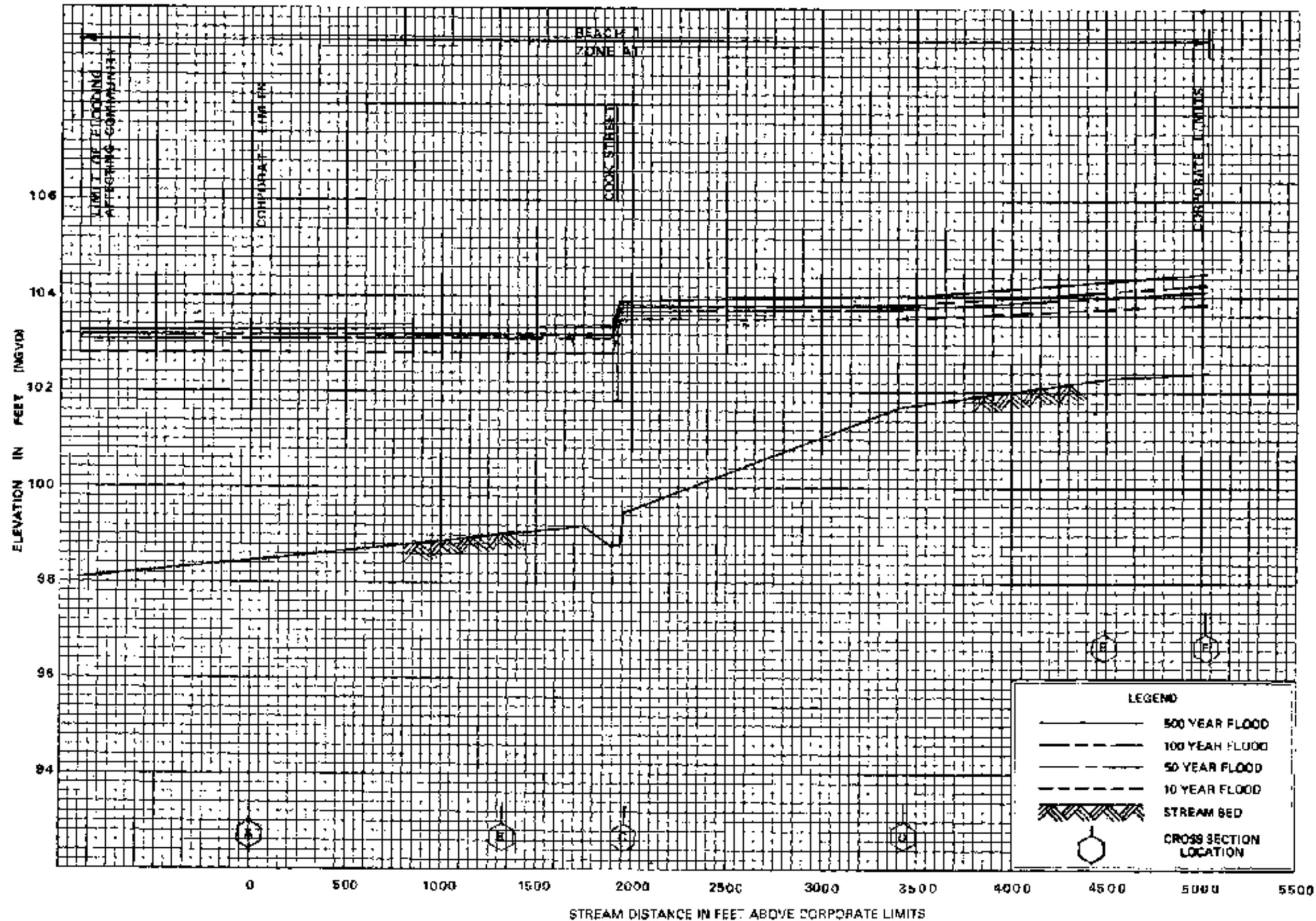
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**TOWN OF BILLERICA, MA**  
MIDDLESEX CO.



**FLOOD PROFILES**  
**MIDDLESEX CANAL**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**TOWN OF BILLERICA, MA**  
(MIDDLESEX CO.)



**FLOOD PROFILES**  
**LUBBER BROOK**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**TOWN OF BILLERICA, MA**  
(MIDDLESEX CO.)



July 7, 2009

Mr. Richard Pizzi, P.E.  
Geotechnical Consultants, Inc  
201 Boston Post West  
Marlborough, Ma. 01752

Re: **Dam Hazard Potential Reclassification  
Talbot Mills Dam, Billerica, MA00774**

Dear Mr. Pizzi:

The Office of Dam Safety (ODS) has reviewed the June 2, 2009 and July 2, 2009 letters and supporting documentation prepared by Geotechnical Consultants, Inc regarding a request to re-classify Talbot Mills Dam from a High Hazard to a **Significant Hazard** potential dam.

In your submittal you present the results of detailed dam breach studies for failure scenarios during storm conditions (your June 2 submittal) and during fair weather conditions (July 2 submittal). Your storm day simulations conclude that there would only be a 0.2 foot incremental rise in flood elevations. As you point out this is well within the 2 foot incremental rise offered as guidance in Section 10.06 of 302 CMR 10.00. You state that the fair weather dam breach simulation shows peak water levels contained within the banks of the river channel and does not represent a hazard to properties downstream of the dam. Based on these results Geotechnical Consultants Inc. recommends that Talbot Mills dam be reclassified as a **Significant** hazard potential dam.

Based upon review of the above information provided to us and in accordance with MGL c. 26B, §§44-48 and 302 CMR 10.00, DCR has determined that the classification of Talbot Mills Dam shall be changed from High Hazard Potential to **Significant Hazard Potential**.

If any major alterations or modifications to the dam are made that change the existing structural and hydraulic characteristics, the dam owner should notify the Office of Dam Safety of such changes and request a new hazard potential determination.

COMMONWEALTH OF MASSACHUSETTS

Department of Conservation and Protection  
251 Causeway Street, Suite 603  
Boston MA 02114-2119  
617-626-1250 617-626-1351 fax  
www.mass.gov/dcr

EXECUTIVE OFFICE OF ENERGY & ENVIRONMENTAL AFFAIRS



Deval L. Patrick  
Governor

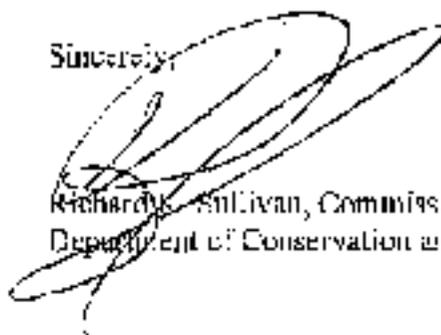
Timothy W. Murray  
Lt. Governor

Ian A. Bowles, Secretary, Executive  
Office of Energy & Environmental Affairs

Richard K. Sullivan, Jr., Commissioner  
Department of Conservation & Rehabilitation

If you have any questions concerning this matter please contact Mark Geib at 617-626-1396 or at [mark.geib@state.ma.us](mailto:mark.geib@state.ma.us).

Sincerely,

A handwritten signature in black ink, appearing to read "Richard M. Sullivan", is written over the typed name and title.

Richard M. Sullivan, Commissioner  
Department of Conservation and Recreation

CC: Mr. Missin, DCR  
Mr. Baratta, DCR  
Ms. Bogdan, ODS  
Mr. Hughes, ODS

## **APPENDIX D**

## COMMON DAM SAFETY DEFINITIONS

For a comprehensive list of dam engineering terminology and definitions refer to 302 CMR10.00 Dam Safety, or other reference published by FERC, Dept. of the Interior Bureau of Reclamation, or FEMA. Please note should discrepancies between definitions exist, those definitions included within 302 CMR 10.00 govern for dams located within the Commonwealth of Massachusetts.

### Orientation

Upstream – Shall mean the side of the dam that borders the impoundment.

Downstream – Shall mean the high side of the dam, the side opposite the upstream side.

Right – Shall mean the area to the right when looking in the downstream direction.

Left – Shall mean the area to the left when looking in the downstream direction.

### Dam Components

Dam – Shall mean any artificial barrier, including appurtenant works, which impounds or diverts water.

Embankment – Shall mean the fill material, usually earth or rock, placed with sloping sides, such that it forms a permanent barrier that impounds water.

Crest – Shall mean the top of the dam, usually provides a road or path across the dam.

Abutment – Shall mean that part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment.

Appurtenant Works – Shall mean structures, either in dams or separate therefrom, including but not be limited to, spillways; reservoirs and their rims; low-level outlet works; and water conduits including tunnels, pipelines, or penstocks, either through the dams or their abutments.

Spillway – Shall mean a structure over or through which water flows are discharged. If the flow is controlled by gates or boards, it is a controlled spillway; if the fixed elevation of the spillway crest controls the level of the impoundment, it is an uncontrolled spillway.

### Size Classification

(as listed in Commonwealth of Massachusetts, 302 CMR 10.00 *Dam Safety*)

Large – structure with a height greater than 40 feet or a storage capacity greater than 1,000 acre-feet.

Intermediate – structure with a height between 15 and 40 feet or a storage capacity of 50 to 1,000 acre-feet.

Small – structure with a height between 6 and 15 feet and a storage capacity of 15 to 50 acre-feet.

Non-Jurisdictional – structure less than 6 feet in height or having a storage capacity of less than 15 acre-feet.

## **Hazard Classification**

(as listed in Commonwealth of Massachusetts, 302 CMR 10.00 *Dam Safety*)

High Hazard (Class I) – Shall mean dams located where failure will likely cause loss of life and serious damage to home(s), industrial or commercial facilities, important public utilities, main highway(s) or railroad(s).

Significant Hazard (Class II) – Shall mean dams located where failure may cause loss of life and damage to home(s), industrial or commercial facilities, secondary highway(s) or railroad(s), or cause the interruption of the use or service of relatively important facilities.

Low Hazard (Class III) – Dams located where failure may cause minimal property damage to others. Loss of life is not expected.

## **General**

EAP – Emergency Action Plan – Shall mean a predetermined (and properly documented) plan of action to be taken to reduce the potential for property damage and/or loss of life in an area affected by an impending dam failure.

O&M Manual – Operations and Maintenance Manual; Document identifying routine maintenance and operational procedures under normal and storm conditions.

Normal Pool – Shall mean the elevation of the impoundment during normal operating conditions.

Acre-foot – Shall mean a unit of volumetric measure that would cover one acre to a depth of one foot. It is equal to 43,560 cubic feet. One million U.S. gallons = 3.068 acre feet.

Height of Dam (Structural Height) – Shall mean the vertical distance from the lowest portion of the natural ground, including any stream channel, along the downstream toe of the dam to the lowest point on the crest of the dam.

Hydraulic Height – means the height to which water rises behind a dam and the difference between the lowest point in the original streambed at the axis of the dam and the maximum controllable water surface.

Maximum Water Storage Elevation – means the maximum elevation of water surface which can be contained by the dam without overtopping the embankment section.

Spillway Design Flood (SDF) – Shall mean the flood used in the design of a dam and its appurtenant works particularly for sizing the spillway and outlet works, and for determining maximum temporary storage and height of dam requirements.

Maximum Storage Capacity – The volume of water contained in the impoundment at maximum water storage elevation.

Normal Storage Capacity – The volume of water contained in the impoundment at normal water storage elevation.

## **Condition Rating**

Unsafe – Major structural\*, operational, and maintenance deficiencies exist under normal operating conditions.

Poor – Significant structural\*, operation and maintenance deficiencies are clearly recognized for normal loading conditions.

Fair – Significant operational and maintenance deficiencies, no structural deficiencies. Potential deficiencies exist under unusual loading conditions that may realistically occur. Can be used when uncertainties exist as to critical parameters.

Satisfactory – Minor operational and maintenance deficiencies. Infrequent hydrologic events would probably result in deficiencies.

Good – No existing or potential deficiencies recognized. Safe performance is expected under all loading including SDF.

\* Structural deficiencies include but are not limited to the following:

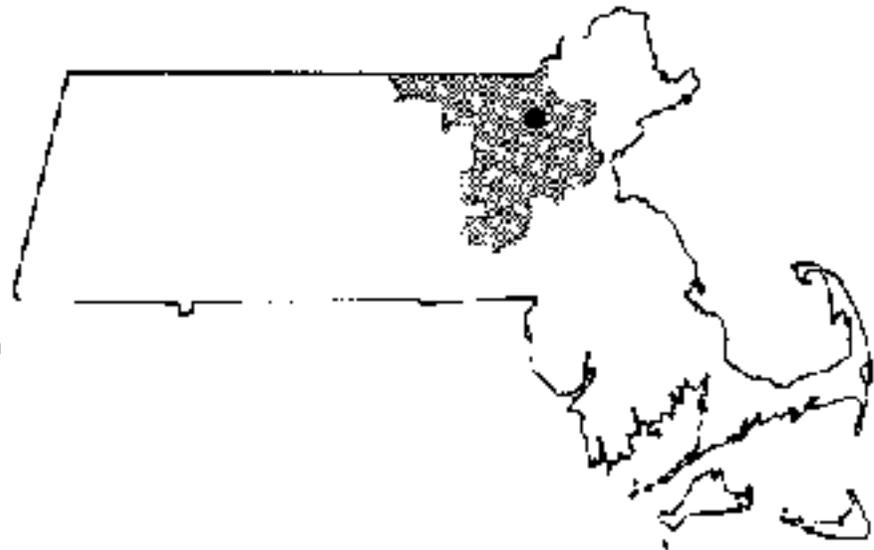
- Excessive uncontrolled seepage (e.g., upwelling of water, evidence of fines movement, flowing water, erosion, etc.)
- Missing riprap with resulting erosion of slope
- Sinkholes, particularly behind retaining walls and above outlet pipes, possibly indicating loss of soil due to piping, rather than animal burrows
- Excessive vegetation and tree growth, particularly if it obscures features of the dam and the dam cannot be fully inspected
- Deterioration of concrete structures (e.g., exposed rebar, tilted walls, large cracks with or without seepage, excessive spalling, etc.)
- Inoperable outlets (gates and valves that have not been operated for many years or are broken)

## **APPENDIX E**

# FLOOD INSURANCE STUDY



TOWN OF  
BILLERICA,  
MASSACHUSETTS  
MIDDLESEX COUNTY



FEBRUARY 5, 1985



Federal Emergency Management Agency

COMMUNITY NUMBER - 250183

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Jones Brook.....	Panels 07P-08E
Content Brook-Middlesex Canal.....	Panels 09P-11E
Lubber Brook.....	Panels 12P

Exhibit 2 - Flood Boundary and Floodway  
Map Index

Exhibit 3 - Flood Boundary and Floodway Map.....	Panels 250183 0001-0006
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**PUBLISHED SEPARATELY:**

Flood Insurance Rate Map Index

Flood Insurance Rate Map.....	Panels 250183 0005-0010
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FLOOD INSURANCE STUDY  
TOWN OF BILLERICA, MASSACHUSETTS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Billerica, Middlesex County, Massachusetts, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1972. This study will allow Billerica to continue participation in the regular program of flood insurance by the Federal Emergency Management Agency (FEMA) with the most current data. Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these federally supported studies are based. These criteria take precedence over the minimum federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.2(d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for the determination and delineation of flood plains for this study were originally performed by Camp, Dresser and McKee, Inc. for the FEMA, under Contract No. H-3851. This work was completed in January 1978 and resulted in the publication of the Billerica Flood Insurance Study (Reference 1).

The hydrologic and hydraulic analyses for the determination and delineation of the Shawsheen River, Jones Brook, and Lubber Brook flood plains were performed by Schoenfeld Associates, Inc. for the FEMA, under Contract No. EMW-C-0280. The Shawsheen River was restudied to account for the flooding of the January 1979 event. Jones Brook was restudied because of channelization completed by the Town in the upper section of the study area. In addition, the flood plains and floodways for all streams studied in detail were delineated on photogrammetric maps obtained from the Town of Billerica (Reference 2). This work, which was completed in July 1983, covered all flooding sources affecting the Town of Billerica.

### 1.3 Coordination

Streams requiring a detailed study were identified at a meeting attended by representatives of the study contractor, the FEMA and the Town of Billerica on August 27, 1979.

During the course of the study, the following were contacted: the U.S. Army, Corps of Engineers (COE); the U.S. Geological Survey (USGS); the U.S. Soil Conservation Service (SCS); the Northern Middlesex Area Commission; the Bridge Design, Photogrammetric, and Waterways Sections of the Massachusetts Department of Public Works (MDPW); and the Director of Public Health and the Town Engineer of Billerica (Reference 1).

On July 26, 1984, the results of the study were reviewed at the final meeting attended by representatives of the study contractor, FEMA, and community officials. The study was acceptable to the community.

## 2.0 AREA STUDIED

### 2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Billerica, Middlesex County, Massachusetts. The area of study is shown on the Vicinity Map (Figure 1).

The limits of the detailed and approximate studies in Billerica were determined by the FEMA with community and study contractor consultation at the meeting in August 1979.

The streams studied by detailed and approximate methods are listed below.

<u>Study Stream</u>	<u>Downstream Limit/ Upstream Limit</u>	<u>Study Method</u>
Concord River	Lowell Corporate Limits/ Bedford Corporate Limits	Detailed
Shawsheen River	Tewksbury Corporate Limits/ Bedford Corporate Limits	Detailed
Jones Brook	Confluence with Shawsheen River/ Approximately 780 feet Upstream of Baldwin Road	Detailed
Jones Brook	Approximately 780 feet Upstream of Baldwin Road/ Vicinity of Meadow Lark Way	Approximate



<u>Study Stream</u>	<u>Downstream Limit/ Upstream Limit</u>	<u>Study Method</u>
Content Brook	Tewksbury Corporate Limits/ Confluence with Middlesex Canal	Detailed
Middlesex Canal	Confluence with Content Brook/ Pond Street	Detailed
Middlesex Canal	Pond Street/Iron Horse Park	Approximate
Lubber Brook	Tewksbury Corporate Limits/ Burlington Corporate Limits	Detailed
Webb Brook	Riverdale Road/Approximately 620 feet Upstream of Ravine Road	Approximate
Mill Brook	Confluence with Concord River/ Nutting Lake	Approximate
Nutting Lake	Entire Lake	Approximate
Winning Pond Tributary	Confluence with Concord River/ Winning Pond	
Winning Pond	Entire Pond	Approximate
Dolly Brook	Winning Pond/Approximately 4000 feet Upstream of Treble Cove Road	Approximate
Richardson Pond	Entire Pond	Approximate

Approximate methods of analyses were used to study those areas having a low development potential or a minimal flood hazard. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction for the next five years, through July 1988.

## 2.2 Community Description

The Town of Billerica is located in northern Middlesex County in northeastern Massachusetts 20 miles northwest of Boston. It is bordered by the City of Lowell and the Town of Tewksbury to the north, the Towns of Wilmington and Burlington to the east, the Town of Bedford to the south, and the Towns of Carlisle and Chelmsford to the west. The total land area is 25.56 square miles. According to the U.S. Census Bureau figures, the population has increased from 31,648 in 1970 to 36,719 in 1980 (Reference 3).

Billerica (first known as Shawsheen) was settled in 1637. In 1655, the town was incorporated as Billerikoyce (later, Billerikey). The town was primarily an agricultural village; apples, cherries, and strawberries were its major crops. The first saw and grist mill was built in 1660 by John Parker. In 1811, a woolen mill, the second of its kind in New England, began operations. The next important manufacturing enterprise, begun in 1830, was a leather-splitting mill. Other important industries which were established were sycamore (in 1836), cabinetmaking (in 1845), chemicals (in 1849), and glue (in 1867). The first library was built in 1772; the first post office was built in 1797. Billerica is now primarily a suburban residential community with some light industrial and manufacturing firms (Reference 1).

The town's topography is hilly with some flatland in the eastern and northeastern parts. Vegetative cover includes deciduous and coniferous trees in the hilly areas and scrub brush and wetland flora in the swampy areas and stream valleys (Reference 1).

The temperature for the Town of Billerica ranges from an average low of 24.9 degrees Fahrenheit (°F) in January to an average high of 70.7°F in July. The average annual precipitation is 42.8 inches (Reference 4).

The two major waterways in Billerica are the Concord and Shawsheen Rivers. The Concord River is formed by the confluence of the Assabet and Sudbury Rivers, approximately one mile northwest of the center of Concord. The river system is often referred to as the Sudbury-Assabet-Concord (S-A-C) river basin. The river flows sluggishly in a general northerly direction for approximately 16 miles and falls 62 feet over its course. Approximately 50 feet of the drop occurs at dams in the first mile of the river in Lowell. The total drainage area is approximately 406 square miles, of which 341 square miles are drained by the confluent rivers. The 11.3-mile reach of the Concord River from its confluence with the Assabet and Sudbury Rivers in Concord to North Billerica is controlled by the Talbot Mills Dam in North Billerica. The Concord River is of major significance to Billerica because it is the community's primary source of water (References 3 and 5).

The Shawsheen River begins near the Bedford-Lexington corporate limits at the confluence of Kilm Brook and an unnamed brook which drains Hanscom Air Force Base and flows northeasterly through Bedford, Billerica, Tewksbury, Andover, and North Andover, where it flows into the Merrimack River (Reference 6).

Jones Brook originates in Billerica and flows eastward into the Shawsheen River. Content Brook originates from Richardson Pond and flows eastward into the Shawsheen River in Tewksbury.

The Middlesex Canal, once used to move barges from Upper Mystic Lake in Winchester to the Concord River in Billerica, is now a fragmented series of channels with several sections no longer carrying water. The portion of the Middlesex Canal studied in detail in this Flood Insurance Study has become a tributary to Content Brook. Lubber Brook originates in Burlington and flows through Billerica and Wilmington where it joins the Ipswich River in the eastern part of Wilmington.

Although development within flood plain areas has occurred along the Concord and Shawsheen Rivers, it has generally consisted of the conversion of summer camps and cottages for year-round residence.

### 2.3 Principal Flood Problems

Each spring, low-lying areas along the Concord and Shawsheen Rivers are subjected to flooding caused by rains and snowmelt. Areas along the other streams studied are also subjected to local flooding because of inadequate protection afforded by existing culverts (Reference 1).

A review of the history of flooding in Billerica indicates that the main flood season for the Concord and Shawsheen Rivers is spring, when melting snows combine with spring rains. However, records for the area indicate that flooding can occur in any month when the variation in monthly precipitation increases more than 10 inches for the month, when the total precipitation for a single storm exceeds 4 inches in 36 hours, or when conditions prior to a storm are conducive to flooding (Reference 6).

There have been four major floods in the Concord River Basin in this century: 1936, 1955, 1968, and 1979. Two floods in 1886 and 1896 were recorded as equalling the magnitude of the 1936 flood.

The flood of March 1936 was the result of four distinct storms. The total precipitation between March 9 and March 22 for the Concord River watershed ranged from 6 to 8 inches. The snow cover in the watershed had a water content at the beginning of the period which averaged approximately 3 inches. The frozen ground and the warm temperatures which accompanied the rainfall combined to give the Concord River one of its greatest flood peaks (Reference 6).

The greatest flood occurring in the watershed was the result of Hurricane Diane on August 17, 1955. Previously, on August 12, another storm, Hurricane Connie, passed over the east coast and left the ground saturated. The Concord River watershed received an average of 2 to 3 inches during this period. Between August 17 and 20, the area received rainfall which

varied from approximately 7 inches in Lowell to more than 13 inches in the headwaters. Total rainfall averaged over 10 inches. The Concord River rose slowly but continuously to flood stage, beginning on August 19 and cresting on August 23. Damage in the area was relatively minor due to lack of development within the flood plain (Reference 6).

Another major storm occurred during March 1968, which is one of the wettest Marches on record. Most of the precipitation fell during two storms -- the first on March 12-13, the second on March 17-19. Snow cover in the Concord River watershed was above normal, with a water content up to 3 inches. Prior to the second storm, the snow had melted and saturated the wetlands surrounding the Concord River, producing the above normal streamflow. Combined with the unexpected heavy rainfall which began on March 17, severe flooding occurred. The peak flow at USGS gaging station in Lowell (01099500) actually exceeded that of the 1955 flood. However, at the Carlisle Road Bridge (State Route 225), which connects Bedford to Carlisle, the maximum flood level was 9 inches less than that experienced in 1955. In spite of this, flood damages were considerably higher due to the increased development in the flood plain (References 6 and 7).

The most recent flood occurred in January 1979. The month of January was an extremely wet one in eastern Massachusetts and the accumulated precipitation set a new record of over 10 inches (Reference 8). The culmination was the storm of January 24-25 when almost 4 inches of rain fell on the Concord River basin (Reference 9). Although the rainfall was not a record for a single event, it came at the worst possible time. The river and upstream reservoirs were already at very high stages as a result of three one-inch storms which occurred earlier in January when the ground was frozen. Most of the rain fell on Thursday, January 25. On Friday, January 26, the Concord River began to flood. The river continued to rise until it reached a peak of 9.5 feet above normal in Billerica in the early morning hours of Monday, January 29. It then began to recede slowly with a drop of approximately one foot measured on Tuesday afternoon (Reference 10).

The 1979 flood was the maximum recorded event on the Shawheen River, with a discharge of 1,000 cfs was recorded at the USGS gage near Wilmington (01100600). This discharge approximated a 50-year frequency event on the Shawheen River (Reference 11).

The storm of 1979 caused more damage than any previous storm, partly due to intensity and existing conditions but also due to increased development in flood plain and wetland areas. Billerica was especially hard-hit, where over 100 families were evacuated from their homes and over 30 roads were flooded (Reference 10).

The information below presents the relative flood heights at the Carlisle Road (State Route 225) bridge for the ten major floods in the Concord River basin, in order of magnitude.

Flood Heights on the Concord River (Reference 6)

Order No.	Date of Crest	Estimated Elevation at Carlisle Road Bridge**	Peak Discharge at Lowell (cfs)***
1	August 23, 1955	119.4	4,540
2	January 26, 1979*	119.3	3,400
3	March 20, 1936	119.2	6,000
4	March 27, 1968	118.7	4,900
5	July 25, 1938	118.1	3,790
6	September 15, 1954	117.5	3,340
7	September 24, 1938	117.3	3,210
8	March 24, 1948	117.3	3,200
9	January 30, 1955	117.2	3,120
10	April 18, 1936	117.0	2,970

\*Reference 11

\*\*The Carlisle Road Bridge is located one mile upstream of the Bedford/Billerica/Carlisle corporate limits.

\*\*\*The Lowell gage is located 9.75 miles downstream of the Bedford/Billerica/Carlisle corporate limits.

Velocities of water during a 100-year flood on the Concord River would be approximately 2.0 feet per second in the main channel and about 0.4 feet per second over the flood plain. For the Shawsheen River, velocities would be somewhat greater than 4 feet per second in the main channel and about 0.3 feet per second over the bank. During the 1936 and 1955 floods, it is estimated that velocities in the channel of the Concord River ranged up to 1.9 feet per second. Overbank velocities ranged up to 0.3 feet per second. These flood velocities are not considered hazardous (Reference 6).

The duration of flooding for most of the Concord River is generally sustained due to the large drainage area, shallow channel slopes, and wide meadow flood storage areas. Records indicate that the 1936 flood remained higher than elevation 118 at the Carlisle Road Bridge for more than eleven days. Hurricane Diane occurred on August 19 and 20, 1955, but the Concord River did not crest until late on August 22, with water levels remaining above elevation 118 for over three days. The Shawsheen River, on the other hand, rises fairly rapidly and crests within 36 to 48 hours after the time of maximum precipitation over the watershed (Reference 6).

There is no recorded flood information for Jones, Lubber and Content Brooks and the Middlesex Canal.

#### 2.4 Flood Protection Measures

There are no existing or proposed flood control structures in Billerica. A local protection project to the south in the Saxonville section of Framingham was recently constructed along the Sudbury River approximately 15 miles upstream of its confluence with the Assabet River. This project benefits mainly the Upper Sudbury watershed. Flood retention structures have also been constructed upstream on the Assabet River. Their effect on lowering Concord River flood elevations, however, is debatable (Reference 6).

In the past it has been proposed that an adjustable gate be installed at the Talbot Mills Dam in North Billerica. This would allow further management of the Sudbury and Concord Rivers during heavy flooding. Low flow augmentation techniques could also be used. Opponents of the gate argue that it would conflict with other water uses and would interfere with the normal flooding cycle which is essential to wildlife along the river. It has been suggested, however, that the gate be used only when abnormal elevations are expected and not for the normal flooding cycle (Reference 12).

Nonstructural flood protection measures include Section 7.0 of Billerica's zoning by-laws, which states that no building or structure intended for occupancy, either continuous or intermittent, can be erected or placed in the flood plain district unless a special permit is granted by the Board of Appeals. Section 7.1.1 requires that special permit requisites be approved by the Board of Health prior to submission to the building inspector. Section 7.3.1 lists four criteria which must be met prior to granting a special permit: sewage and drainage plans must be approved by the Board of Health; access to structures must be provided at an elevation high enough to insure that the structures can be maintained safely at all times; spaces contemplated for use must be elevated at least two feet above the expected water level during flood events and fill and foundations must be installed in a manner safe from erosion and undermining; and the use of the premises must not endanger the health and safety of the occupants thereof or of other land in the flood plain. Section 7.4.1 requires that no land be filled or paved except with the approval of the Board of Appeals (Reference 13).

Section 3.1 of the regulations of the Board of Health provides that no structure within the flood plain can be constructed, located, expanded, converted, subdivided, or altered. In addition, no encroachments, including fill, new construction, substantial improvements to existing structures, or other development, are permitted unless a variance is granted by a majority vote of the Board of Health (Reference 14).

Other nonstructural measures of flood protection are also being utilized to aid in the prevention of future flood damage. Chapter 131, Section 40 (310 CMR 10.00) of the General Laws of the Commonwealth of Massachusetts (most recently revised on April 1, 1983) is commonly referred to as the Wetlands Protection Act. The law gives the responsibility for issuing permits to remove, fill, dredge or alter wetlands to the local conservation commission. The commission has to determine if an area on which a permit is requested "is significant to public or private water supply, to the ground water supply, to flood control, to storm damage prevention, to prevention of pollution, to protection of land containing shellfish, or to the protection of fisheries." After a public hearing, the commission can impose such conditions as will contribute to the protection of these interests. The Department of Environmental Quality Engineering (DEQE) may also make a determination after a review of the commission's order. Conditions imposed by the DEQE supersede conditions imposed by the commission. Detailed rules and regulations concerning the administration of this act have been promulgated by the DEQE.

Section 40 now requires a conservation commission, if requested, to make a determination of whether a particular parcel of land is a wetland and governed by the Wetlands Protection Act. It also contains definitions of terms to aid this determination.

Chapter 131, Section 40A of the Acts of 1968, as amended by Chapter 782 of the Acts of 1972, gives the commissioner of the Department of Environmental Management the authority to protect inland wetlands and flood plains by establishing encroachment lines "for the purpose of preserving and promoting the public safety, private property, wildlife, fisheries, water resources, flood plain areas and agriculture." The commissioner may adopt orders regulating, restricting or prohibiting the altering or polluting of inland wetlands by designating lines with which no obstruction or encroachment would be permitted without prior approval. These restrictions require notifications to each land owner affected, public hearings, and approval by the town.

Section 40A was further amended by Chapter 818 by defining "inland wetlands" to include the definition of "freshwater wetlands" as set forth in Section 40 as "that portion of any bank which touches any inland waters or any freshwater wetland, and any freshwater wetland subject to flooding."

### 3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the

average during any 10, 50, 100, or 500 year period (recurrence intervals), have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10, 50, 100, and 500 year floods, have a 10, 2, 1 and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50 year period is about 40 percent (four in ten), and for any 90 year period, the risk increases to about 60 percent (six in ten). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be updated periodically to reflect future changes.

### 3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the community.

Because some of the watercourses studied in Billerica were ungaged, a method developed by the SCS for ungaged watersheds was used (References 15 and 16). This method is based on soil types, type of land cover, and surface roughness. The soil cover-land use complex is given a curve number from which storm runoff and peak flow can be determined. This procedure was used to develop flows on Gontent and Jones Brooks and Middlesex Canal.

Floodflows for Lubber Brook were determined using a regional method developed by the USGS which gives consideration to the size of the watershed and the slope of the main channel. (Reference 17).

Floodflow frequency analysis for the Shawsheen River was based on records (1963-1980) at the USGS gaging station (01100600) in Wilmington. The station is located on the right bank at the downstream side of the bridge on State Route 129, at the Billerica-Wilmington corporate limits. The Shawsheen River has a drainage area of 35.3 square miles at the gaging station. The frequency analysis was based on a fitted log-Pearson Type III distribution (Reference 18).

In order to determine flood discharges on the Concord River, it was necessary to determine and route flows on the Assabet and Sudbury Rivers, which unite to form the Concord River. Because the Assabet and Sudbury Rivers are gaged, a log-

Pearson Type III analysis (Reference 1) was made. The Assabet River gage (No. 01097000) has been operated by the USGS since 1941. It is approximately 15 miles upstream from Billerica in Maynard. The Sudbury River gage (No. 01097500) has been operated by the USGS since 1875; it is approximately 23 miles upstream from Billerica in Framingham Center. Hydrographs that were established at the headwaters of the Concord River were routed downstream with the calculated flows being increased because of the contributions from the additional drainage areas and being reduced because of the increase in available storage capacity along the banks of the river. The routed flows were further modified based on data from the USGS gage (No. 01099500) operated since 1936, located downstream from Billerica in Lowell, Massachusetts. Resultant flow data were used as discharges for the 10-, 50-, 100-, and 500-year floods (Reference 1).

A summary of drainage area-peak discharge relationships for each stream studied in detail is shown in Table 1.

Table 1 - Summary of Discharges

Flooding Source and Location	Drainage Area Sq. Mi.	Peak Discharges (cfs)			
		10 Yr.	50 Yr.	100 Yr.	500 Yr.
<b>CONCORD RIVER</b>					
At Downstream Corporate Limits	373	3,105	4,924	5,995	8,870
At Talbot Hill Dam	370	2,940	4,660	5,675	8,395
At U.S. Route 2 Bridge	367	2,885	4,577	5,575	8,245
<b>SHAWSHIEN RIVER</b>					
At State Road (SR 179)	96.5	1,115	1,825	2,200	3,285
Above Confluence with Jones Brook	99.0	1,040	1,710	2,050	3,070
At Boston Road (SR 9A)	31.2	1,020	1,550	1,555	2,950
At Bedford/Billerica Corporate Limits	27.7	1,000	1,500	1,500	2,660
<b>CONTENT BROOK</b>					
At Corporate Limits	5.5	205	370	455	585
At Gray Street	4.9	150	330	400	520
<b>MIDDLESEX CANAL</b>					
Just Upstream of Confluence with Content Brook	2.2	95	175	210	275

Table 1 - Summary of Discharges  
(Continued)

<u>Flooding Source and Location</u>	<u>Drainage Area Sq. Mi.</u>	<u>Peak Discharges (cfs)</u>			
		<u>10 Yr.</u>	<u>50 Yr.</u>	<u>100 Yr.</u>	<u>500 Yr.</u>
<b>JONES BROOK</b>					
At Confluence with Shawsheen River	1.7	215	380	450	540
At Golf Course Culvert	1.6	195	355	425	510
At Baldwin Road	1.3	160	290	345	415
<b>LUBBER BROOK</b>					
At Billerica/Wilmington Corporate Limits	1.3	63	106	129	200
At Billerica/Burlington Corporate Limits	0.7	47	80	98	153

### 3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sections studied in detail in Billerica were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the flood sources.

Water-surface elevations of floods of the selected recurrence intervals for all streams studied by detailed methods were computed using the DOE HEC-2 step-backwater computer program (Reference 19).

Cross sections for backwater analyses of the study streams were field surveyed and spaced at specific intervals along the river channel, so that hydraulic properties would be accurately modeled by the computer. Sections were interpolated between surveyed sections where necessary. These interpolated sections were prepared from survey data and data from topographic maps (Reference 2).

The below-water sections were obtained by field measurement. All bridges, dams, and culverts were field checked to obtain elevation data and structural geometry.

Locations of selected cross sections used in hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map.

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations of the streams and flood plain areas. They are as follows:

<u>Stream</u>	Manning's "n" Value	
	<u>Channel</u>	<u>Overbank</u>
Concord River	0.035 to 0.077	0.125
Shawsheen River	0.045	0.110
Content Brook	0.030 to 0.045	0.060 to 0.110
Middlesex Canal	0.030 to 0.045	0.060 to 0.110
Jones Brook	0.030 to 0.040	0.110
Lubber Brook	0.030 to 0.040	0.110

The acceptability of all assumed hydraulic factors, cross sections and hydraulic structure data for the Concord and Shawsheen Rivers was checked by computations that duplicated historic flood water profiles.

Water surface elevations of floods of the selected recurrence intervals were computed through use of the COE HEC-2 step-backwater computer program (Reference 19). Starting water surface elevations on the Concord River were developed from a rating curve for the Wessit River Company Dam in Lowell. Starting water surface elevations on the Shawsheen River and Content Brook were taken from the Tewksbury Flood Insurance Study (Reference 20). Starting water surface elevations on the Middlesex Canal were developed considering the canal a continuation of Content Brook. Starting water surface elevations on Jones Brook were developed using the slope-area method. Starting water surface elevations on Lubber Brook were taken from a rating curve developed for the dam just upstream of Shawsheen Road in Wilmington. Flood profiles were drawn showing computed water surface elevations for floods of the selected recurrence intervals. All elevations are referenced from the National Geodetic Vertical Datum of 1929 (NGVD), formerly referred to as the Sea Level Datum of 1929; elevation reference marks used in this study are shown on the maps.

Due to the meandering nature of the Shawsheen River, the distance between cross sections will not always agree between the map and the profile.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

#### 4.3 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

#### 4.1. Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FEMA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and the 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using photogrammetric maps at a scale of 1:4,800 with a contour interval of 2 feet (Reference 2). In cases where the 100- and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

For the streams studied by approximate methods, the boundaries of the 100-year flood were developed from normal depth calculations and the photogrammetric maps referenced above.

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map. Small areas within the flood boundaries may lie above the flood elevations, and therefore, may not be subject to flooding. Owing to limitations of the map scale and/or lack of detailed topographic data, such areas are not shown.

#### 4.2. Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood can be carried without substantial increases in flood heights. Minimum standards of the FEMA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as a minimum standard that can be adopted or that can be used as a basis for additional studies.

The floodways for this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 2).

Downstream portions of both the Concord and Shawsheen Rivers have floodway widths extending beyond the corporate limits. Also, a portion of Jones Brook is affected by backwater from its confluence with the Shawsheen River. This condition is footnoted in the Floodway Data Table (Table 2).

As shown on the Flood Boundary and Floodway Map (Exhibit 3), the floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water surface elevation of the 100-year flood more than 1.0 foot at any point. This allowable increase considers only the hydraulic response of the stream and its flood plain to any encroachment. The increase in the water surface elevation is a result of the 100-year flood discharge flowing through a smaller flood plain area. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

One aspect of floodway and flood plain encroachment is sometimes overlooked and more often neglected: the cumulative effect of encroachment on flood discharge magnitude. Generally, as encroachment occurs, temporary storage areas are lost, velocities increase, and the magnitude of the discharge increases. As floodwaters move downstream, that increase can become more significant. The combined effect of a narrower flood plain and greater discharge can, due to hydraulic effects alone, produce a flood stage that exceeds the anticipated 100-year flood.

The FEMA does not encourage the filling of the floodway fringe area. Local officials should be aware that even a 1-foot rise in the water-surface elevation can cause flooding in areas which would have received little or no flooding if such filling had not taken place. Careful consideration of the economic and human dislocation which will be caused by a rise in flood heights should be made before filling is allowed. Large quantities of fill in the fringe area could also disrupt the flood plain ecosystem, causing a major impact on local environmental resources.

FLOODING SOURCE		FLOODWAY				BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE	
					(FEET NGVD)	(FEET NGVD)	(FEET NGVD)		
CONCORD RIVER									
A	2,050	385/250 <sup>2</sup>	5,556	3.1	106.5	106.5	107.5	1.0	
B	4,750	238	3,642	3.6	106.6	106.6	107.6	1.0	
C	9,050	161	2,092	2.9	107.0	107.0	108.0	1.0	
D	9,600	217	3,155	3.9	107.7	107.7	108.2	1.0	
E	10,140	495	740	8.1	108.5	108.5	108.5	0.0	
F	11,610	190	2,634	3.1	114.8	114.8	115.8	1.0	
G	13,050	220	1,559	3.6	115.0	115.0	116.0	1.0	
H	14,065	134	1,662	3.4	115.8	115.8	116.8	0.7	
I	17,145	220	2,941	3.9	116.2	116.2	117.4	0.8	
J	17,625	243	1,564	3.6	116.7	116.7	117.7	0.7	
K	17,935	280	2,427	2.4	116.5	116.5	117.7	0.7	
L	19,830	263	3,120	3.8	116.8	116.8	117.5	0.7	
M	22,060	293	3,581	3.5	117.0	117.0	117.7	0.7	
N	24,405	224	1,308	4.3	117.7	117.7	117.9	0.7	
O	25,655	250	3,417	3.6	117.9	117.9	118.5	0.6	
P	26,725	210	1,737	3.2	117.9	117.9	118.5	0.6	
Q	28,175	167	1,883	2.9	118.7	118.7	118.8	0.0	
R	28,725	327	4,804	3.1	118.5	118.5	119.0	0.5	
S	34,435	139	1,924	2.9	119.0	119.0	119.7	0.7	
T	36,665	971	10,608	0.5	119.3	119.3	120.0	0.7	

1-foot Above Certificate Limit      2 width/width of the corporate limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**TOWN OF BILERICA, MA.**  
 ( MIDDLESEX CO. )

**FLOODWAY DATA**  
**CONCORD RIVER**

FLOODING SOURCE		FLOODWAY				BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY FLOODWAY (FEET MVD)	WITH FLOODWAY (FEET MVD)	INCREASE	
Shawsheen River								
A	0 <sup>1</sup>	220/210 <sup>2</sup>	858	2.9	98.3	98.3	0.9	
B	815 <sup>1</sup>	230/215 <sup>2</sup>	1,515	1.2	95.9	95.9	0.9	
C	1,155 <sup>1</sup>	297/152	377	5.0	97.1	97.0	0.9	
D	1,580 <sup>1</sup>	180/115 <sup>2</sup>	1,563	1.3	92.3	92.6	0.3	
E	2,200 <sup>1</sup>	157/242	393	3.7	92.3	92.7	0.4	
F	2,370 <sup>1</sup>	597/202	337	5.5	92.3	92.7	0.4	
G	2,320 <sup>1</sup>	407/252	233	5.2	92.3	92.7	0.4	
H	2,580 <sup>1</sup>	1507/382	3,345	0.9	97.3	97.5	0.2	
I	4,450 <sup>1</sup>	330/152	3,784	0.5	97.3	97.6	0.3	
J	6,550 <sup>1</sup>	250	2,551	0.7	97.2	97.4	0.4	
K	10,740 <sup>1</sup>	250	2,345	0.7	97.6	98.2	0.6	
L	12,470 <sup>1</sup>	190	1,578	1.2	97.7	98.5	0.8	
M	15,340 <sup>1</sup>	182	2,048	1.0	97.9	98.8	0.9	
N	17,340 <sup>1</sup>	300	2,418	0.5	98.1	99.0	0.9	
O	17,450 <sup>1</sup>	300	2,418	3.1	98.1	99.0	0.9	
P	16,260 <sup>1</sup>	350	3,379	0.6	99.0	99.3	0.3	
Jones Brook								
A	975 <sup>2</sup>	50	190	2.6	97.8	94.1 <sup>2</sup>	1.0	
B	1,800 <sup>2</sup>	60	185	2.7	97.8	96.1 <sup>4</sup>	0.5	
C	2,500 <sup>2</sup>	60	137	5.3	98.3	99.0	0.7	
D	3,250 <sup>2</sup>	60	129	2.8	101.9	102.3	0.4	
E	3,750 <sup>2</sup>	50	180	2.2	106.7	105.0	0.5	
F	4,340 <sup>2</sup>	100	373	1.1	105.0	105.6	0.6	
G	4,580 <sup>2</sup>	150	528	0.7	105.1	105.7	0.6	
H	5,220 <sup>2</sup>	15	88	3.5	107.5	107.6	0.0	
I	5,150 <sup>2</sup>	10	213	1.5	108.5	108.8	0.4	

<sup>1</sup>Foot Above Corporate Limits <sup>2</sup>Width/Width Within Corporate Limits

<sup>3</sup>Feet Above Confluence With Shawsheen River <sup>4</sup>Elevation computed without consideration of Backwater Effects

Prof. Shawsheen River

FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF BILLERICA, MA.**  
MIDDLESEX CO.1

**FLOODWAY DATA**

**SHAWSHEEN RIVER AND JONES BROOK**

TABLE 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET MVD)	WITH FLOODWAY	INCREASE
Content Brook								
A	150	9	39	11.7	94.0	94.0	94.0	0.0
B	210	11	72	6.3	97.9	97.9	97.9	0.0
C	1,800	8	37	12.3	98.7	98.7	98.7	0.0
D	2,575	183	1,032	0.4	-0.6	-0.6	-0.6	0.2
E	3,510	15	180	2.8	-0.6	-0.6	-0.6	0.3
F	3,840	7	35	13.0	-0.2	-0.2	-0.2	0.0
G	4,160	225	1,613	0.3	-0.3	-0.3	-0.3	0.2
H	5,125	40	77	5.2	-0.3	-0.3	-0.3	0.1
I	5,865	163	1,285	0.3	-0.6	-0.6	-0.6	0.7
J	6,260	14	70	3.5	-0.6	-0.6	-0.6	0.7
Middlesex Canal								
K	6,300	25	70	3.5	106.9	106.9	107.6	0.7
L	1,265	20	81	3.0	108.2	108.2	108.7	0.5
M	9,075	23	94	2.2	109.3	109.3	109.9	0.6
N	9,050	20	100	2.1	109.5	109.5	110.1	0.6
O	10,495	20	99	2.1	109.7	109.7	110.4	0.7
Lubber Brook								
A	0	100	501	0.3	103.2	103.2	106.2	1.0
B	1,320	100	462	0.3	103.2	103.2	106.2	1.0
C	1,965	100	371	0.4	103.8	103.8	104.3	0.5
D	3,410	100/75	178	0.7	103.8	103.8	104.3	0.5
E	4,495	100/50	169	0.6	104.1	104.1	105.0	0.9
F	5,070	100/50	157	0.6	104.2	104.2	105.1	0.9

1 Feet Above Corporate Limits  
2 Within/With Corporate Limits

TABLE 2

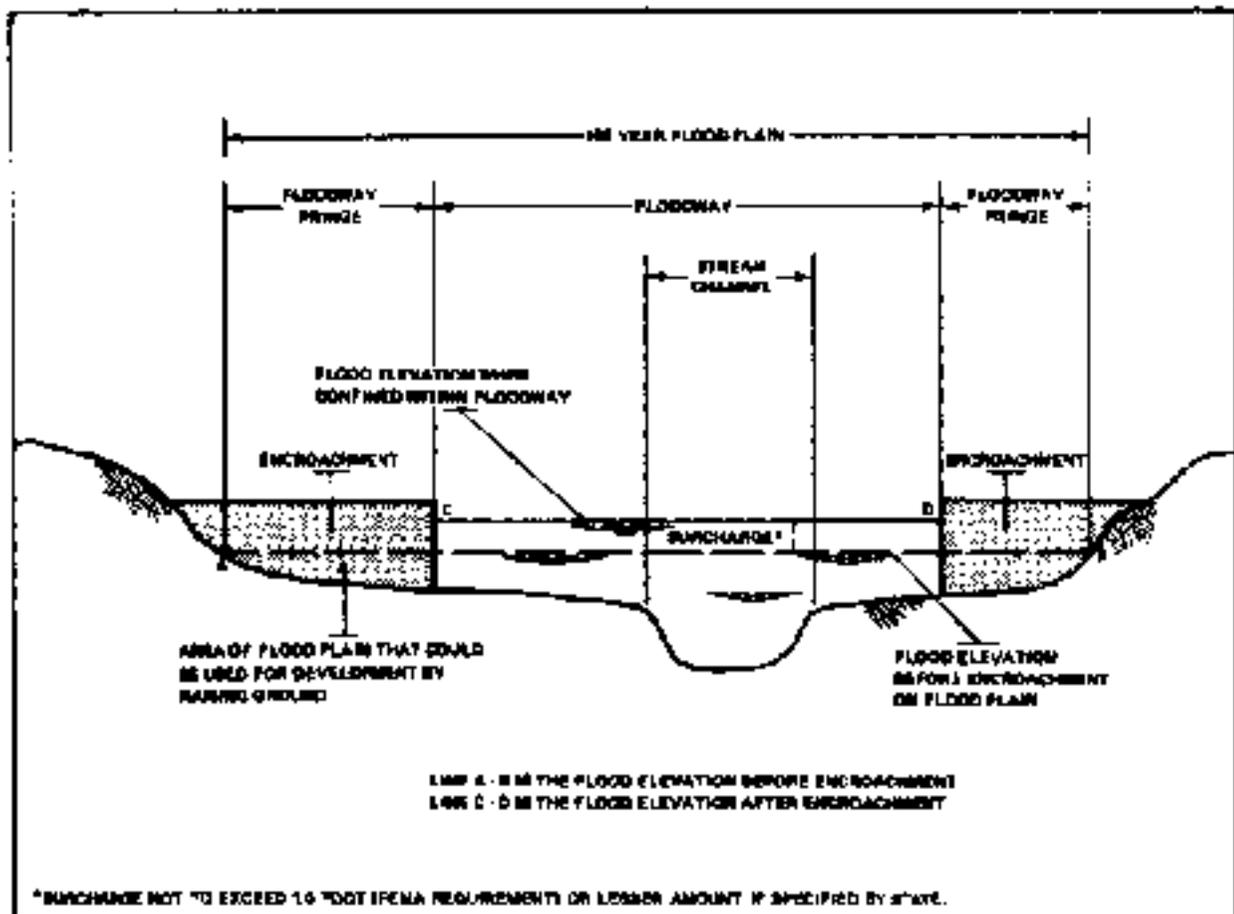
FEDERAL EMERGENCY MANAGEMENT AGENCY  
**TOWN OF BILLERICA, MA.**  
(MIDDLESEX CO.)

**FLOODWAY DATA**

**CONTENT BROOK, MIDDLESEX CANAL AND LUBBER BROOK**

Communities are encouraged by the FEMA to adopt wider, more restrictive floodways and to minimize the amount of fill allowed in the fringe areas. Such actions also meet the intent of the Massachusetts Wetlands Protection Act (Massachusetts General Laws, Chapter 131, Section 40), which was previously described in Section 2.4.

In order to achieve a unified flood plain and wetlands management program, numerous Massachusetts communities have adopted local zoning by-laws, ordinances, subdivision regulations, and local board of health regulations augmenting the minimum requirements of the National Flood Insurance Program and the Massachusetts Wetlands Protection Act. The FEMA encourages the use of this Flood Insurance Study as the technical basis for adoption of a broader, more encompassing local flood plain management program than is required to meet the minimum standards of the National Flood Insurance Program.



FLOODWAY SCHEMATIC

Figure 2

## 5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FEMA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (EHFs), and flood insurance zone designations for each significant flooding source affecting the Town of Billerica.

### 5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

<u>Average Difference Between 10- and 100-Year Floods</u>	<u>Variation</u>
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

Fifteen reaches meeting the above criteria were required for the flooding sources of Billerica. These include one each on Lubber Brook and Middlesex Canal, two on Jones Brook, three each on the Concord River and the Shawshoek River and five on Content Brook. The locations of the reaches are shown on the Flood Profiles.

### 5.2 Flood Hazard Factors (EHFs)

The Flood Hazard Factor is used to correlate flood information with insurance rate tables. Correlations between property damages from floods and their assigned EHF's are used to set actuarial insurance premium rate tables based on EHF's from 005 to 200.

The EHF for a reach is the average weighted difference between the 10- and 100-year flood water surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between the water surface elevations of the 10- and 100-year floods is 0.7 foot, the EHF is 005; if the difference is 1.4 feet, the EHF is 015; if the difference is 5.0 feet, the EHF is 050. When the difference between the 10- and 100-year flood water surface elevations is greater than 10.0 feet, the accuracy for the EHF is to the nearest foot.

### 5.3 Flood Insurance Zones

After the determination of reaches and their respective FHEs, the entire incorporated area of Billerica was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHEs determined.
Zones A1, A2, A3, A5, A6, A7, A8, A11:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones assigned according to FHEs.
Zone B:	Areas between the Special Flood Hazard Areas and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; or, areas subject to 100-year flooding from sources with drainage areas of less than one square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHEs, flood insurance zones, and base flood elevations for each source studied in detail in the community.

### 5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Town of Billerica is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FEMA.

FLOODING SOURCE	FANED <sup>1</sup>	ELEVATION DIFFERENCE <sup>2</sup> BETWEEN 1% (100-YEAR) FLOOD AND 0.2% (500-YEAR)			FLOOD HABASE FACTOR	ZONE	BASE FLOOD ELEVATION <sup>3</sup> (FEET NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
		Concord River Reach 1 Reach 2 Reach 3	0005 0005 0005	-3.4 2.4 3.3			
Shawsheen River Reach 1 Reach 2 Reach 3	0010 0010 0010	1.3 -5.5 5.7	0.5 1.5 0.4	1.1 2.2 1.5	015 055 055	A5 A11 A7	Varies Varies Varies
Jones Brook Reach 1 Reach 2	0010 0010	1.0 -1.6	-0.1 0.2	0.8 0.4	010 015	A2 A3	Varies Varies
Concord Brook Reach 1 Reach 2 Reach 3 Reach 4 Reach 5	0010 0010 0010 0005, 0010 0005, 0010	-3.9 -3.0 -2.3 2.8 3.2	-1.3 -1.1 -0.8 -0.8 -1.3	1.2 0.6 0.7 1.3 1.6	040 030 025 030 035	A8 A6 A5 A6 A7	Varies Varies Varies Varies Varies
Middlesex Canal Reach 1	0005	1.4	-0.5	0.9	015	A3	Varies
Lubber Brook Reach 1	0010	0.3	-0.1	0.2	005	A1	Varies

<sup>1</sup>Flood Insurance Rate Map Panel

<sup>2</sup>Weighted Average - See Map

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**TOWN OF BILLERICA, MA.**  
 (MIDDLESEX CO.)

**FLOOD INSURANCE ZONE DATA**  
**CONCORD RIVER, SHAWSHEEN RIVER, JONES BROOK, CONCORD**  
**BROOK, MIDDLESEX CANAL AND LUBBER BROOK**

## 6.0 OTHER STUDIES

The communities adjoining Billerica are the City of Lowell and the Towns of Tewksbury, Wilmington, Burlington, Bedford, Carlisle and Chelmsford. The Flood Insurance Studies for each of these communities agree with this study at their respective corporate limits (References 20-26) except as noted herein.

There are some discrepancies between this study and the Lowell Flood Insurance Study with respect to floodflows and elevations on the Concord River, because the study contractor used more current information regarding dam construction in the upper reaches of the watershed and a different methodology in flood-discharge development (Reference 1). The Lowell study is presently being revised (Reference 21). The floodflows and elevations of the upper reaches of the Concord River in Lowell will be used in the updated version. This will result in agreement at the Billerica-Lowell corporate limits.

In the Carlisle Flood Insurance Study (Reference 25) Pages Brook was studied by detailed methods. This work included the establishment of a floodway. Pages Brook enters Billerica within the Concord River flood plain in the extreme southern portion of Billerica and, therefore, was not studied in the Billerica Flood Insurance Study. Thus, although no floodway is shown in this study for Pages Brook, the overall flooding data are in agreement with the Carlisle Flood Insurance Study.

In 1968, a Flood Plain Information report was published for the Concord and Shawshen Rivers in Bedford (Reference 6). Since that time, however, additional data have been made available for better flood frequency-discharge analysis.

Although the starting water surface elevations for the Shawshen River were taken from the Tewksbury Flood Insurance Study, the flows used in this study were developed using a longer period of record. Therefore, the flows of the river at the Billerica/Tewksbury corporate limits used in this study are not in agreement with those in the Tewksbury Flood Insurance Study.

In 1971, flood plain maps were prepared using the 2-foot contour maps prepared for the Town of Billerica (Reference 2). These maps delineate flood boundaries of the rivers and streams in the town as well as in other floodprone areas. The information on those maps is not compatible with the information in this Flood Insurance Study. The methodology used in preparing the maps was empirical and used ideal culvert sizes in computing backwater profiles; the methodology used in this Flood Insurance Study was analytical and used existing culvert sizes (Reference 1).

This study is authoritative for purposes of the National Flood Insurance Program, and the data presented here either supersede or are compatible with previous determinations.

## 7.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, Region I Office, John W. McCormack Post Office and Courthouse Building, Post Office Square, Boston, Massachusetts 02109.

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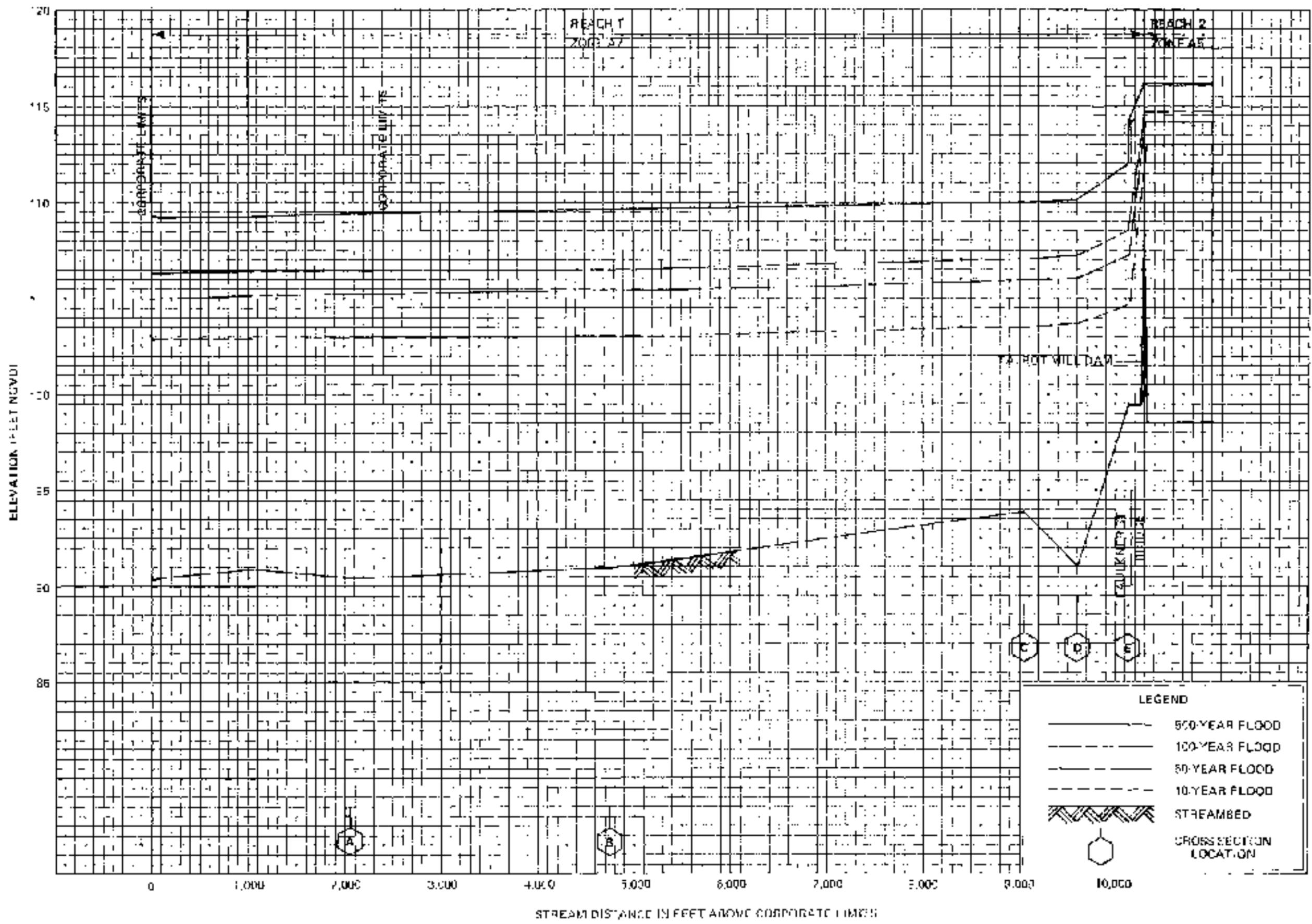
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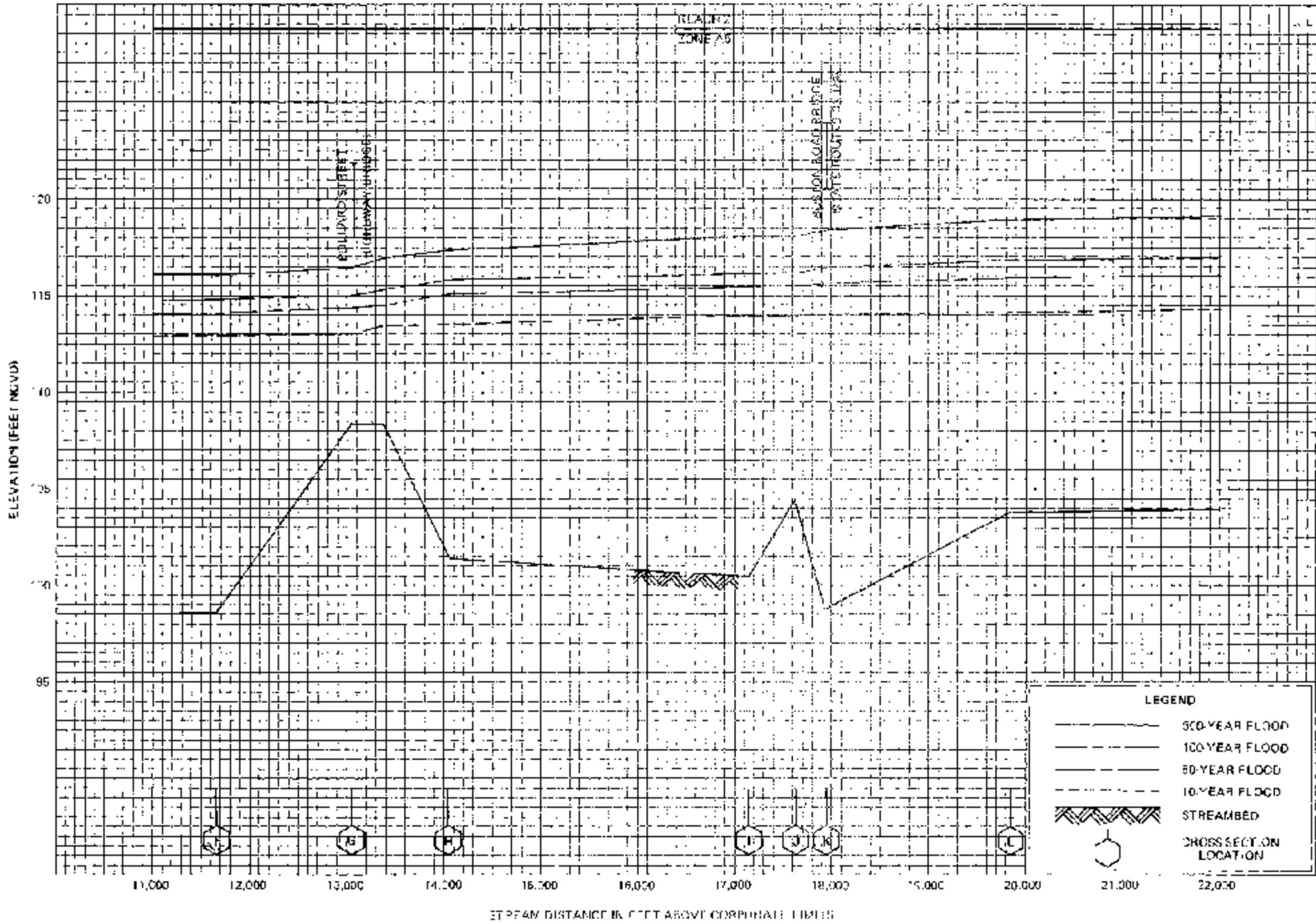


**LEGEND**

	500-YEAR FLOOD
	100-YEAR FLOOD
	50-YEAR FLOOD
	10-YEAR FLOOD
	STREAMBED
	CROSS SECTION LOCATION

**FLOOD PROFILES**  
**CONCORD RIVER**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**TOWN OF BILLERICA, MA**  
MIDDLESEX CO.,



**LEGEND**

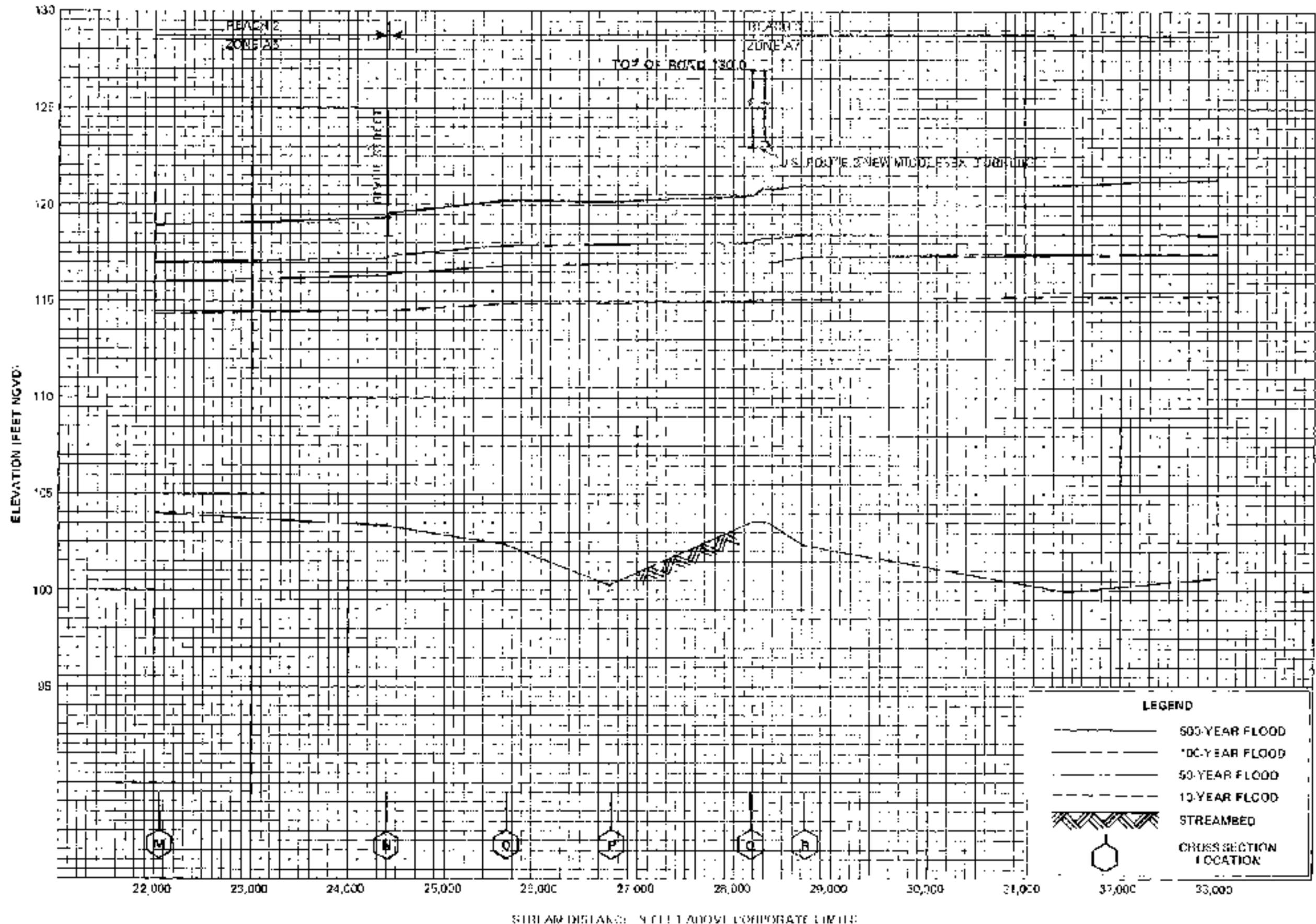
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	100-YEAR FLOOD
	50-YEAR FLOOD
	10-YEAR FLOOD
	STREAMBED
	CROSS SECTION LOCATION

**FLOOD PROFILES**

**CONCORD RIVER**

FEDERAL EMERGENCY MANAGEMENT AGENCY

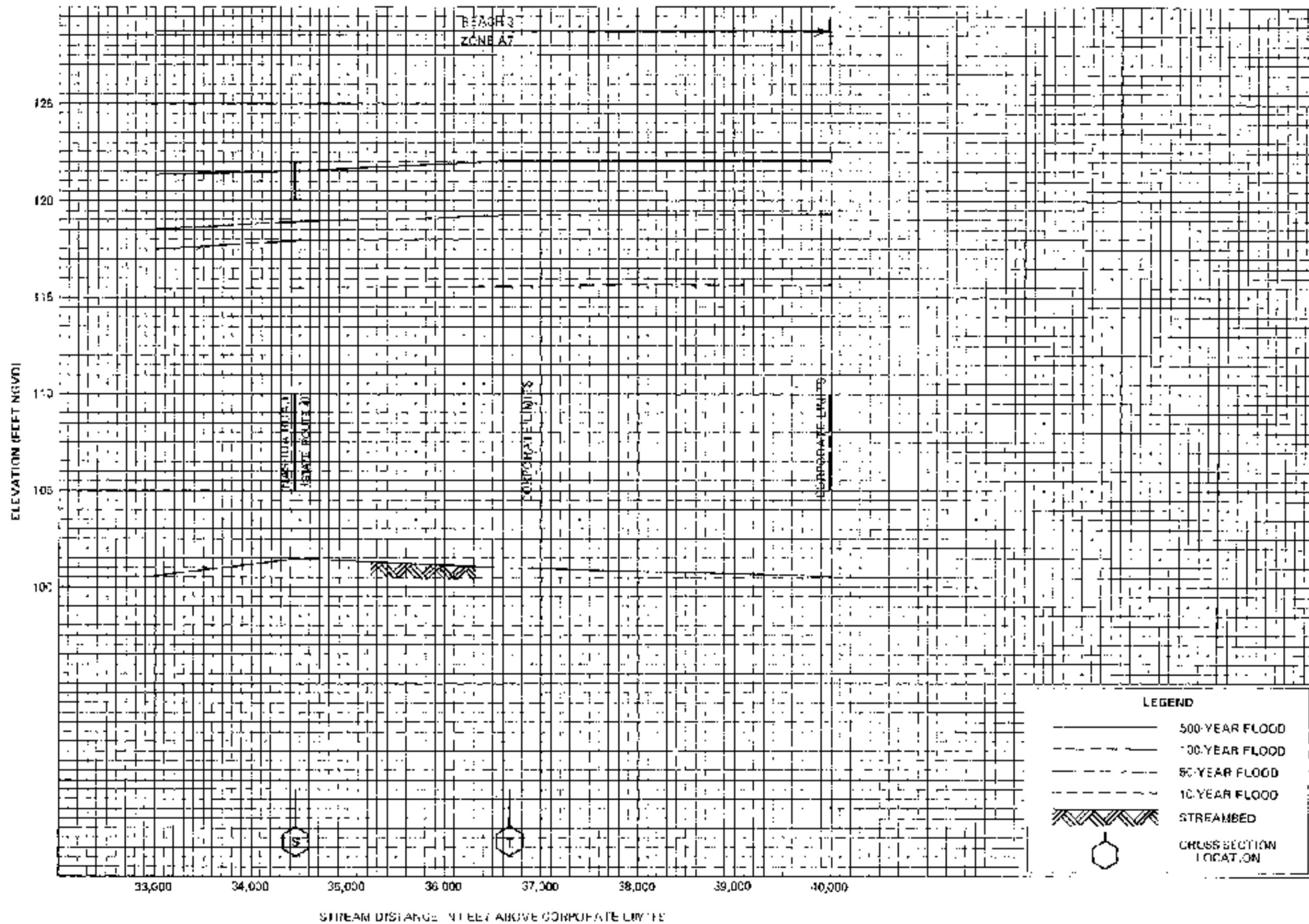
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 (MIDDLESEX CO.)



**FLOOD PROFILES**  
**CONCORD RIVER**

FEDERAL EMERGENCY MANAGEMENT AGENCY

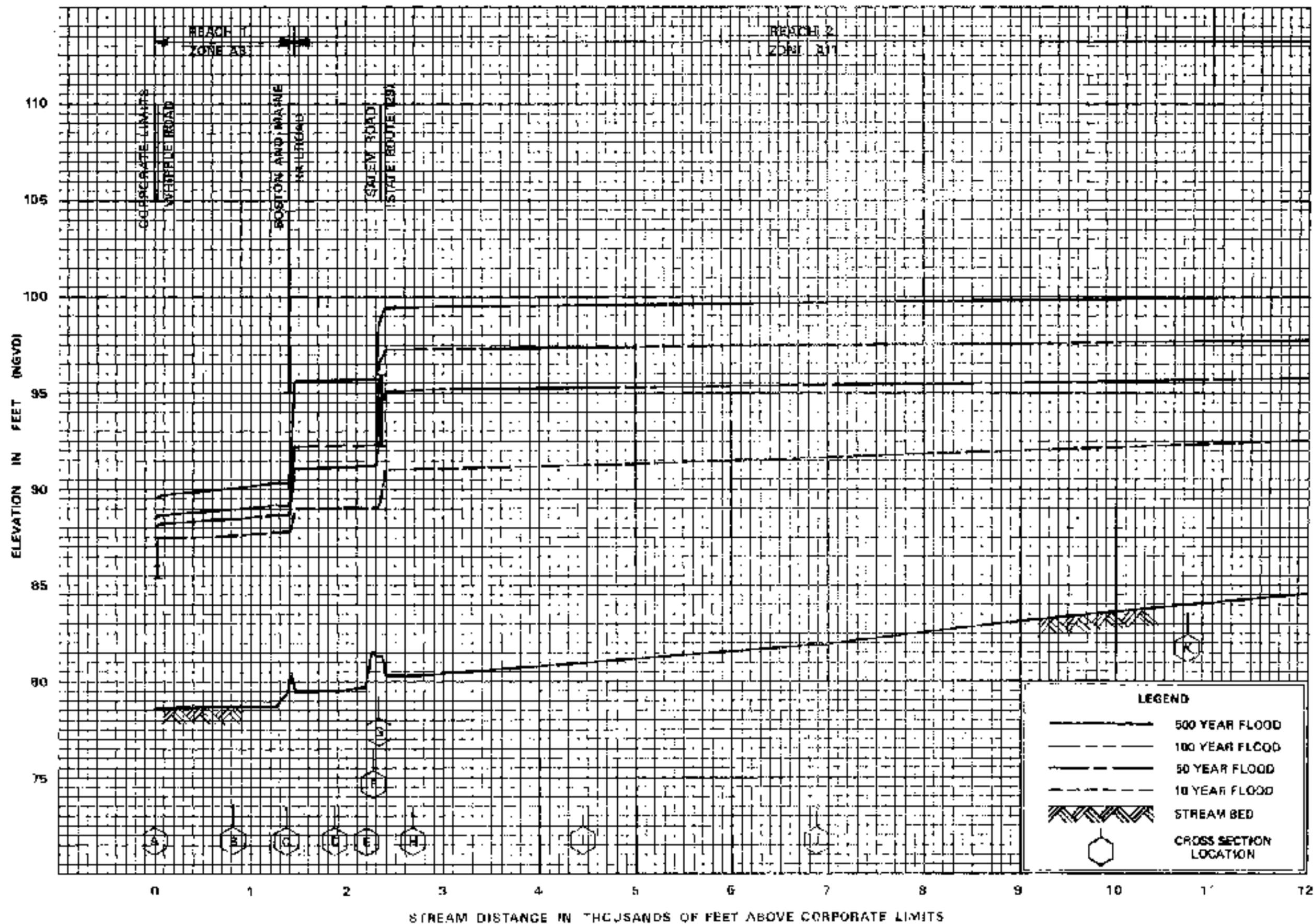
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(MIDDLESEX COUNTY)



**FLOOD PROFILES  
CONCORD RIVER**

FEDERAL EMERGENCY MANAGEMENT AGENCY

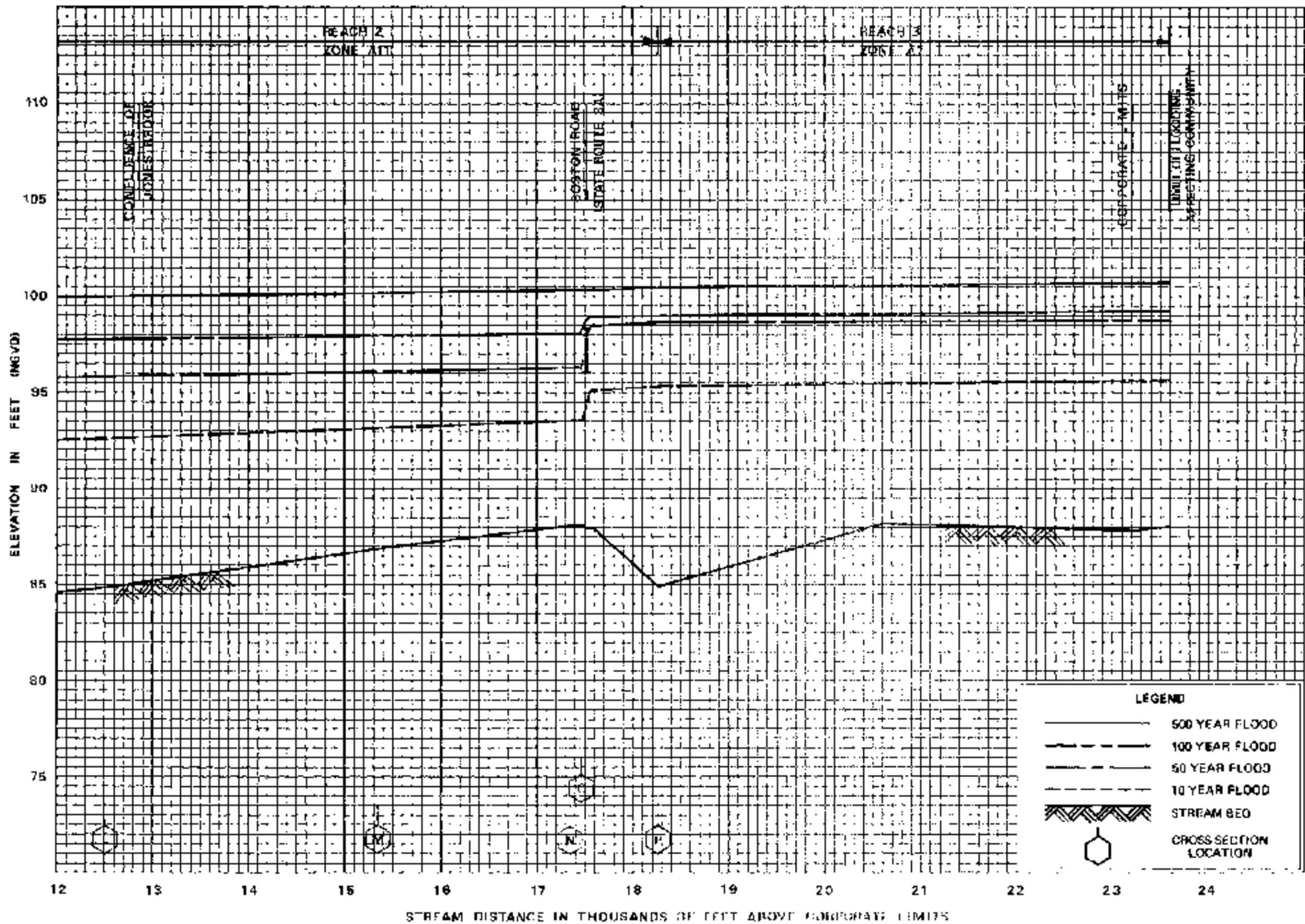
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(MIDDLESEX CO.)



**FLOOD PROFILES**  
**SNAWSHEEN RIVER**

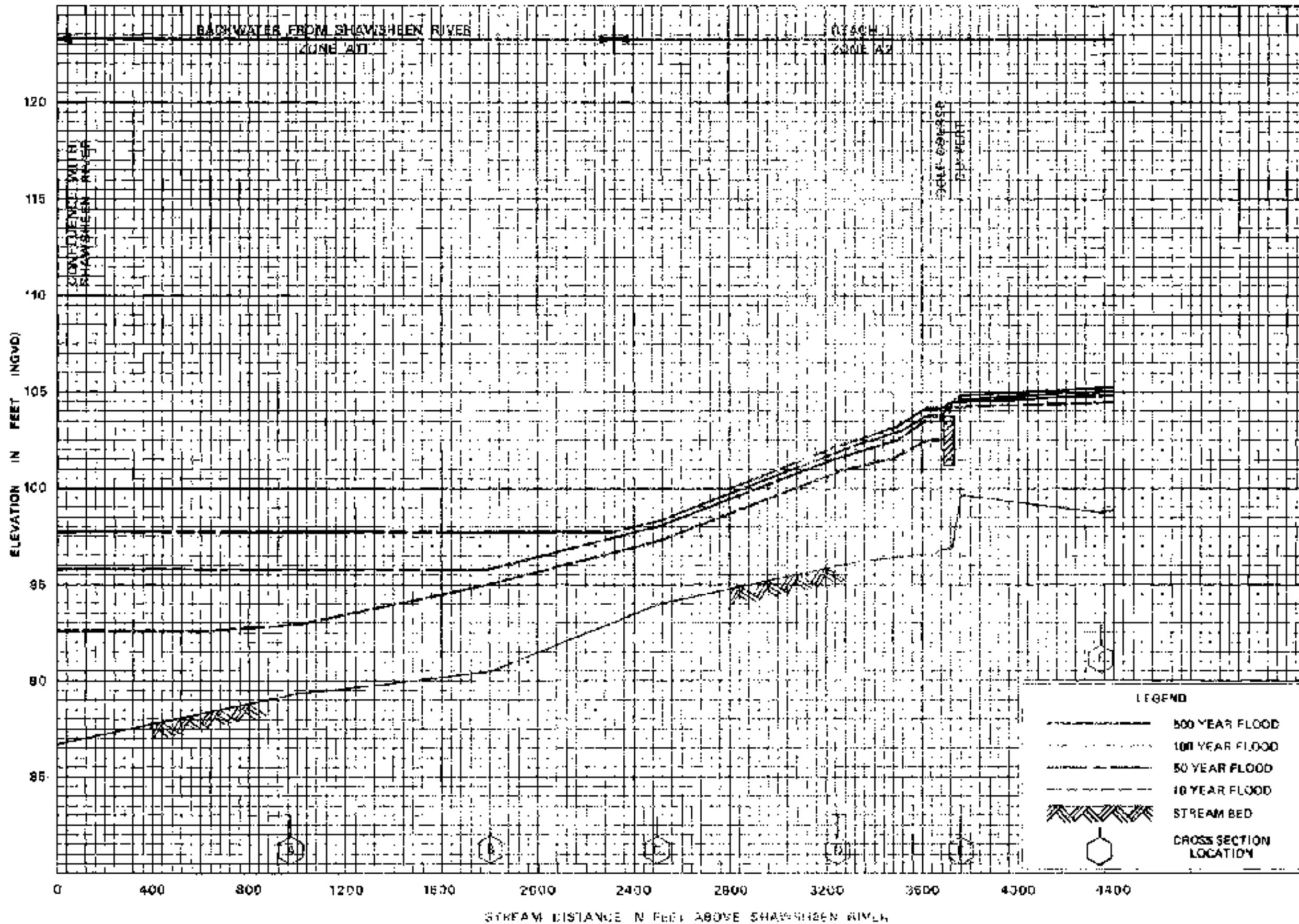
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**TOWN OF BILLERICA, MA**  
(MIDDLESEX CO.)



**FLOOD PROFILES**  
**SHAWSHEEN RIVER**

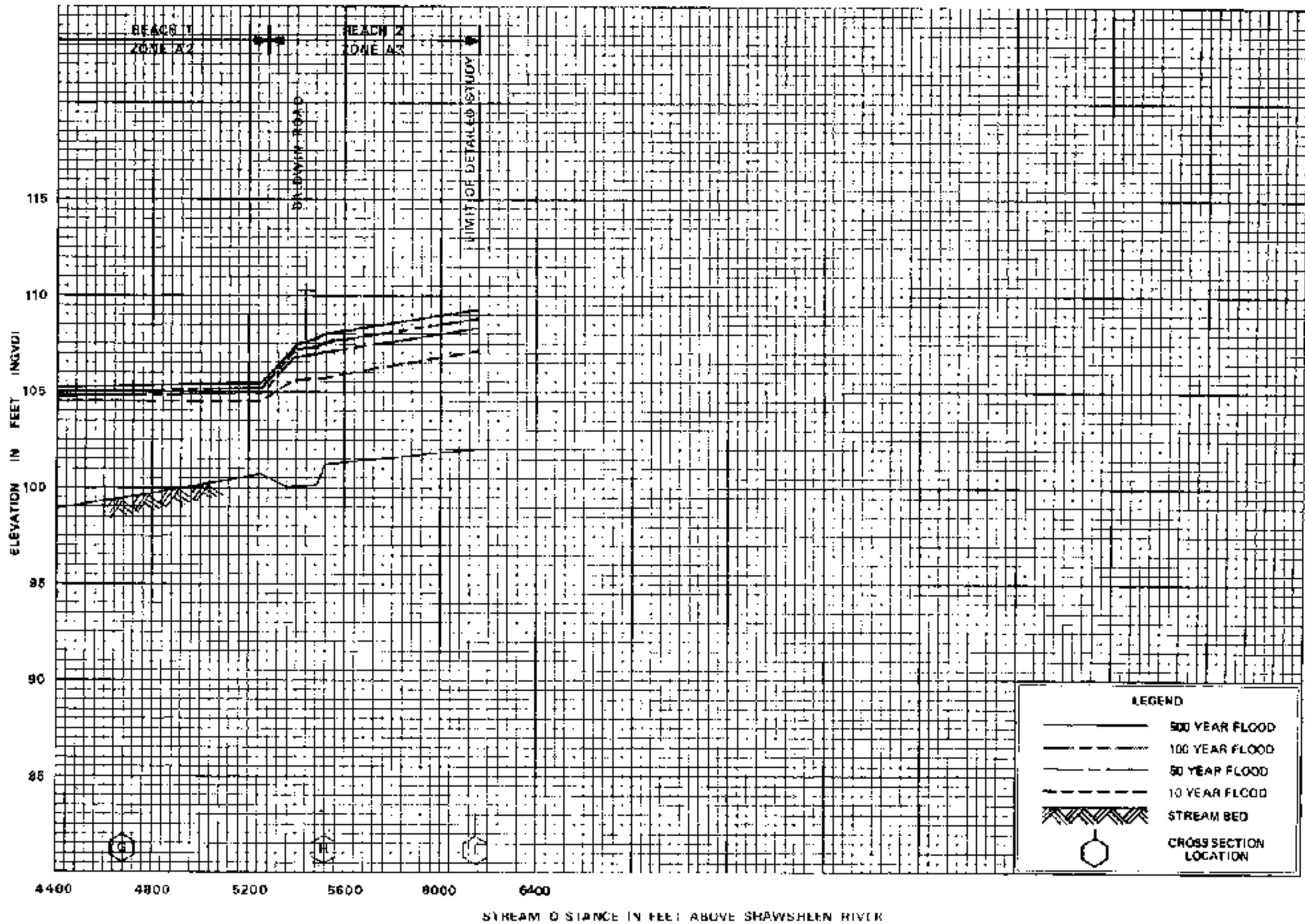
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**TOWN OF BILLERICA, MA**  
(MIDDLESEX CO.)



**FLOOD PROFILES**  
**JONES BROOK**

FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF BILLERICA, MA**  
 (MIDDLESEX CO.)



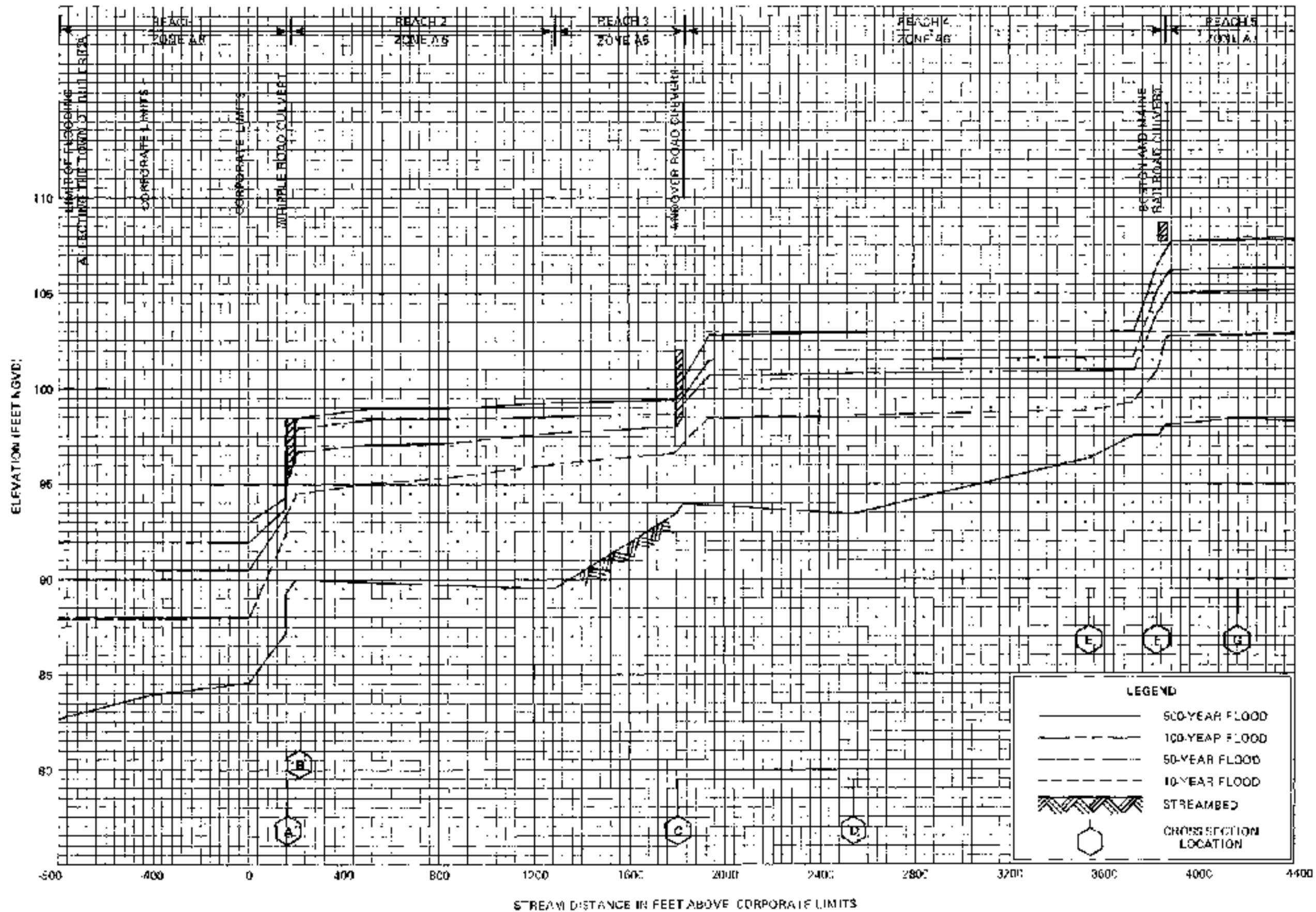
LEGEND	
	500 YEAR FLOOD
	100 YEAR FLOOD
	50 YEAR FLOOD
	10 YEAR FLOOD
	STREAM BED
	CROSS SECTION LOCATION

**FLOOD PROFILES**

**JONES BROOK**

FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF BILLERICA, MA**  
(MIDDLESEX CO.)

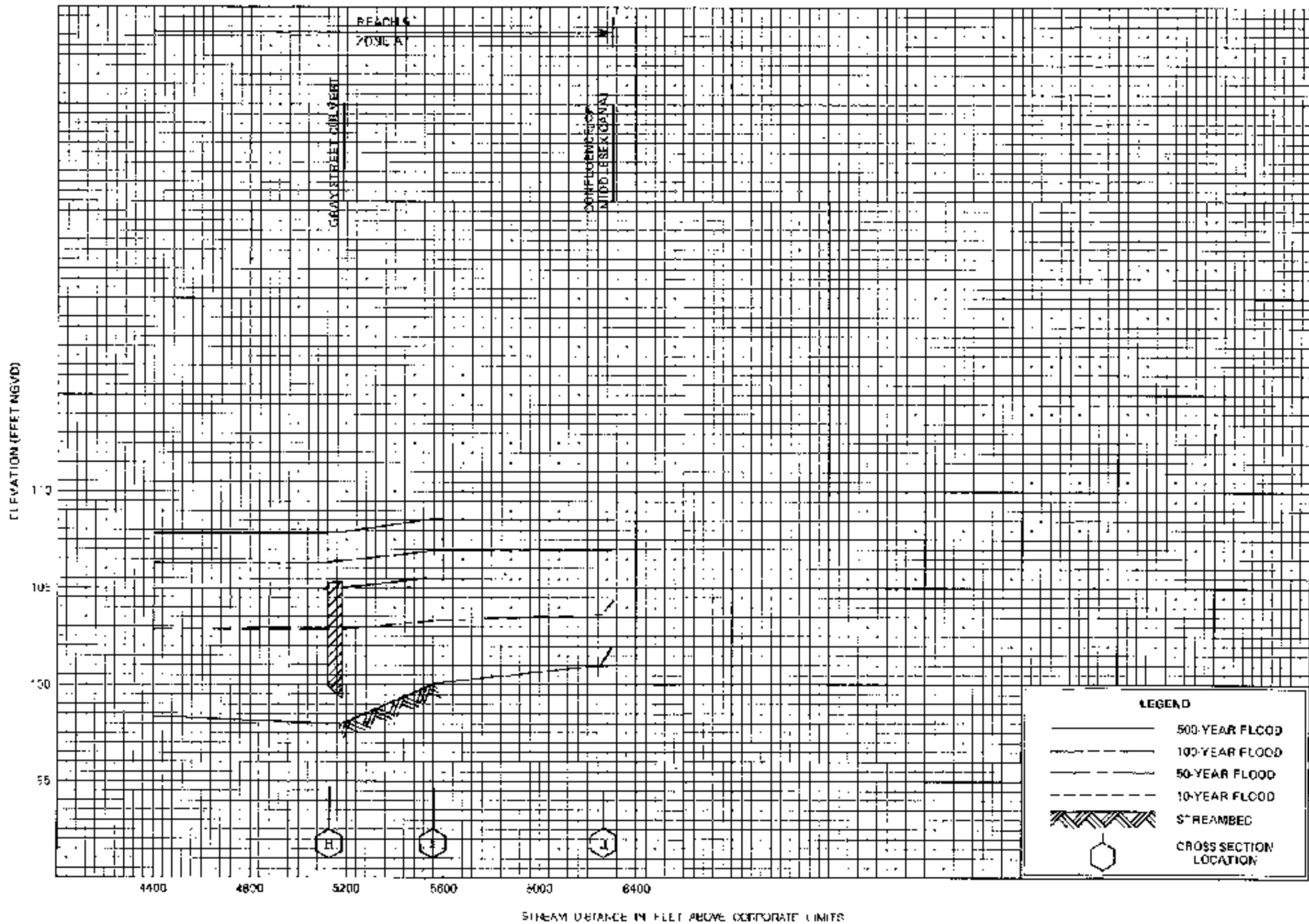


LEGEND	
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	100-YEAR FLOOD
	50-YEAR FLOOD
	10-YEAR FLOOD
	STREAMBED
	CROSS SECTION LOCATION

**FLOOD PROFILES**  
**CONTENT BROOK**

FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF BILLERICA, MA**  
MIDDLESEX CO.

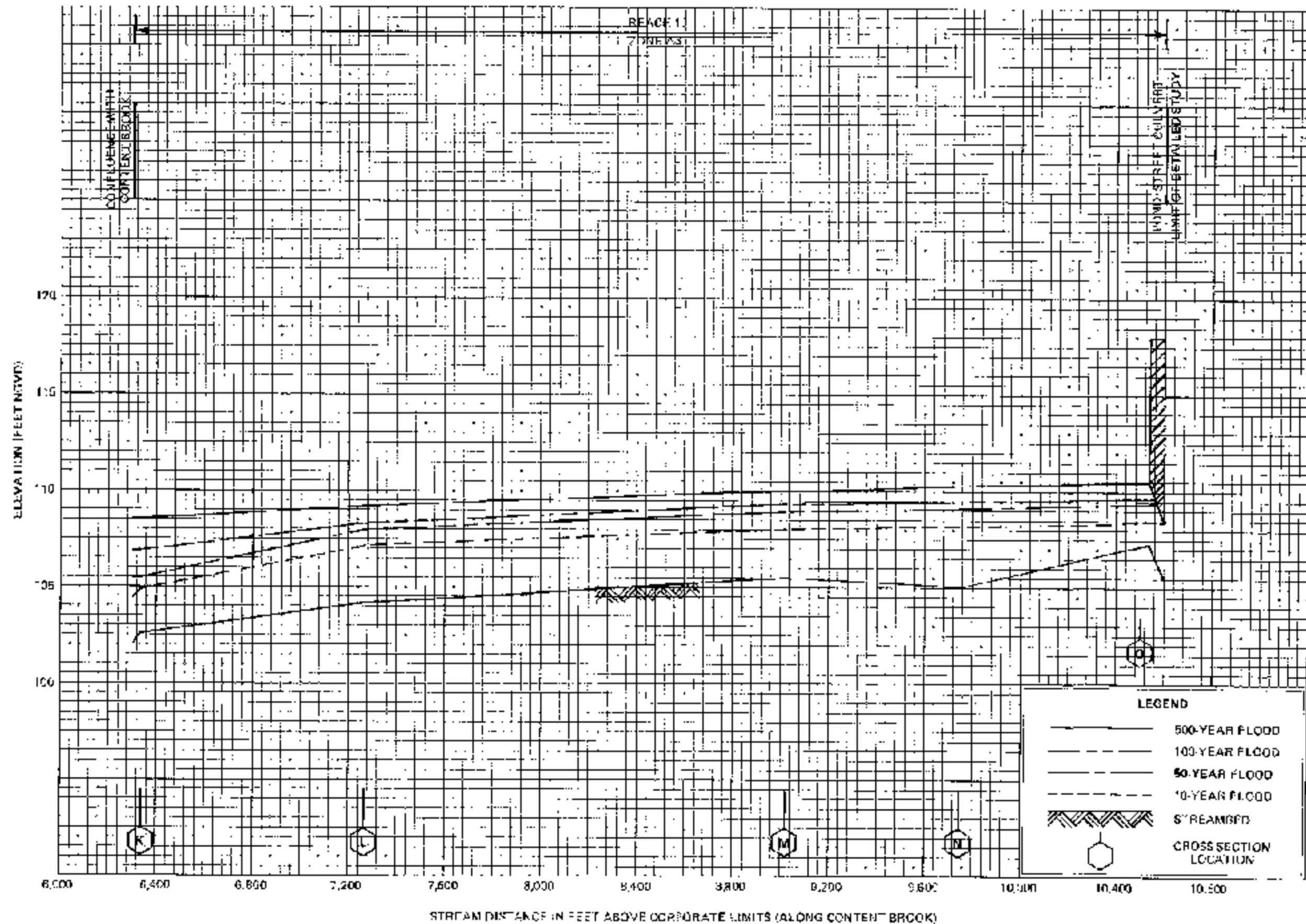


FEDERAL EMERGENCY MANAGEMENT AGENCY

FLOOD PROFILES

CONTENT BROOK

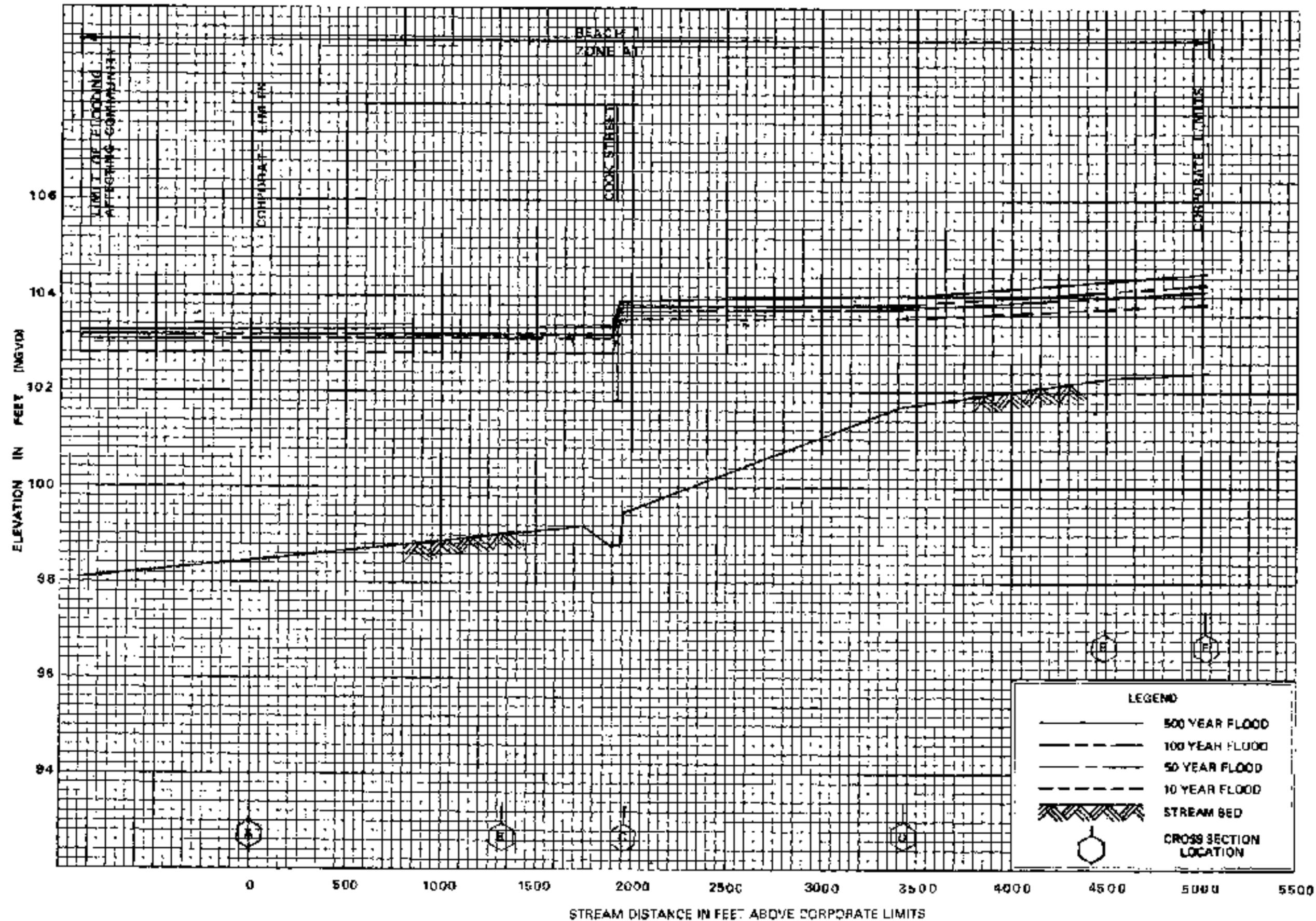
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(MIDDLESEX CO.)



**FLOOD PROFILES**  
**MIDDLESEX CANAL**

FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF BILLERICA, MA**  
(MIDDLESEX CO.)



**FLOOD PROFILES**  
**LUBBER BROOK**

FEDERAL EMERGENCY MANAGEMENT AGENCY  
**TOWN OF BILLERICA, MA**  
(MIDDLESEX CO.)

**APPENDIX F**  
**(The Dam Spillway has remained unchanged since the previous inspection. Therefore,  
our attached Spillway Capacity Check from 2009 is sufficient)**

Project TRUST MILL DAM - NORTH BILBOGUA  
 Project No. 2092445 Sheet No. 1 of 1  
 Calculated By (Signature) Date 5-4-2009  
 Checked By \_\_\_\_\_ Date \_\_\_\_\_  
 Subject \_\_\_\_\_ Scale \_\_\_\_\_

Geotechnical Consultants, Inc.  
 201 Boston Post Road West  
 Marlborough, MA 01752  
 (508) 449-0900 FAX (508) 233-2325

SPILLWAY CAPACITY CHECK.

- REFERENCES: 1. USACE EM-110-2-1603  
HYDRAULIC DESIGN OF SPILLWAYS  
 2. FEMA - FLOOD INSURANCE STUDY 1985  
TOWN OF BILBOGUA, MA.

PERTINENT DATA

DESIGN FLOOD - 100YR EVENT  
 REQUIRED DISCHARGE - 5675 CFS (per FEMA Study)  
 SPILLWAY TYPE - BOARD BEAM  
 SPILLWAY LENGTH - 127' (NOT INCL ROY @ ABUTMENTS)  
 SPILLWAY CREST - EL 109.7 FT  
 CHANNEL UPSTREAM - EL 98.5 FT  
 100YR FLOOD LEVEL - EL 114.7 FT (per FEMA Study)

DESIGN HEAD: 114.7 - 109.7 = H<sub>d</sub> = 5.0 FT

APPROACH CHANNEL X-SECT:

$(114.7 - 98.5) \times 127 = 2057 \text{ ft}^2$

APPROACH CHANNEL VELOCITY

$V_{0.5} = \frac{5675 \text{ CFS}}{2057 \text{ ft}^2} = 2.75 \text{ ft/sec}$

$\frac{V_{0.5}^2}{2g} = \frac{(2.75 \frac{\text{ft}}{\text{sec}})^2}{(2)(32.2 \frac{\text{ft}}{\text{sec}^2})} = 0.12 \text{ FT SMALL!}$

TOTAL ENERGY HEAD:  $H_e = 5.0 + 0.12 = \underline{\underline{5.12 \text{ FT}}}$

Project TALBOT MILLS DAM - NORTH BULLOCK CA

Geotechnical Consultants, Inc.

Project No. 2092945 Sheet No. 2 OF 2

201 Boston Post Road West

Calculated By (Signature) Date 5-4-2009

Marlborough, MA 01752  
(508) 229-1000 FAX (508) 229-2279

Checked By \_\_\_\_\_ Date \_\_\_\_\_

Subject \_\_\_\_\_ Scale \_\_\_\_\_

SPILLWAY CAPACITY CHECK (CONT.)

COMPUTE:  $\frac{H_o}{H_d} = \frac{5.12 \text{ ft}}{5.05 \text{ ft}} = 1.02$  OK

COMPUTE:  $\frac{y_1}{H_d} = \frac{10.7 \text{ ft} - 10.5 \text{ ft}}{5.0 \text{ ft}} = 0.04$  OK

DETERMINE DISCHARGE COEFFICIENT

REFER TO PLATE 3-4  $C = 4.1$

COMPUTE SPILLWAY DISCHARGE CAPACITY

SPILLWAY LENGTH = 127'

$$Q_s = C L H_o^{1.5} = (4.1)(127 \text{ ft})(5.12 \text{ ft})^{1.5} = \underline{\underline{6,632 \text{ cfs}}}$$

ESTIMATE CAPACITY AT SPILLWAY ABUTMENTS

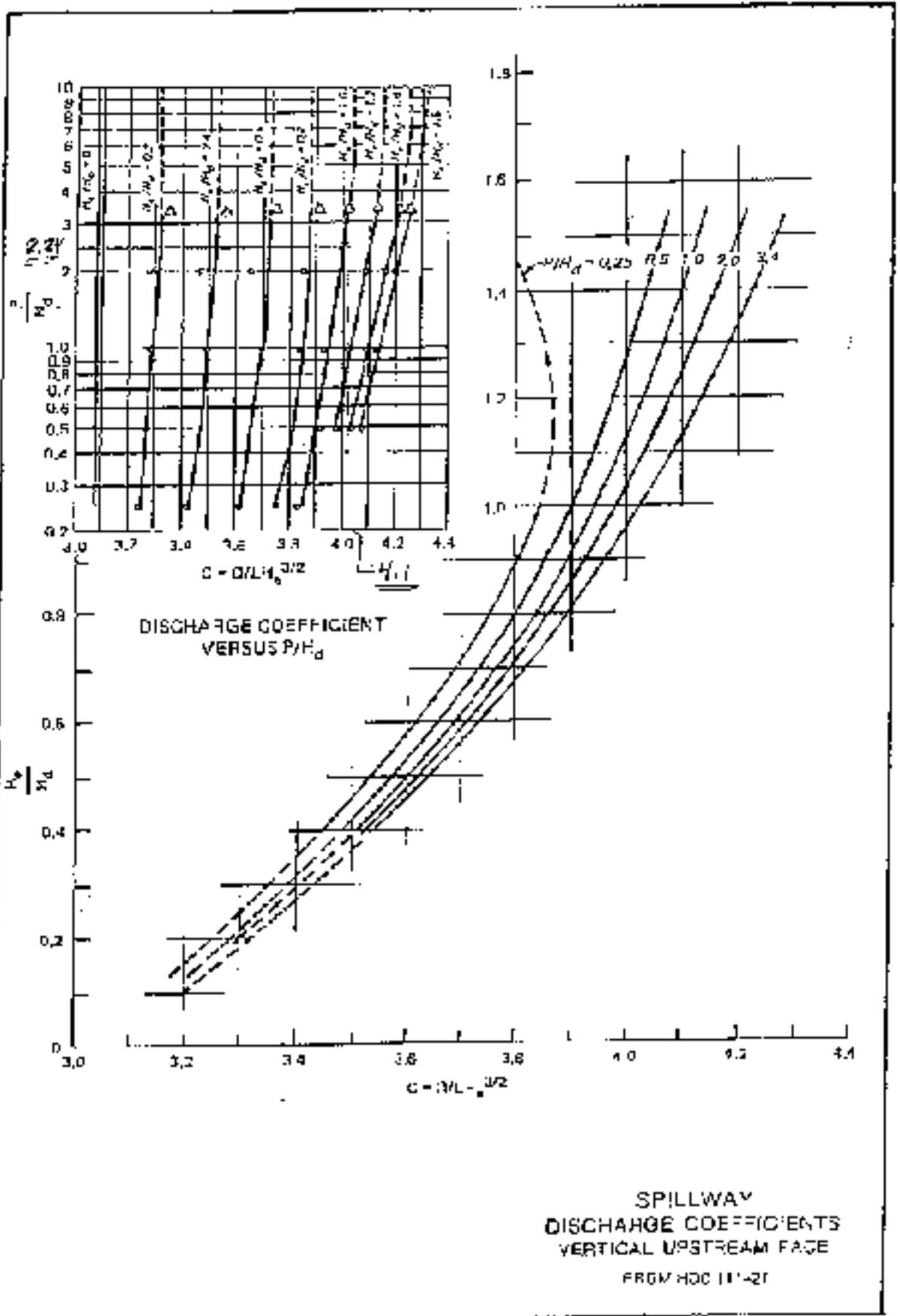
LENGTH: LEFT = 14' RIGHT = 13' TOT L = 27'

$$H_{ca} = 11.7 - 11.5 \text{ ft} = 0.2 \text{ ft}$$

$$Q_a = (4.0)(27 \text{ ft})(0.2 \text{ ft})^{1.5} = \underline{\underline{6.20 \text{ cfs}}}$$

$$Q_{\text{TOTAL}} = 6,650 \text{ cfs} > 5675 \text{ cfs}$$

OK



## **APPENDIX G**



**Talbot Mills Dam**

67 Faulkner Street  
Billerica, MA 01862

Inquiry Number: 2465969.1

April 13, 2009

## The EDR Aerial Photo Decade Package

# EDR Aerial Photo Decade Package

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDRs professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

**When delivered electronically by EDR, the aerial photo images included with this report are for ONE TIME USE ONLY. Further reproduction of these aerial photo images is prohibited without permission from EDR. For more information contact your EDR Account Executive.**

***Thank you for your business.***  
Please contact EDR at 1-800-352-0050  
with any questions or comments.

## **Disclaimer - Copyright and Trademark Notice**

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**Date EDR Searched Historical Sources:**

Aerial Photography April 13, 2009

**Target Property:**

67 Faulkner Street

Billerica, MA 01862

<u>Year</u>	<u>Scale</u>	<u>Details</u>	<u>Source</u>
1938	Aerial Photograph. Scale: 1"=750'	Panel #: 2442071-E3/Flight Date: November 10, 1938	EDR
1952	Aerial Photograph. Scale: 1"=500'	Panel #: 2442071-E3/Flight Date: July 07, 1952	EDR
1963	Aerial Photograph. Scale: 1"=750'	Panel #: 2442071-E3/Flight Date: April 27, 1963	EDR
1978	Aerial Photograph. Scale: 1"=750'	Panel #: 2442071-E3/Flight Date: May 12, 1978	EDR
1980	Aerial Photograph. Scale: 1"=750'	Panel #: 2442071-E3/Flight Date: October 10, 1980	EDR
1986	Aerial Photograph. Scale: 1"=1000'	Panel #: 2442071-E3/Flight Date: March 30, 1986	EDR
1995	Aerial Photograph. Scale: 1"=750'	Panel #: 2442071-E3/Flight Date: March 29, 1995	EDR
2006	Aerial Photograph. Scale: 1"=502'	Flight Year: 2006	EDR



**INQUIRY #:** 2465969.1

**YEAR:** 1938

| = 750'





**INQUIRY #:** 2465969.1

**YEAR:** 1952

| = 500'



21



INQUIRY #: 2465969.1

YEAR: 1963

| = 750'





**INQUIRY #:** 2465969.1

**YEAR:** 1978

| = 750'





**INQUIRY #:** 2465969.1

**YEAR:** 1980

| = 750'





**INQUIRY #:** 2465969.1

**YEAR:** 1986

— = 1000'





**INQUIRY #:** 2465969.1

**YEAR:** 1995

| = 750'





**INQUIRY #:** 2465969.1

**YEAR:** 2006

| = 502'



# Talbot Mills Dam Removal

**Last Updated:**

March 2, 2023

## Welcome to Talbot Mills Dam

*Use this StoryMap to learn about Talbot Mills dam, historical information about the dam and region, maps and visuals regarding migratory fish passage, and potential impacts resulting from the removal of the dam.*

*The guide below shows information about each section, or keep scrolling to view them all!*

## **Existing Conditions at Talbot Mills Dam and the SuAsCo**

**Watershed:** *Start here to learn about the site and get oriented to the dam and the surrounding area.*

**History of Migratory Fish and Humans:** *Visit this section to learn about the rich history of migratory fish and humans at the site prior to the dam construction.*

**History of Talbot Mills Dam:** *Talbot Mills Dam has a rich but fraught history involving some of 19th century New England's most prominent engineers, industrialists and environmentalists. Use this interactive timeline to learn more about the highlights of that conflict.*

**Fish Passage in the Merrimack River Watershed:** *Visit this section to compare historical migratory fish habitat with today, and see where improvements can be made.*

**Comparing Barriers Across the Watershed:** *In this section, compare the habitat restoration potential from removing various dams in the Merrimack watershed.*

**Dam Removal and Flooding:** *Learn how removing the dam will not negatively affect flood control, and may reduce flood risk immediately upstream.*

**Dam Removal and Drinking Water:** *Multiple studies have found that the dam removal will have minimal impact on Billerica's drinking water intake, and does not pose a threat to the town's water supply.*

**Learn More:** *Once you've viewed this StoryMap, check out other sources of information about the project.*

**Stay in Touch:** *Sign up to join our email list to get project updates!*

# Existing Conditions at Talbot Mills Dam and the SuAsCo Watershed

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Talbot Mills is a historic mill complex located on the Concord River in Billerica, Massachusetts.

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It is upstream of two dams on the Concord River:

1. The Middlesex Dam, which is breached so fish can pass here under normal flow conditions.
2. Centennial Island Dam which has a fish ladder for fish passage. Fish counts are conducted here each year.

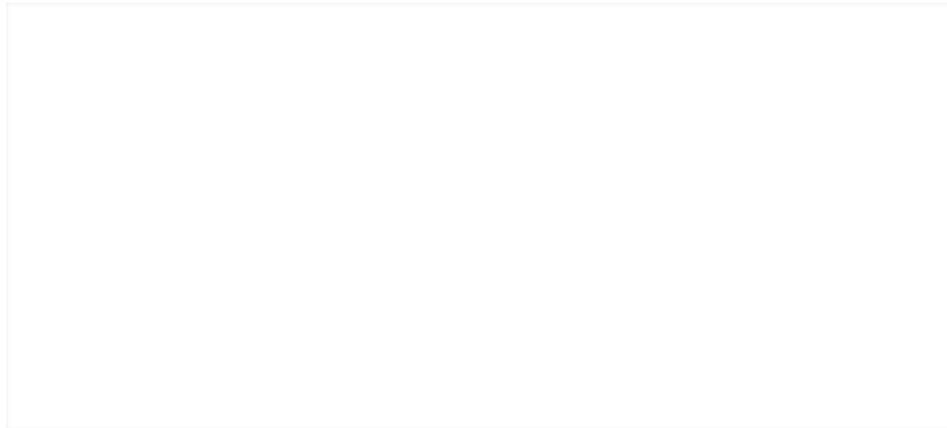
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The Concord River is part of the Sudbury, Assbet and Concord River (SuAsCo) watershed. These rivers flow northward from the headwaters in Westborough to empty into the Merrimack River in Lowell.

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The mill complex has many components.

The dam, made of granite-block, holds back the water...



*Talbot Mills Dam on Sept 4, 2022 during a historic drought.*

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and diverts some of the water behind the dam through two  
sluiceways.

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The sluiceways direct water to two large mills, where it was used to generate power: Talbot Mills Complex on the south side of the river, and Faulkner Mills Complex on the north side of the river. These mills used water from behind the Talbot Mills Dam to power their operations until the mid to late 1800s, at which point they moved to steam power.



*Talbot Mills Complex*

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The sluice gate on the north side of the dam, which once controlled the flow of water into the Faulkner Mill, is still in place.

However, due to its poor condition, water currently flows through this gate uncontrolled.



*View looking upstream at the sluice gate.*

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Another gate controlled the flow of water into the Faulkner Mill. This gate is currently open and receiving uncontrolled flow from the gate upstream.



*View looking downstream at the gate to the Faulkner Mill building.*

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A waste gate, on the south side of the dam, which once controlled the flow downstream in the river, is now plugged.



*View looking upstream at the plugged waste gate.*

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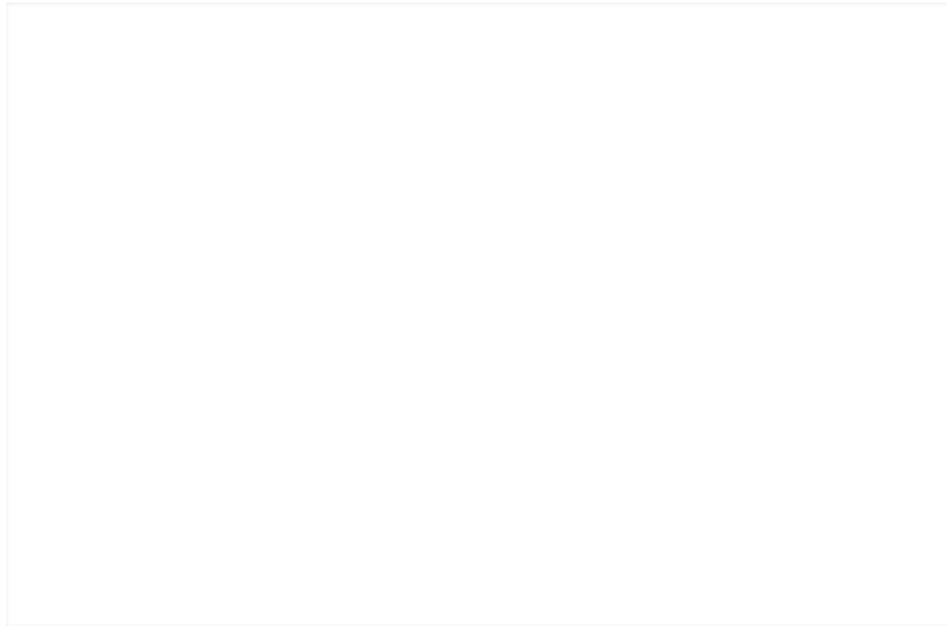
A fishway on the north side of the dam plugged with a concrete block in the 1960's, and remains that way today.



*View looking upstream at the plugged historic fishway.*

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Talbot Mills Dam was also used to divert river water into the Middlesex Canal, which connected Lowell to Boston. The canal was used to move goods produced on the Merrimack River down to Boston between 1802 and the 1860s. Mules pulled barges across the Concord River on a floating towpath.

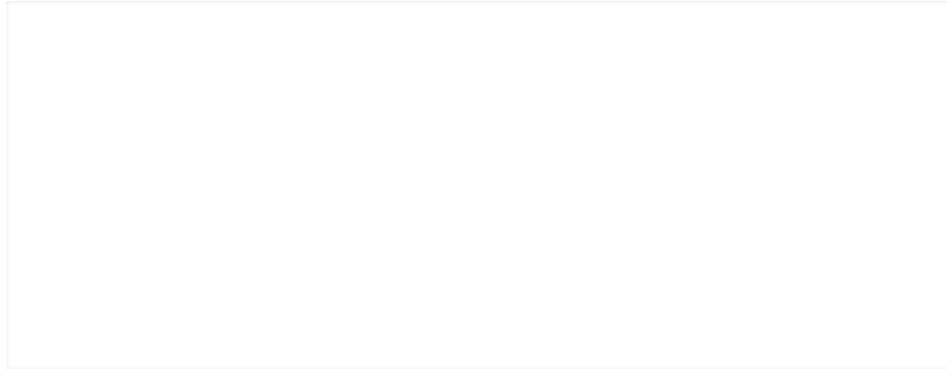


*Sign on the section of the Middlesex Canal near the Talbot Mills Dam*

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Today, the Talbot Mills Dam no longer serves any industrial purpose, but still has an impact on the local ecology, hydrology, and recreational use. The dam holds back water, creating an impoundment known as the Mill Pond. The dam raises the water level significantly for approximately 0.5 miles upstream to the

Pollard St. bridge. It has minor impacts on water levels upstream. The dam slows the flow of water, resulting in near-stagnant conditions upstream during dry summers. It also prevents the natural movement of sediment and nutrients downstream to the Merrimack River and estuary. It is a barrier to fish passage, restricting or preventing the movement of migratory fish both up and downstream.



*The Mill Pond*

The approximate limit of the Mill Pond is at the Fordway Bar at the Pollard St. bridge, a naturally-occurring stretch of bedrock,

boulders, and heavy gravel which creates a high-point in the river. This bar was a natural place for people and wildlife to cross the Concord River before the Pollard St. bridge was built.



*View from the Pollard St. bridge, looking downstream  
at the Fordway bar section of the Concord River.*

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The Concord River is also used for many other purposes. Three miles upstream is the public drinking water intake for the town of Billerica.



*Billerica water intake structure.*

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The river is popular for recreational fishing, boating, and birding. The Great Meadows National Wildlife Refuge is upstream on the Concord River, as is Minute Man National Historical Park. The federally-designated Wild and Scenic Sudbury, Assabet, and

Concord River begins about five miles upstream of the dam. Twenty-nine miles of these rivers have special protection due to their exceptional scenic and recreational value. They are protected by the Wild and Scenic River Stewardship Council made up of local municipal, state, federal and non-profit representatives under the guidance of the National Park Service. This Partnership Wild and Scenic River is one of only 16 such rivers in the US—a unique and precious resource.



*Concord River at Minute Man National Historical Park.*

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Next, learn more about the dam's history, its impact on the region today, and why removing the dam is key to restoring native fish populations and the health of the river.



*Water falling over Talbot Mills Dam.*

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## **History of Migratory Fish and Humans**

The Talbot Mills Dam removal will increase habitat connectivity for many species of fish within the watershed, with the project's priority focus on five species of diadromous fish: sea lamprey, American eel, blueback herring, alewife and American shad. Diadromous fish require both fresh and saltwater habitats to complete their life cycle, and are under threat globally due to human-caused changes. The loss of habitat connectivity is a

primary driver of their decline. These species are critical to nutrient exchange between oceanic and terrestrial ecosystems, and their restoration will benefit many species of fish, mammals and birds throughout the SuAsCo watershed, and the Gulf of Maine, including economically important fisheries.

Diadromous fish have a long evolutionary history, greatly predating the evolution of our own species. They began populating the Concord River after the last glacial retreat, likely around the same time as the first human presence in the area, and they have played an important role in human life here for thousands of years.

**Sea lampreys (*Petromyzon marinus*) are one of the oldest extant species of fish on earth.** Lampreys first appear in the fossil record about 360 million years ago. **They are considered living fossils** and are one of the earliest organisms to have a spinal cord.

Sea lampreys are anadromous, meaning they spawn in freshwater and live their adult lives in saltwater. They are an edible fish, and are part of traditional cuisines around the world.



*Distribution and status of sea lamprey in their native North American range. [A recent study](#) indicated populations in the Merrimack River watershed are vulnerable.*

American eel (*Anguila rostrata*) are another ancient species, with Anguila species entering the fossil record 83 million years ago. **American eel are unique as the only catadromous species in North America**, meaning they spawn in the ocean, but live their adult lives in freshwater habitat. The lifecycle of eels has long been shrouded in mystery. **They spawn in the Saragasso Sea, but this event has never been seen by human eyes.**

Eels have long been a source of human food, many people today are familiar eating eel as unagi sushi, and there continues to be a commercial fishery in Maine. Unfortunately habitat fragmentation, pollution, and overharvesting have led to their decline. **American Eels are listed as endangered by the IUCN 3.1.**

To learn more about the American Eel, check out this PBS documentary *The Mystery of Eels*

## The Mystery of Eels

There are some things in nature we just don't understand, and this creature is one of them. Eels ar...

<https://player.pbs.org/viralplayer/2364992162/>

Blueback Herring (*Alosa aestivalis*), Alewife (*Alosa pseudoharengus*), and American Shad (*Alosa sapidissima*) all belong to the *Alosa* genus of river herring. Like sea lampreys, these three species are anadromous, spawning in freshwater and spending their adult lives in the ocean.

The *Alosa* genus first evolved 55 million years ago, and **these species play a critical role in oceanic food webs**. They are a prey species for many fish targeted by commercial and recreational fisheries, as well as being prey for mammals and birds, including four species of birds and three species of whales listed as endangered by the state of Massachusetts.

Shad, alewife, and blueback herring have also long been used by humans as food, bait and fertilizer. **Their numbers have declined considerably from their historic levels, primarily due to habitat fragmentation caused by dams, with the IUCN considering blueback herring to be a vulnerable species.**

To put into context how long these fish have been on the earth, **human ancestors only split off from the ancestors of chimpanzees 6 million years ago and our species, *Homo sapiens*, has only existed for ~400,000 years.**

Not only do these ancient species have unique evolutionary histories, due to their multi-habitat lifestyles, **they play a critical role in nutrient cycling between oceanic and terrestrial ecosystems.** They are at the base of the food chain, supporting many species in rivers and oceans. **When their populations suffer, so do the many species that rely on them.**

**All of these species have an ancient history of human use as food, and have played an important role in human life in North America.**



Human presence in the Concord River valley goes back to the end of the last Ice Age. **As the glaciers retreated, our current landscape emerged and the northeast gradually became habitable for humans and migratory fish alike.**

Approximately 22,000 years ago New England and much of North America was buried under miles of ice.

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### Talbot Mills Historical Map

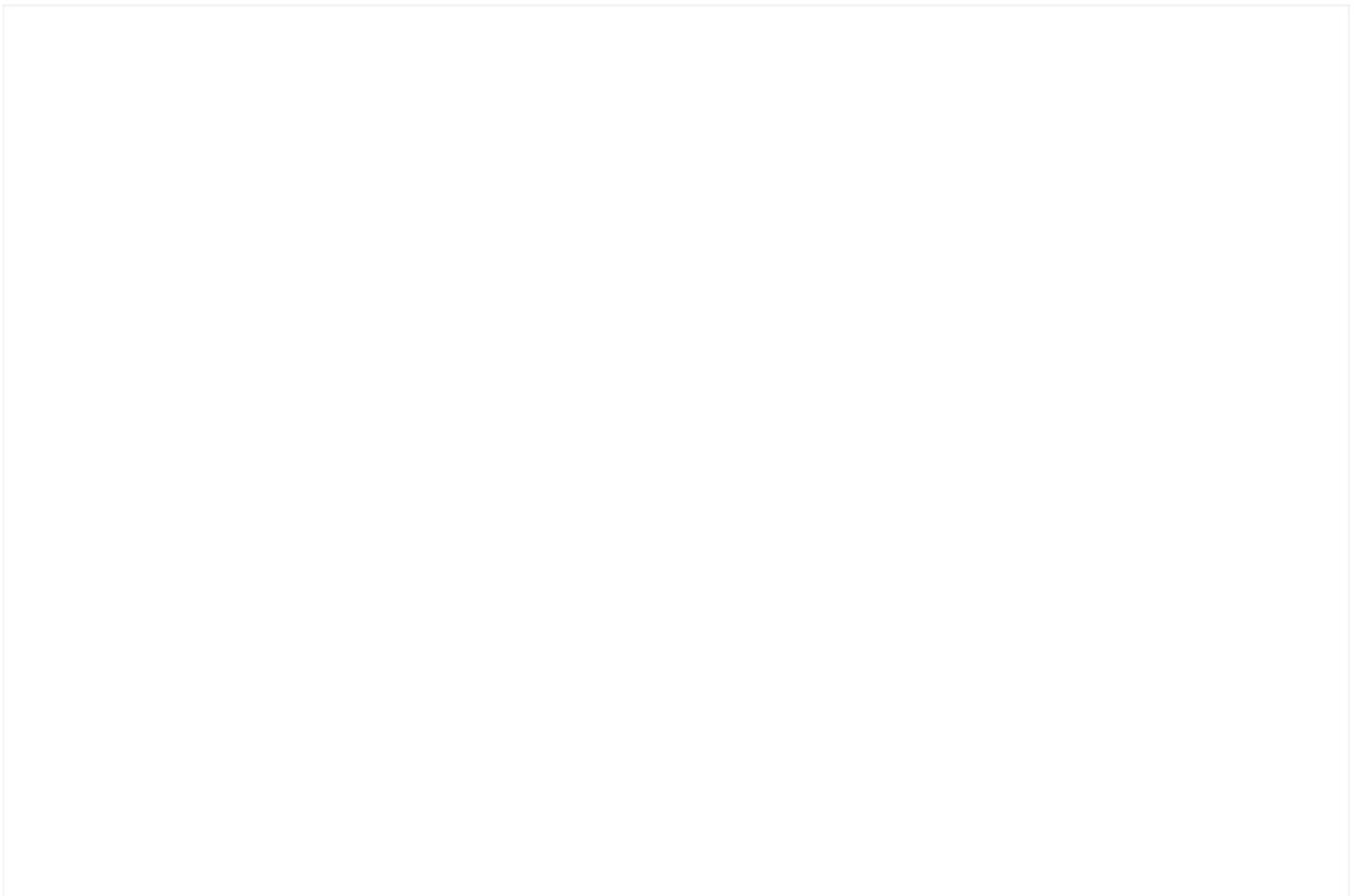


Approximately 14,000-12,500 years ago the glaciers melted, leaving behind rivers and large glacial lakes including Glacial Lake Sudbury and Glacial Lake Concord.

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*Map showing glacial retreat and glacial lakes within the SuAsCo watershed.*

The famed wetlands and sluggish pace of the Great Meadows are a result of the gradual upslope of these ancient lake bottoms.



Approximately 12,500-10,000 years ago humans first entered the region following the retreating ice. **The SuAsCo and Shawsheen**

**River watersheds contain a large inventory of known pre-contact Native American sites.** Artifacts from these locations provide a glimpse into life long ago. Migratory fish began populating the area soon after glacial retreat as well.

The ecosystem at the time was cold tundra and grasslands. Human lifeways were migratory, following herds of large mammals, particularly caribou.

Approximately 10,000-5,000 years ago the tundra converted to boreal forest, then the mixed deciduous forest we see today, as the climate warmed and dried. Due to a decline in many of the larger species, humans relied on smaller game, freshwater fish and wetland plants for food sources. Regular seasonal settlements emerged and settlement sites existed throughout the watershed. **Based on locations of found artifacts, it is understood that people settled near falls where fishing was easier, such as those currently beneath Talbot Mills Dam.**

5,000-3,000 years ago the population of hunter-gatherers increased. Fishing weirs found dating to this period suggests increased fishing and improved fishing methods.

3,600-1,000 years ago people had established long distance trading routes, as indicated by non-local materials found in tools from this period. People began farming, as indicated by the earliest evidence of agriculture in the region. **Anadromous fish continued to be an important food source, along with deer and turkey.** Stone artifacts from this period have been found within the SuAsCo watershed.

1,000-450 years ago Tribal territories, as they existed in the European Colonial Contact period, including the Nipmuc and Pawtucket territories within the watershed were established. Click below to explore an interactive map of native territories, languages and treaties within the SuasCo watershed and around the globe, developed by [Native Land Digital](#).

## Explore the Map



In 1710 a timber crib dam was built on the site. At the time the dam was the first barrier diadromous fish would encounter on their journey from the ocean, and it caused fish populations to suffer. **Within 135 years anadromous fish had been extirpated from the Concord River watershed, and catadromous eels had also declined.** This was primarily due to the continued

construction of dams, many without fish passage. **Thousands of years of human-fish interaction was brought to an end over the span of a few generations.**

These ancient species, who play a critical role in global ecosystems and the human economy, are imperiled. **Removing the dam at Talbot Mills is an opportunity to renew the story of diadromous fish and humans in the SuAsCo watershed, and to honor the long interrelationship between these species and our own.**

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## History of Talbot Mills Dam

Talbot Mills Dam has long played a role in the industrial history of the region. Dams at the site supported development of sawmills and grist mills, the creation of the historic Middlesex Canal, and a robust textile industry that persisted into the late 20th century. However, for as long as there have been dams at the site there has been conflict. The initial conflict pitted subsistence upriver farmers and fishers against their downriver neighbors. Later agriculturalists and transcendentalists clashed against industrialists and their workers.

Over the past 312 years, a lot has happened at this location:

- Five dams in total existed
- One dam was destroyed by court order
- Another destroyed by a group of vigilante farmers
- A third was ordered lowered, but saved by injunction
- Four different commissions studied the dam and its effect on upriver flooding
- At least six petitions requested the dam be removed or altered to reduce flooding, improve drainage, or restore fish passage

- At least eight lawsuits were filed covering the same issue, with many countersuits and appeals

Click below to dig deeper into the exciting events in this dammed history: the controversy over the dam, the mills it powered, the canal it regulated, the flooding it caused, and the fish it disrupted.

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## **Fish Passage in the Merrimack River Watershed**

**Talbot Mills and the Concord River are part of a larger river system: the Merrimack River**

## **watershed, and part of a larger ecosystem: The Gulf of Maine and Atlantic Ocean.**

This means the dam has impacts to the river and ecosystem, well beyond its immediate surroundings.

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This is the Merrimack River Watershed

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These are the rivers in the Merrimack River Watershed.

Historically, prior to colonization and the industrial revolution, fish could move freely up and down these streams.

Sediments and nutrients were transported freely from upstream tributaries, downstream to the marsh, allowing the river to support a variety of habitats and ecosystems.

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Migratory fish used to travel from the oceans, to the mouth of the Merrimack River...

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they swam up the mainstem of the river...

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and some returned to spawning grounds in the lower tributaries, while others continued upstream.

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Some returned to spawning grounds in the Shawsheen River...

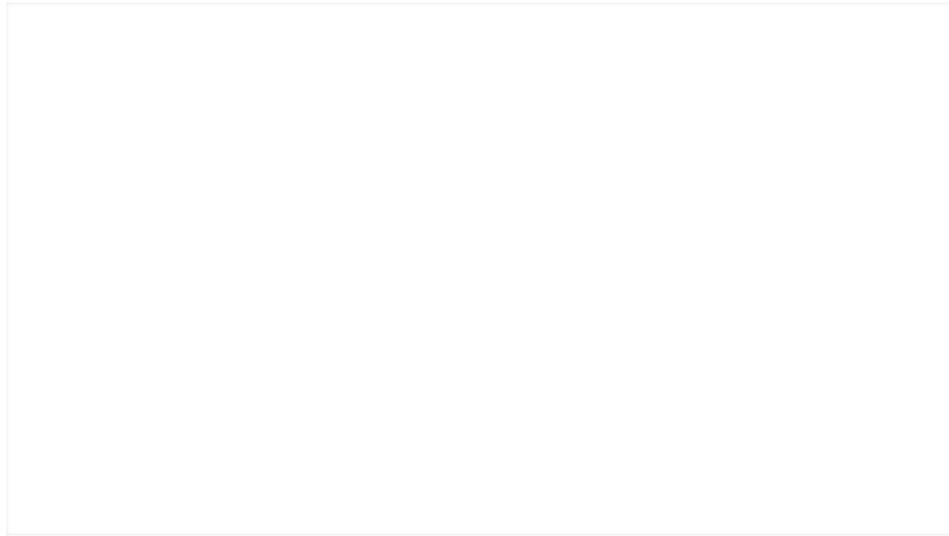
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while others migrated up the Concord River.

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Many continued up the main stem. An observation in an early biological survey of the Merrimack River in from the end of the 18th century recounted shad at Amoskeag Falls:

*“so thick as to crowd each other in the passage up the falls... you could not put in your hand without touching some of them.”*



American shad.

*Marston, P.M. and Gordon, M. 1938. Notes on fish and early fishing in the Merrimack River system. Biological survey of the Merrimack watershed. New Hampshire Fish and Game Commission, Concord: 186-198.*

Migratory fish have been observed as far upstream as...

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the upper sections of the Pemigewasset River, in the White Mountains.

Relative to this, the swim to Talbot Mills Dam is quite close to the ocean.

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The green area shows the historical extent of habitat available to migratory fish for spawning, or for eels, for spending the majority of their lives.

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Today, almost all of that habitat is blocked by estimated 3,148 dams.

Approximately 2,648 in the New Hampshire portion of the watershed and 500 in the Massachusetts portion.

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Now fish can still make it into the mouth of the river,

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and up the lower part of the Merrimack River...

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but most of the tributaries are no longer accessible due to dams.

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Some dams like the Essex Dam in Lawrence and the Pawtucket Dam in Lowell have ways for fish to pass up and down stream. Because of this, they are shown as green circles.



*Fish ladder in Lowell at the Pawtucket Dam*

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Just downstream of Pawtucket Dam, the Concord River flows into the Merrimack River. Talbot Mills Dam is located just a few miles upstream from the confluence, and upstream of Centennial Island dam, which currently has a fish ladder for passage.



*Fish ladder at Centennial Island.*

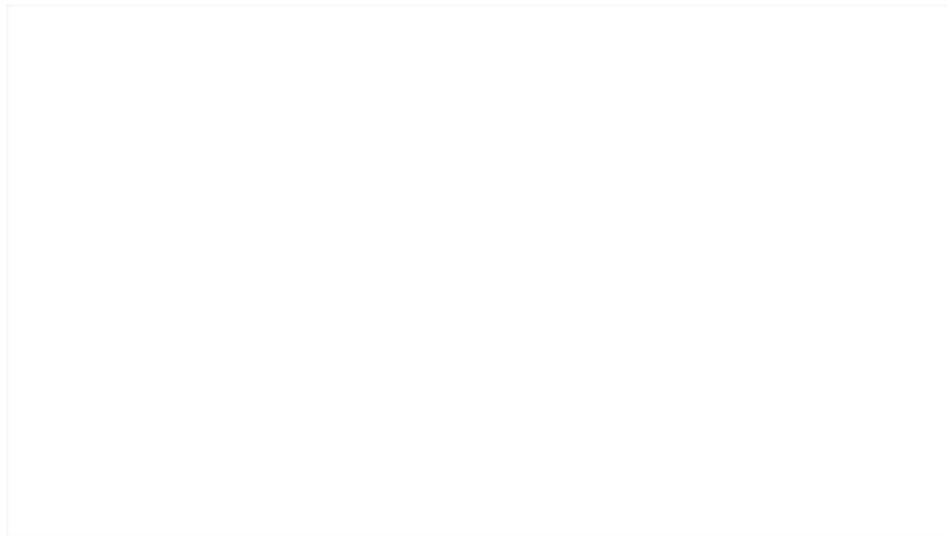
While fish ladders and fish lifts with downstream bypass do make it possible for some fish to pass up and downstream, it is not

guaranteed that all fish can pass and requires an extensive amount of maintenance.

Where dam removal is impractical, this can be an alternative. From the perspective of fish passage, dam removal is the best way to ensure fish are able to move up and down the river.

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Amoskeag Dam in Manchester, NH, also has fish passage, but fish are met with additional barriers a few miles upstream. Hooksett Dam in Hooksett, NH, and Garvins Falls Dam in Bow, NH, currently lack upstream fish passage infrastructure.



*Amoskeag Falls, 1906.*

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The green area shows the habitat available to migratory fish today, relative to the historically available area, in red. The green area assumes fish can pass through various fish passage facilities, which is not always the case.

Most fish need slower moving waters of the tributaries to spawn and survive. While restoration efforts have improved access to tributaries from just 40 years ago, there are still very few tributaries accessible for migratory fish.

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The yellow areas are river segments that are upstream of just one dam lacking fish passage. The yellow shows the potential for migratory fish habitat restoration.

Many state and federal agencies, together with local partners, nonprofits, municipalities and community members are working to free these rivers, and reconnect them to the ocean.

Because dam removals can sometimes take decades to complete, restoration efforts must be prioritized by where the biggest impact can occur - or where the largest yellow area can be turned green with just one dam removal.

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## **Comparing Barriers Across the Watershed**

**Talbot Mills is a high priority for removal because it is blocking significant potential habitat in the Merrimack River watershed, and is upstream of only one dam on the Merrimack River, and one intact dam on the Concord River, both of which already have fish passage structures.**

Use the slides below to review the potential habitat that can be restored within each of the subwatersheds of the Merrimack River watershed. To learn even more about the restoration potential in these watersheds, check out the Merrimack River Comprehensive Plan for Diadromous Fishes.

The Powwow River is the first tributary to the Merrimack River fish may encounter when swimming up the Merrimack. There are many dams in close succession on this river, which makes for a limited area of habitat that can be restored by removing just one dam. There are four dams in the first two miles of the most downstream portion of the river.

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The next river upstream is the Little River. The first dam on the Little River is currently in the permitting process for removal. [Click here](#) to learn more about the project.

Removing this dam will restore approximately 3.5 river miles of habitat. The river section downstream of the dam is buried underground, and not suitable for upstream fish passage for most species. Removal of the dam will have other benefits, including reduced flood risk, greater public access to the river area, cooler water temperature, and diversified in-stream habitat.

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The Spicket River is highly channelized through the city of Lawrence and faces water quality challenges common to urban streams. There are two additional dams within the first two miles of the most downstream dam, thus reducing the impact of removing just one dam.



*Stevens Pond Dam on the Spicket*

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The restoration of the Shawsheen River has already made significant progress, with the two most downstream dams removed in 2017. River herring can now migrate upstream all the

way to the Ballardvale Dam, as has been documented by an [annual herring count](#). Removal of Ballardvale Dam would reconnect 17 miles of mainstem river and numerous tributaries with the ocean, an impressive potential for habitat restoration. Because there are no dams on the mainstem of the Merrimack River between the Shawsheen and the ocean, this potential habitat is particularly important for fish population restoration.

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The Sudbury, Assabet and Concord River watershed has the largest area for potential restoration by a significant margin. With the removal of only Talbot Mills Dam, 35 miles of mainstem river and over 100 miles of tributaries would be available to migratory fish and effectively reconnected with the ocean.

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Beaver Brook has some restoration potential in terms of river miles upstream of only one dam but it is not as significant as the Shawsheen River and far from the potential on the Concord River. Currently, the removal of the three most downstream dams on Beaver Brook is being studied. Removal of these three dams would provide 15 miles of mainstem habitat and 22 miles of tributary streams effectively reconnected with the ocean.

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Due to multiple dams in succession, the migratory fish passage restoration potential for Stony Brook is limited.

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A dam at the mouth of Salmon Brook, followed by multiple dams in close succession makes for limited restoration potential from the removal of one dam.

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Restoration progress has been made in the Nashua River watershed and there is still potential for more progress with improved fish passage. While the yellow area upstream of the Pepperell Paper Co. Dam looks like there is large potential for habitat restoration, this is upstream of four other dams with fish passage. This is a hydropower dam and fish passage is required once 5,000 river herring have passed the downstream dam at Mine Falls, two years in a row. Improved passage at these downstream barriers is an important focus of restoration efforts.

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The Souhegan River already has a significant amount of habitat available in the downstream portion of the river thanks to the removal of the Merrimack Village Dam in 2008. There are two dams in close succession in Milford, NH, blocking approximately six river miles of mainstem habitat until the Pine Valley Mills Dam, an active hydropower dam.

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There is good potential habitat upstream of Pine Island Dam on Cohas Brook, which is known to be alewife spawning and rearing habitat.

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Kelly Falls Dam is the first dam on the Piscataquog River, with two more dams in succession upstream. Improving passage at these locations would provide significant habitat. This is a priority, but due to multiple dams requiring passage improvements to make that habitat available, there may be greater challenges here relative to Talbot Mills Dam.

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The remaining rivers in the upstream portion of the watershed show limited potential for restoring fish passage for migratory fish from the ocean. These rivers are upstream of three dams on the mainstem of the river with fish passage: Essex Dam in Lawrence, Pawtucket Falls Dam in Lowell, and Amoskeag Falls Dam in Manchester. They are also upstream of Hooksett Dam in Hooksett which currently does not have fish passage, but construction of upstream passage is planned. Some are upstream of Garvins Falls Dam in Concord which currently does not have passage or plans for improving it. These mainstem dams make restoring fish passage in the upper watershed a challenge.

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## **Dam Removal and Flooding**



**Talbot Mills dam is a run of river dam. It does not have any way of controlling water coming in, or going out.**

This is similar to a full bathtub with no way to remove the drain plug. The same amount of water that flows in, flows out.



If there is less water flowing in, there will be less water flowing out. If there is more water flowing in, there is more water flowing out.



Because of this, removing the dam doesn't change the water surface elevation downstream of the dam, it only changes the elevation of the water surface directly behind the dam. This animation shows modeled water depth during and following a rainstorm event in March 2010. This same storm without the dam would have led to much lower water levels right behind the dam, but no difference downstream and only a very small difference farther upstream.



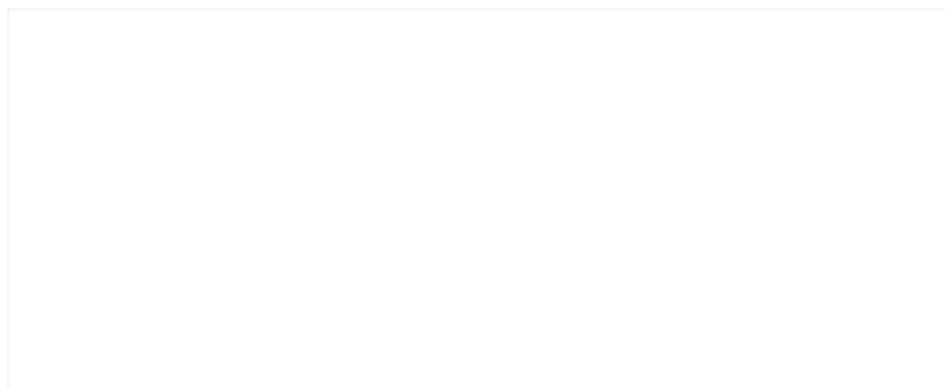
Removing Talbot Mills Dam will actually alleviate flooding in two ways:

1. Water will no longer pond behind the dam, so the water surface just upstream of the dam will be significantly lower, and will be slightly lower farther upstream during high flow conditions.
2. Talbot Mills Dam is aging and in poor condition. Due to climate change, storms are becoming larger and more powerful. These two factors combined creates a major risk for infrastructure and people downstream. Removing the dam eliminates the risk of a catastrophic failure which could send a significant amount of uncontrolled water downstream and underneath the Faulkner Mills Complex.

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## Dam Removal and Drinking Water

A study was completed in 2021 to assess the potential impact removing Talbot Mills Dam may have on the drinking water intake for the Town of Billerica. The study found that the difference in water depth at the drinking water intake after dam removal would be 0.17 feet lower during the median annual flow, 0.35 feet lower during drought conditions and 0.43 feet lower during the 100-year flood. A 7Q10 drought condition is the lowest seven day average flow that has a 10 percent chance of happening any given year.



The water intake facility has three chambers, each equipped with an exterior trash rack, a through-flow traveling screen and a pump wetwell. The potential risk to the facility during drought conditions is that not enough water would enter the wetwell to be able to operate the pump. Fortunately the study found that the change of 0.35' (~4") does not affect the pump's ability to function, with 5.8' of water continuing to make it to the wet well, submerging the pump intake with 4.5' of water.

*Use the slider below to see the difference in water depth during drought conditions, relative to the height of the drinking water intake facility. The left side shows existing conditions and the right side shows post dam removal.*

Can you spot the difference between the two images?



While this impact is considered minimal, it is taken seriously by the project team working to remove the dam. Any changes resulting specifically from the removal of the dam will be thoroughly studied under many different conditions and mitigated through the permitting and design process. Apart from dam removal, however, many changes including climate change, new development, and others will have a larger impact on river flows than dam removal will have at this location.

## Conclusion

Talbot Mills Dam has held a significant place in recent history, but no longer serves the purposes it once did. Aging infrastructure is expensive and burdensome to maintain, and Talbot Mills is no exception. The dam owner has found that this effort is not worthwhile when the dam no longer provides the benefits it was built to provide. Today, Talbot Mills Dam disrupts natural riverine processes, preventing the Concord River from carrying out essential functions like sediment and nutrient transport, and providing habitat to migratory fish species. The dam leads to degraded water quality behind it, which is stagnant, limited in dissolved oxygen and too warm in the summer months.

Removing Talbot Mills Dam provides an opportunity to restore the health of the Concord River, and restore the history of the

river, the fish that lived in it and the Indigenous Peoples who relied on it, long before the dam was here.

## Learn More

This StoryMap will be updated as the project progresses and more information is developed. We are actively conducting studies on the dam and river, and new information will be provided when it becomes available. In the meantime, you can find more helpful and interactive ways to learn about the project and dam removals!

- Take a virtual tour of Talbot Mills, the Middlesex Canal Museum, and the Middlesex Canal
- Check out a video about dam removals in the Merrimack River watershed
- Visit our website, to learn more, read our FAQ document, and check out all of the studies completed to date!

**Take the Tour!**

**Watch the Video!**

**Visit the site!**

## Stay in Touch

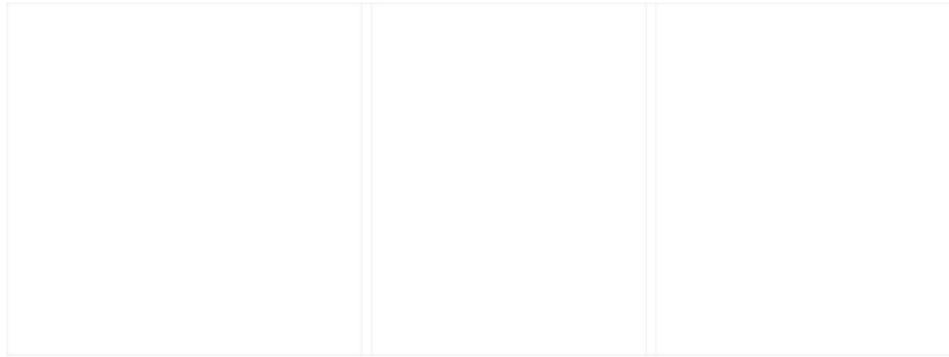
[Sign up](#) to receive updates about the Talbot Mills Dam removal project.

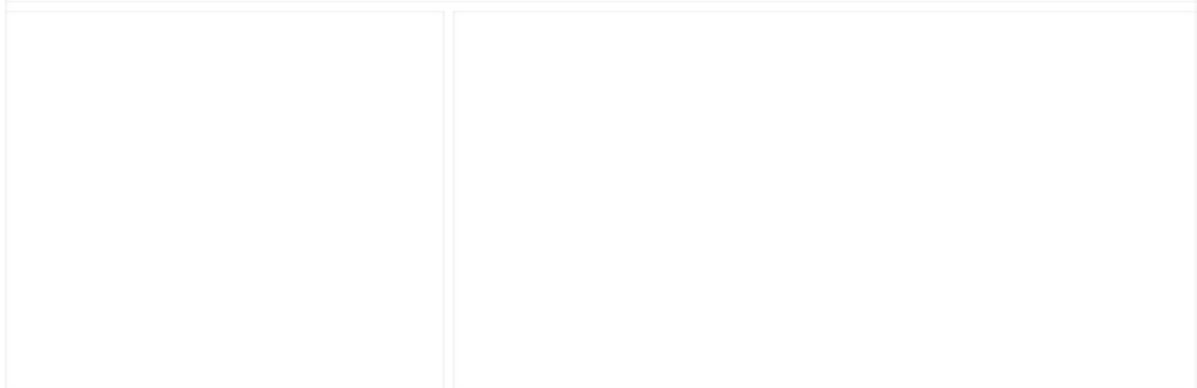
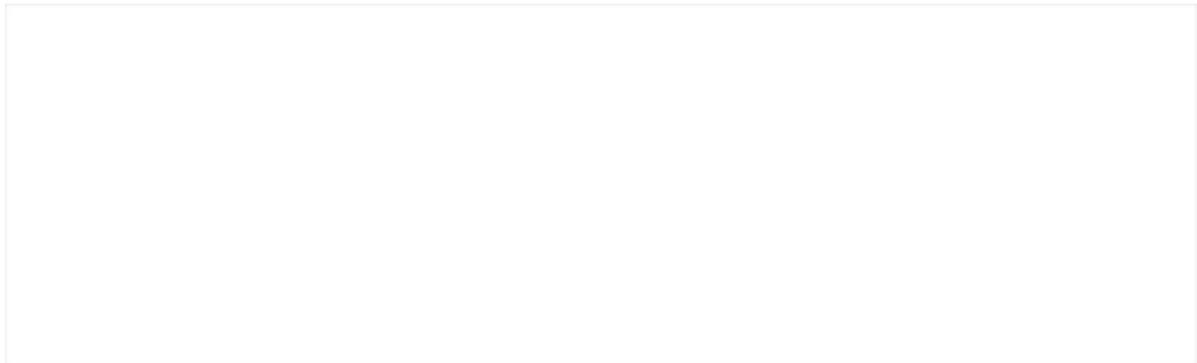
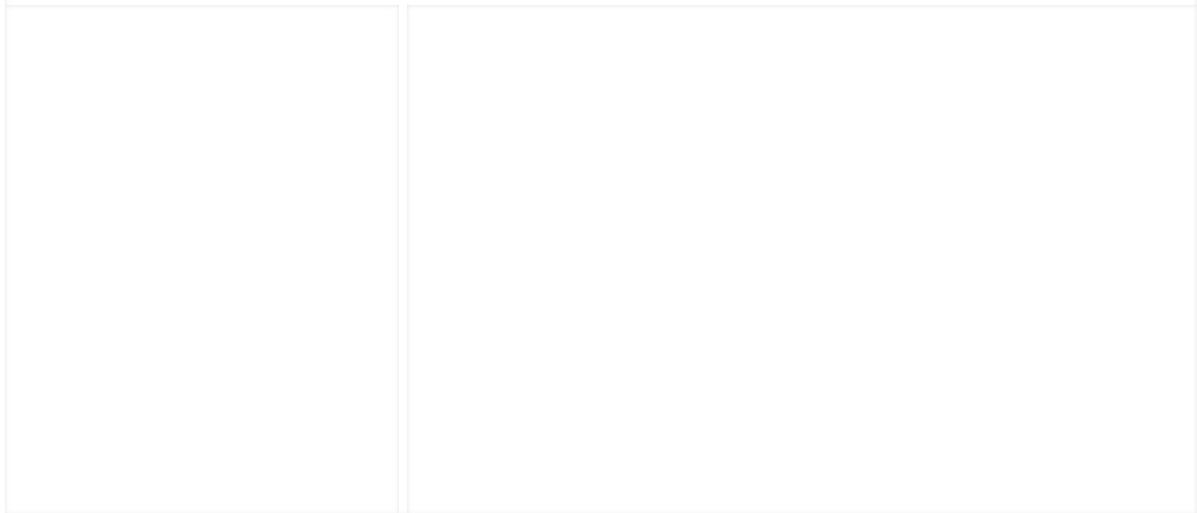
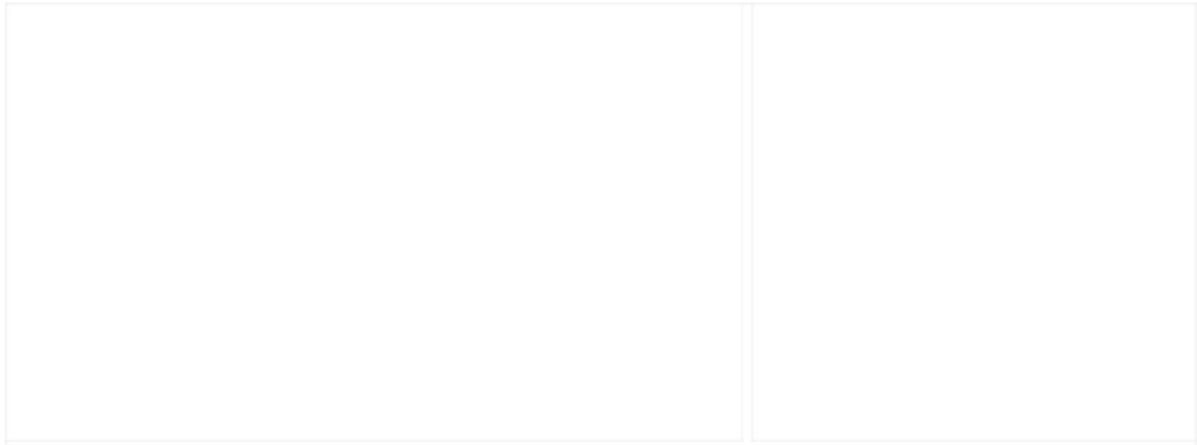
[Check out](#) if there are any upcoming public meetings or events regarding this project.

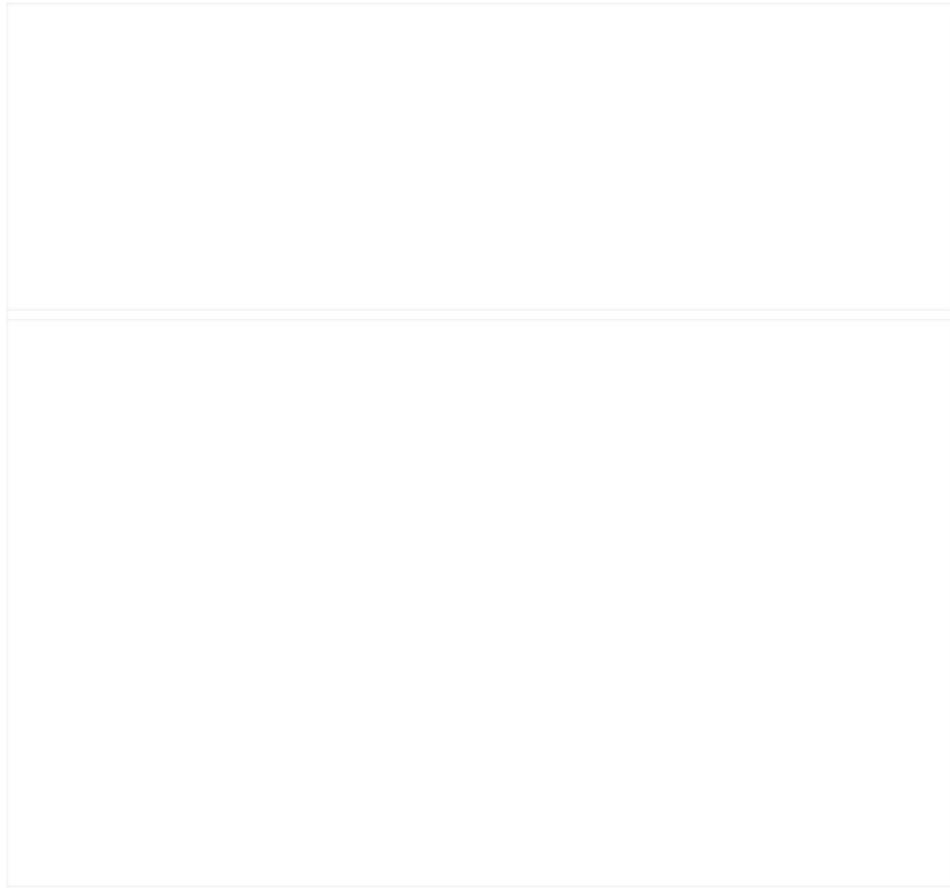
**Join our email list!**

**View upcoming events**

*The development of this StoryMap was funded in part by the [Massachusetts Environmental Trust](#). For more information, please visit [www.mass.gov/eea/met](http://www.mass.gov/eea/met)*







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June 2, 2009

Department of Conservation and Recreation  
251 Causeway Street, Suite 600  
Boston, MA 02114-2119

**Attention:** Mr. Richard K. Sullivan, Jr., Commissioner

**RE: Application to Change Hazard Classification  
Talbot Mills Dam - North Billerica, Massachusetts  
National Inventory of Dam ID #: MA 00774  
GCI Project No. 2092945**

Dear Mr. Sullivan:

On behalf of the dam Owner, CRT Development Realty, LLC, and in accordance with 302 CMR 10.06 (6), please find attached an *APPLICATION TO CHANGE HAZARD CLASSIFICATION OF DAM* for the Talbot Mills Dam (NID ID #: MA 00774) located in North Billerica, Massachusetts.

### **Background**

In 1999, an dam evaluation study was completed for Talbot Mills Dam for the Commonwealth of Massachusetts, Department of Environmental Management, Office of Dam Safety (DEM). Based on the information contained in that report, the Talbot Mills Dam is currently classified as an Intermediate sized, High (Class III) Hazard potential structure. In 2002, the laws governing dams in Massachusetts were amended and the basis for determining the size and hazard potential were clarified.

The hazard classification was based solely on subjective information regarding potential damage to downstream structures. However, the information contained in the 1999 report and used to make this determination is inconsistent and inaccurate. No dam breach analysis or flood study was completed in support of the hazard classification. The sole criteria regarding hazard classification, as stated in Section 1.2.7 entitled *DEM Hazard Classification* of the 1999 report, follows:

*“The possibility for loss of a few lives and appreciable economic damage that would occur to the Faulkner Street Bridge, Talbot Mill buildings, and possibly the wastewater treatment facility as a result of dam failure places the dam in the HIGH hazard category as defined in 302 CMR 10.06.”*

Recently, Geotechnical Consultants, Inc., on behalf of the dam owner, completed a Phase I inspection of the Talbot Mills Dam. The inspection was conducted on various dates between 26 January 2009 and 22 May 2009 and a copy of the report was sent to the Office of Dam Safety. As part of this study, a topographic survey was completed to provide a basis for some of the pertinent engineering data used to evaluate this dam.

In general, the Talbot Mills Dam was found to be in fair condition primarily due to the lack of any operation or maintenance plan. Structurally, we found no indications of instability or seepage which comprise the integrity of the dam and appurtenant structures. The spillway appears to be adequately sized for the Spillway Design Flood (SDF); a 100-year storm event presuming the dam is re-classified as a Significant Hazard structure.

### **Hazard Potential Classification**

Hazard Potential Classifications are defined in section 10.06 of 302 CMR 10.00 as follows:

High Hazard (Class I):	Dams located where failure will likely cause loss of life and serious damage to home(s), industrial or commercial facilities, important public utilities, main highway(s) or railroad(s).
Significant Hazard (Class II)	Dams located where failure may cause loss of life and damage home(s), industrial or commercial facilities, secondary highway(s) or railroad(s) or cause interruption of use or service of relatively important facilities.
Low Hazard (Class III):	Dams located where failure may cause minimal property damage to others. Loss of life is not expected.

Further, section 10.06 (c) provides additional guidance regarding hazard potential.

*Potential damage to habitable structures will be considered minor when habitable structures are not within the direct path of the probable flood wave produced upon failure of a dam or where such structures will experience:*

- 1. no more than 2.0 feet incremental rise of flood water above the lowest ground elevation adjacent to the outside foundation walls; or*
- 2. no more than 2.0 feet incremental rise of flood water above the lowest habitable floor elevation of the structure; the lower of the two elevations governing.*



### **Dam Break Analysis and Evaluation for Potential Damage**

As part of the recently completed evaluation by Geotechnical Consultants, Inc., a dam break analysis was performed to determine the incremental increase in flooding downstream of the dam and evaluate the severity of any potential damage. The dam break analysis was performed using the U.S. Army Corps of Engineers' *River Analysis System* (HEC-RAS) Version 4.0 March 2008. A copy of selected output from the simulation is attached for reference.

Information regarding the existing topography and conditions in the immediate vicinity of the dam was obtained from the survey made by Eaglebrook Engineering Associates, LLC in April 2009. A copy of the *Site Plan*, drawing EX-1 dated April 20, 2009 is attached as Figure 2. in the Phase I Inspection Report.

Information regarding the hydrology of the river was obtained from Federal Emergency Management Agency (FEMA), *Flood Insurance Study*, Town of Billerica, Massachusetts, Middlesex County; dated February 8, 1985. Topography and locations of structures downstream of the dam and mill complexes were determined based on information obtained from the Massachusetts Geographic Information System.

Also attached for your review is a portion of a Federal Insurance Rate Map (FIRMETTE M2501830005C). As shown on the map, the area downstream of the dam and north of the Talbot and Faulkner Mills complexes is a wide flood plain designated as a Zone A7. Our review of recent aerial photographs and a canvass of the neighborhood indicates there are no buildings or other structures, with the exception of the Faulkner Street Bridge, within the direct path of the probable flood wave produced upon failure of the dam. The downstream area and flood plain are shown on the Aerial Photo Map attached as Figure 1.

The Faulkner Street Bridge is immediately downstream of the Talbot Mills Dam. Faulkner Street (or Old Elm Street) is a secondary road in North Billerica, Massachusetts and carries limited traffic. The bridge is constructed as a double concrete arch structure founded directly on bedrock. No significant indications of scour at the bridge pier or abutments were observed during our inspections. As a result, the potential risk of damage which may be sustained by the bridge due to a failure of the dam is low.

Both the Talbot Mills and Faulkner Mills complexes are located downstream of the dam on the left and right embankments of the river, respectively. Based on our assessment, the potential risk of loss of life is considered low and consistent with a Significant Hazard classification.

The dam break analysis prepared using HEC-RAS postulates a dam breach in the masonry



**Application to Change Hazard Classification**  
**Talbot Mills Dam - North Billerica, Massachusetts**  
**National Inventory of Dam ID #: MA 00774**  
**GCI Project No. 2092945**  
**June 2, 2009**  
**Page 4**

spillway as the most likely mode of failure. The resulting unsteady flow analysis shows only a small increase in flood height in the areas downstream of the dam due to a dam breach. Based on the simulation, the incremental increase in flood elevation is approximately 0.2 feet; considerably less than the 2.0 foot incremental rise of flood water offered as guidance regarding hazard potential presented in section 10.06 of 302 CMR 10.00. The FEMA study describes the overall drainage basin as “sluggish” and, given the extent of the flood plain downstream of the dam, the small computed incremental increase in flood elevation is consistent with the FEMA characterization.

The Billerica Treatment Plant is located at 70 Letchworth Avenue in North Billerica, Massachusetts and is shown on the attached Figure 1. According to the FIRM map, the plant is located in a Zone C; an area outside the 100-year and 500-year flood plains. As a result, the risk of damage to the treatment plant due to a dam breach is considered extremely low.

**Dam Hazard Re-Classification**

Based on our evaluation and in accordance with Department of Conservation and Recreation classification procedures, under Commonwealth of Massachusetts dam safety rules and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, it is our opinion the Talbot Mills Dam should be classified as a Significant Hazard (Class II) structure.

On behalf of our client, CRT Development Realty, LLC, we request the attached application to change hazard classification be favorably reviewed. Should you have any questions, or require additional information, please do not hesitate to contact this office.

Sincerely,  
**GEOTECHNICAL CONSULTANTS, INC.**

Richard Pizzi, P.E.

RP/prr

cc: Mr. Robert Martin (with enclosures)  
Mr. William Martin (with enclosures)  
Mr. John Davagian (with enclosures)





## APPLICATION TO CHANGE HAZARD CLASSIFICATION OF DAM

In accordance with 302 CMR 10.06 (6) Hazard Reconsideration. An owner may at any time request the Commissioner to reconsider the hazard determination. The owner's request must be filed by a registered professional civil engineer, specifying the findings and analyses with which the owner disagrees. The Commissioner will issue a written decision to the owner and the registered professional civil engineer within 30 days of receipt of a request for hazard reconsideration, and such decision shall be final and binding upon the parties.

(This form and supporting information must be attached to a letter from the dam owner's registered professional civil engineer on the engineering firm's letterhead.)

**Dam Name:** TALBOT MILLS DAM **Date:** 2 June 2009

**National Inventory of Dams ID Number:** MA 00774

**Dam Location (City or Town):** Billerica, Massachusetts

**Owner(s) Name and Address:** CRT Development Realty, LLC  
6 Nicholas Circle  
Andover, MA 01810-4278

### Fill in Part A or Part B

#### PART A: Application to Raise Hazard Classification (e.g., from Significant to High)

**Current Hazard Classification:** \_\_\_\_\_  
(as listed in DCR Office of Dam Safety Database)

**Proposed Hazard Classification:** \_\_\_\_\_

**Reason for Change:**  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Attach any applicable supporting information.



**PART B: Application to Reduce Hazard Classification (e.g., from High to Significant, High to Low or Significant to Low.)**

**Current Hazard Classification:** High Hazard  
(as listed in DCR Office of Dam Safety Database)

**Proposed Hazard Classification:** Significant Hazard

**Applicant must submit engineering studies to justify the change in Hazard Class. Indicate the studies that accompany this application:**

- Hydrologic / Hydraulic Analyses**
- Dam Breach / Inundation Analyses**
- Incremental Damage Assessment**
- Other** \_\_\_\_\_

**Reason for**

**Change:** The previous dam inspection report was completed in 1999 and contained inaccurate and incomplete information.

The hazard classification was based solely on subjective information regarding potential damage to downstream structures. No dam breach analysis was completed. Since the issuance of this report and classification, the governing regulations have been amended to clarify the nature of the hazards and assist in determining an appropriate hazard classification.

\_\_\_\_\_

APPROXIMATE SCALE  
 1:50,000  
 1980  
 1980 F.C.C.

NATIONAL FLOOD INSURANCE PROGRAM

**FIRM**  
 FLOOD INSURANCE RATE MAP

TOWN OF  
 BILLERICA,  
 MASSACHUSETTS  
 MIDDLESEX COUNTY

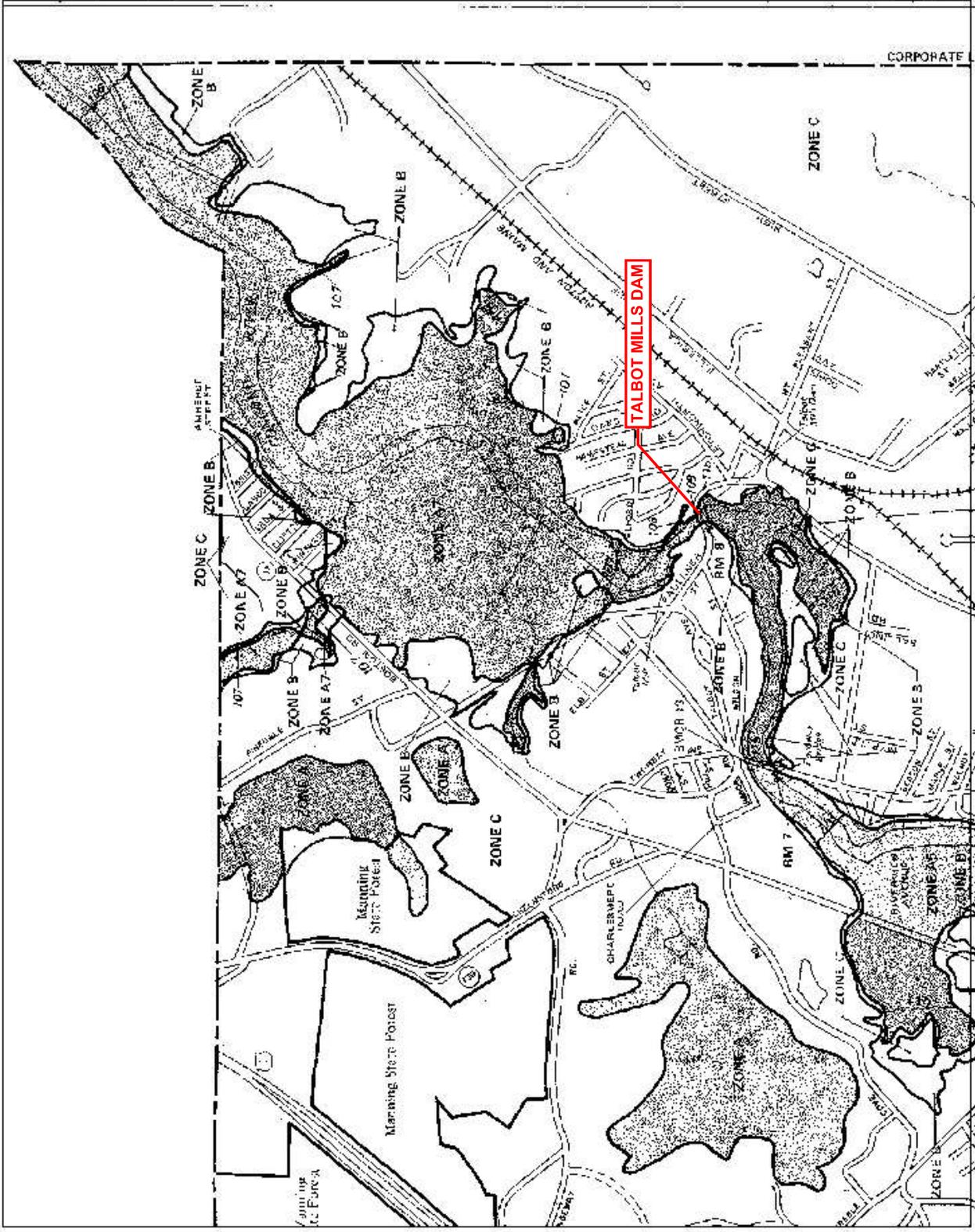
PANEL 5 OF 10

COMMUNITY PANEL NUMBER  
 250183 0005 C

MAP REVISED  
 AUGUST 5, 1985

Federal Emergency Management Agency

This is a Flood Insurance Rate Map (FIRM) showing the special flood hazard areas for the community of BillERICA, Massachusetts, Middlesex County. It is a panel of a larger map. The map is based on the Flood Insurance Study (FIS) for the community of BillERICA, Massachusetts, Middlesex County, dated August 5, 1985. The FIS was prepared by the Federal Emergency Management Agency (FEMA) in cooperation with the State of Massachusetts. The FIS was prepared in accordance with the National Flood Insurance Act of 1968, as amended. The FIS was prepared in accordance with the National Flood Insurance Act of 1968, as amended. The FIS was prepared in accordance with the National Flood Insurance Act of 1968, as amended.





**AERIAL PHOTOGRAPH  
TALBOT MILLS DAM  
NORTH BILLERICA, MA  
NID ID# Ma00774**

TALBOTMILLSDAM.rep

HEC-RAS Version 4.0.0 March 2008  
U.S. Army Corps of Engineers  
Hydrologic Engineering Center  
609 Second Street  
Davis, California

```

X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X  X      X
X      X  X          X          X  X      X  X      X
XXXXXXXX XXXX      X          XXX XXXX      XXXXXX      XXXX
X      X  X          X          X  X      X  X      X
X      X  X          X      X      X  X      X  X      X
X      X  XXXXXX      XXXX      X      X      X  X      XXXXXX

```

PROJECT DATA

Project Title: TALBOT MILLS DAM  
Project File : TALBOTMILLSDAM.prj  
Run Date and Time: 6/2/2009 11:05:44 AM

Project in English units

Project Description:  
DAM BREACH ANALYSIS

GCI#2092945  
PROJECT: TALBOT MILLS DAM

PLAN DATA

Plan Title: TALBOT002  
Plan File : C:\Documents and Settings\Carlos Luna\HEC RAS PROJECTS\TALBOT  
DAM\TALBOTMILLSDAM.p01

Geometry Title: TALBOT001  
Geometry File : C:\Documents and Settings\Carlos Luna\HEC RAS  
PROJECTS\TALBOT DAM\TALBOTMILLSDAM.g01

Flow Title :  
Flow File :

Plan Summary Information:

Number of: Cross Sections	=	10	Multiple Openings	=	0
Culverts	=	0	Inline Structures	=	1
Bridges	=	0	Lateral Structures	=	0

Computational Information

water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary  
Conveyance Calculation Method: At breaks in n values only

Friction Slope Method: Average Conveyance  
 Computational Flow Regime: Subcritical Flow

TALBOTMILLSDAM.rep

GEOMETRY DATA

Geometry Title: TALBOT001  
 Geometry File : C:\Documents and Settings\Carlos Luna\HEC RAS PROJECTS\TALBOT DAM\TALBOTMILLSDAM.g01

CROSS SECTION

RIVER: CONCORD  
 REACH: TALBOT MILL RS: 14045

INPUT

Description:

Station Elevation Data num= 10  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-100	119	0	115.8	17	102.605	17.78	102	22	101.949
67	101.4	110	101.924	116.22	102	134	115.8	250	119

Manning's n Values num= 3  

Sta	n Val	Sta	n Val	Sta	n Val
-100	.04	0	.03	134	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 0 134 995 995 995 .1 .3

CROSS SECTION OUTPUT Profile #Max WS

Parameter	Value	Element	Left OB	Channel
E.G. Elev (ft)	116.19			
Right OB Vel Head (ft)	0.18	wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	116.01	Reach Len. (ft)	995.00	995.00
995.00				
Crit w.s. (ft)		Flow Area (sq ft)	0.68	1661.32
0.79				
E.G. slope (ft/ft)	0.000183	Area (sq ft)	0.68	1661.32
0.79				
Q Total (cfs)	5700.00	Flow (cfs)	0.08	5699.84
0.09				
Top width (ft)	148.08	Top width (ft)	6.52	134.00
7.56				
Vel Total (ft/s)	3.43	Avg. Vel. (ft/s)	0.11	3.43
0.11				
Max Chl Dpth (ft)	14.61	Hydr. Depth (ft)	0.10	12.40
0.10				
Conv. Total (cfs)	421195.5	Conv. (cfs)	5.6	421183.4
6.5				
Length wtd. (ft)	995.00	wetted Per. (ft)	6.52	143.46
7.56				
Min Ch El (ft)	101.40	Shear (lb/sq ft)	0.00	0.13
0.00				
Alpha	1.00	Stream Power (lb/ft s)	0.00	0.45
0.00				
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)	1.20	211.59
1.19				

C & E Loss (ft)	TALBOTMILLSDAM.rep	65.65	59.07
27.08	Cum SA (acres)		

CROSS SECTION OUTPUT Profile #01JUN2009 1200

E.G. Elev (ft)	115.45	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.21	wt. n-val.		0.030
W.S. Elev (ft)	115.24	Reach Len. (ft)	995.00	995.00
995.00				
Crit w.s. (ft)		Flow Area (sq ft)		1558.45
E.G. slope (ft/ft)	0.000223	Area (sq ft)		1558.45
Q Total (cfs)	5700.00	Flow (cfs)		5700.00
Top width (ft)	132.55	Top width (ft)		132.55
Vel Total (ft/s)	3.66	Avg. Vel. (ft/s)		3.66
Max chl Dpth (ft)	13.84	Hydr. Depth (ft)		11.76
Conv. Total (cfs)	381882.3	Conv. (cfs)		381882.3
Length wtd. (ft)	995.00	wetted Per. (ft)		141.63
Min ch El (ft)	101.40	shear (lb/sq ft)		0.15
Alpha	1.00	Stream Power (lb/ft s)		0.56
Frctn Loss (ft)	0.30	Cum Volume (acre-ft)		190.14
C & E Loss (ft)		Cum SA (acres)	61.37	59.03
23.50				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #01JUN2009 1600

E.G. Elev (ft)	115.31	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.21	wt. n-val.		0.030
W.S. Elev (ft)	115.10	Reach Len. (ft)	995.00	995.00
995.00				
Crit w.s. (ft)		Flow Area (sq ft)		1539.67
E.G. slope (ft/ft)	0.000231	Area (sq ft)		1539.67
Q Total (cfs)	5700.00	Flow (cfs)		5700.00
Top width (ft)	132.19	Top width (ft)		132.19

Vel Total (ft/s)	3.70	Avg. Vel. (ft/s)	3.70
Max Chl Dpth (ft)	13.70	Hydr. Depth (ft)	11.65
Conv. Total (cfs)	375059.8	Conv. (cfs)	375059.8
Length wtd. (ft)	995.00	wetted Per. (ft)	141.17
Min Ch El (ft)	101.40	Shear (lb/sq ft)	0.16
Alpha	1.00	Stream Power (lb/ft s)	0.58
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)	187.71
C & E Loss (ft)		Cum SA (acres)	57.09
16.36			58.99

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #02JUN2009 1200

E.G. Elev (ft)	116.04	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.19	wt. n-val.	0.040	0.030
0.040				
W.S. Elev (ft)	115.85	Reach Len. (ft)	995.00	995.00
995.00				
Crit w.s. (ft)		Flow Area (sq ft)	0.04	1640.48
0.05				
E.G. Slope (ft/ft)	0.000191	Area (sq ft)	0.04	1640.48
0.05				
Q Total (cfs)	5700.00	Flow (cfs)	0.00	5700.00
0.00				
Top Width (ft)	137.58	Top Width (ft)	1.66	134.00
1.92				
Vel Total (ft/s)	3.47	Avg. Vel. (ft/s)	0.05	3.47
0.05				
Max Chl Dpth (ft)	14.45	Hydr. Depth (ft)	0.03	12.24
0.03				
Conv. Total (cfs)	412416.4	Conv. (cfs)	0.1	412416.1
0.2				
Length wtd. (ft)	995.00	wetted Per. (ft)	1.66	143.46
1.93				
Min Ch El (ft)	101.40	Shear (lb/sq ft)	0.00	0.14
0.00				
Alpha	1.00	Stream Power (lb/ft s)	0.00	0.47
0.00				
Frctn Loss (ft)	0.56	Cum Volume (acre-ft)	0.00	93.18
0.00				
C & E Loss (ft)		Cum SA (acres)	0.02	41.89
0.02				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.  
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: CONCORD  
 REACH: TALBOT MILL RS: 13050

INPUT

Description:

Station Elevation Data		num= 9	
Sta	Elev	Sta	Elev
-100	118	0	115
238	108.597	239.85	108.6
		240	115
		340	118
		120	108.4

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
-100	.04	0	.03
		240	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	0	240		1380	1380	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

Parameter	Value	Element	Left OB	Channel
E.G. Elev (ft)	115.93			
Right OB				
Vel Head (ft)	0.15	wt. n-val.	0.040	0.030
0.040				
W.S. Elev (ft)	115.79	Reach Len. (ft)	1380.00	1380.00
1380.00				
Crit w.s. (ft)		Flow Area (sq ft)	10.29	1747.60
10.29				
E.G. slope (ft/ft)	0.000294	Area (sq ft)	10.29	1747.60
10.29				
Q Total (cfs)	5399.24	Flow (cfs)	3.52	5392.21
3.52				
Top width (ft)	292.38	Top width (ft)	26.19	240.00
26.19				
Vel Total (ft/s)	3.05	Avg. vel. (ft/s)	0.34	3.09
0.34				
Max Chl Dpth (ft)	7.39	Hydr. Depth (ft)	0.39	7.28
0.39				
Conv. Total (cfs)	314772.4	Conv. (cfs)	205.0	314362.5
205.0				
Length wtd. (ft)	1380.00	wetted Per. (ft)	26.20	252.50
26.20				
Min Ch El (ft)	108.40	Shear (lb/sq ft)	0.01	0.13
0.01				
Alpha	1.02	Stream Power (lb/ft s)	0.00	0.39
0.00				
Frctn Loss (ft)	0.12	Cum volume (acre-ft)	1.08	172.66
1.07				
C & E Loss (ft)		Cum SA (acres)	65.28	54.80
26.70				

TALBOTMILLSDAM.rep

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #01JUN2009 1200

E.G. Elev (ft)	115.07	Element	Left OB	Channel
Right OB Vel Head (ft)	0.19	wt. n-Val.		0.030
W.S. Elev (ft)	114.88	Reach Len. (ft)	1380.00	1380.00
1380.00 Crit w.s. (ft)		Flow Area (sq ft)		1531.05
E.G. Slope (ft/ft)	0.000439	Area (sq ft)		1531.05
Q Total (cfs)	5287.46	Flow (cfs)		5287.46
Top width (ft)	239.99	Top width (ft)		239.99
Vel Total (ft/s)	3.45	Avg. Vel. (ft/s)		3.45
Max Chl Dpth (ft)	6.48	Hydr. Depth (ft)		6.38
Conv. Total (cfs)	252315.0	Conv. (cfs)		252315.0
Length wtd. (ft)	1380.00	wetted Per. (ft)		252.27
Min Ch El (ft)	108.40	Shear (lb/sq ft)		0.17
Alpha	1.00	Stream Power (lb/ft s)		0.57
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)		154.86
C & E Loss (ft)		Cum SA (acres)	61.37	54.78
23.50				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #01JUN2009 1600

E.G. Elev (ft)	114.89	Element	Left OB	Channel
Right OB Vel Head (ft)	0.24	wt. n-Val.		0.030
W.S. Elev (ft)	114.65	Reach Len. (ft)	1380.00	1380.00
1380.00 Crit w.s. (ft)		Flow Area (sq ft)		1475.39
E.G. Slope (ft/ft)	0.000596	Area (sq ft)		1475.39
Q Total (cfs)	5798.59	Flow (cfs)		5798.59
Top width (ft)	239.98	Top width (ft)		239.98

TALBOTMILLSDAM.rep

Vel Total (ft/s)	3.93	Avg. Vel. (ft/s)	3.93
Max Chl Dpth (ft)	6.25	Hydr. Depth (ft)	6.15
Conv. Total (cfs)	237505.9	Conv. (cfs)	237505.9
Length Wtd. (ft)	1380.00	wetted Per. (ft)	251.81
Min Ch El (ft)	108.40	Shear (lb/sq ft)	0.22
Alpha	1.00	Stream Power (lb/ft s)	0.86
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)	153.27
C & E Loss (ft)	16.36	Cum SA (acres)	57.09 54.74

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #02JUN2009 1200

E.G. Elev (ft)	112.42	Element	Left OB	Channel
Right OB Vel Head (ft)	1.10	wt. n-val.		0.030
W.S. Elev (ft)	111.32	Reach Len. (ft)	1380.00	1380.00
1380.00 Crit W.S. (ft)		Flow Area (sq ft)		677.30
E.G. Slope (ft/ft)	0.007445	Area (sq ft)		677.30
Q Total (cfs)	5699.31	Flow (cfs)		5699.31
Top width (ft)	239.83	Top width (ft)		239.83
Vel Total (ft/s)	8.41	Avg. Vel. (ft/s)		8.41
Max Chl Dpth (ft)	2.92	Hydr. Depth (ft)		2.82
Conv. Total (cfs)	66051.7	Conv. (cfs)		66051.7
Length Wtd. (ft)	1380.00	wetted Per. (ft)		245.15
Min Ch El (ft)	108.40	Shear (lb/sq ft)		1.28
Alpha	1.00	Stream Power (lb/ft s)		10.81
Frctn Loss (ft)	2.61	Cum Volume (acre-ft)		66.71
C & E Loss (ft)		Cum SA (acres)		37.62

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for

additional cross sections.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.  
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: CONCORD  
 REACH: TALBOT MILL RS: 11670

INPUT

Description:

Station Elevation Data		num= 9		Sta	Elev	Sta	Elev	Sta	Elev
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-150	120	-50	118	0	114.8	28.4	99	95	98.4
161.6	99	190	114.8	245	118	300	120		

Manning's n Values		num= 3		Sta	n Val	Sta	n Val
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-150	.04	0	.03	190	.04		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	0	190		1490	1490	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	115.75	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	115.70	Reach Len. (ft)	1490.00	1490.00
1490.00				
Crit w.s. (ft)		Flow Area (sq ft)	6.36	2764.66
7.00				
E.G. slope (ft/ft)	0.000038	Area (sq ft)	6.36	2764.66
7.00				
Q Total (cfs)	4868.69	Flow (cfs)	0.85	4866.90
0.94				
Top width (ft)	219.60	Top width (ft)	14.10	190.00
15.51				
Vel Total (ft/s)	1.75	Avg. Vel. (ft/s)	0.13	1.76
0.13				
Max Chl Dpth (ft)	17.30	Hydr. Depth (ft)	0.45	14.55
0.45				
Conv. Total (cfs)	793769.4	Conv. (cfs)	138.8	793478.0
152.7				
Length wtd. (ft)	1490.00	wetted Per. (ft)	14.13	198.20
15.53				
Min Ch El (ft)	98.40	Shear (lb/sq ft)	0.00	0.03
0.00				
Alpha	1.01	Stream Power (lb/ft s)	0.00	0.06
0.00				
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	0.81	101.19
0.79				
C & E Loss (ft)		Cum SA (acres)	64.64	47.99
26.04				

TALBOTMILLSDAM.rep

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #01JUN2009 1200

E.G. Elev (ft)	114.68	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	wt. n-Val.		0.030
W.S. Elev (ft)	114.63	Reach Len. (ft)	1490.00	1490.00
1490.00				
Crit W.S. (ft)		Flow Area (sq ft)		2560.67
E.G. Slope (ft/ft)	0.000045	Area (sq ft)		2560.67
Q Total (cfs)	4673.42	Flow (cfs)		4673.42
Top width (ft)	189.38	Top width (ft)		189.38
Vel Total (ft/s)	1.83	Avg. vel. (ft/s)		1.83
Max Chl Dpth (ft)	16.23	Hydr. Depth (ft)		13.52
Conv. Total (cfs)	699985.4	Conv. (cfs)		699985.4
Length wtd. (ft)	1490.00	wetted Per. (ft)		197.50
Min Ch El (ft)	98.40	Shear (lb/sq ft)		0.04
Alpha	1.00	Stream Power (lb/ft s)		0.07
Frctn Loss (ft)	0.04	Cum volume (acre-ft)		90.04
C & E Loss (ft)		Cum SA (acres)	61.37	47.98
23.50				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #01JUN2009 1600

E.G. Elev (ft)	114.41	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.09	wt. n-Val.		0.030
W.S. Elev (ft)	114.32	Reach Len. (ft)	1490.00	1490.00
1490.00				
Crit W.S. (ft)		Flow Area (sq ft)		2502.30
E.G. Slope (ft/ft)	0.000078	Area (sq ft)		2502.30
Q Total (cfs)	5978.56	Flow (cfs)		5978.56

TALBOTMILLSDAM.rep			
Top width (ft)	188.27	Top width (ft)	188.27
Vel Total (ft/s)	2.39	Avg. Vel. (ft/s)	2.39
Max Chl Dpth (ft)	15.92	Hydr. Depth (ft)	13.29
Conv. Total (cfs)	676502.6	Conv. (cfs)	676502.6
Length wtd. (ft)	1490.00	Wetted Per. (ft)	196.23
Min Ch El (ft)	98.40	Shear (lb/sq ft)	0.06
Alpha	1.00	Stream Power (lb/ft s)	0.15
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	90.27
C & E Loss (ft)	16.36	Cum SA (acres)	57.09
			47.96

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #02JUN2009 1200

E.G. Elev (ft)	106.70	Element	Left OB	Channel
Right OB Vel Head (ft)	0.41	wt. n-Val.		0.030
W.S. Elev (ft)	106.29	Reach Len. (ft)	1490.00	1490.00
1490.00 Crit W.S. (ft)		Flow Area (sq ft)		1106.07
E.G. Slope (ft/ft)	0.000844	Area (sq ft)		1106.07
Q Total (cfs)	5701.83	Flow (cfs)		5701.83
Top width (ft)	159.40	Top width (ft)		159.40
Vel Total (ft/s)	5.16	Avg. Vel. (ft/s)		5.16
Max Chl Dpth (ft)	7.89	Hydr. Depth (ft)		6.94
Conv. Total (cfs)	196211.7	Conv. (cfs)		196211.7
Length wtd. (ft)	1490.00	Wetted Per. (ft)		163.18
Min Ch El (ft)	98.40	Shear (lb/sq ft)		0.36
Alpha	1.00	Stream Power (lb/ft s)		1.84
Frctn Loss (ft)	0.83	Cum Volume (acre-ft)		38.46
C & E Loss (ft)		Cum SA (acres)		31.29

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)  
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is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: CONCORD  
 REACH: TALBOT MILL RS: 10190

INPUT

Description: TALBOT MILL DAM  
 Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-100	117	0	114.8	25	114.8	25	98.5	107	98.5
189	98.5	189	114.8	215	114.8	300	117		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-100	.03	25	.02	189	.03

Bank Sta: Left 25 Right 189 Lengths: Left Channel 50 Right 50 Coeff Contr. .1 Expan. .3

CROSS SECTION OUTPUT Profile #Max WS

Parameter	Value	Element	Left OB	Channel
E.G. Elev (ft)	115.74			
Right OB				
Vel Head (ft)	0.04	wt. n-val.	0.030	0.020
0.030				
W.S. Elev (ft)	115.70	Reach Len. (ft)	50.00	50.00
50.00				
Crit w.s. (ft)	101.26	Flow Area (sq ft)	41.23	2821.59
39.34				
E.G. Slope (ft/ft)	0.000012	Area (sq ft)	41.23	2821.59
39.34				
Q Total (cfs)	4295.15	Flow (cfs)	5.16	4284.96
5.04				
Top width (ft)	291.09	Top width (ft)	66.13	164.00
60.96				
Vel Total (ft/s)	1.48	Avg. Vel. (ft/s)	0.13	1.52
0.13				
Max Chl Dpth (ft)	17.20	Hydr. Depth (ft)	0.62	17.20
0.65				
Conv. Total (cfs)	1240978.0	Conv. (cfs)	1490.0	1238033.0
1455.0				
Length wtd. (ft)	50.00	wetted Per. (ft)	66.14	196.60
60.97				
Min Ch El (ft)	98.50	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.05	Stream Power (lb/ft s)	0.00	0.02
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)		5.64
C & E Loss (ft)		Cum SA (acres)	63.27	41.93
24.73				

CROSS SECTION OUTPUT Profile #01JUN2009 1200

TALBOTMILLSDAM.rep

E.G. Elev (ft)	114.60	Element	Left OB	Channel
Right OB Vel Head (ft)	0.04	wt. n-val.		0.020
W.S. Elev (ft)	114.56	Reach Len. (ft)	50.00	50.00
50.00 Crit W.S. (ft)	101.19	Flow Area (sq ft)		2634.25
E.G. Slope (ft/ft)	0.000014	Area (sq ft)		2634.25
Q Total (cfs)	4118.42	Flow (cfs)		4118.42
Top width (ft)	164.00	Top width (ft)		164.00
Vel Total (ft/s)	1.56	Avg. Vel. (ft/s)		1.56
Max Chl Dpth (ft)	16.06	Hydr. Depth (ft)		16.06
Conv. Total (cfs)	1105872.0	Conv. (cfs)		1105872.0
Length wtd. (ft)	50.00	wetted Per. (ft)		196.13
Min Ch El (ft)	98.50	Shear (lb/sq ft)		0.01
Alpha	1.00	Stream Power (lb/ft s)		0.02
Frctn Loss (ft)		Cum Volume (acre-ft)		1.20
C & E Loss (ft)	23.50	Cum SA (acres)	61.37	41.93

CROSS SECTION OUTPUT Profile #01JUN2009 1600

E.G. Elev (ft)	114.32	Element	Left OB	Channel
Right OB Vel Head (ft)	0.09	wt. n-val.		0.020
W.S. Elev (ft)	114.23	Reach Len. (ft)	50.00	50.00
50.00 Crit W.S. (ft)	102.01	Flow Area (sq ft)		2580.05
E.G. Slope (ft/ft)	0.000033	Area (sq ft)		2580.05
Q Total (cfs)	6152.10	Flow (cfs)		6152.10
Top width (ft)	164.00	Top width (ft)		164.00
Vel Total (ft/s)	2.38	Avg. Vel. (ft/s)		2.38
Max Chl Dpth (ft)	15.73	Hydr. Depth (ft)		15.73
Conv. Total (cfs)	1070616.0	Conv. (cfs)		1070616.0
Length wtd. (ft)	50.00	wetted Per. (ft)		195.46
Min Ch El (ft)	98.50	Shear (lb/sq ft)		0.03
Alpha	1.00	Stream Power (lb/ft s)		0.06
Frctn Loss (ft)		Cum Volume (acre-ft)		3.34

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C & E Loss (ft) 16.36 Cum SA (acres) 57.09 41.93

CROSS SECTION OUTPUT Profile #02JUN2009 1200

E.G. Elev (ft)	105.78	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.40	wt. n-Val.		0.020
W.S. Elev (ft)	105.38	Reach Len. (ft)	50.00	50.00
50.00				
Crit W.S. (ft)	101.84	Flow Area (sq ft)		1128.99
E.G. Slope (ft/ft)	0.000394	Area (sq ft)		1128.99
Q Total (cfs)	5706.61	Flow (cfs)		5706.61
Top width (ft)	164.00	Top width (ft)		164.00
Vel Total (ft/s)	5.05	Avg. Vel. (ft/s)		5.05
Max Chl Dpth (ft)	6.88	Hydr. Depth (ft)		6.88
Conv. Total (cfs)	287661.0	Conv. (cfs)		287661.0
Length wtd. (ft)	50.00	wetted Per. (ft)		177.77
Min Ch El (ft)	98.50	Shear (lb/sq ft)		0.16
Alpha	1.00	Stream Power (lb/ft s)		0.79
Frctn Loss (ft)		Cum Volume (acre-ft)		0.23
C & E Loss (ft)		Cum SA (acres)		25.76

INLINE STRUCTURE

RIVER: CONCORD  
 REACH: TALBOT MILL RS: 10185

INPUT

Description:

Distance from Upstream XS = 5  
 Deck/Roadway width = 12  
 Weir Coefficient = 2.6

Weir Embankment Coordinates num = 6

Sta	Elev								
25	111.4	42	111.4	42	109.7	169	109.7	169	111.4
189	111.6								

Upstream Embankment side slope = 3.5 horiz. to 1.0 vertical  
 Downstream Embankment side slope = 3.5 horiz. to 1.0 vertical  
 Maximum allowable submergence for weir flow = .98  
 Elevation at which weir flow begins =  
 Weir crest shape = Broad Crested

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INLINE STRUCTURE OUTPUT Profile #Max WS Inl Struct:

E.G. Elev (ft)	115.69	Q Gates (cfs)	
W.S. Elev (ft)	115.66	Q Gate Group (cfs)	0.00
Q Total (cfs)	4295.15	Gate Open Ht (ft)	115.53
Q Weir (cfs)	4295.15	Gate #Open	
Weir Flow Area (sq ft)	6877.32	Gate Area (sq ft)	1.00
Weir Sta Lft (ft)	-100.00	Gate Submerg	0.00
Weir Sta Rgt (ft)	300.00	Gate Invert (ft)	0.00
Weir Max Depth (ft)	17.19	Gate Weir Coef	0.000
Weir Avg Depth (ft)	17.19		
Weir Coef	2.600	Q Breach (cfs)	
Weir Submerg	1.00	Breach Avg Velocity (ft/s)	
Min El Weir Flow (ft)	98.51	Breach Flow Area (sq ft)	
wr Top width (ft)	400.00		

INLINE STRUCTURE OUTPUT Profile #01JUN2009 1200 Inl Struct:

E.G. Elev (ft)	114.60	Q Gates (cfs)	
W.S. Elev (ft)	114.56	Q Gate Group (cfs)	0.78
Q Total (cfs)	4118.42	Gate Open Ht (ft)	5164.93
Q Weir (cfs)	4118.42	Gate #Open	233
Weir Flow Area (sq ft)	738.84	Gate Area (sq ft)	4884.05
Weir Sta Lft (ft)	25.00	Gate Submerg	47.79
Weir Sta Rgt (ft)	189.00	Gate Invert (ft)	550.00
Weir Max Depth (ft)	4.90	Gate Weir Coef	550.000
Weir Avg Depth (ft)	4.51		
Weir Coef	2.600	Q Breach (cfs)	
Weir Submerg	0.00	Breach Avg Velocity (ft/s)	
Min El Weir Flow (ft)	109.71	Breach Flow Area (sq ft)	
wr Top width (ft)	164.00		

INLINE STRUCTURE OUTPUT Profile #01JUN2009 1600 Inl Struct:

E.G. Elev (ft)	109.58	Q Gates (cfs)	
W.S. Elev (ft)	109.40	Q Gate Group (cfs)	1.83
Q Total (cfs)	6152.10	Gate Open Ht (ft)	3375.93
Q Weir (cfs)	6152.10	Gate #Open	6
Weir Flow Area (sq ft)	3779.65	Gate Area (sq ft)	3368.52
Weir Sta Lft (ft)	-100.00	Gate Submerg	1.08
Weir Sta Rgt (ft)	300.00	Gate Invert (ft)	550.00
Weir Max Depth (ft)	9.45	Gate Weir Coef	550.000
Weir Avg Depth (ft)	9.45		
Weir Coef	2.600	Q Breach (cfs)	
Weir Submerg	1.00	Breach Avg Velocity (ft/s)	
Min El Weir Flow (ft)	100.15	Breach Flow Area (sq ft)	
wr Top width (ft)	400.00		

INLINE STRUCTURE OUTPUT Profile #02JUN2009 1200 Inl Struct:

E.G. Elev (ft)	105.78	Q Gates (cfs)	
W.S. Elev (ft)	105.38	Q Gate Group (cfs)	158.94
Q Total (cfs)	5706.61	Gate Open Ht (ft)	36.02
Q Weir (cfs)		Gate #Open	
Weir Flow Area (sq ft)		Gate Area (sq ft)	36.02
Weir Sta Lft (ft)		Gate Submerg	
Weir Sta Rgt (ft)		Gate Invert (ft)	550.00
Weir Max Depth (ft)		Gate Weir Coef	550.000

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Weir Avg Depth (ft)  
 Weir Coef 2.600 Q Breach (cfs)  
 Weir Submerg Breach Avg Velocity (ft/s)  
 Min El Weir Flow (ft) 98.51 Breach Flow Area (sq ft)  
 Wr Top Wdth (ft)

CROSS SECTION

RIVER: CONCORD  
 REACH: TALBOT MILL RS: 10140

INPUT

Description:

Station Elevation Data num= 9  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-100	116	-20	115	0	108.5	12.78	99.9	47.5	99.4
82.22	99.9	95	108.5	100	115	200	117		

Manning's n Values num= 3  

Sta	n Val	Sta	n Val	Sta	n Val
-100	.04	0	.025	95	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 0 95 540 540 540 .1 .3

CROSS SECTION OUTPUT Profile #Max WS

Parameter	Value	Element	Left OB	Channel
E.G. Elev (ft)	115.67			
Right OB				
Vel Head (ft)	0.14	wt. n-val.	0.040	0.025
0.040				
w.s. Elev (ft)	115.53	Reach Len. (ft)	540.00	540.00
540.00				
Crit w.s. (ft)		Flow Area (sq ft)	86.86	1392.34
25.94				
E.G. Slope (ft/ft)	0.000079	Area (sq ft)	86.86	1392.34
25.94				
Q Total (cfs)	4295.15	Flow (cfs)	35.38	4252.72
7.05				
Top width (ft)	188.95	Top width (ft)	62.43	95.00
31.52				
Vel Total (ft/s)	2.85	Avg. Vel. (ft/s)	0.41	3.05
0.27				
Max Chl Dpth (ft)	16.13	Hydr. Depth (ft)	1.39	14.66
0.82				
Conv. Total (cfs)	482914.4	Conv. (cfs)	3977.6	478143.8
793.1				
Length wtd. (ft)	540.00	wetted Per. (ft)	63.47	100.26
34.73				
Min Ch El (ft)	99.40	Shear (lb/sq ft)	0.01	0.07
0.00				
Alpha	1.13	Stream Power (lb/ft s)	0.00	0.21
0.00				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	161.32	642.89
35.43				
C & E Loss (ft)		Cum SA (acres)	63.19	41.79
24.68				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

## CROSS SECTION OUTPUT Profile #01JUN2009 1200

E.G. Elev (ft)	109.79	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.40	wt. n-val.	0.040	0.025
0.040				
W.S. Elev (ft)	109.38	Reach Len. (ft)	540.00	540.00
540.00				
Crit w.s. (ft)		Flow Area (sq ft)	1.20	808.25
0.30				
E.G. slope (ft/ft)	0.000455	Area (sq ft)	1.20	808.25
0.30				
Q Total (cfs)	4118.42	Flow (cfs)	0.53	4117.79
0.10				
Top width (ft)	98.39	Top width (ft)	2.71	95.00
0.68				
Vel Total (ft/s)	5.09	Avg. Vel. (ft/s)	0.44	5.09
0.33				
Max Chl Dpth (ft)	9.98	Hydr. Depth (ft)	0.44	8.51
0.44				
Conv. Total (cfs)	193179.2	Conv. (cfs)	24.9	193149.6
4.6				
Length wtd. (ft)	540.00	wetted Per. (ft)	2.85	100.26
1.11				
Min Ch El (ft)	99.40	shear (lb/sq ft)	0.01	0.23
0.01				
Alpha	1.00	Stream Power (lb/ft s)	0.01	1.17
0.00				
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	154.14	542.55
30.50				
C & E Loss (ft)		Cum SA (acres)	61.37	41.79
23.50				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

## CROSS SECTION OUTPUT Profile #01JUN2009 1600

E.G. Elev (ft)	109.56	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.15	wt. n-val.		0.025
W.S. Elev (ft)	108.41	Reach Len. (ft)	540.00	540.00
540.00				
Crit w.s. (ft)		Flow Area (sq ft)		716.30
E.G. slope (ft/ft)	0.001511	Area (sq ft)		716.30
Q Total (cfs)	6152.10	Flow (cfs)		6152.10
Top width (ft)	94.74	Top width (ft)		94.74

	TALBOTMILLSDAM.rep		
Vel Total (ft/s)	8.59	Avg. Vel. (ft/s)	8.59
Max Chl Dpth (ft)	9.01	Hydr. Depth (ft)	7.56
Conv. Total (cfs)	158258.5	Conv. (cfs)	158258.5
Length wtd. (ft)	540.00	wetted Per. (ft)	99.95
Min Ch El (ft)	99.40	Shear (lb/sq ft)	0.68
Alpha	1.00	Stream Power (lb/ft s)	5.81
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	102.27 515.29
12.95		Cum SA (acres)	57.09 41.78
C & E Loss (ft)			
16.36			

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #02JUN2009 1200

E.G. Elev (ft)	2536863.00	Element	Left OB	Channel
Right OB				
Vel Head (ft)	2536764.00	wt. n-val.		0.025
W.S. Elev (ft)	99.48	Reach Len. (ft)	540.00	540.00
540.00				
Crit W.S. (ft)	105.38	Flow Area (sq ft)		0.45
E.G. Slope (ft/ft)	3370533.000000	Area (sq ft)		
0.45				
Q Total (cfs)	5706.61	Flow (cfs)		5706.61
Top Width (ft)	11.14	Top Width (ft)		11.14
Vel Total (ft/s)	12781.53	Avg. Vel. (ft/s)		12781.53
Max Chl Dpth (ft)	0.08	Hydr. Depth (ft)		0.04
Conv. Total (cfs)	3.1	Conv. (cfs)		3.1
Length wtd. (ft)	540.00	wetted Per. (ft)		11.14
Min Ch El (ft)	99.40	Shear (lb/sq ft)		8435478.00
Alpha	1.00	Stream Power (lb/ft s)		
107818300000.00				
Frctn Loss (ft)	174872300.00	Cum Volume (acre-ft)		
84.20				
C & E Loss (ft)		Cum SA (acres)		25.66

warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.  
 warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.  
 warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: CONCORD  
 REACH: TALBOT MILL RS: 9600

INPUT

Description:

Station Elevation Data		num= 9		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-100	116	-50	115	0	107.2	22.25	92	108.5	90.8
194.75	92	217	107.2	225	114.5	250	116		

Manning's n Values		num= 3		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val
-100	.04	0	.03	217	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	0	217		550	550	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

		Element	Left OB	Channel
E.G. Elev (ft)	115.60			
Right OB				
Vel Head (ft)	0.01	wt. n-val.	0.040	0.030
0.040				
W.S. Elev (ft)	115.59	Reach Len. (ft)	550.00	550.00
550.00				
Crit w.s. (ft)		Flow Area (sq ft)	233.10	4884.05
47.79				
E.G. slope (ft/ft)	0.000005	Area (sq ft)	233.10	4884.05
47.79				
Q Total (cfs)	4037.01	Flow (cfs)	37.62	3994.11
5.28				
Top width (ft)	322.58	Top width (ft)	79.43	217.00
26.14				
Vel Total (ft/s)	0.78	Avg. vel. (ft/s)	0.16	0.82
0.11				
Max Chl Dpth (ft)	24.79	Hydr. Depth (ft)	2.93	22.51
1.83				
Conv. Total (cfs)	1894744.0	Conv. (cfs)	17658.1	1874610.0
2476.1				
Length Wtd. (ft)	550.00	wetted Per. (ft)	80.05	226.41
29.01				
Min Ch El (ft)	90.80	shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.08	Stream Power (lb/ft s)	0.00	0.00
0.00				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	159.34	603.98
34.97				
C & E Loss (ft)		Cum SA (acres)	62.31	39.85

24.32

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

## CROSS SECTION OUTPUT Profile #01JUN2009 1200

E.G. Elev (ft)	109.49	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	109.47	Reach Len. (ft)	550.00	550.00
550.00				
Crit w.s. (ft)		Flow Area (sq ft)	16.46	3555.42
2.81				
E.G. Slope (ft/ft)	0.000014	Area (sq ft)	16.46	3555.42
2.81				
Q Total (cfs)	4150.05	Flow (cfs)	2.48	4147.22
0.35				
Top width (ft)	234.01	Top width (ft)	14.53	217.00
2.48				
Vel Total (ft/s)	1.16	Avg. Vel. (ft/s)	0.15	1.17
0.12				
Max Chl Dpth (ft)	18.67	Hydr. Depth (ft)	1.13	16.38
1.13				
Conv. Total (cfs)	1105076.0	Conv. (cfs)	659.1	1104324.0
92.8				
Length wtd. (ft)	550.00	wetted Per. (ft)	14.70	226.41
3.36				
Min Ch El (ft)	90.80	Shear (lb/sq ft)	0.00	0.01
0.00				
Alpha	1.01	Stream Power (lb/ft s)	0.00	0.02
0.00				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	154.04	515.50
30.48				
C & E Loss (ft)		Cum SA (acres)	61.26	39.85
23.48				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

## CROSS SECTION OUTPUT Profile #01JUN2009 1600

E.G. Elev (ft)	108.68	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	108.63	Reach Len. (ft)	550.00	550.00
550.00				
Crit w.s. (ft)		Flow Area (sq ft)	6.53	3373.38

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1.12				
E.G. slope (ft/ft)	0.000037	Area (sq ft)	6.53	3373.38
1.12				
Q Total (cfs)	6149.98	Flow (cfs)	1.17	6148.65
0.16				
Top width (ft)	227.71	Top width (ft)	9.15	217.00
1.56				
Vel Total (ft/s)	1.82	Avg. Vel. (ft/s)	0.18	1.82
0.15				
Max Chl Dpth (ft)	17.83	Hydr. Depth (ft)	0.71	15.55
0.71				
Conv. Total (cfs)	1011923.0	Conv. (cfs)	192.1	1011704.0
27.1				
Length Wtd. (ft)	550.00	wetted Per. (ft)	9.26	226.41
2.12				
Min Ch El (ft)	90.80	shear (lb/sq ft)	0.00	0.03
0.00				
Alpha	1.00	Stream Power (lb/ft s)	0.00	0.06
0.00				
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	102.23	489.94
12.94				
C & E Loss (ft)		Cum SA (acres)	57.03	39.85
16.35				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #02JUN2009 1200

E.G. Elev (ft)	149381.60	Element	Left OB	Channel
Right OB				
Vel Head (ft)	149290.60	wt. n-val.		0.030
W.S. Elev (ft)	90.96	Reach Len. (ft)	550.00	550.00
550.00				
Crit w.s. (ft)	94.62	Flow Area (sq ft)		1.84
E.G. slope (ft/ft)	113548.300000	Area (sq ft)		
1.84				
Q Total (cfs)	5716.99	Flow (cfs)		5716.99
Top width (ft)	23.02	Top width (ft)		23.02
Vel Total (ft/s)	3100.70	Avg. Vel. (ft/s)		3100.70
Max Chl Dpth (ft)	0.16	Hydr. Depth (ft)		0.08
Conv. Total (cfs)	17.0	Conv. (cfs)		17.0
Length Wtd. (ft)	550.00	wetted Per. (ft)		23.03
Min Ch El (ft)	90.80	shear (lb/sq ft)		567631.60
Alpha	1.00	Stream Power (lb/ft s)		
1760053000.00				
Frctn Loss (ft)	107316000.00	Cum Volume (acre-ft)		
84.18				
C & E Loss (ft)		Cum SA (acres)		25.45

TALBOTMILLSDAM.rep

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: CONCORD  
 REACH: TALBOT MILL RS: 9050

INPUT

Description:

Station	Elevation	Data	num=	10	Sta	Elev	Sta	Elev	Sta	Elev
-200	118	0	107	.08	94.01	.1	94.01	80.5	94	
160.91	94.01	160.92	94.01	161	107	411	119	622	118	

Manning's n	Values	num=	3	Sta	n Val	Sta	n Val
-200	.04	0	.03	161	.04		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	0	161		2050	2050	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

	E.G. Elev (ft)		Element	Left OB	Channel
Right OB	109.46				
Vel Head (ft)	0.04		wt. n-Val.	0.040	0.030
0.040					
W.S. Elev (ft)	109.42		Reach Len. (ft)	2050.00	2050.00
2050.00					
Crit w.s. (ft)			Flow Area (sq ft)	53.10	2480.28
60.85					
E.G. Slope (ft/ft)	0.000037		Area (sq ft)	53.10	2480.28
60.85					
Q Total (cfs)	4196.39		Flow (cfs)	13.53	4167.36
15.50					
Top width (ft)	255.30		Top width (ft)	43.94	161.00
50.35					
Vel Total (ft/s)	1.62		Avg. Vel. (ft/s)	0.25	1.68
0.25					
Max Chl Dpth (ft)	15.42		Hydr. Depth (ft)	1.21	15.41
1.21					
Conv. Total (cfs)	693594.6		Conv. (cfs)	2235.8	688796.3
2562.5					
Length wtd. (ft)	2050.00		wetted Per. (ft)	44.01	186.82
50.41					
Min Ch El (ft)	94.00		Shear (lb/sq ft)	0.00	0.03
0.00					
Alpha	1.07		Stream Power (lb/ft s)	0.00	0.05

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0.00				
Frctn Loss (ft)	0.05	Cum volume (acre-ft)	157.53	557.49
34.29				
C & E Loss (ft)		Cum SA (acres)	61.53	37.47
23.84				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #01JUN2009 1200

E.G. Elev (ft)	109.46	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	wt. n-val.	0.040	0.030
0.040				
W.S. Elev (ft)	109.42	Reach Len. (ft)	2050.00	2050.00
2050.00				
Crit w.s. (ft)		Flow Area (sq ft)	53.10	2480.28
60.85				
E.G. slope (ft/ft)	0.000037	Area (sq ft)	53.10	2480.28
60.85				
Q Total (cfs)	4196.39	Flow (cfs)	13.53	4167.36
15.50				
Top width (ft)	255.30	Top width (ft)	43.94	161.00
50.35				
Vel Total (ft/s)	1.62	Avg. vel. (ft/s)	0.25	1.68
0.25				
Max Chl Dpth (ft)	15.42	Hydr. Depth (ft)	1.21	15.41
1.21				
Conv. Total (cfs)	693594.6	Conv. (cfs)	2235.8	688796.3
2562.5				
Length wtd. (ft)	2050.00	wetted Per. (ft)	44.01	186.82
50.41				
Min Ch El (ft)	94.00	Shear (lb/sq ft)	0.00	0.03
0.00				
Alpha	1.07	Stream Power (lb/ft s)	0.00	0.05
0.00				
Frctn Loss (ft)	0.05	Cum volume (acre-ft)	153.60	477.40
30.07				
C & E Loss (ft)		Cum SA (acres)	60.89	37.47
23.15				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #01JUN2009 1600

E.G. Elev (ft)	108.64	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.11	wt. n-val.	0.040	0.030
0.040				
W.S. Elev (ft)	108.54	Reach Len. (ft)	2050.00	2050.00
2050.00				

TALBOTMILLSDAM.rep				
Crit w.s. (ft)		Flow Area (sq ft)	21.51	2338.79
24.64				
E.G. Slope (ft/ft)	0.000096	Area (sq ft)	21.51	2338.79
24.64				
Q Total (cfs)	6146.54	Flow (cfs)	6.58	6132.42
7.54				
Top width (ft)	221.01	Top width (ft)	27.97	161.00
32.04				
Vel Total (ft/s)	2.58	Avg. Vel. (ft/s)	0.31	2.62
0.31				
Max Chl Dpth (ft)	14.54	Hydr. Depth (ft)	0.77	14.53
0.77				
Conv. Total (cfs)	626000.4	Conv. (cfs)	670.0	624562.6
767.8				
Length wtd. (ft)	2050.00	Wetted Per. (ft)	28.01	186.82
32.08				
Min Ch El (ft)	94.00	Shear (lb/sq ft)	0.00	0.08
0.00				
Alpha	1.03	Stream Power (lb/ft s)	0.00	0.20
0.00				
Frctn Loss (ft)	0.12	Cum Volume (acre-ft)	102.06	453.88
12.78				
C & E Loss (ft)		Cum SA (acres)	56.80	37.47
16.14				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #02JUN2009 1200

E.G. Elev (ft)	68336.79	Element	Left OB	Channel
Right OB				
Vel Head (ft)	68242.77	wt. n-Val.		0.030
W.S. Elev (ft)	94.02	Reach Len. (ft)	2050.00	2050.00
2050.00				
Crit w.s. (ft)	97.40	Flow Area (sq ft)		2.73
E.G. Slope (ft/ft)	409867.800000	Area (sq ft)		
2.73				
Q Total (cfs)	5732.50	Flow (cfs)		5732.50
Top width (ft)	160.84	Top width (ft)		160.84
Vel Total (ft/s)	2096.39	Avg. Vel. (ft/s)		2096.39
Max Chl Dpth (ft)	0.02	Hydr. Depth (ft)		0.02
Conv. Total (cfs)	9.0	Conv. (cfs)		9.0
Length wtd. (ft)	2050.00	Wetted Per. (ft)		160.86
Min Ch El (ft)	94.00	Shear (lb/sq ft)		434961.10
Alpha	1.00	Stream Power (lb/ft s)		
911846300.00				
Frctn Loss (ft)	1.96	Cum Volume (acre-ft)		84.16

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: CONCORD  
REACH: TALBOT MILL RS: 7000

INPUT

Description: GCI - Topo Map

Station	Elevation	Data	num=	9	Sta	Elev	Sta	Elev	Sta	Elev
-1500	115	-1000	107	0	106	6	94.01	106	94	
208	94.01	214	107	471	109	622	118			

Manning's n Values

Sta	n Val	Sta	n Val	num=	3	Sta	n Val
-1500	.04	0	.03	214	.04		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	0	214		2250	2250		.1	.3

CROSS SECTION OUTPUT Profile #Max WS

Parameter	Value	Element	Left OB	Channel
E.G. Elev (ft)	109.35			
Right OB				
Vel Head (ft)	0.02	wt. n-val.	0.040	0.030
0.040				
w.s. Elev (ft)	109.33	Reach Len. (ft)	2250.00	2250.00
2250.00				
Crit w.s. (ft)		Flow Area (sq ft)	2999.88	3204.59
342.78				
E.G. Slope (ft/ft)	0.000019	Area (sq ft)	2999.88	3204.59
342.78				
Q Total (cfs)	5045.99	Flow (cfs)	931.59	4047.48
66.93				
Top width (ft)	1622.18	Top width (ft)	1145.64	214.00
262.54				
Vel Total (ft/s)	0.77	Avg. vel. (ft/s)	0.31	1.26
0.20				
Max Chl Dpth (ft)	15.33	Hydr. Depth (ft)	2.62	14.97
1.31				
Conv. Total (cfs)	1146735.0	Conv. (cfs)	211709.0	919815.8
15210.3				
Length wtd. (ft)	2250.00	wetted Per. (ft)	1145.66	229.72
262.56				
Min Ch El (ft)	94.00	shear (lb/sq ft)	0.00	0.02
0.00				

		TALBOTMILLSDAM.rep		
Alpha	2.19	Stream Power (lb/ft s)	0.00	0.02
0.00				
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	85.69	423.72
24.79				
C & E Loss (ft)		Cum SA (acres)	33.54	28.64
16.47				

CROSS SECTION OUTPUT Profile #01JUN2009 1200

E.G. Elev (ft)	109.35	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	wt. n-val.	0.040	0.030
0.040				
W.S. Elev (ft)	109.33	Reach Len. (ft)	2250.00	2250.00
2250.00				
Crit w.s. (ft)		Flow Area (sq ft)	2999.88	3204.59
342.78				
E.G. slope (ft/ft)	0.000019	Area (sq ft)	2999.88	3204.59
342.78				
Q Total (cfs)	5045.99	Flow (cfs)	931.59	4047.48
66.93				
Top width (ft)	1622.18	Top width (ft)	1145.64	214.00
262.54				
Vel Total (ft/s)	0.77	Avg. vel. (ft/s)	0.31	1.26
0.20				
Max Chl Dpth (ft)	15.33	Hydr. Depth (ft)	2.62	14.97
1.31				
Conv. Total (cfs)	1146735.0	Conv. (cfs)	211709.0	919815.8
15210.3				
Length wtd. (ft)	2250.00	wetted Per. (ft)	1145.66	229.72
262.56				
Min Ch El (ft)	94.00	Shear (lb/sq ft)	0.00	0.02
0.00				
Alpha	2.19	Stream Power (lb/ft s)	0.00	0.02
0.00				
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	81.76	343.63
20.58				
C & E Loss (ft)		Cum SA (acres)	32.90	28.64
15.79				

CROSS SECTION OUTPUT Profile #01JUN2009 1600

E.G. Elev (ft)	108.49	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	wt. n-val.	0.040	0.030
0.040				
W.S. Elev (ft)	108.45	Reach Len. (ft)	2250.00	2250.00
2250.00				
Crit w.s. (ft)		Flow Area (sq ft)	2015.48	3016.19
135.05				
E.G. slope (ft/ft)	0.000041	Area (sq ft)	2015.48	3016.19
135.05				
Q Total (cfs)	6088.41	Flow (cfs)	723.92	5338.49
25.99				
Top width (ft)	1490.91	Top width (ft)	1090.61	214.00
186.30				
Vel Total (ft/s)	1.18	Avg. vel. (ft/s)	0.36	1.77

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0.19				
Max Chl Dpth (ft)	14.45	Hydr. Depth (ft)	1.85	14.09
0.72				
Conv. Total (cfs)	948261.8	Conv. (cfs)	112750.1	831463.4
4048.2				
Length wtd. (ft)	2250.00	wetted Per. (ft)	1090.63	229.72
186.30				
Min Ch El (ft)	94.00	Shear (lb/sq ft)	0.00	0.03
0.00				
Alpha	1.99	Stream Power (lb/ft s)	0.00	0.06
0.00				
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	54.12	327.88
9.02				
C & E Loss (ft)		Cum SA (acres)	30.47	28.64
11.00				

CROSS SECTION OUTPUT Profile #02JUN2009 1200

E.G. Elev (ft)	102.30	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.10	wt. n-Val.		0.030
W.S. Elev (ft)	102.20	Reach Len. (ft)	2250.00	2250.00
2250.00				
Crit W.S. (ft)		Flow Area (sq ft)		1687.73
E.G. Slope (ft/ft)	0.000177	Area (sq ft)		1687.73
Q Total (cfs)	4324.75	Flow (cfs)		4324.75
Top width (ft)	209.88	Top width (ft)		209.88
Vel Total (ft/s)	2.56	Avg. Vel. (ft/s)		2.56
Max Chl Dpth (ft)	8.20	Hydr. Depth (ft)		8.04
Conv. Total (cfs)	324981.5	Conv. (cfs)		324981.5
Length wtd. (ft)	2250.00	wetted Per. (ft)		220.18
Min Ch El (ft)	94.00	Shear (lb/sq ft)		0.08
Alpha	1.00	Stream Power (lb/ft s)		0.22
Frctn Loss (ft)	1.11	Cum Volume (acre-ft)		44.38
C & E Loss (ft)		Cum SA (acres)		15.57

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross

section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: CONCORD  
 REACH: TALBOT MILL RS: 4750

INPUT

Description:

Station Elevation Data		num= 7							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-200	116	0	106.6	4.54	91.3	119	91	233.46	91.3
238	106.6	738	115						

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
-200	.04	0	.03	238	.04

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	0	238		2700	2700	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

			Left OB	Channel
E.G. Elev (ft)	109.25	Element		
Right OB				
Vel Head (ft)	0.03	wt. n-val.	0.040	0.030
0.040				
W.S. Elev (ft)	109.22	Reach Len. (ft)	2700.00	2700.00
2700.00				
Crit w.s. (ft)		Flow Area (sq ft)	72.77	4228.77
203.60				
E.G. slope (ft/ft)	0.000021	Area (sq ft)	72.77	4228.77
203.60				
Q Total (cfs)	6162.92	Flow (cfs)	14.70	6107.04
41.17				
Top width (ft)	449.33	Top width (ft)	55.65	238.00
155.68				
Vel Total (ft/s)	1.37	Avg. vel. (ft/s)	0.20	1.44
0.20				
Max Chl Dpth (ft)	18.22	Hydr. Depth (ft)	1.31	17.77
1.31				
Conv. Total (cfs)	1353950.0	Conv. (cfs)	3230.6	1341676.0
9043.7				
Length Wtd. (ft)	2700.00	wetted Per. (ft)	55.71	260.84
155.71				
Min Ch El (ft)	91.00	Shear (lb/sq ft)	0.00	0.02
0.00				
Alpha	1.10	Stream Power (lb/ft s)	0.00	0.03
0.00				
Frctn Loss (ft)	0.09	Cum volume (acre-ft)	6.34	231.74
10.68				
C & E Loss (ft)		Cum SA (acres)	2.52	16.97
5.67				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than

0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and

previous cross section. This may indicate the need for additional cross sections.

## CROSS SECTION OUTPUT Profile #01JUN2009 1200

E.G. Elev (ft)	109.25	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	109.22	Reach Len. (ft)	2700.00	2700.00
2700.00				
Crit w.s. (ft)		Flow Area (sq ft)	72.77	4228.77
203.60				
E.G. slope (ft/ft)	0.000021	Area (sq ft)	72.77	4228.77
203.60				
Q Total (cfs)	6162.92	Flow (cfs)	14.70	6107.04
41.17				
Top width (ft)	449.33	Top width (ft)	55.65	238.00
155.68				
Vel Total (ft/s)	1.37	Avg. Vel. (ft/s)	0.20	1.44
0.20				
Max Chl Dpth (ft)	18.22	Hydr. Depth (ft)	1.31	17.77
1.31				
Conv. Total (cfs)	1353950.0	conv. (cfs)	3230.6	1341676.0
9043.7				
Length wtd. (ft)	2700.00	wetted Per. (ft)	55.71	260.84
155.71				
Min Ch El (ft)	91.00	Shear (lb/sq ft)	0.00	0.02
0.00				
Alpha	1.10	Stream Power (lb/ft s)	0.00	0.03
0.00				
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)	2.40	151.65
6.47				
C & E Loss (ft)		Cum SA (acres)	1.87	16.97
4.99				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

## CROSS SECTION OUTPUT Profile #01JUN2009 1600

E.G. Elev (ft)	108.42	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	108.38	Reach Len. (ft)	2700.00	2700.00
2700.00				
Crit w.s. (ft)		Flow Area (sq ft)	33.80	4030.49
94.55				
E.G. slope (ft/ft)	0.000023	Area (sq ft)	33.80	4030.49
94.55				

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Q Total (cfs)	6017.18	Flow (cfs)	5.62	5995.81
15.75				
Top width (ft)	382.02	Top width (ft)	37.92	238.00
106.10				
Vel Total (ft/s)	1.45	Avg. Vel. (ft/s)	0.17	1.49
0.17				
Max Chl Dpth (ft)	17.38	Hydr. Depth (ft)	0.89	16.93
0.89				
Conv. Total (cfs)	1242890.0	Conv. (cfs)	1161.8	1238476.0
3252.5				
Length Wtd. (ft)	2700.00	wetted Per. (ft)	37.97	260.84
106.11				
Min Ch El (ft)	91.00	Shear (lb/sq ft)	0.00	0.02
0.00				
Alpha	1.05	Stream Power (lb/ft s)	0.00	0.03
0.00				
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)	1.20	145.88
3.09				
C & E Loss (ft)		Cum SA (acres)	1.33	16.97
3.45				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #02JUN2009 1200

E.G. Elev (ft)	3185.53	Element	Left OB	Channel
Right OB				
Vel Head (ft)	3094.40	wt. n-val.		0.030
W.S. Elev (ft)	91.13	Reach Len. (ft)	2700.00	2700.00
2700.00				
Crit w.s. (ft)	92.85	Flow Area (sq ft)		6.47
E.G. slope (ft/ft)	3102.387000	Area (sq ft)		6.47
Q Total (cfs)	2886.36	Flow (cfs)		2886.36
Top width (ft)	99.34	Top width (ft)		99.34
Vel Total (ft/s)	446.41	Avg. Vel. (ft/s)		446.41
Max Chl Dpth (ft)	0.13	Hydr. Depth (ft)		0.07
Conv. Total (cfs)	51.8	Conv. (cfs)		51.8
Length Wtd. (ft)	2700.00	wetted Per. (ft)		99.34
Min Ch El (ft)	91.00	Shear (lb/sq ft)		12606.75
Alpha	1.00	Stream Power (lb/ft s)		5627745.00

Frctn Loss (ft) 5829015.00 Cum Volume (acre-ft) 0.62  
 C & E Loss (ft) Cum SA (acres) 7.58

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.  
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: CONCORD  
 REACH: TALBOT MILL RS: 2050

INPUT

Description:

Station Elevation Data		num= 9		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-500	110	-250	107	-25	106.5	0	106	37.75	90.8
192.5	90.4	347.25	90.8	385	105	635	109		

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-500	.04	37.75	.03	347.25	.04		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	37.75	347.25		2050	2050	.1	.3

CROSS SECTION OUTPUT Profile #Max WS

E.G. Elev (ft)	101.14	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	101.10	Reach Len. (ft)		
Crit w.s. (ft)	92.85	Flow Area (sq ft)	131.66	3248.82
140.94				
E.G. Slope (ft/ft)	0.000056	Area (sq ft)	131.66	3248.82
140.94				
Q Total (cfs)	6000.00	Flow (cfs)	104.00	5784.01
111.99				
Top width (ft)	362.45	Top width (ft)	25.57	309.50
27.37				
Vel Total (ft/s)	1.70	Avg. Vel. (ft/s)	0.79	1.78
0.79				
Max Chl Dpth (ft)	10.70	Hydr. Depth (ft)	5.15	10.50
5.15				
Conv. Total (cfs)	800259.1	Conv. (cfs)	13870.8	771451.7
14936.6				
Length wtd. (ft)		wetted Per. (ft)	27.57	309.50
29.25				

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Min Ch El (ft)	90.40	Shear (lb/sq ft)	0.02	0.04
0.02				
Alpha	1.06	Stream Power (lb/ft s)	0.01	0.07
0.01				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

CROSS SECTION OUTPUT Profile #01JUN2009 1200

E.G. Elev (ft)	93.99	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.24	wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	92.75	Reach Len. (ft)		
Crit w.s. (ft)	92.85	Flow Area (sq ft)	4.71	664.55
5.04				
E.G. slope (ft/ft)	0.011848	Area (sq ft)	4.71	664.55
5.04				
Q Total (cfs)	6000.00	Flow (cfs)	17.79	5963.06
19.15				
Top width (ft)	319.51	Top width (ft)	4.84	309.50
5.18				
Vel Total (ft/s)	8.90	Avg. Vel. (ft/s)	3.78	8.97
3.80				
Max Chl Dpth (ft)	2.35	Hydr. Depth (ft)	0.97	2.15
0.97				
Conv. Total (cfs)	55122.4	Conv. (cfs)	163.4	54783.0
176.0				
Length wtd. (ft)		wetted Per. (ft)	5.21	309.50
5.53				
Min Ch El (ft)	90.40	shear (lb/sq ft)	0.67	1.59
0.67				
Alpha	1.01	Stream Power (lb/ft s)	2.52	14.25
2.56				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

CROSS SECTION OUTPUT Profile #01JUN2009 1600

E.G. Elev (ft)	93.99	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.20	wt. n-Val.	0.040	0.030
0.040				
W.S. Elev (ft)	92.79	Reach Len. (ft)		
Crit w.s. (ft)	92.85	Flow Area (sq ft)	4.90	676.72
5.25				
E.G. slope (ft/ft)	0.011149	Area (sq ft)	4.90	676.72
5.25				
Q Total (cfs)	6000.00	Flow (cfs)	18.20	5962.20
19.60				
Top width (ft)	319.71	Top width (ft)	4.93	309.50

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5.28				
Vel Total (ft/s)	8.74	Avg. Vel. (ft/s)	3.71	8.81
3.74				
Max Chl Dpth (ft)	2.39	Hydr. Depth (ft)	0.99	2.19
0.99				
Conv. Total (cfs)	56823.6	Conv. (cfs)	172.4	56465.6
185.6				
Length wtd. (ft)		wetted Per. (ft)	5.32	309.50
5.64				
Min Ch El (ft)	90.40	Shear (lb/sq ft)	0.64	1.52
0.65				
Alpha	1.01	Stream Power (lb/ft s)	2.38	13.41
2.42				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

CROSS SECTION OUTPUT Profile #02JUN2009 1200

E.G. Elev (ft)	3099.20	Element	Left OB	Channel
Right OB				
Vel Head (ft)	3008.61	wt. n-val.		0.030
w.s. Elev (ft)	90.59	Reach Len. (ft)		
Crit w.s. (ft)	92.85	Flow Area (sq ft)		13.63
E.G. Slope (ft/ft)	1851.720000	Area (sq ft)		13.63
Q Total (cfs)	6000.00	Flow (cfs)		6000.00
Top width (ft)	145.24	Top width (ft)		145.24
Vel Total (ft/s)	440.18	Avg. Vel. (ft/s)		440.18
Max Chl Dpth (ft)	0.19	Hydr. Depth (ft)		0.09
Conv. Total (cfs)	139.4	Conv. (cfs)		139.4
Length wtd. (ft)		wetted Per. (ft)		145.24
Min Ch El (ft)	90.40	Shear (lb/sq ft)		10849.64
Alpha	1.00	Stream Power (lb/ft s)		4775748.00
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

STORAGE AREA: TALBOT MILL  
 Volume Method : Rating Curve

Elevation	Volume
98.4	0
110	110

## SUMMARY OF MANNING'S N VALUES

River: CONCORD

Reach	River Sta.	n1	n2	n3
TALBOT MILL	14045	.04	.03	.04
TALBOT MILL	13050	.04	.03	.04
TALBOT MILL	11670	.04	.03	.04
TALBOT MILL	10190	.03	.02	.03
TALBOT MILL	10185	Inl struct		
TALBOT MILL	10140	.04	.025	.04
TALBOT MILL	9600	.04	.03	.04
TALBOT MILL	9050	.04	.03	.04
TALBOT MILL	7000	.04	.03	.04
TALBOT MILL	4750	.04	.03	.04
TALBOT MILL	2050	.04	.03	.04

## SUMMARY OF REACH LENGTHS

River: CONCORD

Reach	River Sta.	Left	Channel	Right
TALBOT MILL	14045	995	995	995
TALBOT MILL	13050	1380	1380	1380
TALBOT MILL	11670	1490	1490	1490
TALBOT MILL	10190	50	50	50
TALBOT MILL	10185	Inl struct		
TALBOT MILL	10140	540	540	540
TALBOT MILL	9600	550	550	550
TALBOT MILL	9050	2050	2050	2050
TALBOT MILL	7000	2250	2250	2250
TALBOT MILL	4750	2700	2700	2700
TALBOT MILL	2050	2050	2050	2050

## SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: CONCORD

Reach	River Sta.	Contr.	Expan.
TALBOT MILL	14045	.1	.3
TALBOT MILL	13050	.1	.3
TALBOT MILL	11670	.1	.3
TALBOT MILL	10190	.1	.3
TALBOT MILL	10185	Inl struct	
TALBOT MILL	10140	.1	.3
TALBOT MILL	9600	.1	.3
TALBOT MILL	9050	.1	.3
TALBOT MILL	7000	.1	.3
TALBOT MILL	4750	.1	.3
TALBOT MILL	2050	.1	.3

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Profile Output Table - Standard Table 1

Reach Crit W.S. # Ch1	River Sta E.G. Elev	Profile E.G. Slope	Vel Chnl	Q Total Flow Area	Min Ch El Top width	w.S. Elev Froude
(ft)	(ft)	(ft/ft)	(ft/s)	(cfs) (sq ft)	(ft) (ft)	(ft)
TALBOT MILL	14045	Max WS		5700.00	101.40	116.01
0.17	116.19	0.000183	3.43	1662.79	148.08	
TALBOT MILL	14045	01JUN2009	1200	5700.00	101.40	115.24
0.19	115.45	0.000223	3.66	1558.45	132.55	
TALBOT MILL	14045	01JUN2009	1600	5700.00	101.40	115.10
0.19	115.31	0.000231	3.70	1539.67	132.19	
TALBOT MILL	14045	02JUN2009	1200	5700.00	101.40	115.85
0.18	116.04	0.000191	3.47	1640.58	137.58	
TALBOT MILL	13050	Max WS		5399.24	108.40	115.79
0.20	115.93	0.000294	3.09	1768.17	292.38	
TALBOT MILL	13050	01JUN2009	1200	5287.46	108.40	114.88
0.24	115.07	0.000439	3.45	1531.05	239.99	
TALBOT MILL	13050	01JUN2009	1600	5798.59	108.40	114.65
0.28	114.89	0.000596	3.93	1475.39	239.98	
TALBOT MILL	13050	02JUN2009	1200	5699.31	108.40	111.32
0.88	112.42	0.007445	8.41	677.30	239.83	
TALBOT MILL	11670	Max WS		4868.69	98.40	115.70
0.08	115.75	0.000038	1.76	2778.01	219.60	
TALBOT MILL	11670	01JUN2009	1200	4673.42	98.40	114.63
0.09	114.68	0.000045	1.83	2560.67	189.38	
TALBOT MILL	11670	01JUN2009	1600	5978.56	98.40	114.32
0.12	114.41	0.000078	2.39	2502.30	188.27	
TALBOT MILL	11670	02JUN2009	1200	5701.83	98.40	106.29
0.34	106.70	0.000844	5.16	1106.07	159.40	
TALBOT MILL	10190	Max WS		4295.15	98.50	115.70
0.06	115.74	0.000012	1.52	2902.15	291.09	

TALBOTMILLSDAM.rep									
TALBOT	MILL	10190	01JUN2009	1200	4118.42	98.50	114.56		
101.19		114.60	0.000014		1.56	2634.25	164.00		
0.07									
TALBOT	MILL	10190	01JUN2009	1600	6152.10	98.50	114.23		
102.01		114.32	0.000033		2.38	2580.05	164.00		
0.11									
TALBOT	MILL	10190	02JUN2009	1200	5706.61	98.50	105.38		
101.84		105.78	0.000394		5.05	1128.99	164.00		
0.34									

TALBOT MILL 10185 Inl struct

TALBOT	MILL	10140	Max WS		4295.15	99.40	115.53		
0.14		115.67	0.000079		3.05	1505.14	188.95		
TALBOT	MILL	10140	01JUN2009	1200	4118.42	99.40	109.38		
109.79			0.000455		5.09	809.75	98.39		
0.31									
TALBOT	MILL	10140	01JUN2009	1600	6152.10	99.40	108.41		
109.56			0.001511		8.59	716.30	94.74		
0.55									
TALBOT	MILL	10140	02JUN2009	1200	5706.61	99.40	99.48		
105.38	2536863.00		3370533.000000		12781.53	0.45	11.14		
11249.25									

TALBOT	MILL	9600	Max WS		4037.01	90.80	115.59		
0.03		115.60	0.000005		0.82	5164.93	322.58		
TALBOT	MILL	9600	01JUN2009	1200	4150.05	90.80	109.47		
109.49			0.000014		1.17	3574.69	234.01		
0.05									
TALBOT	MILL	9600	01JUN2009	1600	6149.98	90.80	108.63		
108.68			0.000037		1.82	3381.02	227.71		
0.08									
TALBOT	MILL	9600	02JUN2009	1200	5716.99	90.80	90.96		
94.62	149381.60		113548.300000		3100.70	1.84	23.02		
1930.92									

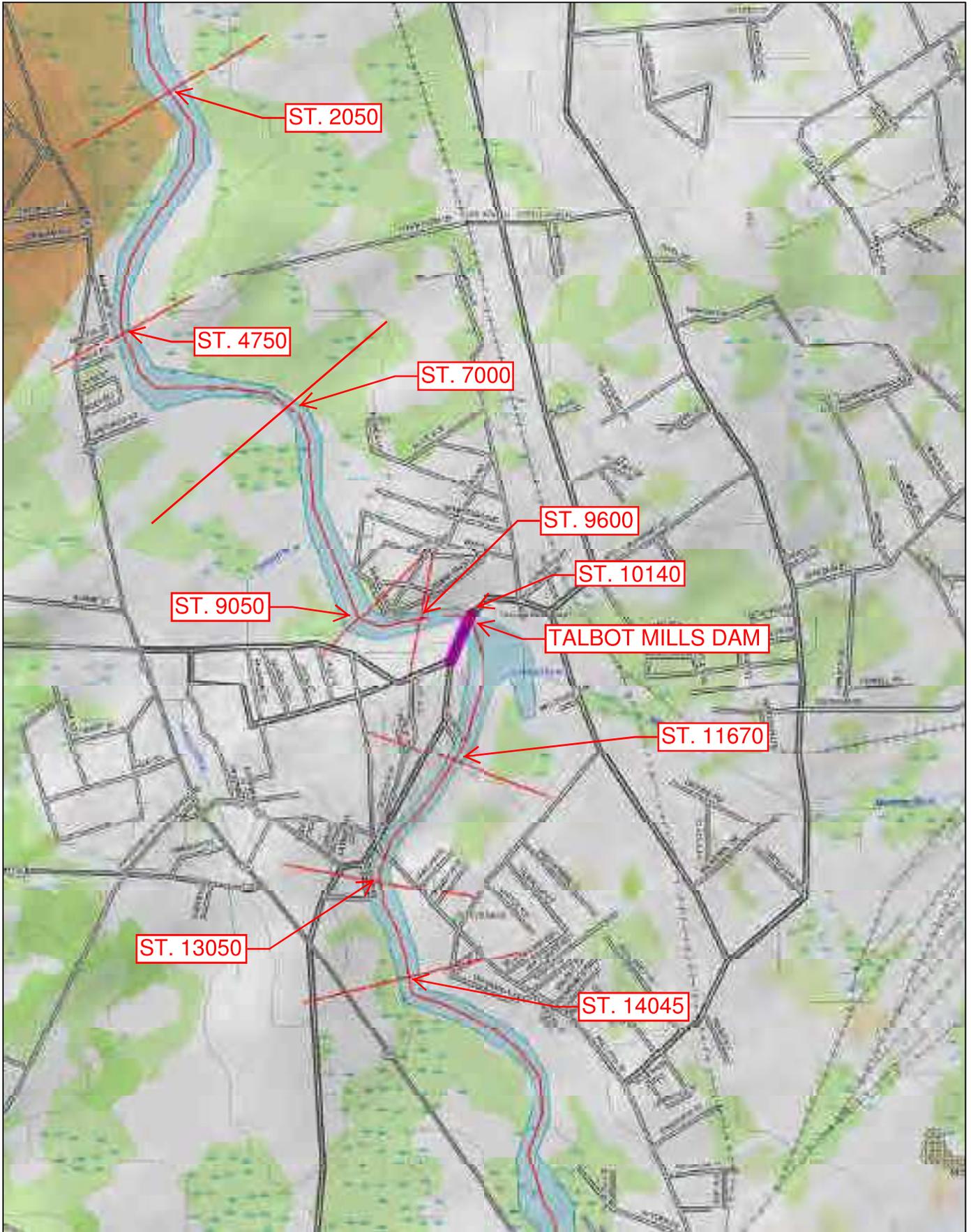
TALBOT	MILL	9050	Max WS		4196.39	94.00	109.42		
0.08		109.46	0.000037		1.68	2594.23	255.30		
TALBOT	MILL	9050	01JUN2009	1200	4196.39	94.00	109.42		
109.46			0.000037		1.68	2594.23	255.30		
0.08									
TALBOT	MILL	9050	01JUN2009	1600	6146.54	94.00	108.54		
108.64			0.000096		2.62	2384.94	221.01		
0.12									
TALBOT	MILL	9050	02JUN2009	1200	5732.50	94.00	94.02		
97.40	68336.79		409867.800000		2096.39	2.73	160.84		
2833.38									

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TALBOT MILL	7000		Max WS		5045.99	94.00		109.33
0.06	109.35		0.000019	1.26	6547.25	1622.18		
TALBOT MILL	7000		01JUN2009 1200		5045.99	94.00		109.33
0.06	109.35		0.000019	1.26	6547.25	1622.18		
TALBOT MILL	7000		01JUN2009 1600		6088.41	94.00		108.45
0.08	108.49		0.000041	1.77	5166.72	1490.91		
TALBOT MILL	7000		02JUN2009 1200		4324.75	94.00		102.20
0.16	102.30		0.000177	2.56	1687.73	209.88		
TALBOT MILL	4750		Max WS		6162.92	91.00		109.22
0.06	109.25		0.000021	1.44	4505.14	449.33		
TALBOT MILL	4750		01JUN2009 1200		6162.92	91.00		109.22
0.06	109.25		0.000021	1.44	4505.14	449.33		
TALBOT MILL	4750		01JUN2009 1600		6017.18	91.00		108.38
0.06	108.42		0.000023	1.49	4158.84	382.02		
TALBOT MILL	4750		02JUN2009 1200		2886.36	91.00		91.13
92.85	3185.53	3102.387000	446.41	6.47		99.34		
308.35								
TALBOT MILL	2050		Max WS		6000.00	90.40		101.10
92.85	101.14		0.000056	1.78	3521.42	362.45		
0.10								
TALBOT MILL	2050		01JUN2009 1200		6000.00	90.40		92.75
92.85	93.99		0.011848	8.97	674.30	319.51		
1.08								
TALBOT MILL	2050		01JUN2009 1600		6000.00	90.40		92.79
92.85	93.99		0.011149	8.81	686.87	319.71		
1.05								
TALBOT MILL	2050		02JUN2009 1200		6000.00	90.40		90.59
92.85	3099.20	1851.720000	440.18	13.63		145.24		
253.21								

Profile Output Table - Inline Structure

Reach Weir	Q Gates	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Q Total (cfs)	Q
TALBOT MILL		10185	Max WS	115.69	115.66	4295.15	
4295.15							
TALBOT MILL		10185	01JUN2009 1200	114.60	114.56	4118.42	
4118.42							
TALBOT MILL		10185	01JUN2009 1600	109.58	109.40	6152.10	
6152.10							
TALBOT MILL		10185	02JUN2009 1200	105.78	105.38	5706.61	

TALBOTMILLSDAM.rep

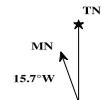


**GEOTECHNICAL CONSULTANTS INC.**  
 PROJECT: TALBOT MILLS DAM  
 GCI#2092945

Scale 1 : 16,000

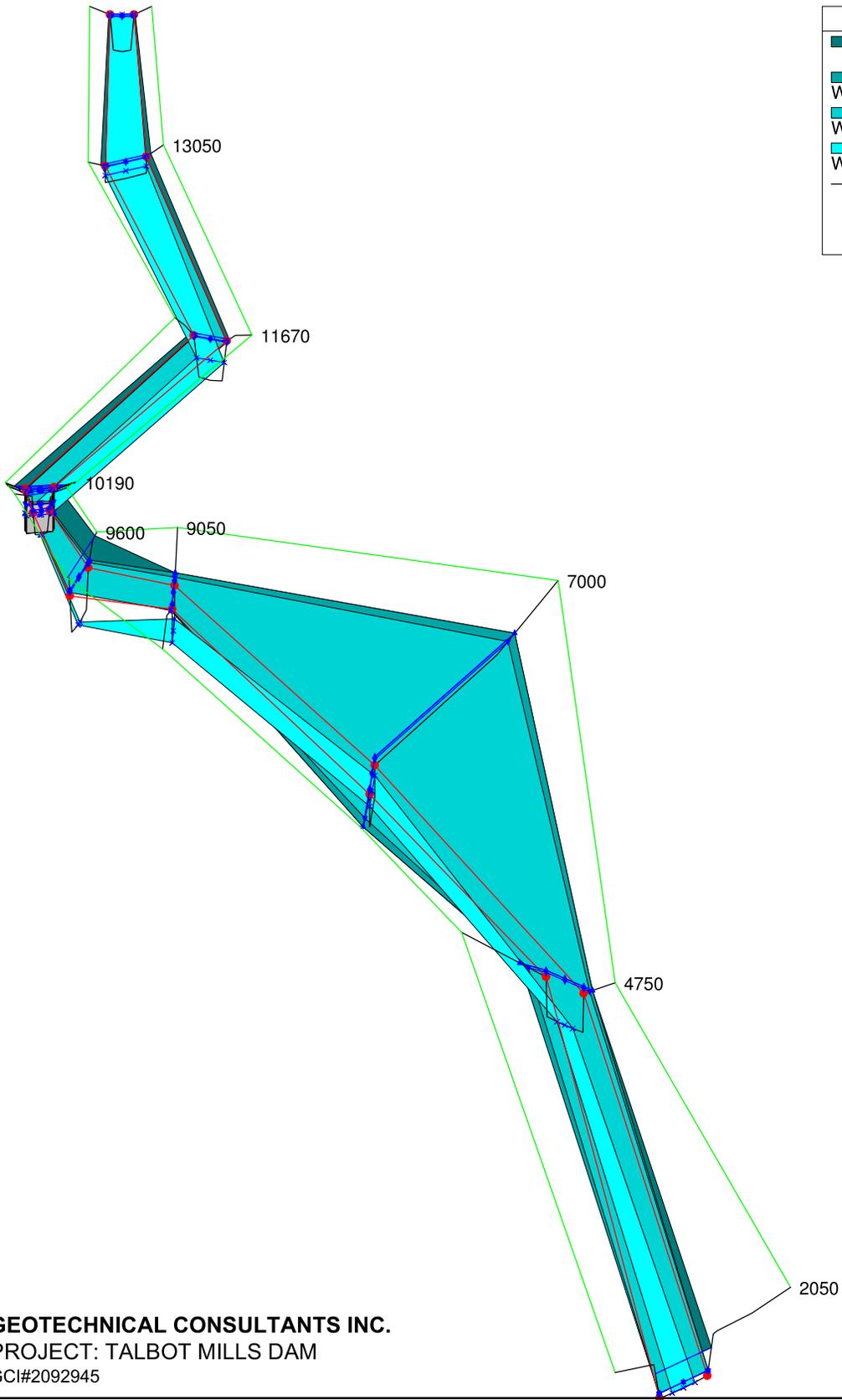
1" = 1,333.33 ft

Zoom Level: 14-0 Datum: WGS84



TALBOT MILLS DAM ORTODIMENSIONAL VIEW SIMULATION

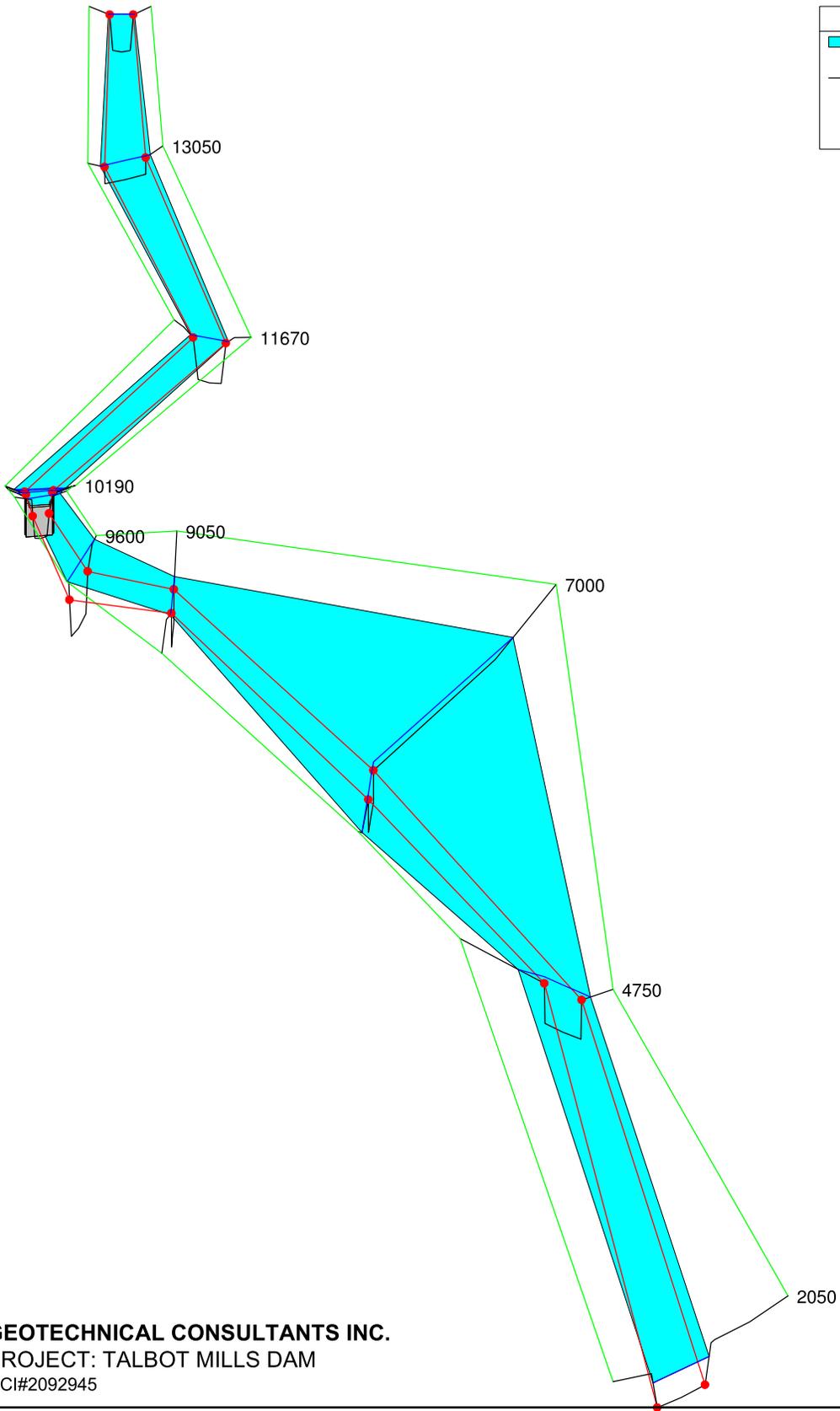
Legend	
	WS Max WS
	WS 01JUN2009 1200
	WS 01JUN2009 1600
	WS 02JUN2009 1200
	Bank Sta



GEOTECHNICAL CONSULTANTS INC.  
PROJECT: TALBOT MILLS DAM  
GCI#2092945

TALBOT MILLS DAM ORTODIMENSIONAL VIEW SIMULATION

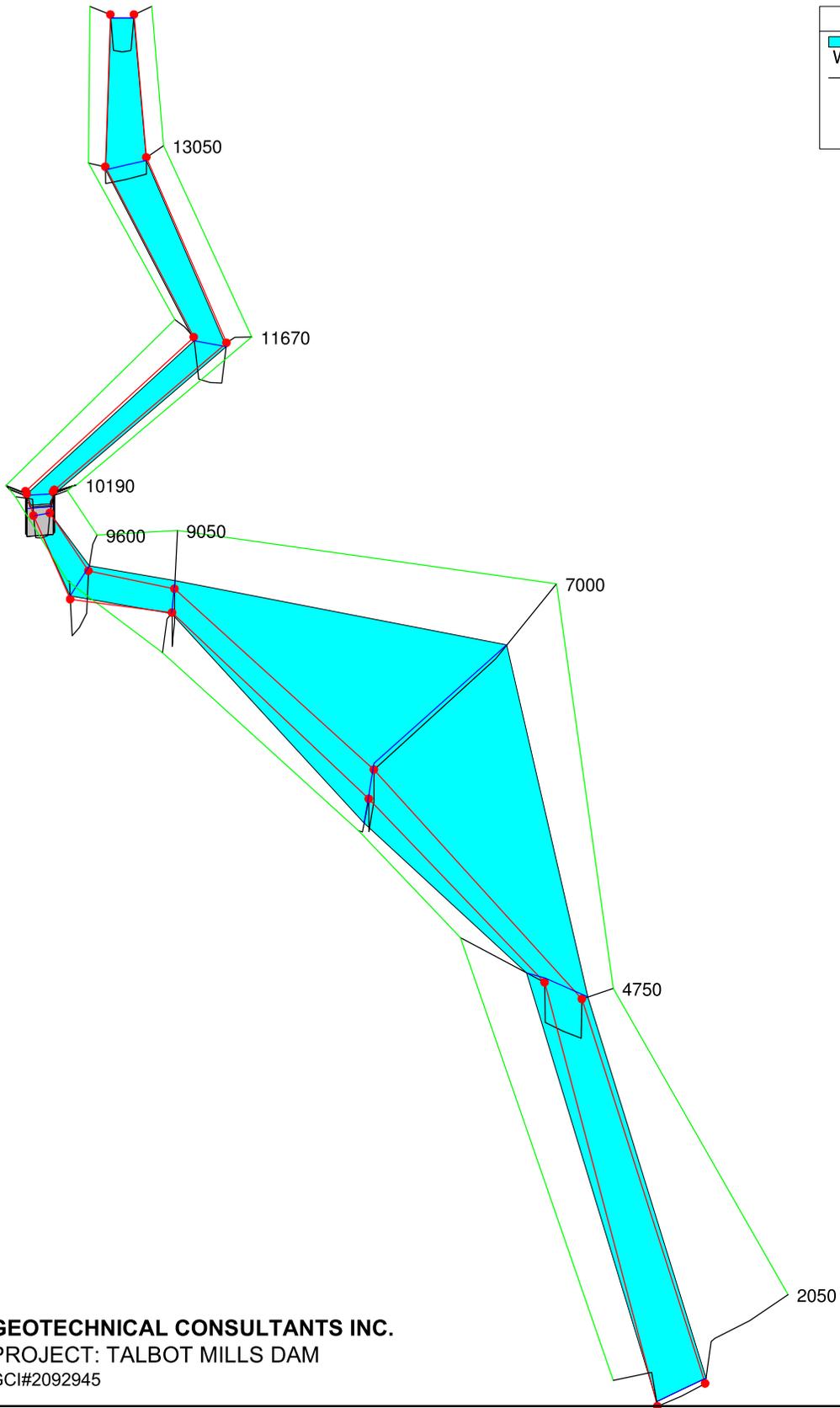
Legend	
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	Ground
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**GEOTECHNICAL CONSULTANTS INC.**  
PROJECT: TALBOT MILLS DAM  
GCI#2092945

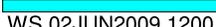
TALBOT MILLS DAM ORTODIMENSIONAL VIEW SIMULATION

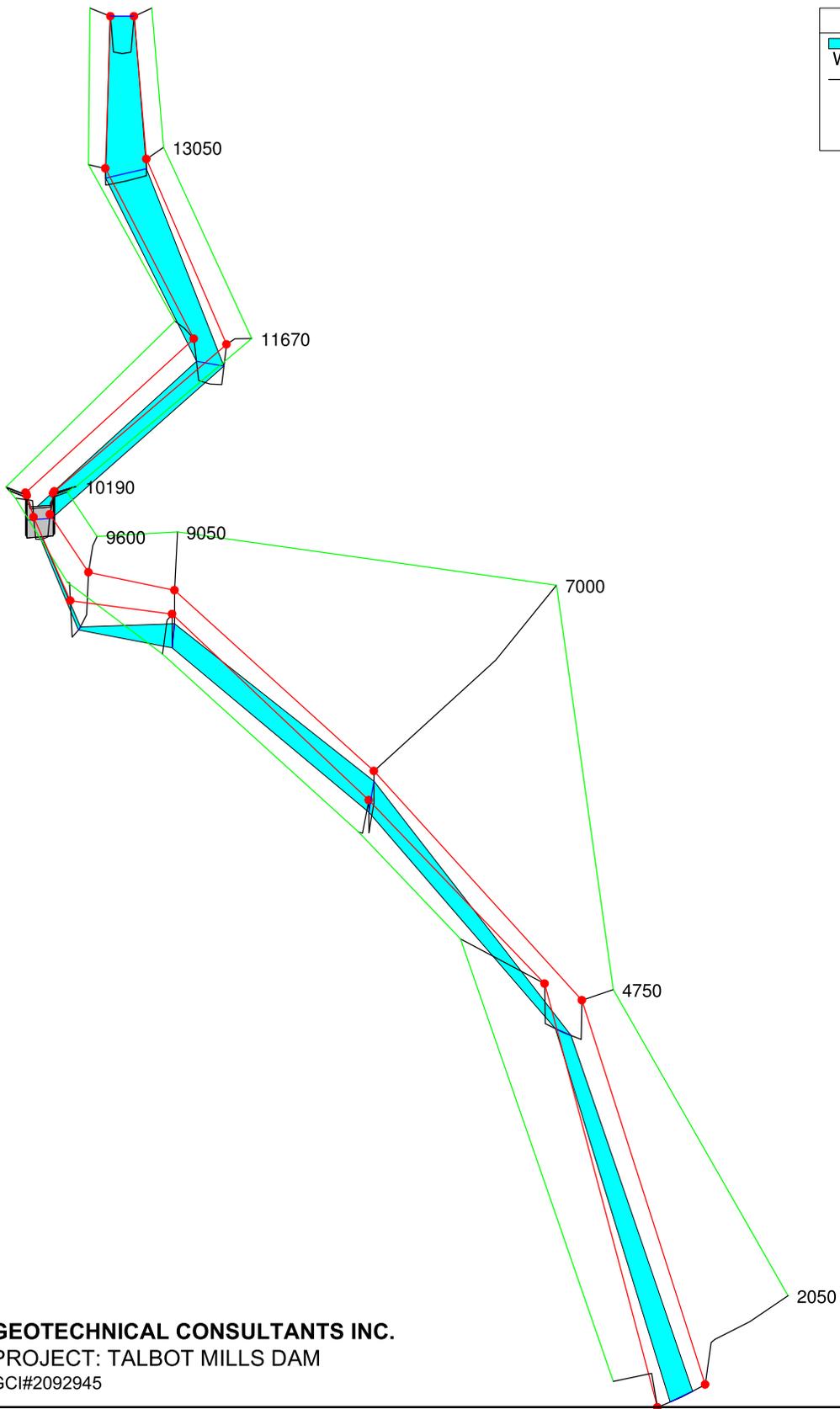
Legend	
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**GEOTECHNICAL CONSULTANTS INC.**  
PROJECT: TALBOT MILLS DAM  
GCI#2092945

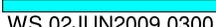
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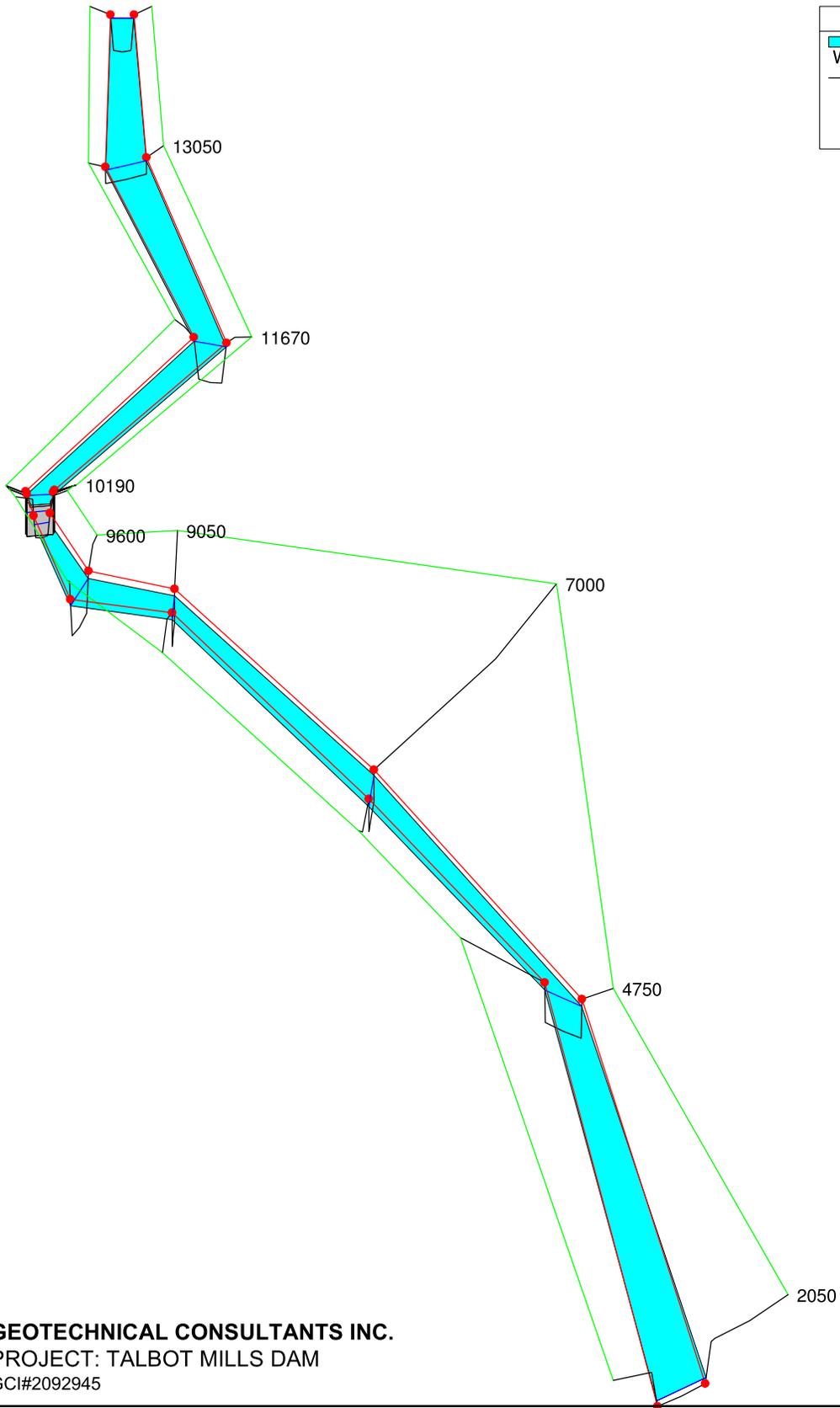
Legend	
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	Ground
	Bank Sta



**GEOTECHNICAL CONSULTANTS INC.**  
PROJECT: TALBOT MILLS DAM  
GCI#2092945

TALBOT MILLS DAM ORTODIMENSIONAL VIEW SIMULATION

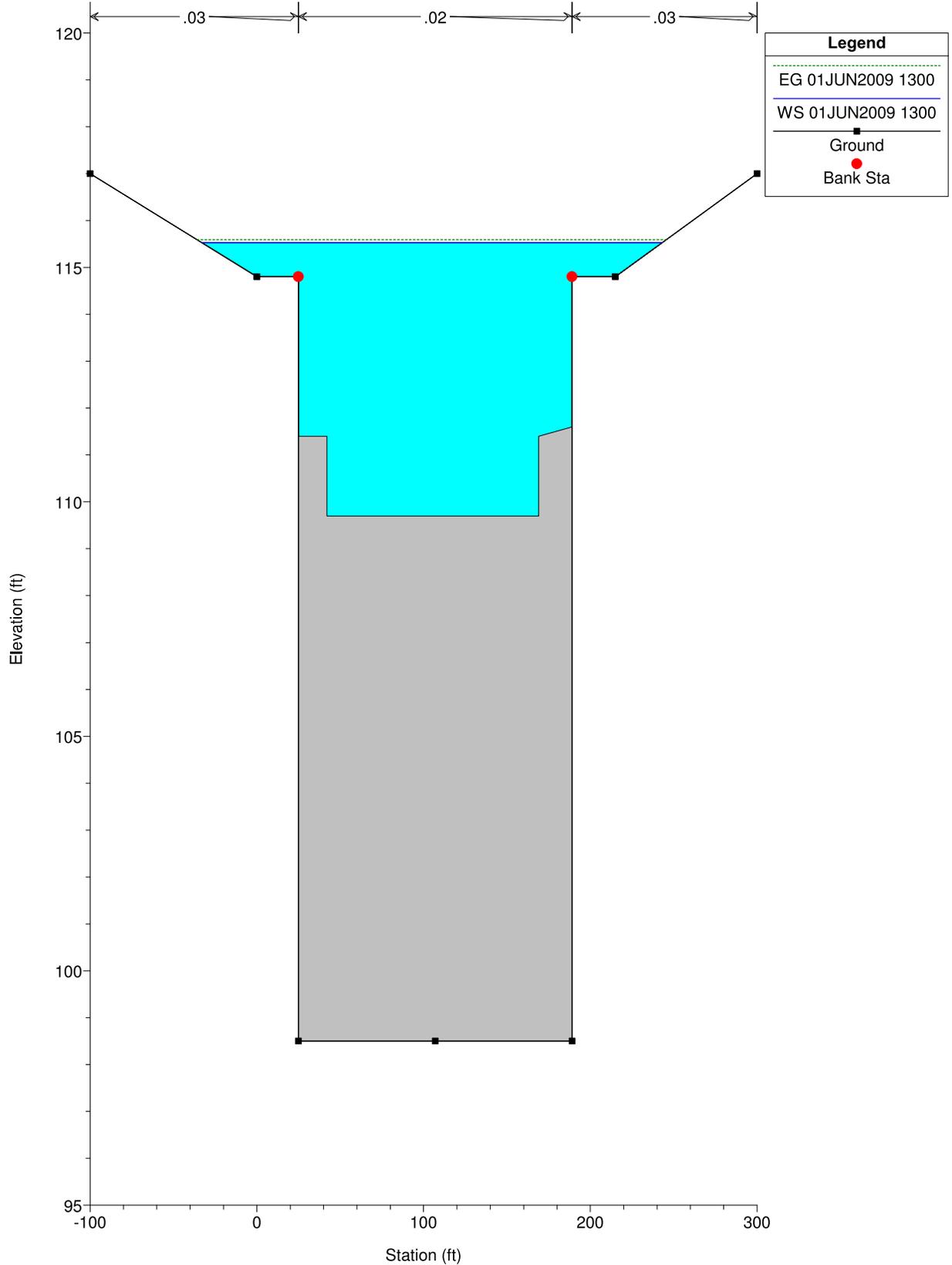
Legend	
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**GEOTECHNICAL CONSULTANTS INC.**  
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GCI#2092945

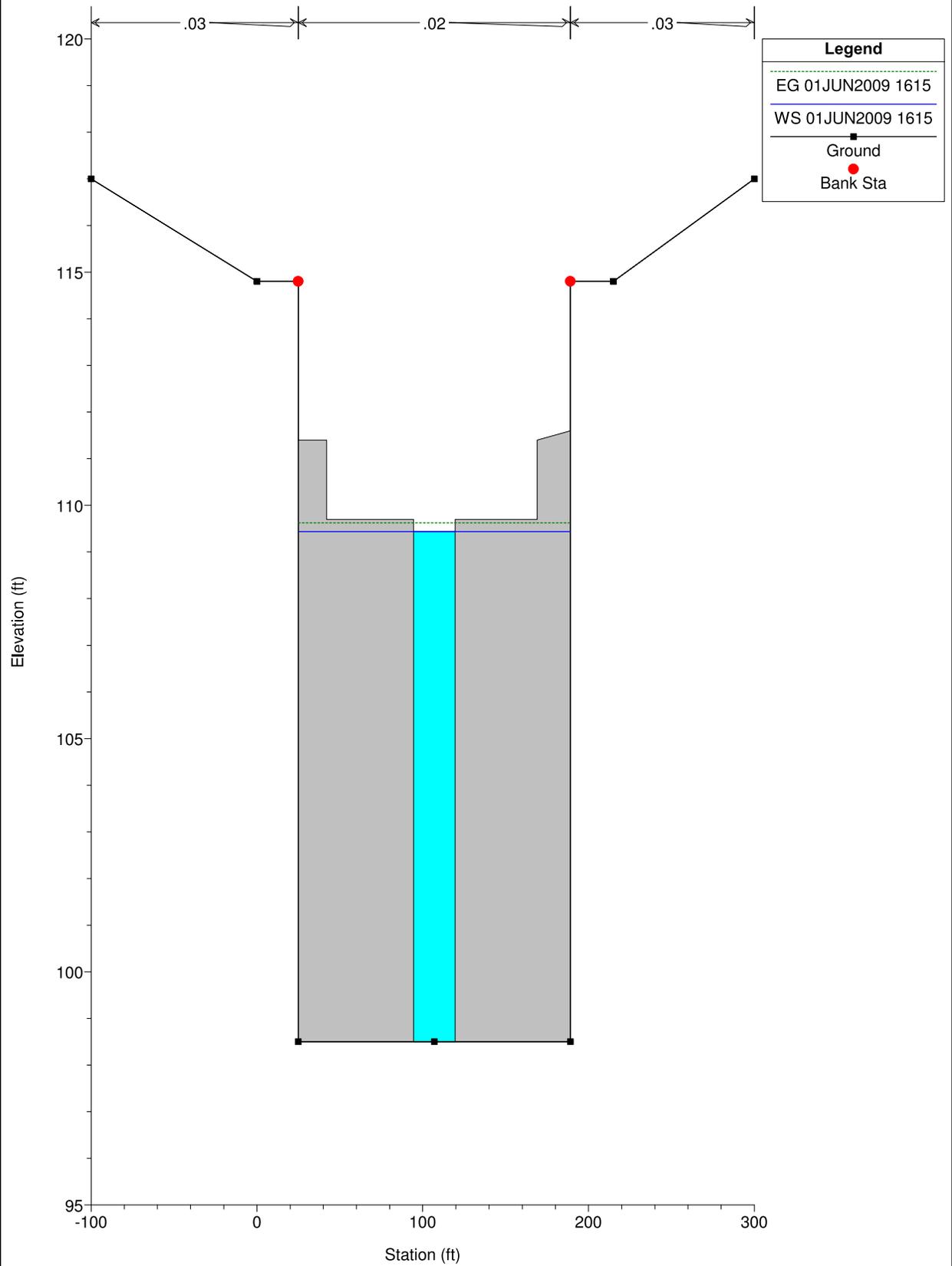
# TALBOT MILLS DAM SECTION

REGULATORY FLOOD - NO BREACH



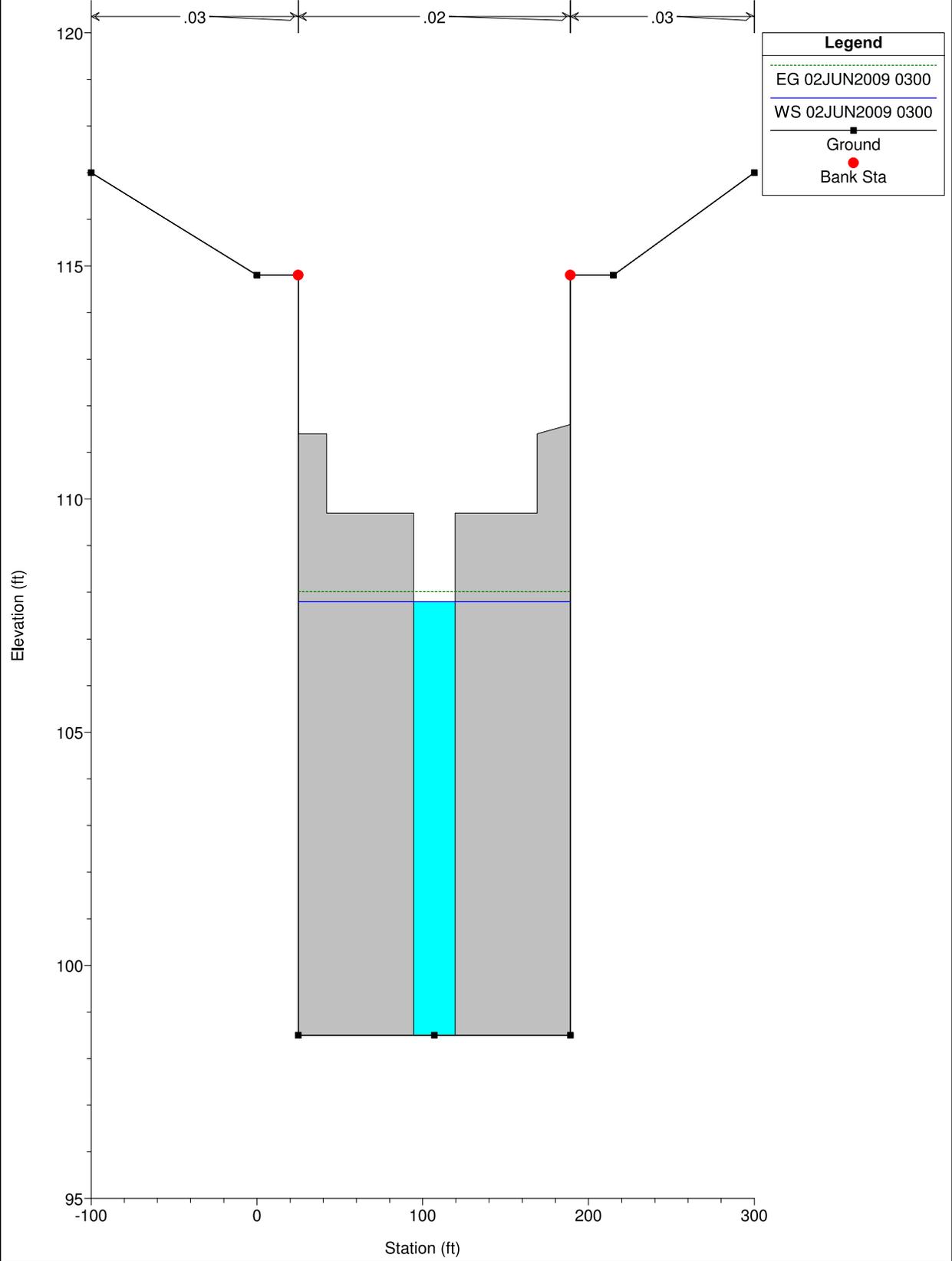
# TALBOT MILLS DAM SECTION

REGULATORY FLOOD - W/ BREACH



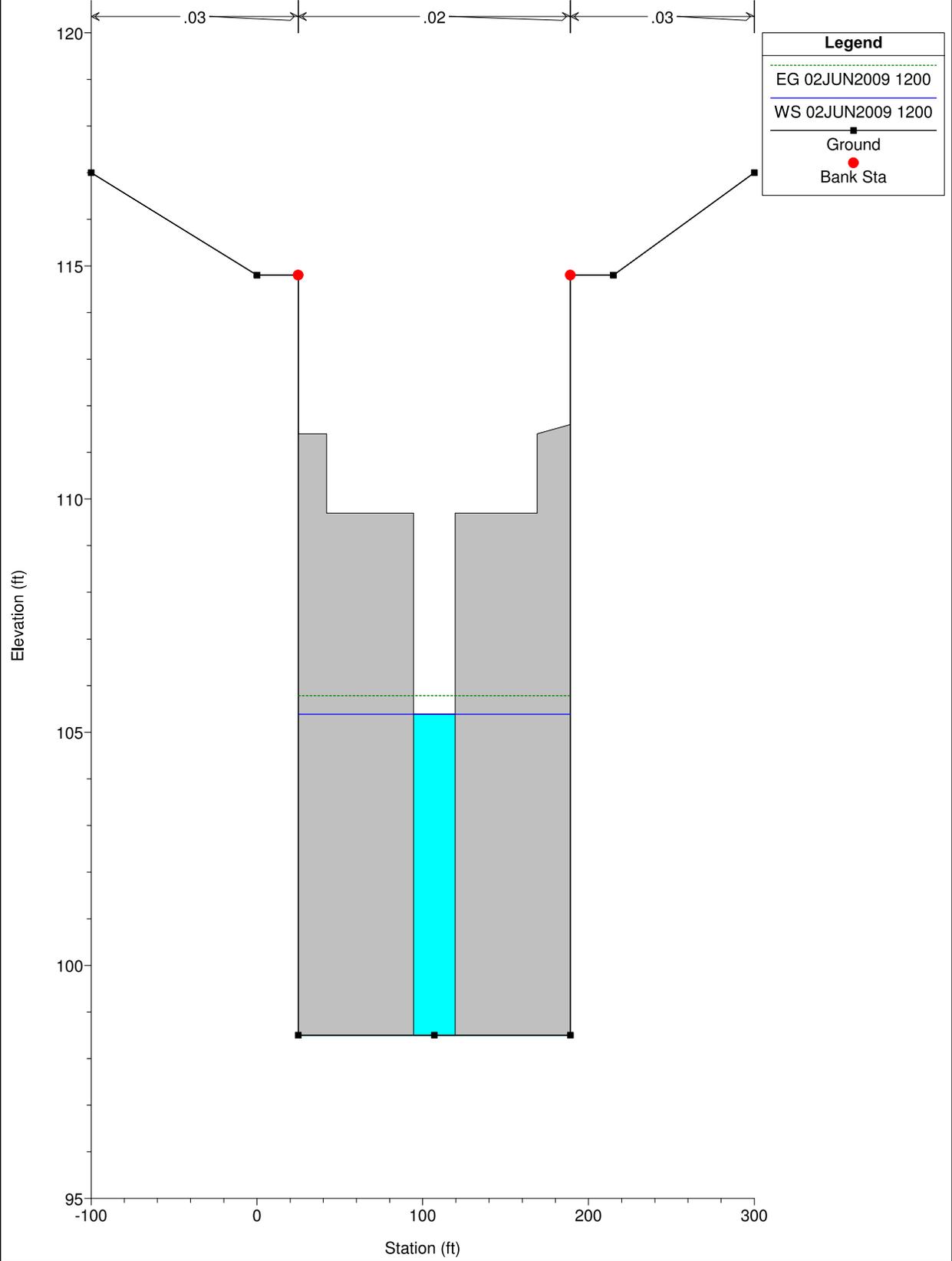
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REGULATORY FLOOD - W/ BREACH  
12Hs AFTER



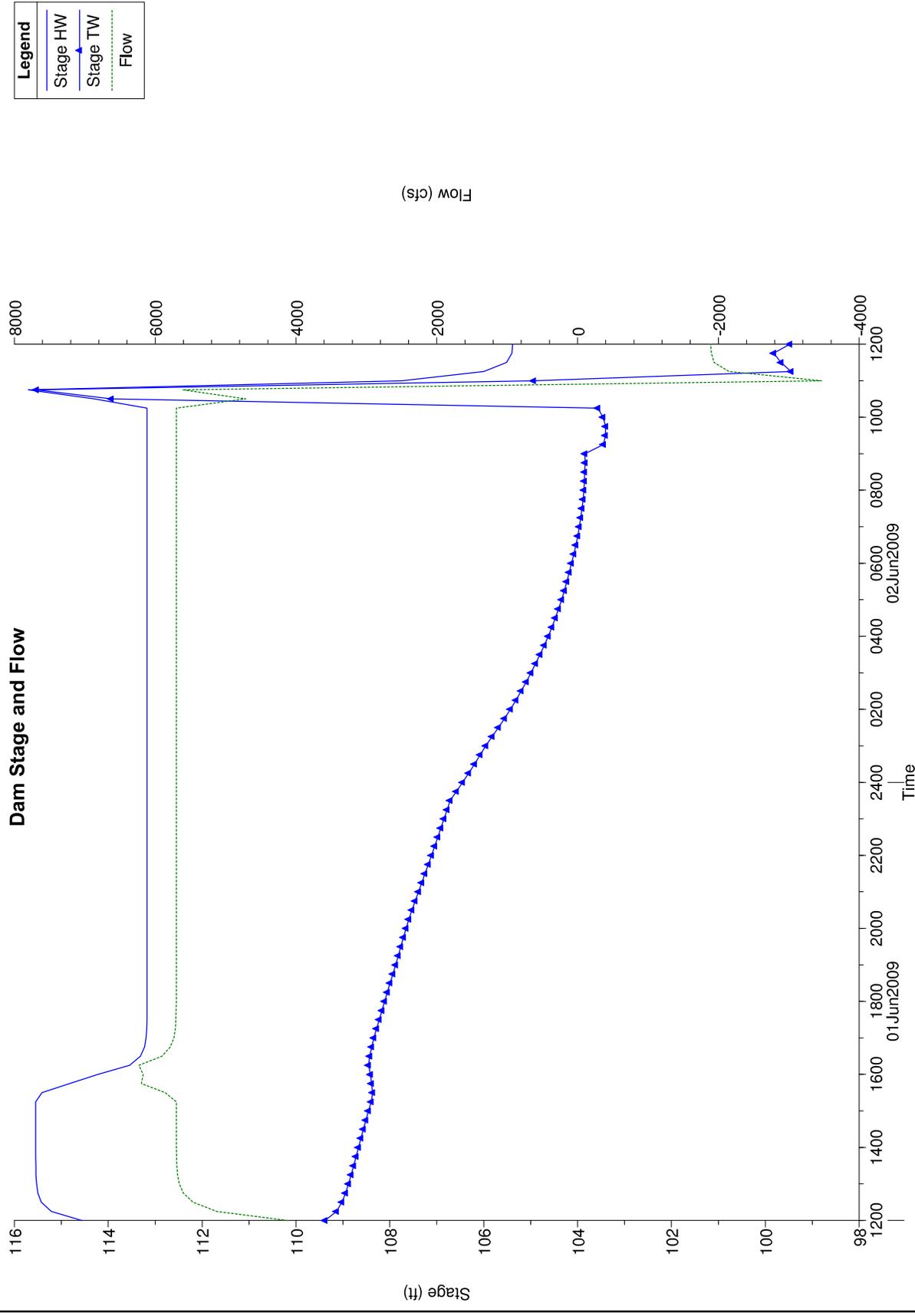
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24Hs AFTER



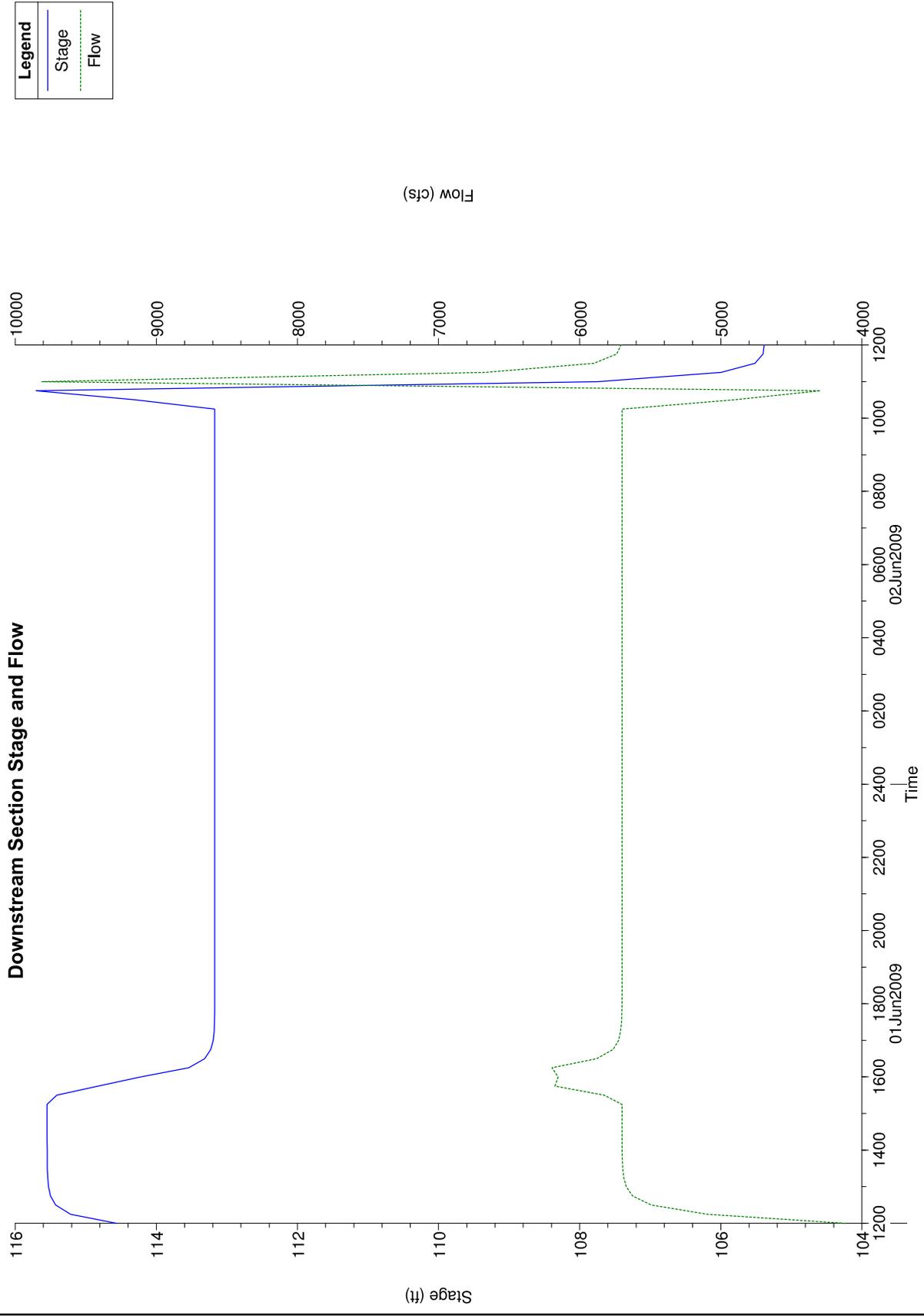
### TALBOT MILLS DAM - CONCORD RIVER - Reach: Station 2050 to Station 14045 - Dam Breach Simulation

Dam Stage and Flow

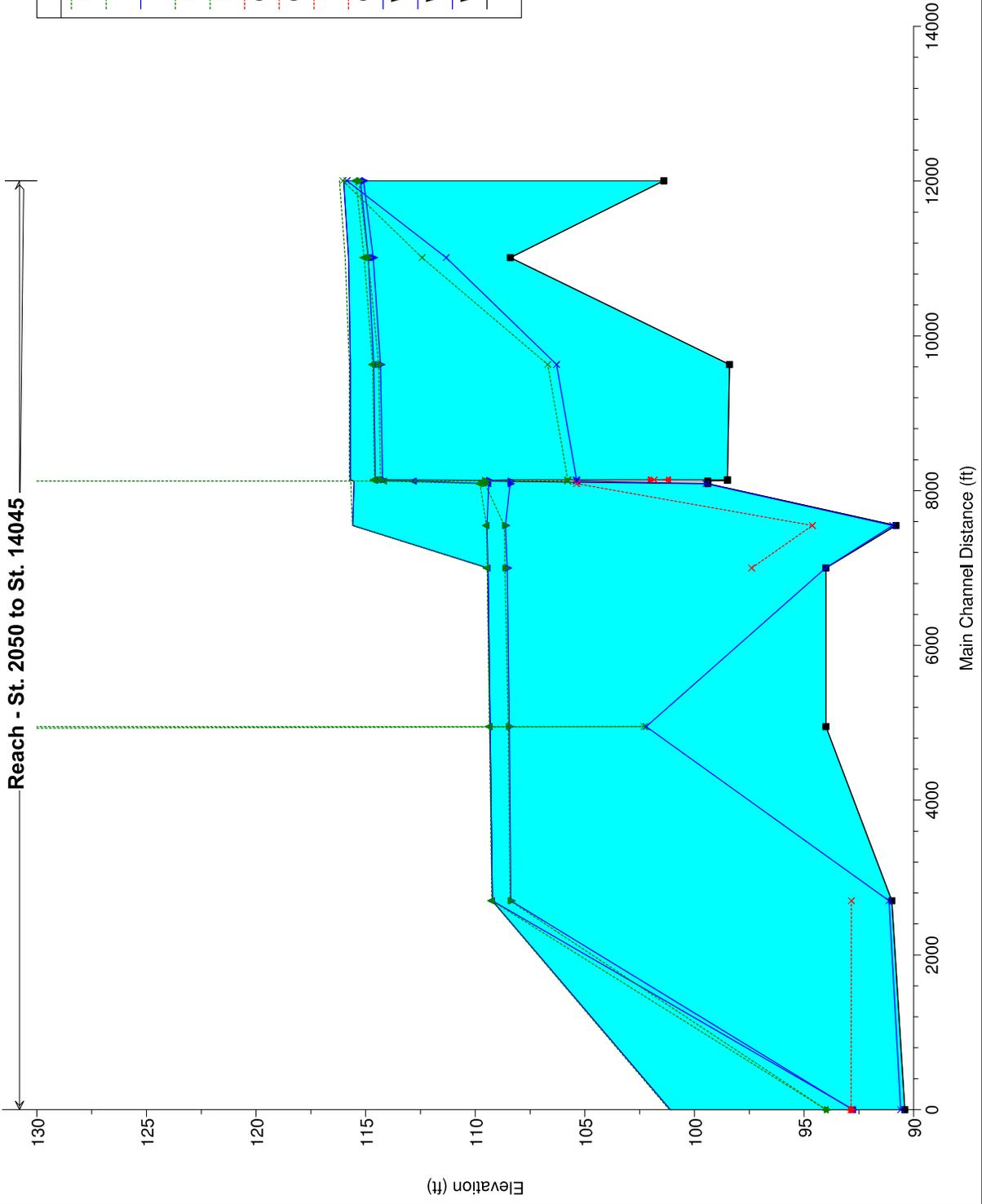


TALBOT MILLS DAM - CONCORD RIVER - Reach: Station 2050 to Station 14045 - Dam Breach Simulation

Downstream Section Stage and Flow



TALBOT MILLS DAM - CONCORD RIVER - Reach: Station 2050 to Station 14045 - Dam Breach Simulation



Legend	
EG 02JUN2009 1200	(dotted green line with 'x' markers)
EG Max WS	(solid green line)
WS Max WS	(solid blue line)
EG 01JUN2009 1200	(dotted green line with triangle markers)
EG 01JUN2009 1600	(dotted green line with inverted triangle markers)
Crit 01JUN2009 1200	(dotted red line with triangle markers)
Crit 01JUN2009 1600	(dotted red line with inverted triangle markers)
Crit Max WS	(dotted red line with '+' markers)
Crit 02JUN2009 1200	(dotted red line with 'x' markers)
WS 01JUN2009 1600	(solid blue line with triangle markers)
WS 01JUN2009 1200	(solid blue line with inverted triangle markers)
WS 02JUN2009 1200	(solid blue line with 'x' markers)
Ground	(solid black line with square markers)

# BY-LAW TO ESTABLISH BILLERICA HISTORIC DISTRICTS COMMISSION

## **Section 1: Purpose**

The purpose of this By-Law is to promote the educational, cultural, economic and general welfare of the public through the preservation and protection of the distinctive characteristics of buildings and places significant in the history and architectural heritage of the Town of Billerica, through the maintenance and improvement of settings for such buildings and places, through the encouragement of design compatible therewith, and through the prevention of development which would impair or be unduly detrimental to the locally or nationally significant structures of the districts.

Therefore, there is hereby established under Chapter 40C of the General Laws of the Commonwealth of Massachusetts a Billerica Historic Districts Commission.

## **Section 2: Definitions**

**Altered:** Includes the words “rebuilt”, “reconstructed” “restored”, “removed” and “demolished”.

**Application:** Application for a certificate of appropriateness, a certificate of hardship or a certificate of non-applicability.

**Building:** A combination of materials forming a shelter for persons, animals, or property.

**Commission:** Billerica Historic Districts Commission.

**Constructed:** Includes the words “built”, “erected”, “installed”, “enlarged”, and “moved”.

**Development:** The erection, demolition, reconstruction, or alteration of any exterior architectural features of any building or structure, including, but not limited to, alteration of the site topography or general architectural arrangement of such portion of the exterior of any building or structure as is designed to be open view from any street, canal or way open to public or private vehicular or pedestrian travel. The use or change of use of any building or structure shall not be considered “development”.

**Exterior Architectural Feature:** Such portion of the exterior of a building or structure as is open to view from a public street, public way, public park, or public body of water, including but not limited to the architectural style and general arrangement and setting thereof: the kind, color and texture of exterior building materials; the color of the paint or other materials applied to exterior surfaces; and the type and style of windows, doors, lights, signs, and other appurtenant exterior features, but does not include items excluded under Section 8 of this by-law.

**Minor Development:** Shall be defined in the Commission’s regulations, and shall include, but not be limited to: cleaning of a building, repairing or replacing architectural elements according to historically compatible plans, placement or removal of signs, and reconstruction in kind of a building, structure or exterior architectural feature damaged or destroyed by fire, storm or other disaster, provided such reconstruction is begun within one year thereafter and carried forward with due diligence.

**Major Development:** Shall be defined in the Commission’s regulations, and shall include, but not be limited to: alterations to exterior facades, construction of additions to existing buildings, new construction and demolition of any structure or building.

**Person:** Natural person, corporation, trust, partnership, incorporated or unincorporated association, town, department, officer, employee, or agency thereof, and any other legal entity.

**Person Aggrieved:** The applicant, an owner of adjoining property, an owner of property within the same historic district or property within one hundred feet of said district, or any charitable corporation in which one of its purposes is the preservation of historic structures or districts.

**Standards:** Historic preservation standards applicable to the historic districts and promulgated by the Commission as part of its regulations.

**Structure:** Combination of materials other than a building, including but not limited to a sign, fence, wall, terrace, walk or driveway.

### **Section 3: Membership**

The Billerica Historic Districts Commission shall consist of seven (7) Members and such alternate members as shall be deemed necessary, all of whom shall be appointed by the Board of Selectmen within 60 days after the effective date of this act as follows:

- (a) Two of the regular members shall be residents of, or owners of property in, the historic districts administered by the Commission.
- (b) One of the regular members shall be an attorney.
- (c) One of the regular members shall be chosen from two nominees submitted by the Billerica Historical Society.
- (d) One of the regular members shall be chosen from two nominees submitted by the Board of Realtors.
- (e) Two of the regular members shall be chosen from at least three nominees submitted by the local chapter of the American Institute of Architects.
- (f) The Town Planner shall also serve as a non-voting ex officio member.

If nominees are not submitted or available for any of the above categories, the Selectmen may appoint other Billerica residents to the remaining vacancies.

The initial appointments to the Commission shall be as follows: Two members appointed for a one-year term each; two members appointed for a two-year term each; three members appointed for a three-year term each; and the terms of the alternate members shall be staggered in a similar manner. The successors of members and alternate members shall be appointed for terms of three years.

In the case of the absence, inability to act or unwillingness to act because of self-interest on the part of a member of the Commission, such member's place shall be taken by an alternate member to be chosen by the chairperson from among the appointed alternate members.

Vacancies shall be filled in the same manner as the original appointment within sixty days after creation of the vacancy. Any Commission member, who fails to attend three consecutive regular or special meetings of the Commission, without good cause approved by the chairman of the Commission, shall be subject to dismissal by a vote of five members of the Commission. The chairman shall give written notice to such Commission member at least ten days prior to the meeting at which said vote is to be taken, and said Commission shall meet, upon the Commission member's request, within said ten day period, to consider any relevant information justifying such failure to attend.

The members of the Commission shall serve without compensation. Members of the Commission are hereby deemed special municipal employees for purposes of chapter two hundred and sixty-eight A of the General Laws.

#### **Section 4: Boundaries of Local Historic Districts**

There are hereby established the Town Center Historic District, the Billerica Mills Historic District and the Corner Historic District which shall initially consist of that property and buildings thereon located in the Town of Billerica, being shown on a map on file with the Town Clerk's Office and attached herein.

An historic district may be enlarged or reduced or an additional historic district created by adoption of a by-law on a two-thirds vote of a town meeting subject to the requirements of section 3 of Chapter 40C of the Massachusetts General Laws, as amended. No by-law creating an historic district, or changing the boundaries of an historic district, shall become effective until a map or maps setting forth the boundaries of the historic district, or the change on the boundaries thereof, has been filed with the town clerk and has been recorded in the registry of deed for Middlesex County.

#### **Section 5: Powers and Duties of the Commission**

Subject to such appropriations as are necessary, the Commission shall have such powers and duties as are reasonably necessary to carry out the purposes of this By-Law, including the following and those provided under chapter 40C of the Massachusetts General Laws, as amended:

- (1) To promulgate, amend, and enforce the standards, which shall apply to all development, by any person, within the historic districts and to promulgate and enforce any interim standards. The Commission may amend such standards as may be necessary, which amendment shall be in the same manner as original adoption. The Commission shall provide in its regulations for modification of the otherwise applicable standards in certain hardship cases.
- (2) To promulgate and enforce any other rules and regulations to carry out the purpose of this By-Law and Chapter 40C of the Massachusetts General Laws.
- (3) To grant, grant with conditions, or deny certificates of appropriateness or hardship or certificates of nonapplicability for development within the districts. Conditions to the grant of such certificates may include, without limitation, imposition of perpetual historic preservation restrictions or easements.
- (4) To determine an amount reasonable for application fees and to collect such fees, to accept gifts, appropriations and grants, and to disburse all such monies in order to further the purposes of this By-Law.
- (5) To propose to the Town Meeting of Billerica changes in the boundaries of the districts and to propose new districts.
- (6) To sue or be sued.
- (7) To publish in cooperation with other interested agencies, guides, maps and other materials to document and highlight the historic resources of the Town of Billerica and to explain the standards and procedures for development within the districts.
- (8) To accept, purchase, or require, as a condition to the grant of a certificate, historic preservation restrictions or easements.
- (9) To conduct studies of the historic and archaeological assets of said town.
- (10) To conduct training sessions for the Commission members on technical subjects related to their duties as Commission members.

(11) To serve in an advisory capacity to the Selectmen of said town, planning board of said town, director of planning of said town, Massachusetts Historical Commission, and other public agencies, in matters pertaining to or affecting any historical structures, sites, or areas or assets of archaeological interest in said town.

(12) To hire such technical staff or consultants as may be required to carry out its responsibilities, subject to appropriation. Such technical and consulting services may include, but are not limited to, experts in the fields of architecture, planning, law, engineering and historical or archaeological research. Administrative, clerical, and other necessary support staff may also be hired by the Commission. The director of the Town's planning department shall, whenever possible, provide assistance to the Commission.

(13) To delegate authority to such members, subcommittees, or staff as it deems necessary to carry out the purpose of this By-Law.

(14) Such other powers, authority and duties as may be delegated or assigned to it from time to time by vote of the Board of Selectmen or Town Meeting.

### **Section 6: Standards**

Standards applicable to development within the districts shall be adopted by two-thirds majority vote of the Commission, after notice and public hearing as provided in section ten. Until the final standards are adopted, the Commission may adopt and use interim standards, after notice and hearing as provided in section ten, except that no notice is required to abutters.

Specific standards may be adopted to apply only to certain districts or portions of districts, such as commercial streets, major thoroughfares, or buffer zones to historic buildings.

The standards shall set forth, at minimum: acceptable materials, techniques, height, massing, setback, and architectural detailing for the exteriors of buildings; standards for signage, design of open spaces and parking areas. The Commission may amend the standards as it deems necessary. Any such amendments shall be made in the same manner as original adoption of the standards.

**Section 7: Alteration, etc.** Forbidden in Absence of Certificate of Appropriateness, Non-Applicability, or Hardship; No Permit to be issued without Certificate.

Except as this By-Law may otherwise provide, no person shall alter or construct any building or structure within an historic district in any way that affects exterior architectural features unless the Commission shall first have issued a certificate of appropriateness, a certificate of non-applicability or a certificate of hardship with respect to such construction or alteration.

No building permit for construction of a building or structure or for alteration of an exterior architectural feature and no demolition permit for demolition or removal of a building or structure within an historic district shall be issued by any Town department until the certificate required by this section has been issued by the Commission.

### **Section 8: Exclusion of Certain Structures from Review by Commission**

The authority of the Commission shall not extend to the review of the following categories of treatments to buildings, structures or exterior architectural features located within the historic district:

(a) Storm windows, window screens and window air conditioners.

(b) The color of paint on buildings used exclusively as residences (but not the color of roofing materials.)

(c) Signs of not more than one square foot in connection with use of a residence for a customary home occupation or for more professional purposes, provided only one such sign is displayed in connection with each residence, and if illuminated, is illuminated only indirectly.

### **Section 9: Ordinary Maintenance Exemption**

Nothing in this By-Law shall be construed to prevent the ordinary maintenance, repair or replacement of any exterior architectural feature within an historic district which does not involve a change in design, material, color or the outward appearance thereof, subject to the application requirements of Section 12(c) of this By-Law, nor to prevent landscaping with plants, trees or shrubs, nor to prevent the meeting of requirements certified by a duly authorized public officer to be necessary for public safety because of an unsafe or dangerous condition, nor construed to prevent any construction or alteration under a permit duly issued prior to the effective date of this By-Law.

### **Section 10: Public Hearings**

All hearings required by this By-Law shall be held by the Commission only after notice of the time, place and sufficient identification of the subject matter of such hearing shall have been given by the Commission by advertisement in a newspaper of general circulation in the Town of Billerica not less than fourteen days before the day of such hearing, and by posting such notice in a conspicuous place in the office of the town clerk of said Town and the office of the director of the planning department for a period of not less than fourteen days before the day of such hearing. Notice for a hearing on an application shall be given at the expense of the applicant and shall also require mailing a copy of such notice to the applicant and to all owners of land abutting the land included in the application as appear on the most recent town tax list.

### **Section 11: Factors to Be Considered in Making Determination Upon Application for Certificate**

In passing upon matters before it the Commission shall consider, among other things, the historic and architectural value and significance of the site, building or structure, the general design, arrangements, texture, material and color of the features involved, and the relation of such features to similar features of buildings and structures in the surrounding area. In the case of new construction or additions to existing buildings or structures the Commission shall consider the appropriateness of the size and shape of the building or structure both in relation to the land area upon which the building or structure is situated and to buildings and structures in the vicinity, and the Commission may in appropriate cases impose dimensional and set-back requirements in addition to those required by applicable by-laws. The Commission shall not consider interior arrangements or architectural features not subject to public view.

## **Section 12: Certificates**

### **(a) Applications**

Any person may apply for a certificate of appropriateness, a certificate of non-applicability or a certificate of hardship, as the case may be, by filing with the Commission in such form as the Commission may reasonably determine, together with such plans, elevations, specifications, material and other information, including in the case of demolition or removal a statement of the proposed condition and appearance of the property thereafter, as may be reasonably deemed necessary by the Commission to enable it to make a determination on the application.

Within fourteen days after receipt of an application, the Commission, its chairman or staff to whom such duty is delegated, shall render a determination, based upon the standards, whether the development proposed by the application is a major development or minor development. If the Commission or its designee determines that a proposed development is a minor development, it shall grant, grant with conditions or deny a certificate within the same fourteen days after receipt of the application. If the Commission or its designee determines that a proposed development is a major development, the application for such development shall be placed on the agenda and discussed at a meeting of the Commission. A proposed development will be deemed minor, and to have been granted a certificate of appropriateness, unless the Commission sends the applicant its written decision to the contrary, within twenty-one days of receipt of the completed application.

Certificates for major developments shall be issued by the Commission by a majority vote of those members or alternates present at a meeting of the Commission where a quorum is present.

Within thirty days after receipt by the Commission of a completed application for a major development, the Commission shall conduct a public hearing on the application after providing notice pursuant to section ten. A written decision on the application, granting, granting with conditions, or denying a certificate and setting forth the reasons for the Commission's decision, shall be rendered by the Commission and filed with the town clerk of said Town within sixty days after such hearing. Failure by the Commission to file its decision with said town clerk within sixty days after the hearing on the application shall be deemed to be approval of the application. A copy of the decision shall also be mailed to the applicant by certified mail within sixty days after such hearing. All certificates for major development (including any certificate of compliance) shall be recorded by the applicant in the registry of deeds within ten days after the expiration of the period of appeal provided in section fourteen.

All time requirements contained within this section, except the requirements of section ten referred to herein; may be modified by written agreement of the Commission and an applicant for a certificate of appropriateness or hardship or certificate of non-applicability.

### **(b) Certificate of Appropriateness**

If the Commission determines that the construction or alteration for which an application has been filed will be appropriate for or compatible with the preservation or protection of the historic district, the Commission shall issue a Certificate of Appropriateness.

If the Commission disapproves an application for a certificate of appropriateness, it shall state the reasons for such determination and shall send a notice of determination, which will include the reasons for its decision, to the applicant.

(1) Prior to the issuance of any disapproval, the Commission may notify the applicant of its proposed action and may make recommendations of changes in the proposal which, if made, would make the application acceptable to the Commission. The recommendations may include appropriateness of design, arrangement, texture, material and similar features.

(2) If within fourteen (14) days of the receipt of such notice, the applicant files a written modification of the application in conformity with the recommended changes of the Commission, the Commission shall promptly issue a Certificate of Appropriateness.

**(c) Certificate of Non-applicability**

Within fourteen (14) days of the filing of an application to the Commission, the Commission or its designee shall determine whether the application involves any exterior architectural features which are subject to approval by the Commission. If the Commission determines that the application does not involve any exterior feature, or involves an exterior architectural feature which is not subject to review by the Commission in accordance with Section 8, the Commission shall issue a Certificate of Non-Applicability.

**(d) Certificates of Hardship**

If the Commission determines that, owing to conditions specific to a particular building or structure, failure to approve an application will result in substantial hardship, whether financial or otherwise, to the applicant, and that granting the application will not involve substantial detriment to the public welfare or substantial derogation from the intent and purpose of this By-Law, the Commission shall grant a Certificate of Hardship.

**(e) Recordkeeping**

(1) Each certificate issued by the Commission shall be dated and signed by either its chairperson, vice-chairperson, secretary or such other person designated by the Commission.

(2) The Commission shall file notice of all certificates and determinations of disapproval with the Town Clerk and the Building Department.

(3) The Commission shall keep a permanent record of its resolutions, transactions, and determinations and of the vote of each member participating therein.

**(f) Certificates of Compliance**

The Commission shall issue a certificate of compliance in recordable form upon determination that the development has been completed in accordance with the certificate of appropriateness, non-applicability or hardship.

**Section 13: Officers, Meetings, Quorum, Majority Vote**

(a) Officers:

The Commission shall elect annually a chairperson and a vice-chairperson from its own number and a secretary from within or without its number.

(b) Meetings:

Meetings of the Commission shall be held at the call of the chairman and shall be called at the request of two members of the Commission and in such a manner as the Commission shall determine in its rules.

(c) Quorum:

A majority of the members of a Commission shall constitute a quorum.

(d) Majority Vote:

The concurring vote of a majority of the members of the Commission shall be necessary to issue:

1. A certificate of appropriateness
2. A certificate of non-applicability
3. A certificate of hardship, or
4. To take any other action on the business properly before the Commission

(e) Two- thirds Vote

A two-thirds concurring vote of the Commission members shall be necessary to adopt standards under Section 6.

**Section 14: Appeals**

Any person aggrieved by a determination of the Commission may, within twenty days after the filing of the notice of such determination with the town clerk, file a written request with the Commission for a review by a person or persons of competence and experience in such matters, designated by the Northern Middlesex Area Commission.

The finding of the person or persons making such review shall be filed with the town clerk within forty five days after the request, and shall be binding on the applicant and the Commission, unless a further appeal is sought in the superior court.

Any person aggrieved by a determination of the Commission or by the finding of a person or persons making a review, may, within twenty days after the filing of the notice of such determination or such finding with the town clerk, appeal to the superior court sitting in equity for Middlesex County. In accordance with Chapter 40C, Section 12A, the court shall hear all pertinent evidence and shall annul the determination of the Commission if it finds the decision of the Commission to be unsupported by the evidence or to exceed the authority of the Commission, or may remand the case for further action by the Commission or make such other decree as justice and equity may require. The remedy provided by this section shall be exclusive but the parties shall have all rights of appeal and exception as in other equity cases. In accordance with Chapter 40C, Section 12A, costs shall not be allowed against the Commission unless it shall appear to the court that the Commission acted with gross negligence, in bad faith or with malice in the matter from which the appeal was taken. Costs shall not be allowed against the party appealing from such determination of the Commission unless it shall appear to the court that such party acted in bad faith or with malice in making the appeal to the court.

**Section 15: Enforcement, Jurisdiction of Superior Court: Injunction, Violations, Penalties**

Upon determination by the Commission that any person is in violation of this act or regulations promulgated hereunder, the Commission shall issue an order requiring that such violation be corrected and that any development in violation of this act cease and desist.

In accordance with Chapter 40C, Section 13, the superior court sitting in equity for Middlesex County shall have jurisdiction to enforce the provisions of this by-law and the determinations, rulings and regulations issued pursuant thereto and may, upon the petition of the board of Selectmen or of the Commission, restrain by injunction violations thereof; and, without limitation, such court may order the removal of any building, structure or exterior architectural feature constructed in violation thereof, or the substantial restoration of any building, structure or exterior architectural feature altered or demolished in violation thereof, and may issue such other orders for relief as may be equitable.

Whoever violates any of the provisions of this by-law shall be punished by a fine of not less than ten dollars nor more than five hundred dollars. Each day during any portion of which a violation continues to exist shall constitute a separate offense.

**Section 16: Severability**

If any section, paragraph or part of this By-Law be for any reason determined invalid or unconstitutional by any court of competent jurisdiction, every other section, paragraph or part shall continue in full force and effect.

June 7, 1990

**Part I** ADMINISTRATION OF THE GOVERNMENT**Title VII** CITIES, TOWNS AND DISTRICTS**Chapter 40C** HISTORIC DISTRICTS**Section 5** DEFINITIONS

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*[ Text of section effective until February 18, 2025. For text effective February 18, 2025, see below.]*

Section 5. As used in this chapter the word "altered" includes the words "rebuilt", "reconstructed", "restored", "removed" and "demolished" and the phrase "changed in exterior color"; the word "building" means a combination of materials forming a shelter for persons, animals or property; the word "commission" means the commission acting as the historic district commission; the word "constructed" includes the words "built", "erected", "installed", "enlarged", and "moved"; the words "exterior architectural feature" means such portion of the exterior of a building or structure as is open to view from a public street, public way, public park or public body of water, including but not limited to the architectural style and general arrangement and setting thereof, the kind, color and texture of exterior building materials, the color of paint or other materials applied to exterior surfaces and the type and style of windows, doors, lights, signs and other appurtenant exterior fixtures; the words "person aggrieved" mean the applicant, an owner of adjoining property,

an owner of property within the same historic district as property within one hundred feet of said property lines and any charitable corporation in which one of its purposes is the preservation of historic structures or districts; and the word "structure" means a combination of materials other than a building, including a sign, fence, wall, terrace, walk or driveway.

### **Chapter 40C: Section 5. Definitions**

*[ Text of section as amended by 2024, 239, Sec. 38 effective February 18, 2025. For text effective until February 18, 2025, see above.]*

Section 5. As used in this chapter the word "altered" includes the words "rebuilt", "reconstructed", "restored", "removed" and "demolished" and the phrase "changed in exterior color"; the word "building" means a combination of materials forming a shelter for persons, animals or property; the word "commission" means the commission acting as the historic district commission; the word "constructed" includes the words "built", "erected", "installed", "enlarged", and "moved"; the words "exterior architectural feature" means such portion of the exterior of a building or structure as is open to view from a public street, public way, public park or public body of water, including but not limited to the architectural style and general arrangement and setting thereof, the kind, color and texture of exterior building materials, the color of paint or other materials applied to exterior surfaces and the type and style of windows, doors, lights, signs and other appurtenant exterior fixtures; the words "person aggrieved" mean the applicant, an owner of adjoining property, an owner of property within the same historic district as property within one hundred feet of said property lines and any charitable corporation in which one of its purposes is the preservation of historic structures or districts; the words "solar energy system" shall mean a device or

structural design feature, a substantial purpose of which is to provide for the collection, storage and distribution of solar energy for space heating or cooling, electricity generation or water heating; and the word "structure" means a combination of materials other than a building, including a sign, fence, wall, terrace, walk or driveway.

**ARTICLE V**

**DEMOLITION REVIEW BY-LAW**

**PROCEDURES FOR THE DEMOLITION OF HISTORICALLY OR ARCHITECTURALLY SIGNIFICANT BUILDINGS**

**DEFINITIONS**

**Building:** Any combination or part thereof of materials forming a shelter for persons, animals or property.

**Commission:** The Billerica Historical Commission or Historic Districts Commission depending on the location of the building in question. If the building is in one of Billerica's Historic Districts then the Historic Districts Commission shall act on the application. All other applications shall be acted upon by the (Billerica) Historical Commission.

**Demolish or Demolition:** The pulling down, destroying, burning by arson, removing or razing, of a building or structure or any portion thereof, or allowing it to be done by others; or the act of total or substantial destruction of a building or structure with the intent of completing the same.

**Permit to Demolish:** A permit issued by the Inspector of Buildings as required by the State Building Code for the demolition, partial demolition or removal of a building or structure.

**Inventory of Historic Properties:** The official inventory on file with the Massachusetts Historical Commission and the Billerica Historical Commission, or any property within the Historic Districts.

**Inspector:** The Billerica Inspector of Buildings.

**Preferably-Preserved Building:** Any significant building or structure which the Commission determines is of historical or architectural significance and it would be in the public interest to be preserved or rehabilitated rather than demolished.

**Significant Building or Structure:** Any building or structure, or portion thereof which:

- A. Is listed on the National Register of Historic Places, either as an individual site or as part of a district, or is the subject of a pending application for listing on said National Register; or
- B. Is located within one of Billerica's Historic Districts; or
- C. Is listed on the State Register of Historic Places; or
- D. Is included in the most recent Inventory of Historical Properties prepared by the Commission, including those buildings listed for which complete surveys may be pending; or
- E. Has been determined by vote of the Commission to be historically or architecturally significant in terms of period, style, method of building construction, or association with a famous architect, builder, owner or event, provided that the owner of such a building and the Inspector of Buildings has been notified within 15 days after such a vote.

**Property:** The entire parcel of land upon which the demolished significant building was located.

**Structure:** The combination of materials or part thereof other than a building including but not limited to a sign, fence, wall, statue, mechanical device, bridge, walk, driveway or road.

**1. INTENT and PURPOSE**

This By-Law is enacted for the purpose of preserving and protecting significant buildings or structures within the Town. These buildings or structures should constitute or reflect distinctive features of the architectural, cultural, political, economic or social history of the Town. The owners of such buildings or structures shall be encouraged to seek out persons who will purchase, preserve, rehabilitate or restore such buildings or structures rather than demolish them. To achieve these purposes the Billerica Historical Commission and the Billerica Historic Districts Commission are empowered to pre-approve all permits for the demolition of part or all of a significant building or structure. The issuance of demolition permits for significant buildings or structures is regulated as provided in this By-Law.

## 2. PROCEDURE

### 2.1 Receipt of Application

Upon receipt of an application for a demolition permit for any building or structure, the Inspector of Buildings shall forward a copy to the Commission within seven (7) days of the filing of such application. An application for the demolition of a building or structure shall be made only by the owner(s) of record.

- 2.2 All applications for a permit to demolish will be accepted and the building or structure's significance will be determined at the next regularly scheduled meeting after receipt thereof.
- A. The Commission will in writing notify the Inspector of Buildings within fifteen (15) days after the determination of their finding. If no meeting is scheduled within forty-five (45) days of the receipt of the application by the Commission, a special meeting must be held within forty-five (45) days.
  - B. If the building or structure is determined non-significant, the Inspector of Buildings may issue a permit to demolish.
  - C. If the Inspector of Buildings determines that in the interest of public safety a building or structure must be demolished, a permit may be issued after notifying the chairman of the Commission.

### 2.3 Determination of Preferably-Preserved

- A. Within 30 days after determination of significance, the Commission shall hold a public hearing to determine if the building or structure is preferably-preserved. The Commission shall give public notice of the hearing following the procedures established in M.G.L., Chapter 40(A), Section 11.
- B. The Commission shall also mail notification of the hearing to the direct abutters, the Historic Districts Commission, the Historical Commission, the Inspector of Buildings, the applicant and to such other persons as the Commission shall deem to be entitled to such notice.
- C. If, after the hearing, the Commission determines that the significant building is not a preferably preserved building, the Commission shall so notify the Inspector of Buildings, and applicant in writing, within ten (10) days after the date of such determination.
- D. If the demolition permit application is not acted upon within thirty (30) days after receipt by the Commission, the Inspector of Buildings may issue a permit to demolish.
- E. Upon determination by the Commission that the significant building or structure is preferably-preserved, the Commission shall so advise the applicant and the Inspector of Buildings in writing within ten (10) days of the date of determination.
- F. No demolition permit may be issued within six months after notification that a significant building or structure is determined to be preferably preserved by the commission.
- G. During the six (6) month waiting period, the owner shall make continuing, bona fide attempts to find a buyer or alternative use for the building or structure that will result in its preservation
- H. The Inspector of Buildings may issue a demolition permit for a preferably-preserved building at any time after receipt of written notice from the Commission which states that the Commission is satisfied that there is no reasonable likelihood that either the owner or some other person is willing to purchase, preserve, rehabilitate or restore such building or structure.
- I. No building permit may be issued for the property on which a significant building or structure is located prior to the granting of approval for and the issuance of a permit for demolition of such significant building.
- J. No building or demolition permit shall be granted for the property on which a building or structure determined to be preferably-preserved (except as in 2.3H) until:
  - (1) the plans for the use or development of the site after the demolition have been filed with the Building Department and

- (2) they have been found to comply with all the laws pertaining to the issuance of a building permit: and
  - (3) all the approvals necessary for the issuance of such a building permit, including any necessary zoning variances or special permits, must be granted; and
  - (4) all appeals from the granting of such approvals must be concluded prior to the issuance of a building or demolition permit.
- K. No part of this By-Law is meant to supersede the Historic Districts By-Law. (M.G.L. Chapter 40C)

**3. ENFORCEMENT and REMEDIES**

**3.1 Enforcement**

The Commission and the Inspector of Buildings are each authorized to institute any and all proceedings in law or equity as they deem necessary and appropriate to obtain compliance with the requirements of this By-Law, or to prevent a violation thereof. This By-Law may also be enforced by a non-criminal procedure. The Building Inspector shall be the enforcing agent of the Town. Fines shall be as follows:

All offenses – Three hundred dollars (\$300.00)

**3.2 Remedies**

No building permit of any type shall be issued for any property upon which a significant building or structure has been intentionally demolished in violation of this By-Law for a period of two (2) years after the date of such violation.

302 CMR 10.00: DAM SAFETY

Section

- 10.01: Purpose
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- 10.10: Revocation, Suspension, or Modifications of Chapter 253 Permits
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10.01: Purpose

The purpose of 302 CMR 10.00 is to provide regulatory guidelines for the safety of dams by establishing reasonable standards and to create a record for public review of the performance of a dam.

10.02: Application

302 CMR 10.00 shall apply to the registration of dams, safety inspections, owner responsibilities, applications for review and approval of plans for the construction, alteration, modification, repair, enlargement, and removal of dams, quality assurance of construction, acceptance of construction, notification of intent to construct, and emergency action plans. 302 CMR 10.00 shall apply to any dam, as defined in 302 CMR 10.03, constructed, altered or used to store and/or divert water in Massachusetts. Certain structures defined in 302 CMR 10.03 are exempt from 302 CMR 10.00.

10.03: Definitions

In addition to M.G.L. c. 253, § 44 as used in 302 CMR 10.00, the following terms shall have the following meanings:

(1) Undefined Terms. As used in 302 CMR 10.00 any term not defined in accordance with 302 CMR 10.03 shall have the meaning given to the term by any statutes, regulations, executive orders or policy directives governing the subject matter of the term. Examples include terms pertaining to:

(a) Wetlands, which is defined by the Wetlands Protection Act, M.G.L. c. 131, § 40, and its implementing regulations, 310 CMR 10.00: *Wetlands Protection*, and 33 USC 1341 and 314 CMR 9.00: *401 Water Quality Certification for Discharge of Dredged or Fill Material, Dredging, and Dredged Material Disposal in Waters of the United States Within the Commonwealth* regarding Water Quality Certification, as well as other statutes, regulations, executive orders, or policy directives that govern wetlands issues; and

(b) Roadways or traffic, which are defined by the Massachusetts Highway Department's Highway Access Policy (adopted September 17, 1991), its Standard Operating Procedure for Review of State Highway Access permits (adopted September 17, 1991), and the Guidelines for EIR/EIS Traffic Impact Assessment (1989, as amended) by the Massachusetts Department of Transportation and the Executive Office of Energy and Environmental Affairs, as well as other statutes, regulations, executive orders or policy directives that govern roadway and traffic issues.

10.03: continued

(2) Defined Terms. As used in 302 CMR 10.00, the following terms shall have the following meanings:

Abutment. That part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment. Right and left abutments are those on respective sides of an observer looking downstream.

Acre-foot. A unit of volumetric measure that would cover one acre to a depth of one foot. It is equal to 43,560 cubic feet. One million U.S. gallons = 3.068 acre foot.

Applicant. Any person making application for a dam safety permit.

Appurtenant Works. Structures, either in dams or separate therefrom, including, but not limited to, spillways; reservoirs and their rims; low level outlet works; and water conduits, including tunnels, pipelines or penstocks, either through the dams or their abutments.

Artificial Impoundment. As applied to dam safety, a reservoir created by a dam.

As-builts. Plans, drawings and all other descriptive and factual information that depict how a dam was actually constructed or repaired. As-builts are required to be submitted to the Commissioner at dam completion.

Axis of Dam. A plane or curved surface, arbitrarily chosen by a designer, appearing as a line in a plan or cross section to which the horizontal dimensions of the dam can be referred.

Baffle Block. A block, usually of concrete, constructed in a channel or stilling basin to dissipate the energy of water flowing at high velocity.

Base Width (Base Thickness). The maximum width or thickness of a dam measured horizontally between upstream and downstream faces and normal to the axis of the dam but excluding projections for outlets, *etc.*

Beaver Dams. Dams that are constructed by beavers and not subject to 302 CMR 10.00. Control of beaver population and removal of beaver dams is regulated by M.G.L. c. 131, 321 CMR 2.00: *Miscellaneous Regulations Relating to Fisheries and Wildlife*, and also by the Local Boards of Health and Conservation Commissions.

Berm. A horizontal step or bench in the sloping profile of an embankment dam.

Boil. A disturbance in the surface layer of soil caused by water escaping under pressure from behind a water retaining structure such as dam or a dike. The boil may be accompanied by the deposit of soil particles (usually sand) in the form of a ring (miniature volcano) around the area where the water escapes.

Certificate of Completion. A document signed and stamped by a registered professional engineer with contractor's signature and supporting as-builts, upon completion of the work, attesting that the work has been performed in accordance with the design plans and specifications and permit conditions.

Certificate of Compliance. When a dam has been evaluated, constructed, repaired, altered or removed to the satisfaction of the Commissioner under a properly issued permit, the Commissioner shall issue a certificate of compliance, on a form prescribed by the Commissioner, to the owner certifying that the permitted construction project has been completed in accordance with the plans and specifications and any requirement set forth by the Commissioner. Such certificate shall be recorded by the owner in the registry of deeds in the county where the dam lies. Issuance of such Certificate of Compliance shall release the dam owner from the requirements of the Certificate of Non-compliance.

10.03: continued

Certificate of Non-compliance. A certificate issued by the Commissioner when a dam or appurtenant features are in poor or unsafe condition with identified structural deficiencies. Such certificate shall be recorded by the Commissioner in the registry of deeds in the county where the dam lies.

Cofferdam. A temporary structure enclosing all or part of a construction area so that construction can proceed in a dry area. A "diversion cofferdam" diverts a river into a pipe, channel or tunnel.

Commissioner. The Commissioner of the Department of Conservation and Recreation or his or her authorized designee.

Conduit. A closed channel for conveying discharge through or under a dam.

Crib Dam. A gravity dam built up of boxes, cribs, crossed timbers, or gabions and filled with earth or rock.

Culvert. A drain or waterway built transversely under a road, railway, or embankment, usually consisting of a pipe or covered channel of box section. It includes a gallery or waterway constructed through any type of dam, which is normally dry but is used occasionally for discharging water, hence the terms "scour culvert", "draw-off culvert", and "spillway culvert". A roadway or railway culvert may not be considered a dam if its invert is at the natural bed of the water course, it has adequate discharge capacity, and it does not impound water under normal circumstances. A culvert with an installed man made water control device which impounds, releases, or diverts water may be designated by the Commissioner as a dam.

Cutoff Wall. An impervious construction or material which reduces seepage or prevents it from passing through foundation material.

Dam Any artificial barrier, including appurtenant works, which impounds or diverts water, and which:

- (a) is 25 feet or more in height from the natural bed of the stream or watercourse measured at the downstream toe of the barrier, or from the lowest elevation of the outside limit of the barrier, if it is not across a stream channel or watercourse, to the maximum water storage elevation; or
- (b) has an impounding capacity at maximum water storage elevation of 50 acre feet or more. Any other artificial barrier, including appurtenant works, the breaching of which could endanger property or safety, may be designated by the Commissioner as a dam, and shall be subject to M.G.L. c. 21, § 65 and c. 253, §§ 44 through 48.

Dam shall not mean any of the following:

1. any appurtenant works which temporarily impounds or diverts water used on land in agricultural use as defined pursuant to M.G.L. c. 131, § 40;
2. any barrier or appurtenant works which has a size classification of small or low hazard potential classification that is used on land in agricultural use as defined in M.G.L. c. 131, § 40; and
3. any barrier which is not in excess of six feet in height, regardless of storage capacity, or which has a storage capacity at maximum water storage elevation not in excess of 15 acre feet, regardless of height.

The Commissioner shall make such determination by taking into consideration factors such as height, type of structure, condition of structure, volume of the impoundment, extent of development downstream, and other factors deemed appropriate by the Commissioner.

Dam Breach. An eroded or failed section opening through a dam which drains the impoundment. A controlled breach is a design and constructed opening. An uncontrolled breach is an unintentional opening which allows uncontrolled discharge from the impoundment.

Dam Break Analysis. A determination of a flood hydrograph, resulting flood levels and inundation area resulting from a dam breach.

10.03: continued

Dam Certificate of Registration. A certificate to be issued by the Commissioner to the dam owner following completion and submittal by the dam owner of the dam registration form.

Dam Failure. A collapse of an impounding structure resulting in an uncontrolled release of impounded water from a dam.

Dam Inspection Form or Format. A form or forms prescribed by the Commissioner containing information relative to the present condition, safety and adequacy of the dam and such other information as the Commissioner may require by regulation, signed by a registered professional engineer and filed with the Department.

Dams Not Regulated by M.G.L. c. 253, §§ 44 through 48. Dams constructed by beavers, created by ice, debris, *etc.* and any other non-man-made structures.

Dam Registration Form. A form or forms to be provided by the Commissioner to be prepared by the owner and filed with the Commissioner containing the name of the owner, the location and the dimensions of the dam and such other information as the Commissioner may require by regulation.

Dam Safety Engineer. A person who is employed by the department who meets the requirements established by the Department of Personnel Administration.

Database. An electronic database of detailed information about dams. The database is owned, compiled, maintained and distributed by the Commissioner. Requests for database information are subject to M.G.L. c. 4, § 7, clause twenty-sixth (n) (Public Records) until suspended.

DEP. The Department of Environmental Protection.

Department or DCR. The Department of Conservation and Recreation, as established in M.G.L. c. 21 § 1.

Drainage Area. The area which drains to a particular point on a river or stream.

Drawdown. The lowering of water surface level due to loss of water from a reservoir.

Embankment. The fill material, usually earth or rock, placed with sloping sides which provide a permanent barrier which impounds water.

Emergency Condition. Unsafe dams with highest risk of failure, requiring immediate attention and a predetermined plan of action to reduce the highest level of risk, for the protection of public safety.

Emergency Action Plan. A predetermined plan of action to be taken to reduce the potential for property damage and/or loss of life in an area affected by an impending dam break.

Engineer/Design Engineer. *See* Registered Professional Engineer.

Factor of Safety. As applied to dam safety, the ratio of the forces or moments resisting mass movement to the forces or moments tending to produce mass movement.

Fees. As applied to dam safety, the cost of services listed under 801 CMR 4.02: *Fees for Licenses, Permits, and Services to be Charged by State Agencies* (302 CMR: Department of Conservation and Recreation) and provided by the Department.

Flashboards. A length of timber, concrete, or steel placed on the crest of a spillway or other hydraulic control structure to raise the retention water level but that may be quickly removed in the event of a flood either by a tripping device or by a deliberately designed failure of the flashboard or its supports.

10.03: continued

Flood Hydrograph. A graphical representation of the flood discharge and/or stage with respect to time for a particular point on a stream or river.

Flow Net. A graphical representation of families of streamlines and equipotential lines, used in groundwater studies to determine quantities, rate, and directions of flow.

Freeboard. The vertical distance between a stated water level and the top of a dam. Net freeboard, dry freeboard, flood freeboard or residual freeboard are measured by the vertical distance between the spillway design flood water level and the top of a dam.

Gravity Dam. A dam constructed of concrete and/or masonry that relies on its weight for stability.

Great Pond. A pond containing in its natural state more than ten acres of land, as defined in 310 CMR 9.02: *Definitions*.

Great Pond/Enlarged. As applied to dam safety, any change in or addition to an existing Great Pond which raises, or may raise, the normal water level of the water impounded by a Great Pond, by construction of a dam.

Hazard Potential Classification. The rating for a dam based on the potential consequences of failure. The rating is based on potential for loss of life and damage to property that failure of that dam could cause downstream of the dam. The hazard potential classification for a dam has no relationship to the current structural integrity, operational status, flood routing capability, or safety condition of the dam or its appurtenances.

Height of Dam. The vertical distance from the elevation of the dam crest to the lowest point of natural ground, including any stream channel, along the downstream toe of the dam.

Hydraulic and Hydrologic (H&H) Analyses. The analytical process of computing the inflow and outflow from the dam under normal and flood conditions. Such analysis determines normal and maximum reservoir levels, outflows and spillway design and freeboard requirements.

Hydraulic Height. The height to which water is normally retained behind a dam above the lowest point of natural ground, including any stream channel along the downstream toe of the dam.

Inspections.

(a) Additional Required Inspection means an additional inspection by a registered professional engineer of the dam, in accordance with the inspection frequency established by the Commissioner, to detect apparent signs and changes of deterioration in material, developing weaknesses or unsafe hydraulic and/or structural behavior or any other deficiencies of the dam structure or function since the initial Phase I or poor/unsatisfactory condition was determined. The additional inspection report shall follow a form as established by the Commissioner.

(b) Follow-up Inspection means an inspection of dams determined to be in poor or unsafe condition with structural deficiencies performed on a frequency determined by the Commissioner, or as otherwise required for any dam at any time. The Follow-up Inspection report shall follow a form as established by the Commissioner.

(c) Phase I Formal Inspection means the formal visual inspection of the dam, in accordance with the inspection frequency established by, at a minimum, M.G.L. c. 21, § 65, or by the Commissioner, by a registered professional civil engineer to evaluate or reevaluate the safety and integrity of the dam and appurtenant structures to determine if the structure appears to meet current design criteria. Formal inspection includes field observations to detect any signs of deterioration in material, seepage, developing weaknesses or unsafe hydraulic and/or structural conditions and a review of the records on project design, construction and performance. The Phase I Formal Inspection shall determine the overall dam condition. The final Phase I Formal Inspection report shall follow a form or format as established by the Commissioner and shall be filed with the Office of Dam Safety.

10.03: continued

(d) Phase II Detailed Inspection means all studies, investigations and analyses ordered by the Commissioner to evaluate the structural stability and hydraulic capacity of a dam or reservoir and appurtenant works. This inspection may include, but is not limited to, updated visual inspection, structural stability analyses, detailed hydrologic/hydraulic assessment, dam breach analyses, subsurface investigation, soil and materials testing, foundation explorations, conclusions, conceptual alternatives, cost estimate and recommendations. This inspection shall be performed by a registered professional civil engineer.

(e) VIF (Verification In Field) Jurisdictional Determination Inspection means an inspection to collect pertinent and sufficient information pertaining to a dam to determine if the Commissioner has a basis for claiming statutory and regulatory jurisdiction of a dam.

Instrumentation. An arrangement of devices installed into or near dams (*i.e.* piezometers, inclinometers, strain gages, measurement points, seepage measuring devices, *etc.*) which provide for measurements that can be used to evaluate the structural behavior and performance parameters of the structure.

Inundation Map. A map delineating the area that would be flooded by a particular flood event or dam failure.

Liability. Legal liability associated with the ownership, operation, maintenance, repair and failure of a dam.

Lien. A notice for the payment by the owner of a dam to the Commonwealth of the costs and expenses incurred by the Commonwealth for any actions taken in accordance with M.G.L. c. 253, § 47 and shall be effective upon mailing to the owner at the address shown in the Certificate of Registration and recorded at the Registry of Deeds in the county where the dam lies.

Low Level Outlet (Pond Drain). An installed pipe and operable gate or valve that can be utilized to alter water levels, empty an impoundment, or otherwise meet operational or safety needs.

Materially Alter. Any change to a dam or reservoir which affects the physical parameters and/or safety of the dam or reservoir which may include, but is not limited to, changing the height of a dam, increasing the normal pool or spillway elevation or changing the elevation or physical dimensions of an emergency spillway.

Maximum Impoundment Elevation. The maximum water surface elevation which can be contained by the dam without overtopping the embankment section.

Maximum Water Storage Elevation. The water surface elevation reached during the spillway design flood, which could be below the top of the dam or above the top of the dam.

Normal Water Level. The water surface elevation that is maintained by the dam owner under normal operating conditions.

Office of Dam Safety (ODS). The office of the Department of Conservation and Recreation, composed of technical and administrative staff responsible for administering the Commonwealth's Dam Safety Law and Regulations.

One-hundred-year Storm Event. A storm which is estimated to have a 1% chance of occurrence in any year, or a one in 100 chance of being equaled or exceeded in one year.

Operation and Maintenance Manual (O&MM). A document identifying routine maintenance and operational procedures under routine and storm conditions.

Order. A written document prepared and issued by the Commissioner which mandates specific actions to be accomplished by a dam owner within a specified time frame. Failure to comply with an order shall make the owner subject to fines as provided for in 302 CMR 10.15.

10.03: continued

Orientation.

- (a) Upstream means the side of the dam that borders the reservoir;
- (b) Downstream means the side opposite the upstream side;
- (c) Right means the area to the right when the viewer is looking downstream; and
- (d) Left means the area to the left when the viewer is looking downstream.

Owner. The person or persons, including any individual, firm, partnership, association, syndicate, company, trust corporation, municipality, agency, political or administrative subdivision of the commonwealth or any other legal entity of any kind holding legal title to a dam, but excluding the United States, its agencies or any person who operates a dam owned by the United States.

Permit or Chapter 253 Dam Safety Permit. A written approval, pursuant to M.G.L. c. 253, §§ 44 through 48, to construct, repair, alter, breach or remove a dam. The technical aspect of the Permit must be reviewed and confirmed complete by an Office of Dam Safety Engineer.

Phreatic Surface. The free surface of groundwater at atmospheric pressure.

Piezometer. As applied to dam safety, an instrument used for measuring water pressure within soil, rock or concrete.

Piping. The progressive development of internal erosion by seepage, appearing downstream as a hole or seam discharging water that contains soil particles.

Poor Condition Dam. A dam whose condition, as determined by the Commissioner, presents a significant risk to public safety located downstream from the dam. Among the deficiencies that may result in this determination are: significant seepage or piping, significant woody vegetation and tree growth on embankments and areas immediately adjacent to the dam and appurtenances, significant erosion or subsidence conditions, significant sink holes, significant sloughing of embankment, significant deficient flood routing spillway capacity and/or condition of outlet(s), significant movement or cracking of structural elements and other significant structural deficiencies.

Probable Maximum Flood (PMF). The most severe flood that is considered reasonably possible at a site as a result of the most severe combination of critical meteorological and hydrologic conditions possible in the region. PMFs are based on National Oceanic and Atmospheric Administration (NOAA) Probable Maximum Precipitation Estimates published in *Hydrometeorological Report No. 51* and applicable NOAA guidance documents.

Registered Professional Engineer. In the context of dam engineering, means a civil engineer licensed and registered in the Commonwealth of Massachusetts with experience in dam safety inspections and engineering.

Removal. The physical removal or engineered breaching of a dam to the extent that no water can be impounded by the dam.

Repairs means any work done at a dam which affects the integrity of the dam. This includes, but is not limited to, work requiring excavation into the embankment fill or foundation of a dam or work requiring removal or replacement of major structural components of a dam.

Reservoir. The area which contains or will contain the body of water impounded by a dam.

Riprap. A layer or layers of sufficiently large uncoursed stones, broken rock, or pre-cast blocks placed in random fashion on the upstream or downstream slope of an embankment dam, on a reservoir shore, on the sides of a channel or other elements of a dam to provide protection from erosion expected to be caused by wave action, freeze thaw cycles, flowing water or other erosive forces. Riprap is sometimes referred to as armoring.

10.03: continued

Risk. A measure of the likelihood and severity of adverse consequences. In dam safety applications, life-safety risk is expressed in units of loss-of-lives per year; economic, societal and environmental risks are expressed in units of dollars per year. The risk may be associated with an individual failure mode or it may be total risk, representing the cumulative risk associated with all failure modes.

Risk Assessment. As applied to dam safety, the process of identifying the likelihood and consequences of dam failure to provide the basis for informed decisions on a course of action.

Roll Dams. Low head dams usually run-of-the-river overflow weir or spillway structures that produce vertical water surface drops of one to 15 feet and change river flows from super-critical to sub-critical.

Run-of-the-river-dam. A dam situated on a river or stream whose spillway length and width of impoundment is nearly equal to the width of the original river or stream bank to bank and likely having minimal storage available for flood attenuation.

Safety Evaluation. As applied to dam safety, the process of determining the ability of a dam and its appurtenances to pass a given flood.

Seepage. The interstitial movement of water that may take place through a dam, its foundation, or its abutments.

Siphon/Inverted. A conduit or culvert to permit water to pass under an intersecting roadway, stream or other obstruction.

Spillway. A structure over or through which non-storm related and flood flows are discharged. If the flow is controlled by gates or other works of control, it is a controlled spillway; if the elevation of the spillway crest is the only control, it is an uncontrolled spillway.

Spillway/Auxiliary or Emergency Spillway. A secondary spillway designed to operate only during flood events that exceed the principal spillway capacity or operate in tandem with the principal spillway.

Spillway(s) Design Flood (SDF). The flood used in the design of a dam and its appurtenant works particularly for sizing the spillway(s) and outlet works, and for determining maximum temporary storage and height of dam requirements.

Stoplogs. Logs, timbers, steel or alloy beams placed on top of each other with their ends held in guides on each side of a channel or conduit to control water level in reservoir.

Tailwater Level. As applied to dam safety, the level of water in the discharge channel immediately downstream of the dam. Tailwater levels can be those levels that result from normal to flood flow (SDF) conditions.

Toe of Dam. The junction of the downstream face of a dam with the ground surface, also referred to as downstream toe. For an embankment dam, the junction of the upstream face with ground surface is called the upstream toe.

Unsafe Condition Dam. A dam whose condition, as determined by the Commissioner, is such that a high risk of failure exists and the dam condition presents a high risk to public safety located downstream from the dam. Among the deficiencies that may result in this determination are: severe seepage or piping, severe woody vegetation and tree growth on embankments and areas immediately adjacent to the dam and appurtenances, severe erosion or subsidence conditions, severe sink holes, severe sloughing of embankment, severely deficient flood routing spillway capacity and/or condition of outlet(s), severe movement and/or severe cracking of structural elements and other severe structural deficiencies.

10.03: continued

Uplift. As applied to dam safety, the upward pressure in the pores of a material (interstitial pressure) or on the base of a structure.

Weir. A barrier installed in an open channel stream or constructed waterway used for measuring and/or controlling the flow of water. Types of weir include broad crested weir, sharp-crested weir, ogee weir, and V-notched weir.

10.04: Exclusions

Dams owned and operated by the United States, its agencies or any person who operates a dam owned by the United States are excluded from the provisions in 302 CMR 10.00, together with dams and reservoirs licensed and subject to inspection by the Federal Energy Regulatory Commission (FERC) provided that a copy of all FERC approved periodic inspection reports are provided to the Department. All other dams are subject to 302 CMR 10.00 unless exempted in writing by the Commissioner, M.G.L. c. 253, §§ 44 through 48, or 302 CMR 10.00. Examples of exempt dams could be temporary drainage detention ponds, depending upon size and other considerations, surface impoundments (other than water) for industrial or commercial wastes which are regulated by other agencies or storage tanks.

10.05: Registration

- (1) General. The purpose of registration is to establish a public record for the dam.
- (2) The owner of any dam subject to 302 CMR 10.00 shall cause to be filed with the Commissioner, within 30 days following notice by him, on a form prescribed by him, a Dam Registration Form containing the name of the owner, the location and dimensions of such dam and such other information as the Commissioner may reasonably require.
- (3) A registration form shall not be deemed received by the Commissioner until all information required by statute or 302 CMR 10.00 is furnished.
- (4) In the event that the owner fails to file the dam registration form in the time prescribed, the Commissioner may notify the owner of such failure and offer a 30 day grace period after which a Certificate of Non-compliance will be issued and recorded at the Registry of Deeds in the county where the dam lies, with all costs of recording, and interest thereon, to be assessed against the owner.
- (5) Upon receipt and approval of the Dam Registration Form, a Certificate of Registration will be issued to each owner. Within 14 days of receipt such Certificate of Registration must be recorded by the owner at the Registry of Deeds in the county where the dam lies, and a copy of the recorded Certificate filed with the Commissioner within ten days of recording.
- (6) The owner shall notify the Commissioner by registered or certified mail, of the proposed transfer of legal title of such dam 30 days prior to any such transfer. Upon receipt of such notice, a new Certificate of Registration will be issued. Such Certificate shall contain any outstanding obligations of the registered owner under M.G.L. c. 253, §§ 44 through 50.

10.06: Size and Hazard Potential Classification

- (1) General. Dams shall be classified for purposes of establishing inspection schedules and adherence to design criteria, in accordance with their potential for damage to life or property in the area downstream from the dam in the event of failure of the dam or appurtenant facilities. This determination shall be made by the Commissioner and noted on the owner's Certificate of Registration. It may be necessary to periodically reclassify dams as additional information becomes available and/or conditions change. The criteria established in 302 CMR 10.06(2) through (4) shall be used by the Commissioner to determine the size and hazard potential classification based upon the extent of development downstream from the dam, taking into consideration factors such as height, type of structure and volume of impoundment, pursuant to M.G.L. c. 253.

10.06: continued

(2) Size Classification. The classification for size based on the height of the dam and storage capacity shall be in accordance with 302 CMR 10.06(2): *Size Classification Table*. The height of the dam is established as described in 302 CMR 10.06 with respect to maximum water storage elevation. The storage capacity of the dam is the volume of water contained in the impoundment at maximum water storage elevation measured as defined in 302 CMR 10.06(2). Size class may be determined by either storage or height, whichever gives the larger size classification.

SIZE CLASSIFICATION TABLE

Category	Storage (acre-feet)	Height (feet)
Non-jurisdictional*	Not in excess of 15 regardless of height	Not in excess of six regardless of storage capacity
Small	≥ 15 and <50	≥ 6 and <15
Intermediate	≥ 50 and <1000	≥ 15 and <40
Large	≥ 1000	≥ 40

\*For dams not in excess of 6 feet in height or having maximum impounding capacity not in excess of 15 acre-feet, the Commissioner shall make jurisdictional determination by taking into consideration factors or combination of factors such as height, type of structure, volume of the impoundment, extent of downstream development, and other factors deemed appropriate by the Commissioner.

(3) Hazard Potential Classification. The classification for hazard potential shall be in accordance with 302 CMR 10.06(3): *Hazard Potential Classification Table*. The hazards pertain to potential loss of human life or property damage in the event of failure of the dam or appurtenant works. Development of the area downstream from the dam that would be affected by its failure shall be considered in determining the classification. Dams will be subject to reclassification if the Commissioner determines the hazard potential has changed.

HAZARD POTENTIAL CLASSIFICATION TABLE

High Hazard Potential (Class I)	Dams located where failure will likely cause loss of life and serious damage to home(s), industrial or commercial facilities, important public utilities, main highway(s) or railroad(s).
Significant Hazard Potential (Class II)	Dams located where failure may cause loss of life and damage to home(s), industrial or commercial facilities, secondary highway(s) or railroad(s) or cause interruption of use or service of relatively important facilities.
Low Hazard Potential (Class III)	Dams located where failure may cause minimal property damage to others. Loss of life is not expected.

(4) Dams in Series. If an upstream dam failure has the capability to create failure of a downstream dam because of its failure flood wave, it shall have the same or higher hazard potential classification as the downstream dam. If the failure flood wave of the upstream dam will not cause failure of the downstream dam, the upstream dam may have a different hazard potential classification from the downstream dam.

(5) Failure Damage. The extent of potential damage resulting from a dam breach may justify designating damage as either major or minor.

(a) Such a designation may be made after a detailed analysis has established the relative impact of the probable dam breach and has considered the following factors:

1. the conditions prior to and after a dam breach;
2. the extent to which access has been affected, both before and after a dam breach; and
3. the extent of damage.

10.06: continued

(b) Potential damage to habitable structures will be considered minor when habitable structures are not within the direct path of the probable flood wave produced upon failure of a dam or where such structures will experience:

1. no more than 2.0 feet incremental rise of flood water above the lowest ground elevation adjacent to the outside foundation walls; or
2. no more than 2.0 feet incremental rise of flood water above the lowest habitable floor elevation of the structure; the lower of the two elevations governing.

(6) Hazard Potential Reconsideration. An owner may at any time request the Commissioner to reconsider the hazard potential classification of their dam. The owner's request must be filed by a registered professional engineer, in a form provided by the Commissioner which provides the findings of the engineer's technical analysis and investigations which may support a change in classification. The Commissioner will issue a written decision to the owner and the registered professional civil engineer within 30 days of receipt of a request for hazard potential reconsideration, and such decision shall be final and binding upon the parties.

(7) Hazard Potential Classification Review. While it is recommended dam safety practice to review the classification of each dam during each subsequent periodic Phase I Formal Inspection, to ensure the accuracy of Hazard Potential Classification of dams, each dam owner shall hire a qualified Registered Professional Engineer to review the classification of their dam(s) at least on a frequency of ten years or as otherwise ordered by the Commissioner.

10.07: Inspection Schedule

(1) Upon the failure of an owner to file a dam inspection report within the time prescribed, the Commissioner or his or her designee, in accordance with M.G.L. c. 253, § 47 may enter upon the property on which the Department's jurisdictional dam(s) and appurtenant works lie at any time to conduct any kind of dam safety evaluation(s) and/or action(s) as required, and/or to obtain the requisite information. In addition to the assessed fines described in 302 CMR 10.15, the cost to the Commonwealth of conducting the inspection and producing the inspection report(s) plus interest shall be assessed against the owner in this case.

(2) Dam owners shall periodically inspect all dams in accordance with the following schedule. These time periods are the maximum time between inspections; more frequent inspections may be performed at the discretion of the Commissioner.

PHASE I FORMAL INSPECTION FREQUENCY

Hazard Potential	Inspection Frequency
Low	Ten Years
Significant	Five Years
High	Two Years

ADDITIONAL INSPECTION FREQUENCY

(a) High and Significant Hazard potential dams whose condition have been determined to be poor or unsafe by inspection must be inspected and reported at least every three months by a registered professional engineer employed by the owner until the dam safety repairs are completed and the dam is found to be in satisfactory condition, unless otherwise ordered by the Commissioner. Such inspections shall be termed Follow-up Inspections and shall be submitted to the Office of Dam Safety.

(b) Any dam determined to be in poor or unsafe condition may be required to be monitored during anticipated rain/runoff events as ordered by the Commissioner.

(c) All inspections, monitoring data and updates on the condition of the dam shall be provided by a registered professional engineer to the Office of Dam Safety and local emergency management officials until the dam is brought into compliance with dam safety requirements.

10.07: continued

- (3) Inspections scheduled according to the time period set forth in 302 CMR 10.07(2) may be modified, at the discretion of the Commissioner, in special cases where it is desirable to observe a dam under particular conditions (*i.e.* wet season, dry season, foliage, *etc.*).
- (4) For any regulated dam, the Commissioner may require scheduled inspections on a more frequent basis if particular conditions exist which require more frequent monitoring.
- (5) When the Commissioner reschedules the inspection of a particular dam for any reason cited in 302 CMR 10.07, the date of that inspection may become the starting date from which the date of the next regularly scheduled periodic inspection will be computed.
- (6) The owner shall employ the services of a registered professional engineer experienced in the design, construction and inspection of dams, to inspect the owner's dam according to the inspection schedules determined by the Commissioner and on forms prescribed by the Commissioner.
- (7) The owner shall furnish a copy of each completed inspection report in a format determined by the Commissioner within 30 days of the date of the inspection to the Commissioner.
- (8) The inspection report shall be sealed by a registered professional engineer, as described in 302 CMR 10.00.
- (9) The owner must submit a statement of his or her intent to implement such recommendations of the registered professional engineer, if required.
- (10) Upon review and approval of submitted inspection report, the Commissioner will determine compliance and appropriate procedure(s) in accordance with 302 CMR 10.08.

10.08: Compliance with Inspection Results

- (1) The Commissioner shall determine whether the dam and appurtenant features meet accepted dam safety standards. If the Commissioner determines that the dam does not meet these standards and a threat to life and/or property exists, he shall issue a Certificate of Non-compliance. Certificates shall be recorded by the Commissioner with the Registry of Deeds for the county where the dam lies.
- (2) A Certificate of Non-compliance shall be issued if the Commissioner determines that the dam or appurtenant features are structurally deficient and in either poor or unsafe condition, as defined under 302 CMR 10.03.
- (3) If the Commissioner issues a Certificate of Non-compliance, after receiving the owner's inspection form, or at any other time, the Commissioner may order the owner of the dam to: obtain a detailed inspection of the dam by a registered professional engineer, including such tests as the Commissioner may require or recommend to determine the course of action necessary to bring the dam into compliance and a time schedule by which the work shall be accomplished; or take whatever action is necessary to reduce the safety risk, as determined by the Commissioner.
- (4) Notice of such aforementioned orders shall be served upon the owner(s) by registered or certified mail, return receipt requested, and recorded by the Commissioner in the Registry of Deeds in the county where the dam lies.
- (5) When the dam meets minimum dam safety standards, or has been corrected or removed pursuant to an order by the Commissioner, the Commissioner shall issue a Certificate of Compliance to the owner following completion of a dam safety permitted project.

## 10.08: continued

(6) The Commissioner has the authority, pursuant to M.G.L. c. 253, § 47, and in accordance with the Memorandum of Understanding between the DEP and the DCR relative to lake water level drawdowns/dam repair projects, to determine the maximum allowable water elevation for reservoirs and impoundments where dams have been determined to be unsafe. In determining the maximum allowable water elevation, the Commissioner may consider the recommendations of a registered professional engineer representing the owner, if the owner has retained one. The owner shall not store water in excess of the stated elevation determined by the Commissioner.

(7) When the spillway capacity of the existing dam does not meet stated criteria, the Commissioner may require the dam owner's engineer to perform a relative impact analysis. This analysis shall address such factors as: downstream impact area; capacity and/or condition of outlet work(s); overtopping potential; operation plans; consideration of incremental impacts of possible failure; and emergency action plans. A reduction in the standard design flood may be allowed to such dam upon review and approval by the Commissioner.

10.09: Dam Construction, Repair, Alteration, Breach or Removal Permit

(1) General Application. Any person(s) who proposes to construct, repair, materially alter, breach or remove a dam, pursuant to M.G.L. c. 253, must file with the Commissioner a permit application to determine whether or not a Chapter 253 Dam Safety Permit is required. Routine maintenance-related work such as mowing, brush cutting, spillway debris removal and other site maintenance does not require a Chapter 253 Dam Safety Permit. Approved permits issued by the Commissioner do not relieve the applicant from required compliance with M.G.L. c. 131, § 40, and, where applicable, M.G.L. c. 131, §§ 5C and 19. Applications shall be sent by certified mail, return receipt requested. All permit applications must comply with DCR's standard design and construction criteria (*see* 302 CMR 10.14). If the Commissioner determines that the proposed dam falls within the jurisdiction of 302 CMR 10.00, the owner must complete the construction, repair, alteration, breach or removal permit application as follows:

(a) Preliminary Report. The Permit application for any dam shall include a preliminary report. (Filing of the preliminary report prior to filing the final report, early in the site investigation and design schedule, is encouraged to assure the Commissioner's concurrence with the hazard potential classification, site investigations, design concept and required design analysis and supporting data.) The preliminary report shall be filed with the permit application and shall include, but not be limited to, the following information:

1. completion of all required information on the application;
2. maps showing the location of the proposed structure that include the county, location of state roads, access to site, and outline of the reservoir (aerial photographs or U.S. Geological Survey may be used);
3. preliminary drawings or sketches that include cross sections, plans and profiles of the dam, proposed pool levels, and type of all spillways;
4. preliminary design criteria and basis for selection including a description of the size, ground cover conditions, and extent of development of the watershed, drainage area, spillway design storm, geology and geotechnical engineering assumptions for the foundation and embankment materials, and type of materials used in the principal spillway(s); and
5. book and page number of location of the dam as recorded in the Registry of Deeds with the name of the Registry.

(b) Final Design Report. Approval or denial of a permit to construct, repair, alter, breach or remove a dam will be issued within 60 days from the time the final design report and permit application is received. The final design report shall include, but may not be limited to, the following information:

1. A report of the investigation of the foundation soils or bedrock and the borrow materials, including the location of borrow areas, that are to be used to construct or repair the dam;
2. Analysis and/or criteria to indicate that the dam will be stable during construction and filling and under all conditions of reservoir operations;
3. Computations indicating that the dam is safe against overtopping during occurrence of the inflow design flood and wave action; however, wave action need not be considered when the design flood is based on the full probable maximum precipitation (PMP);

10.09: continued

4. Criteria, design data or references to indicate that seepage flow through the embankment, foundation, and abutments will be controlled to limit internal erosion and sloughing in the area where the seepage occurs;
5. Calculations and assumptions relative to design of the spillway(s);
6. Provisions to protect the upstream slope, crest, and downstream slope of earth embankments and abutments from erosion due to wind and rain;
7. Other design data, assumptions and analysis data pertinent to individual dams and site conditions as needed;
8. A proposed construction schedule;
9. A proposed filling schedule for the reservoir;
10. A maintenance and operation plan; and
11. For all new high and significant hazard potential dams, an emergency action plan to be implemented in the event of a dam failure.

The preliminary report and the final design report may be submitted as one document.

(2) Construction Documents. Two sets of plans and specifications must be submitted along with the Final Design Report. The documents shall be detailed engineering design drawings and specifications that include the following at a minimum:

- (a) A cover sheet one showing the name of the project; name of owner; hazard potential classification of the dam; designated access to the project; and location with respect to highways, roads, streams, and any dam(s) that would affect or be affected by the proposed structure;
- (b) Maps showing the drainage area and outline of the reservoir and the ownership of properties covered by the reservoir or flood pools;
- (c) Geologic investigation, cross section, profiles, logs of borings, location of borrow areas, drawing of principal and emergency spillways, drawn in sufficient detail to clearly indicate the extent and complexity of the work performed;
- (d) The technical provisions, as may be required, to describe the method of construction and quality control for the project; and
- (e) Special provisions, as may be required, to describe technical provisions and requirements needed to ensure that the dam is modified and repaired according to the approved plans and specifications.

(3) Notification. The Commissioner shall notify the applicant in writing within 60 days following the receipt of the completed application and all required technical design submittals if the application is approved or disapproved. If the application is disapproved an explanation will be provided.

(4) Permit. Approval of construction, drawdown, repair, alteration, breach or removal of a dam will be contained in a Chapter 253 Permit to be issued by the Commissioner. A permit may be subject to written general stipulations and/or written specific stipulations deemed necessary by the Commissioner. No construction shall be performed until the permit is issued and recorded in the Registry of Deeds for the county within which the dam lies. The permit shall be valid for the construction schedule specified in the approved final design report and application. Construction must commence within two years after the permit is issued. If construction does not commence within two years after the permit is issued, the permit shall expire and a new application shall be submitted unless prior to the permit expiration date, upon written application and for good cause shown, the Commissioner extends the time for commencing construction.

(5) Recording a Chapter 253 Permit. A permit to construct, drawdown, repair, alter, breach or remove a dam shall be recorded at the Registry of Deeds in the county where the dam lies. Recording must be done prior to the commencement of construction and a copy of the recorded permit filed with the Commissioner.

(6) Notice of Construction and Drawdown Notification.

- (a) For dam safety permitted projects, at least 21 days before construction and/or controlled drawdown is commenced, the owner shall provide notice by certified and/or registered mail to the Commissioner, the local Conservation Commission and to the Commonwealth Division of Fish and Wildlife, Field Headquarters, 1 Rabbit Hill Road, Westborough, MA 01581 attn: Natural Heritage and Endangered Species Section.

10.09: continued

(b) In cases of emergency conditions, when repairs are necessary to safeguard life and property, they may be started under the provisions of M.G.L. c. 253, § 47 upon notification by the Commissioner that an emergency condition exists. The owner shall assign a registered professional engineer to monitor any drawdown for the first four hours after its commencement, observing conditions at least on an hourly basis. Thereafter, the owner or his or her registered professional engineer shall monitor the drawdown at least once each 24 hours, or as otherwise determined by the Commissioner, until drawdown has been completed. Except for emergency drawdowns in accordance with an order issued by the Commissioner, to meet standards established by the Commonwealth Division of Fisheries and Wildlife, drawdown rates should not exceed four cubic feet per second per square mile of drainage area (CFSM), as measured at the outlet structure. During re-impoundment, 0.5 cfs/m should be maintained at the outflow.

(7) Entry. During construction, the Commissioner or his or her designee may enter upon the property to inspect without prior notice and may direct any additional testing or actions as required.

(8) Removal of Dams. If it is desirable to remove a dam due to new construction, abandonment or unsafe conditions, the owner shall be required to comply with 302 CMR 10.09 regarding the construction and repair of dams. Upon complete removal of the dam, the Commissioner will issue a Certificate of Approval stating that the removal has been in accordance with the approved plans and specifications, or any approved revisions thereof.

10.10: Revocation, Suspension, or Modifications of Chapter 253 Permits

Chapter 253 Permits may be revoked, suspended, modified or denied by the Commissioner for causes including, but not limited to, the following:

- (1) Violation of any permit condition;
- (2) Failure to fully disclose all relevant facts or obtaining a permit through misrepresentation;
- (3) Violation of any provisions of M.G.L. c. 253 or 302 CMR 10.00;
- (4) Change or newly discovered condition or circumstance that makes or would make the dam unsafe; or
- (5) Change of conditions develop that are hazardous to life and/or property.

10.11: Emergency Action Plans

All dams classified as High Hazard Potential or Significant Hazard Potential shall have an Emergency Action Plan (EAP) submitted to the Commissioner and the Massachusetts Emergency Management Agency. All EAPs shall be updated annually and their format shall be in accordance with guidelines established by ODS which will be posted and updated on the ODS website. Approval to construct a new Significant Hazard Potential dam or High Hazard Potential dam shall be contingent upon the submission of an EAP to the Commissioner. All EAPs are subject to approval by the Commissioner.

- (1) High Hazard Potential Dams. High Hazard Potential EAPs shall, at a minimum, contain the following:
  - (a) Identification of equipment, manpower and material available for implementation of the plan;
  - (b) A notification procedure, including Flowchart, for informing the local emergency agencies;
  - (c) A dam failure inundation map showing the stream which will be flooded, as well as the impacted downstream environment. The inundation map shall be developed by engineering modeling and methods subject to review by the Commissioner and shall display the timing and attenuation of the dam breach flood at strategic locations; and

10.11: continued

(d) A procedure for warning downstream residents if failure of the dam is imminent, and a listing of addresses and telephone numbers of downstream residents who may be affected by the failure of the dam. If an automatic notification procedure is available within the town such as a reverse 911 or comparable alert system, this may augment or substitute for a traditional telephone list, subject to approval by the Commissioner.

(2) Significant Hazard Potential Dams. Significant Hazard Potential EAPs shall, at a minimum, contain the following:

(a) Identification of equipment, manpower and material available for implementation of the plan;

(b) A notification procedure, including Flowchart, for informing local emergency agencies

(c) A dam failure inundation map showing the stream which will be flooded as well as the impacted downstream environment. The inundation map shall be developed by engineering modeling and methods subject to review by the Commissioner and shall display the timing and attenuation of the dam breach flood at strategic locations;

1. For Significant Hazard Potential Dams, an inundation map developed by engineering modeling and methods shall be required where, in the judgment of the dam owner's engineer or the Commissioner, more than several downstream interests are expected to be significantly impacted resulting from dam failure..

2. In the judgment of the dam owner's engineer, and subject to review by the Commissioner, a simplified inundation map may be allowed if there exists only one to several downstream interests that are expected to be significantly impacted by dam failure. In such a case, engineering modeling and methods may be substituted with simpler methods such as engineering judgment considering FEMA flood plain maps, review of height of dam, volume in storage, breach discharge calculations, stream channel slope, topography, proximity of the identified several interests along the anticipated flood wave route. A simplified inundation map shall locate and annotate the several downstream interests that are expected to be impacted following dam failure. An example of a setting where this paragraph may be applicable is a Significant Hazard Potential dam that carries a public roadway across the dam crest (that would collapse into a dam failure) and there are two or three occupied properties located downstream that are likely to be significantly impacted..

(d) A procedure for warning downstream residents if failure of the dam is imminent and a listing of addresses and telephone numbers of downstream residents who may be affected by the failure of the dam.

(3) Prior to submission of an EAP to the Commissioner, the owner shall submit a copy of the proposed EAP to the local and state emergency agencies, and all local emergency coordinators involved in the plan for review. The owner shall submit with the EAP, recommendations received from said agencies and coordinators, if any.

(4) Annually, the owner shall review the EAP, update it and provide the updated EAP to all involved agencies for review. Any GIS based inundation map shapefiles are to be forwarded to ODS electronically along with their copy of the completed EAP.

(5) EAPs and annual updates shall be provided by the owner in both hard copy and electronic format to the Commissioner and the Massachusetts Emergency Management Agency.

10.12: Records

Upon request by the Commissioner, an owner shall make available for inspection and review, all plans, specifications and other such pertinent material relating to the dam. The Commissioner shall return all such material upon completion of his inspection.

10.13: Liability

(1) The owner shall be responsible and liable for damage to property of others or injury to persons, including but not limited to, loss of life resulting from the operation, failure of or mis-operation of a dam.

10.13: continued

(2) 302 CMR 10.00 shall not relieve from or lessen the responsibility of any person owning, or operating a dam from any damages to persons or property caused by defects, nor shall the Commissioner be held liable by reason of any inspections, technical documents or permits issued.

10.14: Design and Construction Criteria for New and Existing Dams

(1) General. Design and construction of dams shall comply with 302 CMR 10.14. Design and construction standards that are not included in 302 CMR 10.14, shall conform to design procedures established by: The U.S Army Corps of Engineers, the U.S. Bureau of Reclamation, the U.S. Natural Resources Conservation Service and other generally accepted engineering practices and principles. Where specific site conditions may exist which warrant appropriate changes in the following design and construction criteria, the Commissioner shall review and approve the design.

(2) Foundations and Abutments. The foundations and abutments investigation shall consist of borings, test pits, and other subsurface exploration necessary to assess the soil, rock, and groundwater conditions.

(3) Construction Materials. Specifications for construction materials shall establish minimum acceptance criteria so that anticipated design properties are achieved. If the use of onsite borrow materials is specified, exploration, testing, and calculations shall be performed to indicate that there are sufficient quantities of material available that meet the design criteria.

(4) Surveys. Surveys shall be made with sufficient accuracy and scale to locate the proposed construction and to define the volume of the storage in the reservoir. The downstream area shall be investigated in order to delineate the area of potential damage in case of failure. Locations of centerlines, and other horizontal and vertical control points, shall be shown on a map of the site.

(5) Hydrologic Investigation. The drainage area shall be determined. Present land use shall be considered in determining the runoff characteristics of the drainage area. All hydrologic assumptions and design calculations shall be included in the report.

(6) Spillway Design.

(a) The spillway system shall have a capacity to pass a flow resulting from a design storm, as indicated in the following table, unless the applicant provides calculations, designs and plans to show that the design flow can be stored, passed through, or passed over the dam without failure occurring.

SPILLWAY DESIGN FLOOD DESIGN STORM

Hazard Potential	Size	Existing Dams	New Dams
Low	small	50 year	100 year
	intermediate	50 year	100 year
	large	100 year	100 year
Significant	small	100 year	500 year
	intermediate	100 year	500 year
	large	500 year	½ PMF
High	small	500 year	PMF
	intermediate	½ PMF	PMF
	large	½ PMF	PMF

(b) Vegetated earth or unlined emergency spillway(s) will be approved when computations indicate that it will pass the design flood without jeopardizing the safety of the structure. The risk of recurring storms, excessive erosion, and inadequate vegetative cover will be considered acceptable in such a spillway when its average frequency of use is predicted to be no more than indicated in the following table.

10.14: continued

EMERGENCY SPILLWAY FREQUENCY TABLE

Hazard Potential	Size	Existing Dams	New Dams
Low	small	25 years	25 years
	intermediate	25 years	25 years
	large	25 years	25 years
Significant	small	25 years	50 years
	intermediate	25 years	50 years
	large	50 years	50 years
High	small	50 years	100 years
	intermediate	50 years	100 years
	large	100 years	100 years

(c) The Department recognizes that the relationships between valley slope and width, total reservoir storage, drainage area, and other hydrologic factors have a critical bearing on determining the safe spillway design flood. Rational selection of a safe spillway design flood for specific site conditions based on quantitative and relative impact analysis is acceptable. The spillway may be sized so that the increased downstream damage resulting from an overtopping failure of the dam (*i.e.*, the selected spillway design capacity has been exceeded) would not be significant when as compared with the damage caused by the flood in the absence of dam overtopping failure. In *lieu* of quantitative and relative impact analysis, the preceding table shall be used as spillway design criteria.

(d) Lined Spillways and Channels. The design report shall include design data criteria for open channel, drop, ogee, and chute spillways and other spillway types that include crest structures, walls, channel linings, and miscellaneous details. All masonry or concrete structures shall have joints that are relatively water tight and shall be placed on foundations capable of sustaining applied loads without undue deformation. Provisions must be made for handling leakage from the channel or under seepage from the foundation which might cause saturation of underlying materials or uplift against the undersurfaces.

- (7) Conduits. A gate or controlled conduit shall be provided to drain each reservoir.
- (a) Any new and/or existing conduit design shall include the computation of the minimum time required to drain the reservoir.
  - (b) All pipe conduits shall convey water at the design velocity without damage to the interior surface.
  - (c) Protection shall be provided to prohibit unsafe seepage along conduits through the dam, abutments, and foundations. The specific design for seepage protection along conduits shall be shown in the drawings and specifications.
  - (d) Adequate allowances shall be incorporated in the design to compensate for differential settlement and possible elongation of the pipe conduit.
  - (e) Trash racks shall be installed at the intake of conduits to prevent clogging the conduit.
  - (f) Pipe Conduit Materials.
    1. Pipe conduits shall be designed to support the total external loads in addition to the total internal hydraulic pressure without leakage.
    2. Reinforced or Prestressed Concrete Pipe Conduits.
      - a. All conduits shall be designed and constructed to remain watertight under maximum anticipated hydraulic pressure and maximum probable joint opening, including the effects of joint rotation and extensibility.
      - b. Provisions for safe movement of the barrel shall be provided at each joint in the barrel and at the junction of the barrel and riser or inlet. Cradles shall be articulated if constructed on a yielding foundation.
      - c. The owner's engineer shall submit the final design details of the proposed pipe to be used for all significant and high hazard potential dams.
    3. Corrugated Metal Pipe Conduits.
      - a. Corrugated metal pipe shall not be used in any dam, except for special cases where the design engineer can adequately demonstrate satisfactory performance. Any exemption which allows their use must be issued in writing by the Commissioner.

10.14: continued

4. Dissipating Devices. All gates, valves, conduits and concrete channel outlets shall be provided with an energy dissipater designed and constructed to control erosion and prevent damage to the embankment or the downstream outlet or channel.

- (g) In the case when an alternative method(s) of drawdown is requested, the proponent shall submit with the permit application reasons why a waiver should be granted (*i.e.*, contaminated sediment, funding issues, complexity of construction). The request for waiver shall demonstrate that the water in storage can be moved out of the reservoir by mechanical means. The project design report shall include a detailed description of the pumps, siphons, *etc.* that would be necessary to remove the stored water in a reasonable period of time and maintain the reservoir in a dry state if necessary. A detailed drawdown plan must be included in the design, that identifies the volume of water in storage, the rate of inflow under average inflow conditions, identification of pump equipment, or other means necessary to remove stored water and maintain a drawdown condition, the time it will take to lower the water level, *etc.* The alternative drawdown plan shall be included in the required Operation and Maintenance Manual (O&MM) and in the Emergency Action Plan (EAP), if required.
- (h) In the case where an existing conduit is in poor condition (*i.e.*, severely deteriorated, structurally compromised, leaky) and the condition could compromise the structural stability of the existing dam, the design report shall address the compromised conduit condition (relining, slip lining, grouting or other feasible means) and bring the existing conduit to safe and good condition.

(8) Seepage Control.

- (a) All dams shall be designed and constructed to prevent the development of instability due to excessive seepage forces, uplift forces, or loss of materials in the embankment, abutments, spillway areas, or foundation. Seepage analyses for design shall identify areas having high internal uplift or exit gradients.
- (b) The design shall include an embankment internal drainage system, a zoned embankment, a foundation cut-off, an upstream blanket, a sufficiently wide homogeneous section, or other methods to protect against instability from excessive seepage forces or high hydraulic gradients.
- (c) For high hazard potential dams, a flow net analysis shall be made to determine the location of the phreatic surface, flow lines, and equipotential lines within the embankment and its foundation. These analyses may be based on graphical construction, electrical or liquid analogs, soil prototype methods, or other generally accepted methods. The flow net and stability analysis shall be the maximum water storage elevation. Possible fluctuations in tail water elevation shall be included in the analysis. The flow net and seepage analysis shall be included in the final design report.
- (d) Piezometers for confirming the location of the phreatic surface assumed for seepage and slope stability analyses shall be considered by the design engineer for low and significant hazard potential dams and shall be required for high hazard potential dams. Where piezometers are required, their design, depths and locations shall be provided in the final design report.

(9) Structural Stability and Slope Protection.

- (a) Design and construction of dams to assure structural stability shall be consistent with accepted engineering practice. The scope and degree of precision that will be required for a specific project will depend on the conditions of the site and the damage potential of the proposed structure. Consideration in design for structural stability shall include, but are not necessarily limited to, the following:
1. The hazard potential of the dam under present downstream conditions and under conditions which would likely develop during the life of the reservoir;
  2. Foundation bearing capacity, compressibility, and permeability; the extent and reliability of the site investigation; and the predictability of the site and foundation conditions;
  3. The reliability of construction materials, such as borrow soils, in terms of sufficient volume to complete construction without unanticipated interruption and in terms of predictability of physical properties such as strength, permeability, and compressibility;
  4. Durability of construction materials;
  5. Construction conditions at the site;

10.14: continued

6. The degree of quality control to be exercised during construction;
7. Pore pressure build-up during construction;
8. The rate of filling the reservoir and the rate of possible reservoir drawdown;
9. Tailwater conditions and the impact of drawdown;
10. Possible effects of landslides and subsurface solution activity on the structural stability of the dam and spillway structures; and
11. The extent of the proposed use of piezometers and other devices which will be used to monitor the completed dam and the means of access for inspections.

(b) Slope stability analysis shall be considered by the design engineer for all embankment dams, or as required by the Commissioner, and is required for high hazard potential dams. Where slope stability analysis is required, documentation in the final design report, such analysis shall include the design cross section(s) showing the soil parameters assumed for analysis, the location of the phreatic surface assumed for analysis, stability computations, and the location and computed safety factor(s) for the most critical circle(s) or failure wedge(s).

(c) Minimum factors of safety are listed in the following table. Final accepted factors of safety may depend upon the degree of confidence in the engineering data available. In selecting a minimum acceptable factor of safety, an evaluation should be made on both the degree of conservatism with which assumptions were made in choosing soil strength parameters and pore water pressures, and the influence of the method of analysis used.

1. 302 CMR 10.14(8)(c) shall not be applicable to embankments on clay shale foundations, soft sensitive clays, or materials with large strength loss under stresses.
2. For embankments over 50 ft. high on relatively weak foundations, a minimum factor of safety of 1.4 shall be used.

**SLOPE STABILITY ANALYSIS  
MINIMUM FACTORS OF SAFETY**

Loading Conditions	Minimum Factor of Safety Analyzed	Slope to be
End of construction condition	1.3	upstream and downstream
Sudden drawdown from maximum pool	>1.1*	upstream
Sudden drawdown from spillway crest or top of gates	1.2	upstream
Steady seepage with maximum storage pool	1.5	upstream and downstream
Steady seepage with surcharge pool	1.4	downstream
Earthquake (for steady seepage conditions with seismic loading using seismic coefficient method)	>1.0	upstream and downstream

\* The factor of safety shall not be less than 1.5 when drawdown rate and pore water pressures developed from flow nets are used in the stability analyses and where rapid drawdown is a normal operating condition as with pumped storage reservoir.

(d) Foundation bearing capacity and sliding base analysis shall be considered for all dams and are required for high hazard potential dams. Where bearing capacity or sliding base analysis is required, documentation of assumptions, computations, and safety factors shall be included in the final design report.

(e) Resistance of appurtenant structures against flotation uplift shall be provided for all dams. If the structures are anchored by dead weight alone, the buoyant weight shall be used for analysis. If the structures are anchored to soil or rock, the minimum factor of safety for that portion of the resistance provided by soil or rock anchorage shall be 2.0 unless the design engineer provides a thoroughly documented basis for using a lower safety factor.

## 10.14: continued

(f) For concrete, masonry, or other similar dams of relatively narrow cross section, resistance against overturning and sliding under maximum design loading conditions shall be considered; overturning and sliding stability computations shall be required for significant and high hazard potential dams.

(g) The anticipated reservoir and tailwater drawdown conditions shall be considered in all stability computations and shall be included in the design documents provided in the final design report.

(h) The slopes shall be protected against erosion by wave action, and the crest and downstream slope shall be protected against erosion due to wind and rain. Riprap and other erosion protection shall be provided over the full range in stages between the lowest drawdown elevation and at least two feet above maximum water storage elevation. Exemptions for specific site conditions such as special use slowly rising reservoirs or waste storage facilities may be approved in writing by the Commissioner upon written request by the Applicant.

(i) All significant and high hazard potential dams shall be designed to withstand seismic accelerations of the following intensities: Zone 1 = 0.025 g., Zone 2 = 0.05 g., Zone 3 = 0.15. Zones refer to "Geologic Hazard Maps".

(j) Loading Combinations. The following conditions and requirements are suitable in general for gravity dams of intermediate size. Loads which are not indicated such as wave action or any unusual loadings should be considered where applicable.

Case I: Usual Loading Combination--Normal Operating Condition. The reservoir elevation is at the normal pool, as governed by the crest elevation of an overflow structure or the top of the closed spillway gates, whichever is greater. Normal tailwater is used. If applicable, horizontal silt pressure should also be considered.

Case II: Unusual Loading Combination--Flood Discharge. The projected inflow design flood up to and including the Probable Maximum Flood, if appropriate, that results in reservoir and tailwater elevations that exert the greatest head differential and uplift pressure upon the structure shall be used. However, unusual conditions, such as high tailwater, shall be examined on a case by case basis as it is possible that the worst case loading condition exists under other than extreme floods.

Case IIA: Unusual Loading Combination--Ice Case. Ice loading plus ice pressure, if applicable. Generally ice pressure will not be a factor in the stability analyses, but may affect the operation, or structural integrity of flashboards and spillway gates.

Case III: Extreme Loading Combination--Normal Operating with Earthquake. Case I loading except that the inertial force due to the earthquake acceleration of the dam, and the increased hydrostatic forces due to the reservoir reaction on the dam are added.

(k) Stability Criteria. Specific stability criteria for a particular loading combination shall be dependent upon the type of analysis being done (*i.e.* foundation or concrete analysis), the degree of understanding of the foundation-structure interaction and site geology, and, to some extent, on the method of analysis.

1. For new dams, preliminary analyses shall be based upon more conservative criteria than final designs. As the design process progresses, the designer has available more sophisticated and detailed foundation information and material testing results. Therefore, when the unknowns associated with the preliminary designs are reduced by the final design stage, lower safety factors may be acceptable.

2. For existing dams, assumptions used in the analysis shall be based upon construction records and the performance of the structures under historical flood loadings. In the absence of available design data and records, site investigations shall be conducted to verify all assumptions.

3. Recommended safety factors shall apply to the calculations of stress and the shear-friction factor of safety within the structure, at the rock/concrete interface and in the foundation. Safety factors shall be determined using the gravity method of analysis.

10.14: continued

RECOMMENDED FACTORS OF SAFETY Dams having a high or significant hazard potential.	
Loading Condition	Factor of Safety
Usual	3.0
Unusual	2.0
Extreme	>1.0

Dams having a low hazard potential.	
Loading Condition	Factor of Safety
Usual	2.0
Unusual	1.25
Extreme	>1.0

(10) Design Life of a Dam. The selection of materials and equipment to be used in a dam and all of its appurtenant features shall either be based on sufficient quality and durability to function satisfactorily throughout the design life or to provide for safe and economical replacement within the design life span. The design life of a dam shall be the period of time the dam can be expected to perform effectively as planned. The design life of a dam shall be determined by the following:

- (a) The time required to fill the reservoir with sediment from the contributing watershed;
- (b) The durability of appurtenances and materials used to construct the dam; and
- (c) The time required to perform the specific function for which the dam was designed.

(11) Additional Design Requirements.

- (a) All elements of the dam shall conform to good and generally accepted engineering practice. The safety factors, design standards, and design references that are used shall be included in the final design report.
- (b) Monitoring or inspection devices may be required by the Commissioner for use by the inspectors or owners during construction and filling and after completion of construction. The Commissioner may also require that such monitoring or inspection devices, existing or installed by requirement, be read and documented at specified intervals and copies of such be forwarded to his or her office.

(12) Construction Schedule. The applicant shall submit a construction schedule that includes:

- (a) Suggested techniques and work force to be used to demonstrate that the dam will be constructed according to the plans and specifications;
- (b) An estimated time to complete the construction activities;
- (c) Techniques to be used to divert the stream flow to prevent interference with construction; and
- (d) The extent and method of quality control.
- (e) A determination of the likelihood of seasonal or winter shut down and any provisions or requirements to ensure safe dam operations during shut down period.

(13) Proposed Changes In Design. The owner shall notify the Commissioner in writing of any proposed changes in design, plans, and specifications that will affect the stability of the dam. Rationale and analysis supporting the proposed changes must be provided. Approval shall be in the form of a written addendum to the Chapter 253 Permit and must be obtained prior to installation.

(14) As-built Plans. Two complete sets of as-built plans shall be submitted to the Commissioner within 30 days of completion of the project.

10.14: continued

(15) Engineer's Certification. The registered professional civil engineer who has inspected the construction of the dam, shall submit a written statement bearing his or her professional seal that the dam and all appurtenances have been built, repaired, altered, or removed in conformance with the plans, specifications, and drawings approved by the Commissioner and that the dam is in compliance with 302 CMR 10.00. For repairs accomplished, the certification shall be for the repairs only.

(16) Acceptable Design: Procedures and Technical References. The following represent acceptable design procedures and references:

- (a) The design procedures, manuals and criteria used by the United States Army Corps of Engineers;
- (b) The procedures, manuals, and criteria used by the United States Natural Resources Conservation Service (formerly US Soil Conservation Service);
- (c) The procedures, manuals, and criteria used by the US Bureau of Reclamation; and
- (d) Other procedures that are approved by the Commissioner.

(17) Granting of Final Approval. Unless the Commissioner has reason to believe that the dam, on completion, is unsafe or not in compliance with any applicable requirement, regulation, or law, or of any condition or specification contained within the Permit, upon completion of construction and upon receipt of the engineer's statement, the Commissioner shall issue a final Certificate of Compliance certifying that the work has been completed in conformance with plans, specifications, drawings and conditions of the permit, subject to such terms as deemed necessary for the protection of life and property.

10.15: Fines

Fines shall be levied for a failure to comply with the following nonexclusive list of requirements:

(1) Fines for Non-compliance with the Following Requirements (but not necessarily limited to):

- (a) Failure to register a dam with the Office of Dam Safety and the Registry of Deeds will result in fines up to \$5,000.00.
- (b) Failure to notify the Office of Dam Safety of the transfer of a dam from one owner to another will result in fines up to \$5,000.00.
- (c) Failure of the owners of High Hazard Potential and Significant Hazard Potential dams to hire a qualified Registered Professional Engineer to provide compliant Emergency Action Plans and required updates to the Office of Dam Safety and the Massachusetts Emergency Management Agency will result in fines up to \$5,000.00.
- (d) Failure of the owners to provide the Office of Dam Safety with an Inspection Report that is in compliance as to content and frequency of inspection as provided for in 302 CMR 10.00 will result in fines up to \$5,000.00.
- (e) Failure of a dam owner to comply with the requirements of a Certificate of Non-compliance and Dam Safety Order pursuant to a dam determined to be in Poor or Unsafe Condition will result in fines up to \$5,000.00.
- (f) Failure of an owner to obtain a Chapter 253 Dam Safety Permit prior to performing any dam work such as alteration, breach, removal or substantial repairs will result in fines up to \$5,000.00.
- (g) Failure of the owners to comply with the conditions of a Chapter 253 Dam Safety Permit will result in fines up to \$5,000.00.

(2) Any person who fails to comply with the provisions of M.G.L. c. 253 or of any order, regulation or requirement of the department relative to dam safety, shall be fined an amount not to exceed \$5,000.00 for each offense, to be fixed by the court.

(3) Each violation shall be a separate and distinct offense and, in case of a continuing violation, each day's continuance thereof shall be deemed to be a separate and distinct offense.

302 CMR: DEPARTMENT OF CONSERVATION AND RECREATION

10.16: Severability

If any section, subsection, division or subdivision of 302 CMR 10.00 shall be determined to be invalid, such determination shall apply only to the particular section, subsection, division or subdivision, and all other provisions of 302 CMR 10.00 shall remain valid in full force and effect.

REGULATORY AUTHORITY

302 CMR 10.00: M.G.L. c. 253, §§ 44 through 48 and c. 21, § 65.

**Review Standards of the  
Billerica Historic Districts Commission**

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## 1. PURPOSES

- 1.1 The purpose of the Standards is to guide rehabilitation and construction in the historic districts in the Town of Billerica in order to preserve and protect the distinctive characteristics of buildings and places significant in the history and architectural heritage of the town through the maintenance and improvement of settings for such buildings and places, through the encouragement of design compatible therewith, and through the prevention of development which would impair or unduly detrimental to the locally or nationally significant structures of the districts.
- 1.2 The goal is to minimize reliance on the individual tastes and preferences of those who happen to be awarding permits and instead set up clear rules that everyone will understand.

## 2. EXISTING STRUCTURES

### 2.1 Removal of Structures

#### 2.10 Demolition

2.101 There shall be a presumption toward retaining all existing historic buildings.

2.102 Demolition shall be allowed only when the new construction relates better to the Historic District than does the existing building, and when all the other requirements below are satisfied.

2.1021 A prerequisite for demolition shall be an application for Certificate of Hardship, which shall contain a financial report detailing the costs of rehabilitation, and evidencing that the existing building is incapable of producing a reasonable economic return on the investment. The maximum rate of return which is theoretically possible on the land with new buildings shall not constitute such evidence if the existing buildings can generate a reasonable return.

2.1022 If an applicant's request for permission to demolish a structure or part of a structure is based upon structural instability or advanced deterioration, a technical report prepared by an architect or professional engineer registered in Massachusetts and approved by the Commission shall be submitted, detailing the nature and extent of the specific problems, and providing reasonably accurate cost estimates for their correction.

2.1023 Applications for permission to demolish existing structures shall be accompanied by complete plans for the new development proposed on the site, together with a timetable and a budget for the demolition and the reconstruction, as well as satisfactory evidence that adequate financing is available.

2.1024 A standard condition of approval for demolition shall be the documentation of the building's elevations, including details of specific notable architectural features (doors, cornices, etc.), through measured drawings and photographs. Such data shall be provided according to the procedures established by the Historic American Building Survey.

## 2.11 Relocation

2.111 Buildings shall be retained on their present sites. Relocation shall be considered only as an alternative to demolition. Standards 2.1021, 2.1023, and 2.1024 above shall apply.

2.112 Building shall be relocated preferably within the District or to sites where they would be compatible with the architectural, cultural and landscape surroundings.

## 2.2 Maintenance

2.20 Owners of all buildings should provide sufficient maintenance to keep such buildings from falling into a state of poor repair.

2.21 Owners shall therefore be responsible for providing maintenance necessary to prevent the deterioration of the following items, which could cause either an unsafe condition or a detrimental effect upon the character of the Historic District or which could lead to a later claim that deterioration has become so advanced that demolition or removal of the architectural features is necessary:

2.211 Foundations, exterior walls or other vertical supports (exterior or interior);

2.212 Roofs or other horizontal members (including joists, beams, etc.);

2.213 Chimneys or chimney support system;

2.214 Architectural features (including but not limited to window and door trim, parapets, roof cresting, cornices);

2.215 Rainwater drainage systems (gutters, downspouts) whether exterior or interior;

2.216 Water-proofing systems (roofing, flashing, windows, doors, paint on wooden or corrodible metallic surfaces); and

2.217 Any other elements which, if not adequately maintained, would eventually cause the building to crack, bulge, buckle, sag, rot, crumble or collapse, in whole or in part.

2.22 In cases where deterioration has already progressed to an advanced stage, and where immediate removal is requested by the owner, the standards for demolition shall be applied.

## 2.3 Chances to Structures

### 2.30 General Participation

#### 2.301 Historic Architectural Character

2.3011 The historic architectural character of each building shall be maintained or restored. Buildings shall be rehabilitated to reveal their historic materials and details. Missing architectural elements shall be recreated. Significant existing materials shall be retained by stabilizing, repairing or matching them with compatible new materials as required.

2.3012 The architectural character of each historic period is made up of several key factors. Each period interpreted these design elements in its own characteristic fashion. These factors or elements are:

Scale - relationship to human size, form and perception

Rhythm - the pattern of repeating elements such as windows, columns, arches and other facade elements, trees, other buildings, etc.

Form - overall shapes, combinations of as seen from different perspectives, skylines and contours

Massing - height, setback of major building elements, roof planes

Proportion - the relationship among the dimensions of various elements

Features - building elements such as windows, doors, cornices, roofs, porches, widow walks, balconies, cupolas, and decorative trim

Materials – the skin of each building, consisting traditionally of brick, cast iron, steel, sheet metal, wood, glass, terra cotta, and slate.

#### 2.302 Commercial Streets

2.3021 The commercial integrity of the Billerica Town Center District shall be protected through sensitive rehabilitation and new construction that provides a continuity of shops along the street frontages.

#### 2.303 Mill Buildings

2.3031 Critical exterior features of the mills shall be preserved, including front facades, river and canal facades, courtyards incorporating such facades, and prominent elements, such as windows, doors, towers, cupolas, and connector buildings or bridges.

2.3032 Rehabilitation of existing interior features shall be encouraged. Uses which highlight these interiors (exposed brick walls, heavy timber framing, etc.) and/or interpret the industrial or social history shall also be encouraged.

## 2.304 Residential Buildings

2.3041 The viability of Billerica's residential neighborhoods shall be enhanced by restoring and preserving residential buildings while respecting the historic character created by the various architectural features defining roof and facade.

## 2.31 Historic Materials and Colors

2.311 Masonry - Masonry shall be returned to a serviceable and visually acceptable state by replacing missing masonry units and mortar with matching elements, repointing and stabilizing using proper techniques and materials. Cleaning shall be accomplished using the gentlest effective means possible, so as not to damage either the masonry unit or the mortar joints. Cleaning specifications shall be submitted to the Historic Districts Commission for review prior to commencement of the work. Coatings to stabilize or waterproof masonry shall be permitted only if they have been proven not to block the masonry's water vapor permeability, or to contribute to its long-term deterioration.

2.3111 Old mortar should be duplicated in joint size, method of application, and joint profile.

2.3112 Masonry should be cleaned only when it is necessary to halt deterioration and always with the gentlest method possible, such as low pressure water and soft natural bristle brushes. **DO NOT SANDBLAST MASONRY. UNDER ANY CIRCUMSTANCES.** Chemical cleaning products which could have an abrasive reaction with masonry should be avoided.

2.3113 Deteriorated original materials should be repaired or replaced, where necessary, with new materials that duplicate the old as closely as possible. Replacement bricks should be carefully matched in size and color to the originals.

2.3114 New construction should follow traditional brick coursing and appearance; salvage brick should not be used.

2.3115 Foundations should be repaired or extended with the material of the existing foundation. The exposed portion of a foundation for a new building will be evaluated on an individual case basis.

2.3116 The original or early color and texture of masonry surfaces should be retained whenever possible. Brick or stone surfaces may have been painted or whitewashed for practical and aesthetic reasons. Indiscriminate removal of paint from masonry surfaces may be historically incorrect and may also subject the building to harmful damage. Masonry facades shall not be painted unless there is evidence that the building was painted originally.

2.3117 Chimneys are an important architectural feature. They should not be shortened or removed but repaired as necessary.

2.3118 Existing stucco should be repaired with a stucco mixture duplicating the original as closely as possible in appearance and texture.

2.312 Wood - Missing or deteriorated wooden features shall be sensitively replaced with new wood milled to match the original elements, and existing features shall be repaired wherever possible.

2.3121 Deteriorated material should be repaired or replaced, where necessary, with new material that duplicates the original as closely as possible. If a house is to be reclapboarded, the clapboards should line up to match the window heads and sills. Clapboards should be applied smooth side exposed.

2.3122 Aluminum or synthetic sidings (such as vinyl) are not recommended for properties in Billerica's historic districts. Their installation is discouraged because of the loss of architectural detail when it is carelessly applied; because the long term effects (such as rot or deterioration) on the underlying wooden structure are unknown; because they can create unsuspected fire hazards; and because the synthetic siding is difficult to repair and will itself need painting in time. Wood has been the most traditional siding material in Billerica. Wood is easily worked, has natural insulating qualities, and is adaptable, plentiful, relatively inexpensive and resistant to denting. It can be patched, refinished, and repainted or stained. And it has its own singular beauty. For all of these reasons every reasonable effort should be spent to keep the original siding on a building. If replacement is absolutely necessary, new wood clapboards will look better than any synthetic material and will, with care, last longer.

2.3123 Original details such as trim, cornice, brackets, corner and sill boards, quoins, window and door hoods and casings, and all other decorative elements shall be retained or replicated in-kind.

2.3124 Wood shingles are only appropriate for exterior cladding if they were used as a siding material for the style of the structure in question. Shaped shingles and shingle patterns for such a structure should be duplicated in-kind where repair and replacement are necessary.

2.313 Metals missing or deteriorated architectural metals shall be replaced with original or substitute metal fabrications or other visually compatible and durable features manufactured from acceptable alternative materials.

2.314 Colors architectural features should be restored with colors and finishes appropriate to the nature of the materials and to the character of the original building. Where original colors are not to be used, historic colors within the spirit of the period should be substituted.

2.315 Other where glass, plastic and/or aluminum architectural elements are an integral part of a building's original design, and where this design is deemed to be of a high aesthetic quality, consideration shall be given to preservation of these elements.

## 2.32 Major Building Elements

2.321 Storefronts - Existing historic storefronts shall be retained and rehabilitated. Generally, the term "historic" in these standards shall refer to the appearance of the building fifty or more years ago. Storefronts which have been altered or removed shall be restored or compatibly redesigned. Research should be done to discover each storefront's original appearance, and to learn what architectural features might be covered by existing siding or facing material.

2.322 Doors and Entries - Existing historic doors shall be retained and rehabilitated. Where doorways must be altered to meet current building code and safety requirements, doors and entranceways shall be designed also to respect the exterior architectural integrity of the building.

2.3221 Original or historically significant entries (including reveals, doors, surrounds, vestibule sidewalls, transoms or fanlights, sidelights and other features) may not be altered.

2.3222 If replacement doors are necessary, new doors shall be appropriate to the existing surround in style, material and proportions.

2.3223 Residential doors should be made of wood. Pine and fir are most commonly used for exterior doors. Replacement doors should have the appropriate panel arrangement for the date of the building's construction. Metal doors on houses are not acceptable.

2.3224 Generally it is not appropriate to introduce a new door opening into the principal or front elevation. The appropriateness of new side or rear doors depends on their design. (See 2.3225)

2.3225 The elaborateness of the entrance is related to the design of the house. Simple houses tend to have relatively plain doorways while more ornate houses have more highly decorated doorways. Therefore, when a replacement doorway is necessary on the principal facade or a new doorway is being added on a side or rear facade, it should harmonize with the style of the house as far as the type and extent of detail. Large sheets of glass are not generally in keeping with the character of a historic house.

2.3226 Doorways above ground floor level which provide secondary egress must be individually evaluated. In general, approval will result only when visibility from the street is minimal. The application of exterior staircases to buildings is generally not acceptable.

2.3227 Deteriorated porticos, porches, steps, and railings should be repaired with materials that duplicate the original.

2.3228 Storm doors (aluminum or wood-framed) shall be discouraged unless they were originally in use on the building.

2.3229 Replacement door hardware should replicate the original or be of an appropriate design.

2.3230 Exterior lighting shall be in traditional locations. The design of these fixtures should be of an appropriate size and not imitate styles earlier than the building.

2.3231 Front steps should be replaced in-kind with the material historically used with the particular style building.

2.323 Existing historic windows shall be retained and repaired to improve thermal efficiency wherever possible. Where replacement is essential, new windows shall match the originals or be in character with the building. The original window type (hung sash, casement, pivot, awning, etc.) shall be retained as shall be the appearance of the individual lights of glass formed by the muntin grid. The original width and of the individual elements (such as exterior molding and/or casing, exterior frame, exterior sash members, and exterior muntin) shall be reproduced or be closely approximated.

2.3231 Replacement windows for original wood windows should be made of wood. Aluminum and vinyl windows are generally not acceptable.

2.3232 The muntin thickness and profile of replacement windows should approximate those of the original historic windows. Also, the proportions of the frame to the sash should be preserved. Windows with removable or sandwich muntin bars are not acceptable.

2.3233 Double glazing is permitted under the following circumstances:

- a. when the use of the single-paned sash is appropriate to the architectural style of the building.
- b. when the double-glazed sash has integral (fixed) muntin bars, provided the proportions of the muntin bars Suit the building.
- c. when the double-glazed sash has glued-on muntin bars of the proper proportions. Muntins must be applied with weather proof adhesive on both sides of the glass.

2.3234 Only clear-paned, non-tinted glass shall be used (except to replace original stained glass). Mirrored and tinted heat-reflective glass are not appropriate.

2.3235 The frame and decorative window trim should be retained and repaired if necessary with materials that duplicate the original as closely as possible. Application of metal or vinyl panning over original wood trim is strongly discouraged.

2.3236 Exterior window shutters may not be appropriate to every architectural style and the Commission should be consulted before action is taken to remove or install them. Where replacement shutters are installed, they shall be wood constructed and match the height and one-half the width of the window opening and replicate a traditional shutter. All shutters shall be properly secured with shutter hardware so as to be operable, not nailed to the window casing. If vinyl or metal shutters were original to a particular structure, replacement shutters may be vinyl or metal.

2:3237 Original skylights should be retained, repaired, or replaced in kind. Size, location, and materials are important determinants for the acceptability of skylights. Bubble skylights are not permitted. New skylights are permitted in new construction. Skylights should be placed on roof surfaces with the least visibility to the street. Smaller skylights are preferable to larger ones.

2.324 Roofs - Features which give the roof its essential historical character shall be preserved or restored to the extent that they are visible from the ground. The principal considerations include the original roof shape; original roofing materials or materials compatible with the old in composition, size, shape, color and texture; and architectural details such as dormer windows, cupolas, cornices, brackets, chimneys, cresting, and weather vanes.

2.3241 Slating should be retained whenever possible. Slate should not be removed without a careful evaluation of the cost of its repair.

2.3242 Roof replacement materials should be sensitive to the original. Slate and wood shingles are preferred but may not be feasible due to cost, longevity, or fire safety considerations. Acceptable alternatives are to install one of the limited groups of products which successfully imitate slate or wood or to "render out" the roof by using a dark asphalt or fiberglass shingle which does not draw attention to this feature and the absence of original materials.

2.3243 Asphalt or fiber glass should be black, charcoal, or, in limited uses, dark brown. Only a very subtle blending of lighter and darker tones is acceptable; variegated asphalt lights and darks are unacceptable. White roofs are also not acceptable. White was not a shingle color used on historic roofs. Additionally, white is not an energy efficient color in cold climates because it reflects heat rather than absorbs it.

2.3244 Wooden or copper gutters can be an important architectural feature. In older houses they were often designed as part of the eave moldings. Therefore gutters should be properly maintained and only replaced in cases of extreme deterioration.

2.3245 New gutters and downspouts should be placed in an architecturally sensitive manner and painted the color of the surface on which they are installed; i.e. if a downspout runs down a white corner board, it should be painted white.

2.3246 Historic dormers shall be retained and repaired or restored. Expansion of existing dormers or adding new dormers may be approved on a case-by-case basis provided designs are based on historic models.

2.325 Industrial Hardware - Historically significant industrial hardware shall be preserved and more recent equipment judged to be of a significant design shall be retained.

2.326 Mechanical Equipment - Essential outdoor mechanical equipment (ducts, fans, solar panels, etc.) shall be installed in locations which create the least disturbance to the historical appearance of the building, and which involve the minimum alteration to its structural integrity.

### 3. NEW CONSTRUCTION

#### 3.1 General Principles

3.10 Character - New construction on currently vacant sites in the town center shall be encouraged to reinforce the character embodied in the traditional New England town pattern, closely framing the road. New construction in residential districts shall follow the existing pattern of setbacks and building placement.

3.11 Continuity - New buildings should not be designed as free-standing objects, but instead shall generally conform with the tradition of continuous structures holding the lines of streets, canals and riverfronts.

3.12 Ground-Level Design - On commercial streets, ground-level building design shall generally follow existing patterns created by the type and scale of shops, street facades, sign design, shop windows, and materials traditional to the town center.

3.13 Materials - New buildings shall utilize exterior materials in keeping with the exteriors seen in the districts, with natural textures being encouraged. Colors shall generally be compatible with the surrounding streetscape.

3.14 Contemporary Approaches - New buildings shall generally utilize contemporary design ideas, but shall also respect and reflect the traditional scale, proportions, rhythms, and mood of historic structures. These traditional architectural values should be interpreted into contemporary building design, but the use of imitation historic building details and ornaments is discouraged. Building design must also be internally consistent, and amalgamations of historically unrelated stylistic elements shall generally be prohibited.

3.15 Directional Expression - Strongly horizontal designs shall be avoided, by dividing long horizontal facades into smaller vertically-oriented units that conform to the primary expression of the streetscape. Overly vertical or exaggerated expression in any direction shall be avoided. Proportional systems based on traditional methodology, such as the Golden Triangle, are encouraged.

3.16 Infill and Major - Different standards are applicable to infill sites and major sites because the former generally have greater impact upon their immediate neighbors, while the latter can have significantly larger impact upon the overall townscape.

#### 3.2 Infill Structures

3.20 Harmony - Infill structures must blend in with the existing architectural fabric as seen from the street, and reinforce the feeling of continuity rather than stand out individually. The “General Principles” contained in Section 3.1. above shall also apply to infill structures.

3.21 Height - Infill structures shall generally contain at least two stories above street level, and relate very closely to the height of the immediately adjacent buildings.

3.22 Setback - Infill structures shall continue the street setback parameters established by adjacent buildings.

3.23 Roofs - Infill structures shall not introduce new roof shapes, pitches or colors not found on traditional buildings located on the same block.

3.24 Wall Openings - Infill structures shall respect the alternation of window area to wall area, and the width-to-height ratio of windows and doors, in the facades of surrounding structures. Introducing incompatible facade patterns that upset the rhythms of openings established in historic buildings in the immediate area shall be prohibited.

### 3.3 Major Sites

3.30 Basic Approach - New construction shall generally recreate Billerica's traditional town fabric, using contemporary designs adapted to new functional needs. Parking lots shall be located behind new and existing structures, to the greatest possible extent, so as not to be visible from streets, canals, and the river.

3.31 Height - Height control is critical along street, canal, and river frontages, and at the axis of major street vistas. Shadow and wind impacts are particularly important in active public pedestrian areas. In general, buildings in such areas, within commercial or industrial districts shall generally maintain the height of adjacent buildings.

3.32 Parking Garages - Parking garages should harmonize with mill architecture by utilizing brick-faced exterior walls with window-type openings instead of the conventional designs which incorporate long horizontal openings between deck levels. On commercial streets, ground-level treatment should include storefronts.

3.33 Other - The "General Principles" contained in Section 3.1 above shall also apply to major new construction.

## 4.0 SIGNAGE

### 4.1 General

4.10 All new signs, and all changes in the appearance of existing signs displayed so as to be visible from streets, sidewalks, alleys, or canals, require a Certificate of Appropriateness. This includes changes in message or colors on pre-existing signs.

4.11 Temporary signs are those intended to be used for a period of 30 days or less, and shall not be allowed for more than 30 days. Temporary signs do not require a Certificate of Appropriateness.

4.12 If there is a conflict between these standards and the requirements in the Town Sign Code, the stricter shall apply.

4.13 Off-premise advertising signs shall be prohibited, but off-premise sign directory boards may be permitted in certain locations where visibility is a significant problem (such as within a millyard, or along a street, for example), where they can be harmoniously integrated into the surroundings.

4.131 Temporary advertising signs for charitable events, (i.e. political, religious, fund raising) are permitted in the Districts. Such signs shall not exceed 2' x 3' or 6 square feet.

#### 4.2 Location and Size of Signs

4.20 Signs must not dominate building facades or obscure their architectural features (arches, transom panels, sills, moldings, cornices, windows, etc.).

4.21 The size of signs and individual letters shall be an appropriate scale for pedestrians and slow-moving traffic. Projecting signs shall generally not exceed nine square feet, on first floor level.

4.22 Signs on adjacent storefronts should be coordinated in height and proportion. The use of a continuous sign-band extending over adjacent shops within the same building is encouraged, as a unifying element.

4.23 Portable signs located on sidewalks, driveways, on top of vehicles or in parking lots are not allowed.

4.24 Wall signs shall be located no higher than the window sill line of the second story.

4.25 Signs displayed during business hours only, such as those which are removed every evening and displayed again the following morning, constitute an on-going advertising format and shall be construed as being permanent signs rather than temporary signs, if such display continues for more than thirty calendar days. The date when such sign was first displayed shall be affixed in a permanent manner to the sign so as to be readily seen.

#### 4.3 Messages and Lettering Signs

4.30 Messages should be as simple and brief as possible. The use of pictorial symbols or logos is encouraged.

4.31 Lettering should be of a traditional block or curvilinear style which is easy to read and not incompatible with the style of the building. No more than two different styles should be used on the same sign. -

4.32 Letters shall be carefully formed and properly spaced, to be neat and uncluttered. Generally, no more than 60% of the total sign area shall be occupied by lettering.

#### 4.4 Color

4.40 Colors should be chosen to complement, not clash, with the facade color of the building. Signs should normally contain not more than three different colors. Fluorescent colors are not permitted.

#### 4.5 Materials and Illumination

4.50 The use of durable and traditional materials is strongly encouraged (metal and wood). All new signs shall be prepared in a professional manner. Paper signs for advertising or identification purposes shall be allowed for not more than 30 days, as temporary signage, and shall not be attached directly to the glass. The date on which a paper sign was first displayed shall be written on the sign, so as to be readily seen.

4.51 In general, any illumination used shall be external, non-flashing, and glare less.

4.52 Internal illumination is generally discouraged, but it may be appropriate in certain circumstances, such as:

4.521 Individual back-lit letters which are silhouetted against a softly illuminated wall, and

4.522 Individual letters with translucent faces, containing soft lighting elements inside each letter. However, such signs are generally suitable only on contemporary buildings.

4.53 Neon signs may be permitted in exceptional cases where they are custom-designed to be compatible with the building's historic and architectural character.

#### 4.6 Other Stylistic Points

4.60 The shape of a projecting sign shall be compatible with the period of the building to which it is affixed, and shall harmonize with the lettering and symbols chosen for it.

4.61 Supporting brackets for projecting signs should complement the sign design, and not overwhelm or clash with it. They must be adequately engineered to support the intended load, and generally should conform to a 2:3 vertical-horizontal proportion. Screw holes must be drilled at points where the fasteners will enter masonry joints, to avoid damaging bricks, etc.

### 5.0 **OTHER DEVELOPMENT**

#### 5.1 Pedestrian Amenities

5.10 While pedestrian amenities must be compatible with the town's historic character, variations shall be permitted in order to re the vitality and the variety of the town's different thoroughfares and neighborhoods.

5.11 Different types of public spaces should respond to the following general performance criteria:

- Commercial Streets shall be treated simply with maximum open sidewalk space, minimal obstruction on the ground and pedestrian preference for street crossing.

- Historic, Non-Commercial Pedestrian Streets and Walks shall have a smaller scale, more intimate design using textures and smaller elements that stimulate interest along the path.

- Mill Yards should be restored as historic to the public.

- Canal and Riverfronts were not typically pedestrian spaces in the 19th century but should be opened up to the public due to their historic interest and value as a public amenity.

Parking Areas must be carefully designed and landscaped due to their large size and first-impression impact upon visitors.

Parks should provide day-time cultural activity for the districts as well as relief from paved areas.

## 5.2 Streetscape

### 5.20 Paving and Planting

5.201 Tree corridors or canopies, stone walls, and roadside planting should be extended and strengthened.

5.202 The existing streetscape should be enriched, especially around historic buildings and heavily used pedestrian areas. Historically appropriate improvements should create some consistency while avoiding complete uniformity.

5.203 Historic paving features shall be retained wherever possible and incorporated into the streetscape improvements.

5.204 Subtle variations in paving patterns and materials shall be used to enrich sidewalks and plazas, such as by highlighting patterns in street lights, trees, furniture, street crossings, and entryways.

5.205 Planting shade trees and shrubs shall be encouraged where they would enhance the historic character or create more inviting spaces. Removal of healthy trees over 3" in diameter, measured four feet above ground level, shall be discouraged, except where they threaten existing structures and canal walls.

### 5.21 Street Furniture

5.211 Placement of street furniture which is appropriate to the context, attraction and durable shall be encouraged. Placement of furniture shall be based upon careful study of how people tend to use a street.

### 5.22 Lights, Signs, and Traffic Signals

5.221 Public signs shall utilize compatible graphics, colors, proportions, dimensions, and fabrication methods, in order to create greater consistency and improve their compatibility with their historic setting.

traffic 5.222 Street lights shall be designed to harmonize with their surroundings, and signal poles and mounts shall be as unobtrusive as possible, both physically and visually.

## 5.3 Transportation Facilities

### 5.30 Parking

5.301 Parking lots should be sited at the rear of commercial structures but may be permitted to the side of the structure. This achieves three positive results: 1) a large often aesthetically barren area is avoided along a public street; 2) a building may be designed with two equally attractive "fronts" - one for pedestrians and one for passengers arriving by automobile; and 3) delivery trucks encounter fewer loading space problems and have more room to maneuver free from street traffic.

5.302 Removal of buildings to create ground level parking shall be prohibited.

5.303 Sensitivity to the surrounding landscape and the type of paving material used is important. Landscaping can greatly enhance the appearance of a yard and should be considered an integral part of the design and installation of a driveway. Ground level parking spaces proposed to be located on existing open land shall be adequately landscaped utilizing a combination of shade trees and shrubs for screening. The Commission recommends the use of crushed or washed stones, brick cobblestones, or Belgian block as surface paving materials. Asphalt or hot top is not recommended because it is not visually attractive or historically appropriate. Residential front yards shall not be converted to parking.

#### 5.4 Open Space

##### 5.40 Canal and River Banks

5.401 The historic character and the environments associated with river banks shall be protected.

5.402 Public pedestrian access, safety, and enjoyment shall be considered when construction is proposed adjacent to a river.

##### 5.41 Parks

5.411 Existing parks shall be preserved and enhanced.

5.412 The removal of existing historic structures to create new parks shall be prohibited.

#### → 5.5 Fencing and Screening

##### 5:50 Fencing

5.501 Fences are significant architectural features. Architecturally important fences should be repaired or replaced with new materials that duplicate the old. Other fences may be architecturally unimportant, the result of fence replacement in more recent years. In these cases, property owners are encouraged to upgrade their design rather than duplicate the existing fence.

→ 5.502 Fences along the street facades of historic houses were meant serve a decorative purpose. Such fences should not block a house's view, but complement it; they should be in scale to the property and they should be open, not solid. Narrow pickets (approximately 2 1/2" in width) are preferred to wide pickets. Back and side yard fences which serve a screening purpose may be higher and solid.

5.503 The design of a residential fence should be sensitive to that of the house. Since Federal architecture stressed delicate proportions, the fence in front of such a house should also be delicate in scale, whereas the fence in front of a more massive Victorian house could be heavier. Elaborate fences are suitable for elaborate houses; simple houses should have simple fences.

5.504 If wood is to be used, picket, capped picket, or spindle fences are recommended for anywhere around the yard. Capped flat board fences are most appropriate for side and back yards. The flat board fence with a lattice top is an excellent privacy option for side or rear yards.

5.505 The Commission encourages the retention of suitable cast and wrought iron fences. Such fences should be repaired and painted as necessary. If sections are missing and it is financially feasible, replacement sections should be obtained. Otherwise it is preferable to consolidate the existing sections of the fence than to remove the fence altogether.

5.506 Historically, fences were located along the sidewalk and the continuity of such fences is an important asset to the street. The Commission generally discourages fence relocation to accommodate off-street parking. Gates may be required as an alternative to relocation.

5.507 Chain link, stockade, and wire-type fences are not appropriate in historic districts. Low brick walls and brick planters are also not acceptable unless documented to be an original design feature.

#### 5.51 Screening

5.511 Outdoor storage areas and other uses which are to be screened from view shall be enclosed with an opaque fence or wall built of traditional materials (such as wood or brick) in a manner which is not inconsistent with the historic character of the district.

### 6.0 **CERTIFICATES OF HARDSHIP**

6.1 Where the Historic Districts Commission finds that extraordinary and unnecessary hardships may result from strict compliance with these standards, or where there are exceptional circumstances, it may vary these standards so that substantial justice may be done. In order to issue a Certificate of Hardship, the Commission shall make specific factual findings demonstrating that:

6.10 Owing to conditions specific to a particular building or structure, failure to approve an application will result in substantial hardship, whether financial or otherwise, to the applicant, and

6.11 That granting the application will not involve substantial detriment to the public welfare or substantial derogation from the intent and purpose of the Historic Districts By-Law.

6.2 In granting waivers, the Historic Districts Commission may require such conditions as will, in its judgment, secure substantially the objectives of the standards which have been waived. A Certificate of Hardship shall then be issued.

## **APPENDIX: DETERMINATION OF HARDSHIP**

Application for a Certificate of Hardship shall be made on a form prepared by the Historic Districts Commission. The Commission shall schedule a public hearing concerning the application and any person may testify at the hearing concerning hardship.

The Commission may solicit expert testimony or require that the applicant for a Certificate of Hardship make submissions concerning any or all of the following information before it makes a determination on the application.

1. A professional estimate of the cost of the proposed construction, alteration, demolition, or removal and an estimate of any additional cost that would be incurred to comply with the standards of the Commission for changes necessary for the issuance of a Historic Permit.
2. A report from a licensed engineer or architect with experience in rehabilitation as to the structural soundness of any structures on the property and their suitability for rehabilitation.
3. Estimated market value of the property in its current condition; after completion of the proposed construction, alteration, demolition, or removal; and after changes required by the Commission.
4. In the case of a proposed demolition, an estimate from an architect, developer, real estate consultant, appraiser, or other real estate professional experienced in rehabilitation as to the economic feasibility of rehabilitation or reuse of the existing Structure on the property.
5. Amount paid for the property, the date of purchase, and the party from whom purchased including a description of the relationship, if any, between the owner of record or applicant and person from whom the property was purchased, and any terms of financing between the seller and buyer.
6. If the property is income-producing, the annual gross income from the property for the previous two years; itemized operating and maintenance expenses for the previous two years; and depreciation deduction and annual cash flow before and after debt service, if any, for the previous two years;
7. Remaining balance on any mortgage or other financing secured by the property and annual debt service, if any, for the previous two years.
8. All appraisals obtained within the previous two years by the owner or applicant in connection with the purchase, financing, or ownership of the property.
9. Any listing of the property for sale or rent, price asked, and others received, if any, within the previous two years.
10. Assessed value of the property according to the two most recent assessments.
11. Real estate taxes for the previous two years.
12. Form of ownership or operation of the property, whether sole proprietorship, for-profit or not-for-profit corporation limited partnership, joint venture, or other.

# Middlesex North Registry of Deeds

## Electronically Recorded Document

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### Recording Information

Document Number	: 11566
Document Type	: DEED
Recorded Date	: April 22, 2025
Recorded Time	: 03:54:42 PM
Recorded Book and Page	: 39199 / 193
Number of Pages(including cover sheet)	: 4
Receipt Number	: 1051406
Recording Fee (including excise)	: \$1,990.40

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MASSACHUSETTS EXCISE TAX  
Middlesex North ROD #14 001  
Date: 04/22/2025 03:54 PM  
Ctrl# 109078 10731 Doc# 00011566  
Fee: \$1,835.40 cons: \$402,500.00  
\*\*\*\*\*

### **Middlesex North Registry of Deeds**

**Karen M. Cassella, Registrar**

**370 Jackson Street**

**Lowell, Massachusetts 01852**

**978/322-9000**

**[www.lowelldeeds.com](http://www.lowelldeeds.com)**

Property Address: 6 Old Elm Street, Billerica, MA

## **QUITCLAIM DEED**

PACE INDUSTRIES, LLC, a Delaware limited liability company, with a principal office located at 2049 E. Joyce Boulevard, Suite 201, Fayetteville, Arkansas 72703,

*for consideration paid, and in full consideration of the sum of Four Hundred Two Thousand Five Hundred and 00/100 (\$402,500.00) Dollars,*

*grant to CRT DEVELOPMENT REALTY, LLC, a Massachusetts limited liability company,*

### *WITH QUITCLAIM COVENANTS*

A certain parcel of land with all the buildings and improvements thereon, situated in Billerica, in the County of Middlesex and Commonwealth of Massachusetts, bounded and described as follows:

The land, with buildings and improvements thereon, situated in Billerica, Middlesex County, Massachusetts on the southerly side of Elm Street and the easterly side of Wilson Street, thus bounded and described:

Parcel One:

The land with the buildings and improvements thereon situated in North Billerica, Middlesex County, Massachusetts, being a certain parcel of land designated as Parcel B on a plan entitled, "Plan of Land in Billerica, Mass.," prepared by Claudio Sala, P.L.S. Registered Land Surveyor, dated November 15, 2013 and recorded in the Middlesex North Registry of Deeds in Plan Book 237, Plan 27.

Parcel Two:

The land in North Billerica, together with the buildings thereon, presently known and numbered 4-6 Wilson Street and being shown as Lot 3 on plan "A" of a plan of land entitled, "Plan of a Portion of Property, Belonging to the Talbot Mills, North Billerica, Mass.," showing division into lots, surveyed 1926-27-36, by J.C. and W.T. Monahan, C.E. recorded with Middlesex North District Registry of Deeds, Plan Book 60, Plan 25, bounded and described as follows:

Westerly: by said Wilson Street, sixty-nine and 05/100 (69.05) feet;

Northerly: by Lot 2, on said plan, one hundred seven and 24/100(107.24) feet;

Northeasterly: by Lot 1, on said plan, seventy-two and 02/100 (72.02) feet;

Easterly: by land now or formerly of Talbot Mills, fifty (50) feet; and

Southerly: by Lot 4, on said plan, one hundred eighty-two and 29/100 (182.29) feet.

But excepting therefrom:

Lot 3-A as shown on a plan entitled "Plan of Land in Billerica, Mass., for Cambridge Tool & Mfg. Co. Inc." Surveyed by Robert M. Gill & Associates, Inc., dated June 5, 2002 and recorded in Plan Book 209, Plan 2

The Grantor, after being first duly sworn, hereby certifies and states that the conveyance hereunder does not constitute the sale or transfer of all or substantially all of the Grantor's assets within the Commonwealth of Massachusetts,

Meaning and intending to convey, and hereby conveying, that portion of the premises referred to in the Warranty Deed from Leggett & Platt, Incorporated, successor in interest to Cambridge Tool & Mfg. Co., Inc., to Pace Industries LLC, f/k/a L&P Aluminum Holdings, LLC, dated March 27, 2008, and recorded in Middlesex County Northern District Registry of Deeds Book 22079, Page 41.

See affidavit of name change from L&P Aluminum Holdings, LLC to Pace Industries, LLC recorded in the Middlesex County Northern District Registry of Deeds Book 22332, Page 6.

This conveyance is not a sale of all or substantially all of Seller's assets in the Commonwealth of Massachusetts.

*[The remainder of this page is intentionally left blank. Signature page to follow.]*

EXECUTED as an instrument under seal this 8<sup>th</sup> day of April, 2025.

PACE INDUSTRIES, LLC

By: 

Name: Douglas Albert

Title: CEO

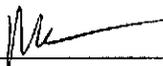
COMMONWEALTH/STATE OF MICHIGAN

Oakland County, ss

On this 8 day of April, 2025, before me, the undersigned notary public, Douglas Albert personally appeared, proved to me through satisfactory evidence of identification, which was a driver's license or government issued photographic identification issued by North Carolina or personally known to me, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he/she/they signed it voluntarily for its stated purpose, as duly authorized CEO of Pace Industries, LLC, as the voluntary act of Pace Industries, LLC.



(Official Seal)

  
[Signature]

Notary Public: MARVIN ALKAS-SHAMOUN

My Commission Expires: 3-14-2031

MARVIN ALKAS-SHAMOUN  
Notary Public, State of Michigan  
County of Genesee  
My Commission Expires 03-14-2031  
Acting in the County of Oakland

**RANNE P. WARNER vs. LEXINGTON HISTORIC DISTRICTS COMMISSION.**

64 Mass. App. Ct. 78

October 19, 2004 - July 22, 2005

Middlesex County

Present: ARMSTRONG, C.J., GREENBERG, & TRAINOR, JJ.

This court concluded that a historic district commission's decision denying a landowner's application seeking a certificate of appropriateness for certain proposed improvements on her lot was, on its face, not based on a legally tenable ground, where the decision relied on criteria not found in the relevant enabling act or by-law, consisted of mere repetition of statutory language, and failed to link any alleged harm to a relevant statutory factor. [82-84]

The case was heard by S. Jane Haggerty, J., on a motion for summary judgment, and entry of final judgment was ordered by her.

Michael A. Murphy for the plaintiff.

William L. Lahey for the defendant.

ARMSTRONG, C.J. The plaintiff, Ranne Warner, owns a house and lot at the corner of Hancock Street and Hancock Avenue in Lexington (town). Her land lies within one of the three historic districts (the Hancock-Clarke Historic District) established in the town by St. 1956, c. 447 (the Act). In 2000, she sought a certificate of appropriateness from the town's historic districts commission (commission) for improvements to her driveway and yard that she had largely already constructed. The commission denied her application, and Warner sought judicial review of its decision under § 10 of the Act. In 2003, a Superior Court **Page 79** judge, acting on the commission's motion for summary judgment, entered a final judgment affirming the commission's decision. Warner appeals from that judgment.

The improvements at issue are these: first, a gravel driveway extension of a paved driveway that runs from Hancock Avenue parallel to the rear line of Warner's lot,<sup>1</sup> the purpose of the extension being to provide additional parking; second, a low, railroad-tie retaining wall, topped by a cast iron rail fence,<sup>2</sup> separating the gravel extension from Warner's yard; and, third, cedar fencing for a compost pile located between the end of the gravel extension and the back corner of the lot.

We mention, by way of background, that this was not Warner's first encounter with the commission. In 1994 and 1995, she received certificates of appropriateness for major improvements to the same property. These included rebuilding and enlarging a passageway from her house to a barn, extending the driveway from Hancock Street around the barn and out to Hancock Avenue (thus forming a paved segment that Warner has lengthened by the gravel

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<sup>1</sup> Neither the existing paved driveway nor the gravel extension abuts the rear lot line; a photograph shows a buffer of lawn, bushes, and trees.

<sup>2</sup> Warner represents that the cast iron fence has been on the property for many decades from the early 1900's, apparently in another location.

extension), creating a parking cut-out off the Hancock Avenue segment of the driveway to accommodate off-street parking, and repainting the house, barn, and shutters with a new, agreed-upon color scheme. By 2001, the commission had come to quarrel with Warner's execution of the work authorized in 1994-1995.

Lexington's was one of the earliest of the Commonwealth's historic district statutes, being preceded, so far as we know, only by St. 1955, c. 616, which created the Historic Beacon Hill District in Boston. The purpose of the Act was to protect "historic buildings, places and districts through the development of appropriate settings for said buildings, places and districts and through the maintenance of said buildings, places and districts as landmarks of historic interest." St. 1956, c. 447, § 1. The role of the commission is to police the construction, alteration, and demolition of visible buildings and structures within the defined district, including changes of color and posting **Page 80** of signs. In particular § 9 of the Act, as applied to Warner's application, required the commission to "pass upon . . . [t]he appropriateness of exterior architectural features of . . . structures to be erected within the historic districts whenever such features are subject to view from a public street, way, or place." St. 1956, c. 447, § 9(a)(1). Warner acknowledged that the gravel drive extension, the railroad-tie retaining wall and cast iron rail fence, and the cedar fence proposed for the compost area were all at least "slightly visible" from Hancock Avenue, thus establishing the necessity of a certificate of appropriateness to proceed with the work.<sup>3</sup> On appeal Warner does not argue that the wall, the two fences, and the gravel driveway extension are not "structures" within the commission's jurisdiction.<sup>4</sup>

Upon receipt of an application for a certificate of appropriateness for a project involving "external architectural features," the commission is required by the statute to conduct a public hearing (St. 1956, c. 447, § 8) and to render a determination on the application within a specified time. In making its determination, the commission is required to "consider, among other things, the historic value and significance of the building or structure, the general design, arrangement, texture, material, and color of the features, sign or billboard involved and the relation of such factors to similar factors of buildings and structures in the immediate surroundings." St. 1956, c. 447, § 9(a)(4), third **Page 81** par. Where a project is deemed generally inappropriate, the commission is directed to consider whether a "failure to approve an application will involve a substantial hardship to the applicant and whether such application may be approved without substantial detriment to

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<sup>3</sup> Warner argues that the "extent [to which] the work is subject to view from a public street" is a disputed issue of fact, precluding summary judgment; but we understand the materiality of the issue relates not to the commission's jurisdiction but only to the reasonableness of its determination that the work was not appropriate.

<sup>4</sup> The concession is, we think, correctly made. Walls and fences have been held to be "structures" within the coverage of historic district statutes, see *Globe Newspaper Co. v. Beacon Hill Architectural Comm'n*, [421 Mass. 570](#), 581 (1996); and the definitions section of the general historic districts enabling act, G. L. c. 40C, § 5, explicitly includes "fence[s], wall[s], terrace[s], walk[s] or driveway[s]" as "structures." We recognize that the General Law, enacted by St. 1971, c. 359, § 1, and its predecessor act, St. 1960, c. 372, was enacted after the Lexington historic districts act; but it has been held that "where we interpret path-breaking legislation in the historic-preservation field, we should not be quick to infer large differences from subsequent legislative fine tuning and refinement of statutory language." *Globe Newspaper Co. v. Beacon Hill Architectural Comm'n*, 421 Mass. at 581.

the public welfare and without substantial derogation from the intent and purposes of this act." St. 1956, c. 447, § 9(a)(4), second par. Then, "[i]n the case of disapproval of an application for a certificate of appropriateness," the commission is required to "notify the applicant in writing, setting forth therein the reasons for its determination," and it "may make recommendations to the applicant with respect to appropriateness of design, arrangement, texture, material, color, and similar factors" (emphasis supplied). St. 1956, c. 447, § 9(c).

Here, the commission's notice of determination, after a brief introduction describing the application, consisted of five dispositive paragraphs. The first three described the failure of Warner and her husband to complete satisfactorily the work done under the 1994-1995 certificates of appropriateness. The painting of the barn was incomplete. The cupola had been left a different color from the barn itself. The slate roof remained in a state of disrepair. Shutters removed from the house during the repainting had never been put back, and, indeed, Warner, despite assurances to the commission that the shutters would be rehung, had removed most of the hardware necessary for rehanging. Neighbors were complaining of peeling paint. The commission stated in its determination that "the Warners had never completed their original project. All Certificates of Appropriateness clearly state that upon completion of construction, the work is expected to be kept in good condition; clearly this was not the case with the barn."

The remaining two dispositive paragraphs of the notice of determination, set out below,<sup>5</sup> relate that the commission considered the various factors that the Act, as quoted above, **Page 82** directed it to consider. This it does largely by reciting the statutory language; missing are explanations of

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<sup>5</sup> "At the conclusion of the hearing, in accordance with the provisions of chapter 447, Acts of 1956, as amended ('Act'), the Commission unanimously determined that the requested driveway extension almost to the property line . . . as well as the retaining wall and iron pipe fence over same, were not appropriate for the purposes of the Act. The Commission determined that failure to approve the application would not involve substantial hardship to the Applicant, owing to conditions especially affecting the property at 30 Hancock Street but not affecting the historic district generally. Even if substantial hardship owing to said conditions were shown, which it was not, the Commission determined that approval of the above items could not be given without substantial derogation from the intent and purposes of the Act and without substantial detriment to the public good, especially to the neighboring properties and Hancock Avenue properties, in general.

"In summary, the Commission, in reaching its unanimous determination, considered the applicant's proposal for the driveway extension, railroad-tie retaining wall with the iron pipe railing over it, including, size, general design, arrangement, texture and materials. The Commission considered the approved bituminous concrete driveways maintained by the Applicant at this location, including and especially the size of same, considered generally the building lot and the buildings themselves, including the historical value and significance of the buildings, and the Commission took into account the relation of all said conditions to other properties in the immediate surroundings. Prior to reaching its unanimous decision, the Commission recommended that the homeowners finish the original renovation of the house: including rehanging the shutters, repairing the barn and repainting it and also finishing the painting of the cupola. The Commission also stressed the point that enlarging the parking area parallel to Hancock Street almost to the property line, where there is a 'dump' for composting and workmen's trash, would compact the land to an extent that the roots of the large trees belonging to the neighbors along that area would be crushed and thus starved, thereby killing the trees in a few years time. . . ."

how those statutory factors bore on their denial of the certificate, the reasons, in effect, for their determination.<sup>6</sup>

The Superior Court, in reviewing the adequacy of the decision of a historic district commission, applies "a standard of review analogous to that governing exercise of the power to grant ordinary special permits," taken from the zoning context. *Gumley v. Board of Selectman of Nantucket*, [371 Mass. 718](#), 719 (1977). See *Marr v. Back Bay Architectural Comm'n*, [23 Mass. App. Ct. 679](#), 682-683 (1987). A "decision of the commission cannot be disturbed . . . 'unless it is based on a legally untenable ground, or is unreasonable, whimsical, capricious or arbitrary.'" *Gumley v. Board of Selectman of Nantucket*, supra at 723, quoting from *MacGibbon v. Board of Appeal of Duxbury*, [369 Mass. 512](#), 515-516 (1976). The judge should conduct a two-step inquiry. First, the judge should determine whether **Page 83** the decision, on its face, is "insufficient in law to warrant the commission's determination." *Marr v. Back Bay Architectural Comm'n*, supra at 683. If so, the decision "should be annulled without further ado unless the court, in the exercise of its discretion, chooses to request a supplemental statement of the commission's reasons before any further proceedings are had." *Ibid.* Compare *Ford*, *Judicial Review in Zoning Variances Cases & Related Matters*, 61 Mass. L.Q. 24 (1976).

"If the commission's decision appears to be based on a legally tenable ground, the court must then consider whether the reasons given are 'warranted by the evidence' . . . ." *Marr v. Back Bay Architectural Comm'n*, 23 Mass. App. Ct. at 684. "The court is obliged to take evidence and make findings of fact on this branch of the inquiry." *Ibid.* Focusing on this principle, Warner argues, with some plausibility, that the judge could not properly affirm the commission's decision without first affording her the de novo review of the facts called for by § 10 of the Act. We do not reach this contention because, in our view, the commission's decision failed the first prong of the inquiry.

The principal and recurring focus of the factual portion of the commission's decision was the failure to complete the 1994 and 1995 improvements. To the extent that the commission relied on that failure, it erroneously "inject[ed] criteria not found in the enabling act . . . or in the by-law." *Dowd v. Board of Appeals of Dover*, [5 Mass. App. Ct. 148](#), 156 (1977) (discussing zoning by-law and enabling act). Accord *Fafard v. Conservation Comm'n of Reading*, [41 Mass. App. Ct. 565](#), 571 (1996). The balance of the commission's decision consisted of paraphrasing statutory language, without making specific findings. Mere repetition of statutory language does not adequately support the commission's decision. See *Wolfson v. Sun Oil Co.*, [357 Mass. 87](#), 89-90 (1970); *Josephs v. Board of Appeals of Brookline*, [362 Mass. 290](#), 298 (1972); *Delgaudio v. Board of Appeals of Medford*, [1 Mass. App. Ct. 850](#), 850-851 (1973).

The commission's finding that the improvements would kill neighbors' trees appears to be logically relevant in applying the hardship exception and the substantial detriment criterion. St. 1956, c. 447, § 9(a). The commission failed otherwise to **Page 84** link harm to neighboring trees to a statutory factor. Historic district commission decisions affirmed by this court have clearly explained the project's impact on enumerated statutory factors such as historic character or neighborhood context. See *Sleeper v. Old King's Highway Regional Historic Dist. Comm'n*, [11 Mass. App. Ct. 571](#), 573 (1981) (radio tower did not fit with low physical profile of surrounding

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<sup>6</sup> The sole articulation of a reason is the final sentence relating to parked cars endangering neighboring trees.

structures and with historical context); *Anderson v. Old King's Highway Regional Historic Dist. Comm'n*, [397 Mass. 609](#), 612 (1986) (vinyl siding would diminish historic significance of property, cause deterioration of the structure, and set detrimental precedent for neighborhood); *Harris v. Old King's Highway Regional Historic Dist. Comm'n*, [421 Mass. 612](#), 616 (1996) (home with three-car garage and outbuilding would overwhelm small lot, be out of keeping with massing and organization of neighborhood homes, and appear incongruous from street).

We conclude that the commission's decision was facially deficient. There is no need for the Superior Court to engage in an evidentiary hearing beyond establishing the record of the decision of the commission. The court may annul the decision or, in its discretion, request a supplemental statement of the commission's reasons. *Marr v. Back Bay Architectural Commn.*, 23 Mass. App. Ct. at 683. The judgment is reversed, and the case is remanded to the Superior Court for further proceedings consistent with this opinion.

So ordered.



# Billerica Historic Districts Commission

365 Boston Road, Billerica, MA 01821

www.town.billerica.ma.us/HDC

968-671-0962

*David Gagliardi-Chair  
Richard Hawes  
George Simolaris  
Tina Pesiridis-Alt.*

*Travis Brown-Vice Chair  
John McKenna  
Mary Jones-Alt.  
Dan Valentine-Alt.*

*Mary K. McBride-Secretary  
Michael Rea  
Kathy Meagher-Alt.*

## *Application for Certificate of Hardship Talbot Mills Dam Removal*

RECEIVED  
TOWN OF BILLERICA  
JUN 13 10 26 AM 2025

The following item was Denied at the Historic District Commission hearing on June 4, 2025:

Application Name	Location	Description	Major/Minor	Application #
CRT Development Realty, LLC	Talbot Mills Dam / Concord River	Dam removal	Major	2025-01

**Vote:**

None (0) in favor – six (6) opposed.

**Findings:**

Pursuant to Section 12(d) of the Bylaw to Establish Historic Districts Commission, a Certificate of Hardship shall be issued if the Commission determines that, owing to conditions specific to a particular building or structure, failure to approve an application will result in substantial hardship, whether financial or otherwise, to the applicant, and that granting the application will not involve substantial detriment to the public welfare or substantial derogation from the intent and purpose of this By-Law, the Commission shall grant a Certificate of Hardship.

Commission found that loss of the dam would not be in the public's best interest as the dam has local and national historical significance and should be protected and preserved.

**Katherine Malgieri**  
Planning and Community Development  
Director

<b>Part I</b>	ADMINISTRATION OF THE GOVERNMENT
<b>Title VII</b>	CITIES, TOWNS AND DISTRICTS
<b>Chapter 40C</b>	HISTORIC DISTRICTS
<b>Section 10</b>	ADDITIONAL POWERS, FUNCTIONS AND DUTIES OF COMMISSION

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Section 10. The commission shall have the following additional powers, functions and duties:—(a) If the commission determines that the construction or alteration for which an application for a certificate of appropriateness has been filed will be appropriate for or compatible with the preservation or protection of the historic district, the commission shall cause a certificate of appropriateness to be issued to the applicant. In the case of a disapproval of an application for a certificate of appropriateness the commission shall place upon its records the reasons for such determination and shall forthwith cause a notice of its determination, accompanied by a copy of the reasons therefor as set forth in the records of the commission, to be issued to the applicant, and the commission may make recommendations to the applicant with respect to appropriateness of design, arrangement, texture, material and similar features. Prior to the issuance of any disapproval the commission may notify the applicant of its proposed action accompanied by recommendations of changes in the applicant's proposal which, if made, would make the application acceptable to the commission. If within fourteen days of the receipt of

such a notice the applicant files a written modification of his application in conformity with the recommended changes of the commission, the commission shall cause a certificate of appropriateness to be issued to the applicant.

(b) In the case of a determination by the commission that an application for a certificate of appropriateness or for a certificate of nonapplicability does not involve any exterior architectural feature, or involves an exterior architectural feature which is not then subject to review by the commission in accordance with the provisions of section eight, the commission shall cause a certificate of nonapplicability to be issued to the applicant.

(c) If the construction or alteration for which an application for a certificate of appropriateness has been filed shall be determined to be inappropriate, or in the event of an application for a certificate of hardship, the commission shall determine whether, owing to conditions especially affecting the building or structure involved, but not affecting the historic district generally, failure to approve an application will involve a substantial hardship, financial or otherwise, to the applicant and whether such application may be approved without substantial detriment to the public welfare and without substantial derogation from the intent and purposes of this chapter. If the commission determines that owing to such conditions failure to approve an application will involve substantial hardship to the applicant and approval thereof may be made without such substantial detriment or derogation, or in the event of failure to make a determination on an application within the time specified in section eleven, the commission shall cause a certificate of hardship to be issued to the applicant.

(d) Each certificate issued by the commission shall be dated and signed by its chairman, vice-chairman, secretary or such other person designated by the commission to sign such certificates on its behalf.

(e) The commission shall keep a permanent record of its resolutions, transactions, and determinations and of the vote of each member participating therein, and may adopt and amend such rules and regulations not inconsistent with the provisions of this act and prescribe such forms as it shall deem desirable and necessary for the regulation of its affairs and the conduct of its business. The commission shall file a copy of any such rules and regulations with the city or town clerk.

(f) The commission shall file with the city or town clerk and with any department of the city or town having authority to issue building permits a copy or notice of all certificates and determinations of disapproval issued by it.

(g) A commission may after public hearing set forth in such manner as it may determine the various designs of certain appurtenances, such as light fixtures, which will meet the requirements of an historic district and a roster of certain colors of paint and roofing materials which will meet the requirements of an historic district, but no such determination shall limit the right of an applicant to present other designs or colors to the commission for its approval.

(h) The commission may, subject to appropriation, employ clerical and technical assistants or consultants and incur other expenses appropriate to the carrying on of its work, and may accept money gifts and expend the same for such purposes. The commission may administer on behalf of the city or town any properties or easements, restrictions or other interests in

real property which the city or town may have or may accept as gifts or otherwise and which the city or town may designate the commission as the administrator thereof.

(i) The commission shall have, in addition to the powers, authority and duties granted to it by this act, such other powers, authority and duties as may be delegated or assigned to it from time to time by vote of the city council or town meeting.

**Town of Reading**  
**Historic District Commission**



***Design Guidelines***  
**for**  
**Local Historic District**

*Adopted – May 2006*

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**Almost all construction work on the outside of a property located in the Historic District, including fences, requires review by the Historic District Commission and in many cases a building permit from the Building Inspector. Always check with the Commission and the Building Inspector before having such exterior work performed.**

## **Introduction**

Reading is a rare community in its architecture and history. Few towns have so many homes whose styles and construction methods span three centuries, and a heritage that includes settlement in the mid-1600s and a colonial militia that fought during the Battle of Lexington and Concord.

The Town's Historic District reflects that rich heritage. It was the site of the first settlement in today's Reading and the site for the mustering of the militia on April 19, 1775. The District is a showcase of modest and diverse houses built from the mid-1700s to the Victorian Period to the post-World War II suburban boom. Numerous homes have been honored by being placed on the National Register of Historic Places. This architectural diversity reflects how West Street, like Reading itself, grew from a 17<sup>th</sup> century farming village to a mature 21<sup>st</sup> century suburb.

## **Background**

The Historic Districts Act, Massachusetts General Laws Chapter 40C, was created to protect and preserve the historic resources of the Commonwealth through a local review system that encourages and ensures compatible improvement and development. In general, local historic districts have three key purposes:

1. To preserve and protect the distinctive characteristics of buildings and places significant to the history of the Commonwealth and its cities and towns;
2. To maintain and improve the settings of those buildings and places; and
3. To assure that new construction is compatible with existing buildings and their historic relationship to other buildings in their vicinity.

Under Massachusetts General Laws Chapter 40C and Town of Reading Bylaws, Section 5.18, the Historic District Commission is required to review the architectural appropriateness of most proposed exterior design changes, whether they be a minor alteration, new additions, or removal of trim or structures. Property owners in the Historic District are required to obtain a certificate from the Commission prior to starting any exterior work on buildings or structures. Please note that, by Town Bylaw, the Building Inspector cannot issue a building permit for exterior work or demolition without the necessary certificate from the Commission. Anyone contemplating exterior work should contact the Commission and property owners are encouraged to present preliminary plans at a regularly scheduled Commission meeting to better understand Commission requirements.

## **Purpose of Guidelines**

These Guidelines are intended to help the Commission and homeowners in the Historic District make sure that physical alterations and new construction are done in a manner that respects this heritage and are compatible with the historic architecture and streetscape. They are also intended to help the Commission make consistent and informed decisions about what is and what is not appropriate.

The Guidelines are not meant to prevent change or freeze houses as they are. They are to guide exterior changes as houses are inevitably adapted to contemporary needs and requirements. They are meant to balance individual creativity in design with continuity in the District's physical and cultural character, with the goal of enhancing the quality of the built environment for all residents.

## **General Guidelines**

In the District, the Historic District Commission shall determine whether the proposed construction, alteration or demolition of an exterior architectural feature, as seen from a public way, will be appropriate to preserve the character and appearance of the District. Commission members may refer to the available house-by-house description when reviewing applications to better understand architectural and historic significance. The Commission also serves as a resource. It can recommend publications and provide information about appropriate design and use of materials.

In the District, each building or structure shall be recognized as a physical and cultural record of its time, place and use. The historic *character* of a building or structure shall be retained and preserved even if the materials are not retained in all cases. The removal of historic materials or alteration of features that characterize a building or structure shall be avoided as determined by the Commission.

The purpose of reviewing a proposal is to make sure any change honors the history and cohesiveness in the architectural style of individual houses and reflects the best qualities of the home's period. For this reason, these guidelines cannot be a prescriptive design manual of simple "do's" and "don'ts." Reasonable judgment is involved, from both the applicants and the Commission.

It is not the intent of the Commission to dictate style or taste by the review process. Rather, it will review the compatibility of a proposal with existing architecture, the site, streetscape, and the community. It will review land coverage, massing (bulk), proportions, design, detail and materials.

Changes and additions to the property and its environment that have taken place over the course of time are evidence of the history of the property and the neighborhood. These changes to the property may have developed significance in their own right, and this significance should be recognized and respected.

The review process will only be extended to the form and detail that are perceptible from a public way. But it is the Commission's authority to determine whether a property and certain features are visible from a public way, and to proceed with the review when appropriate.

## **General Guidelines - *continued***

Deteriorated historic features should be repaired rather than replaced. All architectural changes shall be appropriate to the original style of the building or structure (if sufficient evidence exists for it), or to its altered style (if it has been significantly altered to reflect characteristics of a later style).

Where the severity of deterioration requires replacement of a distinctive feature, the new feature should match the old in design, color, texture, and the other visual qualities and, where possible, materials. Replacement of missing features should be substantiated by documentary, physical, or pictorial evidence.

Whenever possible, new materials should match the material being replaced with respect to their physical properties, design, color, texture and other visual qualities. The use of imitation replacement materials is discouraged. The use of substitute replacement materials is generally discouraged because the replacement of historic materials on a large scale may jeopardize the integrity of a historic resource. Every means of repairing deteriorating historic materials or replacing them with identical materials should be examined before turning to substitute materials.

The Commission acknowledges, however, that use of alternative materials may be necessary under certain conditions, such the following:

- the unavailability and / or unaffordability of historic materials
- the unavailability of craftspeople skilled in the use of historical materials
- inherent flaws in the original materials
- code-required changes

Under the above conditions, the Commission may consider substitute materials that

- are compatible with the historic materials in appearance
- have similar physical properties to the historic materials, or are installed in a manner that tolerates differences
- meet certain basic performance expectations over time: At the time of their appearance before the Commission, applicants must be prepared to answer questions about the long-term performance of the materials they propose to use

Demolition of part or all of a structure is considered to be an alteration to the exterior and is subject to determination of review by the Commission.

When applying for approval to demolish a building, it is necessary for the Commission to approve the proposed footprint of the replacement building. The importance of the old building to the streetscape, as well as its historical significance, will be considered by the Commission.

## The District's Characteristics

Characteristics which are encouraged and which contribute to the uniqueness of the District include:

- Modest designs that are residential in scale and with such elements as porches, dormers, etc.
- Emphasis on craftsmanship for overall design as well as detail
- Use of natural materials
- Compact but not oversized ratio of building mass (bulk) to land
- Variety of vernacular architectural styles with an emphasis on simplicity of design

## General Principles for Design Used in a Review

**Character** – Is the proposal appropriate to the existing community character which is illustrated by the variety of architectural styles?

**Harmony** – Does the proposal have a consistency and unity of form and detail which is separate from style and building type?

**Site Context** – How successful is the relationship between a proposal and its surroundings relative to setbacks, heights, and the harmony and character of streetscape?

**Spatial Relationship** – Does the proposal address the issue of varying sizes of front, side and rear spaces in relation to site and adjacent properties?

## Specific Principles for Design

**Scale** – Does the proposal demonstrate a balance relationship in the parts of the design and a domestic scale consistent with other structures in the district?

**Height** – Does it have relationship of height to that of adjacent properties which tend to be consistent within streetscapes of areas of the overall community?

**Massing/Bulk** – Is there an overall relationship of the building size and scale relative to the lot and to surrounding properties?

**Setback** – Does the relationship to site and to streetscape maintain balance and harmony within the streetscape?

**Roof** – Are the shapes and angles consistent with surrounding roof shapes and pitches to maintain balance and setbacks and visual lines?

**Fenestration** – Do the patterns and rhythms of windows and doors maintain a balance, which can be symmetrical or asymmetrical and convey a sense of function?

**Materials** – Is the exterior cladding, roof, window, door, and architectural trim compatible with materials used in the district?

**Surface Treatments** – Is there an overall harmony of texture and detail?

## Examples of Items Subject to Review

The following list of examples of the *most frequent items* as seen from a public way that are subject to review should be considered to be a guideline only. It is not intended to be all-inclusive.

- Exterior HVAC equipment (excluding window air conditioners)
- Exterior lighting fixtures
- Garden houses/storage sheds
- Non-vegetative landscaping (fencing, walls, drive/pathways)
- Outside stairs (except as required by Law)
- Roofing
- Roof Decks
- Siding
- Skylights
- Street furniture
- Swimming pools
- Temporary garages
- Trellises
- Windows

## Exemptions from Review

- Chimney caps
- Paint color
- Flagpoles, sculpture mailboxes (freestanding or attached), window boxes, house numbers
- Gutters and downspouts
- Interior items such as features, colors, or materials
- Mechanical and plumbing vents
- Ordinary maintenance and Repair of any exterior architectural feature of buildings and structures within the historic district. (“Ordinary maintenance and repair” does not include replacement, or changes of materials, design, or size of the existing feature.)
- Outdoor furniture
- Plant materials/trees
- Play sets
- Solar Panels
- Storm windows and doors
- Satellite antennae or similar mechanical equipment
- Temporary signs or structures for celebrations, charitable drives or other purposes
- Terraces, walks, sidewalks or similar structures, provided that any such structure is substantially at grade level; any change to existing grade level will be subject to review.

## **Further Advice**

**Fencing** – Natural fencing is encouraged where possible. Wire fencing may be installed inside hedges to make them less child, pet, and ball permeable. Fences of wood, stone, brick or iron are encouraged; vinyl or other synthetic fences are not an appropriate material in the district. Fences across the front of a property are discouraged, especially across the front of a house. Stone walls should be left intact.

**Roofing** – Whenever possible retain original roof covering or replace deteriorated roof covering with material that matches the old in composition, color, size, shape, texture and installation detail.

**Shutters** – Shutter size is an important component; generally they are to be one-half the size of the window so that they can close and cover the height of the window or appear to do so.

**Siding** – The use of aluminum, vinyl or other synthetic siding is generally discouraged.

**Masonry** – Wherever possible, original masonry and mortar should be retained. Original mortar should be duplicated in composition, texture, joint size, joint profile and method of application. Deteriorated masonry should be repaired and replaced with material which matches as closely as possible the original.

**Windows and Doors** – The opening dimensions of original and later doors and windows are best preserved, as are original or later important window elements such as sash, lintels, sill, architrave, glass, shutters and other decorative elements and hardware.

## **Policy Regarding New Technology**

The Commission recognizes the importance of and encourages the use of energy efficient technologies and their use within the District.

When an application is filed that includes use of new technology that is not already addressed in the District's Guidelines, then efforts to evaluate the visual impact on the District as a whole and the impact to a structure shall be considered. Both the long-term effect on the District and adherence to the established Guidelines shall be reviewed. Overall visual impact shall take precedence particularly concerning outside wiring, conductive tubes or piping or any other means to conceal heating/cooling conduits or associated products. The goal of review will be to ensure that the effect of the new technology on the exterior appearance of the structure is minimized (i.e., located behind the house, screened with foliage, painted to match the house, etc.).

New technologies shall include but not be limited to the following:

1. Energy efficient technology such as HVAC mini-splits, EV charging stations, etc.
2. A/V equipment, outside televisions, etc.

Exceptions:

1. Solar installations are protected under M.G.L. Chapter 40 Section 3 and are not subject to this Policy.
2. Window air conditioning units.

## **New Exterior Additions**

New exterior additions should:

1. preserve significant historical materials, features, and forms of the historic building;
2. be designed to complement, not replicate, the style of the historic building; and
3. be clearly distinguishable from, and subordinate to, the historic building.

The Commission requests that applicants consider placing the addition on a secondary facade, rather than on the primary facade.

Applicants are encouraged to review the design guidelines from the Department of the Interior on this issue, available here: <https://www.nps.gov/orgs/1739/upload/preservation-brief-14-exterior-additions.pdf>

## **Application Information and Instructions:**

**Contact the Commission before you begin any exterior work within the Historic District:** Property owners in the Historic District are required to obtain a certificate from the Commission prior to starting any exterior work on buildings or structures. Once an application is received, the Commission will determine within 14 days whether the proposal is subject to review by the Commission and will require a public hearing. Such hearing is to be held within 45 days of receipt of application. Please note that, by Town Bylaw, the Building Inspector cannot issue a building permit for exterior work or demolition without the necessary certificate from this Commission. Anyone contemplating exterior work should contact the Commission. Property owners are encouraged to present preliminary plans at a regularly scheduled Commission meeting to better understand Commission requirements.

### **Summary of Commission Authority:**

The Historic Districts Act, Massachusetts General Laws Chapter 40C, was created to protect and preserve the historic resources of the Commonwealth through a local review system that encourages and ensures compatible improvement and development. Under Chapter 40C and Town Bylaw, the Historic District Commission is required to review the architectural appropriateness of most proposed exterior design changes, whether they be a minor alteration, new additions, or removal of trim or structures. The applicant bears the burden of establishing that the proposed work is not inconsistent with the historic nature of the district. The Commission will issue a Certificate of Non-Applicability for items specifically excluded from review. Failure to comply with the Reading Town Bylaws establishing the Historic District by failing to obtain a required certificate or refusing to cease uncertified work can result in penalties as described in Reading General Bylaw Section 1.8.

### **Types of Certificates:**

Certificate of Appropriateness – Required for exterior alterations and new construction that is subject to public view unless specifically exempted by the Bylaw.

Certificate of Non-Applicability – Issued for matters that are specifically excluded from review under the Bylaw.

Certificate of Hardship – Issued when the denial of a Certificate would constitute a hardship, financial or otherwise, on the property owner and if the proposed work does not conflict substantially with the intent and purposes of the Bylaw. Approval of a Certificate of Hardship requires detailed documentation of specific hardship to an individual property owner.

### **Required Documentation:**

In addition to the documentation specifically listed on the application form, a “Request for Certified Abutters List” may be required. This form should be filled out and submitted if required by the HDC. It is best to provide as much documentation in advance of the hearing to expedite the process. Required documentation can be presented at the formal hearing, however, this may delay action on the application. Based on the complexity or unique nature of a particular project, the Commission may, as allowed by law, require additional information. Failure to provide sufficient documentation could delay approval or be cause for a negative determination.

### **Contact Information:**

The Commission typically meets once a month at 7:00PM. The meetings are held at the Reading Town Hall, 16 Lowell Street. Applications, including document submittal, may be made online or a completed paper application may be submitted to the Public Services Department located in the Reading Town Hall. Any inquiries should be directed to the Commission’s Chair at [HDC@ci.reading.ma.us](mailto:HDC@ci.reading.ma.us).



## Review Standards of the Chelmsford Historic District Commission

Accepted at the May 2, 2022 Historic District Commission meeting.  
To replace any existing Rules and Regulations previously used by this Commission.

## **1. PURPOSES**

- 1.1. The purpose of the Standards is to guide rehabilitation and construction in the historic district in the Town of Chelmsford in order to preserve and protect the distinctive characteristics of buildings and places significant in the history and architectural heritage of the town through the maintenance and improvement of settings for such buildings and places, through the encouragement of design compatible therewith, and through the prevention of development which would impair or be unduly detrimental to the locally or nationally significant structures of the district. The Commission shall be guided by these Review Standards when acting on any application.
- 1.2. The goal is to minimize reliance on the individual tastes and preferences of those who happen to be awarding permits and instead establish clear rules and guidelines that everyone will understand.

## **2. WORK REQUIRING A CERTIFICATE OF APPROPRIATENESS**

- 2.1. A Certificate of Applicability shall be required for any change to, construction of, removal of, relocation, addition or alternation to a building, structure, site or sign, provided that said change, construction, removal, relocation, addition and/or alteration, when completed, is subject to public view, or otherwise effects that portion of a building, structure, site or sign presently to public view from a public way, public park or public body of water. The following work would generally require a Certificate of Appropriateness:
  - A building
  - Air conditioner, permanently installed (that is, one for more than twelve (12) consecutive months)
  - Alteration of any exterior feature
  - An addition
  - Any interior signage and window lighting visible from a public way
  - A window, exterior door or door frame
  - Awnings and Canopies
  - Change of roofing material
  - Change or replacement of exterior material
  - Chimney
  - Driveway
  - Exterior light fixtures
  - Fence
  - Foundation
  - Garage, shed, other dependent building
  - Landscaping
  - Permanent signs/Replacement of signs/Temporary signs
  - Solar panels
  - Stonewall
  - Swimming pool or tennis court
  - Walk or curb

Pursuant to the Town of Chelmsford Historic District By-Law, a Certificate of Appropriateness is not required for the following categories of work on buildings or structures or exterior architectural features: (a) color or paint; (b) the color of materials used on roofs; (c) the reconstruction substantially similar in exterior design of a building, structure or exterior architectural feature damaged or destroyed by fire, storm or other disaster, provided such reconstruction is begun within one year thereafter and carried forward with due diligence; and (d) storm doors and windows, screen doors and windows.

In the event that the Historic District Commission determines that the work sought to be completed is not subject to public view, or does not affect that portion of a building, structure, site or sign subject to public view, it may issue a Certificate of Non-Applicability. Applicants are encouraged, however, to refer to these Review Standards even in instances where a Certificate of Appropriateness is not required, in order to ensure that any proposed building rehabilitation or construction is consistent with the spirit and intent of historic preservation.

2.2 For Purposes of these Review Standards, the definitions contained in G.L. c. 40C, subsection 5 are incorporated by reference herein.

### 2.3 Enforcement and Penalties

2.30 The Historic District Commission shall determine whether a particular activity is in violation of these Review Standards or not, and the Historic District Commission shall be charged with the enforcement of these Review Standards.

2.31 The Historic District Commission, upon a written complaint of any resident of the Town of Chelmsford, or owner of property within the Town of Chelmsford, or upon its initiative, shall institute any appropriate action or proceedings in the name of the Town of Chelmsford to prevent, correct, restrain or abate violation of these Review Standards. In the case where the Historic District Commission is requested in writing by any resident or owner of property within the Town of Chelmsford to enforce these Review Standards against any person allegedly in violation of same and the Historic District Commission declines to act, the Historic District Commission shall notify, in writing, the party requesting such enforcement of any action or refusal to act and the reasons therefore, within twenty-one (21) days of receipt of such request.

2.32 Whoever violates any of the provisions of these Review Standards shall be punishable by a fine of up to \$300.00 for each offense. Each day during any portion of which such violation continues to exist shall constitute a separate offense.

2.33 The Historic District Commission shall designate the Building Commissioner of the Town of Chelmsford to act on its behalf and to enforce these Review Standards under the direction of the Historic District Commission.

## **3. EXISTING STRUCTURES**

### 3.1 Removal of Structures

### 3.10 Demolition

3.101 There shall be a presumption toward retaining all buildings in the district.

3.102 Demolition shall be allowed only when the new construction relates better to the Historic District than does the existing building, and when all the other requirements below are satisfied.

3.1021 A prerequisite for demolition shall be an application for Certificate of Hardship, which shall contain a financial report detailing the costs of rehabilitation and evidencing that the existing building is incapable of producing a reasonable economic return on the investment. The maximum rate of return which is theoretically possible on the land, with new buildings, shall not constitute such evidence, if the existing buildings can generate a reasonable return.

3.1022 If an applicant's request for permission to demolish a structure or part of a structure is based upon structural instability or advanced deterioration, a technical report prepared by an architect or professional engineer registered in Massachusetts and approved by the commission shall be submitted, detailing the nature and extent of the specific problems, and providing reasonably accurate cost estimates for their correction.

3.1023 Applications for permission to demolish existing structures shall be accompanied by complete plans for the new development proposed on the site, together with a timetable and a budget for both the demolition and the reconstruction, as well as satisfactory evidence that adequate financing is available.

3.1024 A standard condition of approval for demolition shall be the documentation of the building's elevations, including details of specific notable architectural features (windows, doors, cornices, etc.), through measured drawings and photographs. Such data shall be provided according to the procedures established by the Historic American Building Survey available online at <https://www.nps.gov/hdp/habs/index.htm>.

3.1025 In addition, demolition of any structure over 75 years old is subject to review by the Historical Commission under Town Bylaws.

### 3.11 Relocation

3.111 Buildings shall be retained on their present sites. Relocation shall be considered only as an alternative to demolition. Standards 3.1021, 3.1023, 3.1024, and 3.1025 above shall apply.

3.112 Buildings shall be relocated preferably within the District or to sites where they would be compatible with the architectural, cultural and landscape surroundings.

## 3.2 Maintenance Advisory

- 3.20 Owners of all buildings shall provide sufficient maintenance to keep such buildings from falling into a state of poor repair.
- 3.21 Owners shall therefore be responsible for providing maintenance necessary to prevent the deterioration of the structure, which could cause either an unsafe condition or a detrimental effect upon the character of the Historic District or which could lead to a later claim that deterioration has become so advanced that demolition or removal of the architectural features is necessary, owners should monitor and maintain;
- 3.211 Foundations, exterior walls or other vertical supports (exterior or interior);
- 3.212 Roofs or other horizontal members (including joists, beams, etc.);
- 3.213 Chimneys or chimney support system;
- 3.214 Architectural features (including but not limited to windows and door trim, parapets, roof cresting, cornices);
- 3.215 Rainwater drainage systems (gutters, downspout) whether exterior or interior;
- 3.216 Water-proofing systems (roofing, flashing, windows, doors, paint on wooden or corrosible metallic surfaces); and
- 3.217 Any other elements which, if not adequately maintained, would eventually cause the building to crack, bulge, buckle, sag, rot, crumble or collapse, in whole or in part.

In cases where deterioration has already progressed to an advanced stage, and where immediate removal is requested by the owner, the standards for demolition shall be applied.

## 3.3 Changes to Structures

### 3.30 General Participation

#### 3.301 Historic Architectural Character

- 3.3011 The historic architectural character of each building shall be maintained or restored. Buildings shall be rehabilitated to reveal their historic materials and details. Missing architectural elements shall be recreated. Significant existing materials shall be retained by stabilizing, repairing or matching them with compatible new materials as required.

3.3012 The architectural character of each historic period is made up of several key factors. Each period interpreted these design elements in its own characteristic fashion. These factors or elements are:

Scale — Relationship to human size, form and perception.

Rhythm — The pattern of repeating elements such as windows, columns, arches and other facade elements, trees, other buildings, etc.

Form — Overall shapes, combinations or shapes as seen from different perspectives, skylines, and contours.

Massing Height, setback of major building elements, roof panes.

Proportion — The relationship among the dimensions of various elements.

Features Building elements such as windows, doors, cornices, roofs, porches, widow walks, balconies, cupolas, and decorative trim.

Materials — The "skin" of each building, consisting traditionally of brick, cast iron, steel, sheet metal, wood, glass, terra cotta and slate.

3.3013 The viability of the District's residential neighborhoods shall be enhanced by restoring and preserving residential buildings while respecting the historic character created by the various architectural features defining roof and facade.

### 3.302 Commercial Streets

The commercial integrity of the Chelmsford Town Center District shall be protected through sensitive rehabilitation and new construction that provides a continuity of shops along the street frontages.

### 3.31 Historic Materials

3.311 Masonry - Shall be returned to a serviceable and visually acceptable state by replacing missing masonry units and mortar with matching elements and repointing and stabilizing using proper techniques and materials. Cleaning shall be accomplished using the gentlest effective means possible, so as not to damage either the masonry unit or the mortar joints. Cleaning specifications shall be submitted to the Historic District Commission for review prior to commencement of the work. Coatings to stabilize or waterproof masonry shall be permitted only if they have been proven not to block the masonry's water vapor permeability or to contribute to its long-term deterioration.

3.3111 Old mortar should be duplicated in joint size, method of application, and joint profile.

- 3.3112 Masonry should be cleaned only when it is necessary to halt deterioration and always with the gentlest method possible, such as low-pressure water and soft natural bristle brushes. DO NOT HIGH-PRESSURE WASH OR SANDBLAST MASONRY UNDER ANY CIRCUMSTANCES. Chemical cleaning products which could have an abrasive reaction with masonry should be avoided.
- 3.3113 Deteriorated original materials should be repaired or replaced, where necessary, with new materials that duplicate the old as closely as possible. Replacement bricks should be carefully matched in size and color to the originals.
- 3.3114 New additions should follow traditional brick coursing and appearance.
- 3.3115 Foundations should be repaired or extended with the material of the existing foundation, wherever possible. The exposed portion of a foundation for a new building will be evaluated on an individual case basis.
- 3.3116 The original or early color and texture of masonry surfaces should be retained whenever possible. Brick or stone surfaces may have been painted or whitewashed for practical and aesthetic reasons. Indiscriminate removal of paint from masonry surfaces may be historically incorrect and may also subject the building to harmful damage. Masonry facades shall not be painted unless there is evidence that the building was painted originally.
- 3.3117 Chimneys are an important architectural feature. They should not be shortened or removed but repaired as necessary.
- 3.3118 Existing stucco should be repaired with a stucco mixture duplicating the original as closely as possible in appearance and texture.
- 3.312 Wood — Missing or deteriorated wooden features shall be sensitively replaced with new wood milled to match the original elements and existing features shall be repaired whenever possible.
- 3.3121 Deteriorated material should be repaired or replaced, where necessary with new material that duplicates the original as closely as possible. If a house is to be re-clapboarded, the clapboards should line up to match the window heads and sills. Clapboards should be applied smooth side exposed.
- 3.3122 Synthetic sidings (such as vinyl) are not allowed for properties in historic districts, unless approved by the Historic District Commission. Their installation is discouraged because of the loss of architectural detail when it is carelessly applied; because the long-term effects (such as rot or deterioration) on the underlying

wooden structure are unknown; because they can create unsuspected fire hazards; and because the synthetic siding is difficult to repair and will itself need painting in time. Wood has been the most traditional siding material in Chelmsford. Wood is easily worked, has natural insulating qualities, is adaptable, plentiful, relatively inexpensive, and resistant to denting. It can be patched, refinished, and repainted or stained. And it has its own singular beauty. For all of these reasons, every reasonable effort should be spent to keep the original siding on a building. If replacement is absolutely necessary, new wood clapboards will look better than any synthetic material and will, with care, last longer.

3.3123 Original details such as trim, cornice, brackets, corner and sill boards, quoins, window and door hoods and casings, and all other decorative elements shall be retained or replicated in kind.

3.3124 Wood shingles are only appropriate for exterior cladding if they were used as a siding material of the style of the structure in question. Shaped shingles and shingle patterns for such a structure should be duplicated in kind where repair and replacement are necessary.

3.313 Metals — Missing or deteriorated architectural metals shall be replaced with original or substitute metal fabrications or other visually compatible and durable features manufactured from acceptable alternative materials.

3.314 Colors — It is recommended that architectural features should be restored with colors and finishes appropriate to the nature of the materials and to the character of the original building. Where original colors are not to be used, historic colors within the spirit of the period should be substituted.

### 3.32 Major Building Elements

3.321 Commercial Storefronts — Existing historic storefronts shall be retained and rehabilitated. Generally, the term "historic" in these standards shall refer to the appearance of the building fifty or more years ago. Storefronts which have been altered or removed shall be restored or compatibly redesigned. Research should be done to discover each storefront's original appearance, and to learn what architectural features might be covered by existing siding or facing material.

3.322 Doors and Entries — Existing historic doors shall be retained and rehabilitated. Where doorways must be altered to meet current building code and safety requirements, doors and entranceways shall be designed also to respect the exterior architectural integrity of the building.

3.3221 Original or historically significant entries (including reveals, doors, surrounds, vestibule sidewalls, transoms or fanlights, sidelights and other features) may not be altered.

- 3.3222 If replacement doors are necessary, new doors shall be appropriate to the existing surround in style, material and proportions.
- 3.3223 Residential doors should be made of wood. Pine and fir are most commonly used for exterior doors. Replacement doors should have the appropriate panel arrangement for the date of the building's construction. Metal doors on houses are not acceptable.
- 3.3224 Generally, it is not appropriate to introduce a new door opening into the principal or front elevation. The appropriateness of new side or rear doors depends upon their design. (See 3.3225.)
- 3.3225 The elaborateness of the entrance is related to the design of the house. Simple houses tend to have relatively plain doorways while more ornate houses have more highly decorated doorways. Therefore, when a replacement doorway is necessary on the principal facade or a new doorway is being added on a side or rear facade, it should harmonize with the style of the house as far as the type and extent of detail. Large sheets of glass are not generally in keeping with the character of an historic house.
- 3.3226 Doorways above ground level which provide secondary egress must be individually evaluated. In general, approval will result only when visibility from the street is minimal. The addition of exterior staircases to buildings is generally not acceptable.
- 3.3227 Deteriorated porticos, porches, steps and railings should be repaired with materials that duplicate the original. Front steps should be replaced in-kind with the material historically used with the particular style building.
- 3.3228 It is recommended that storm doors be consistent with the historic period of the building. Replacement door hardware should replicate the original or be of an appropriate design.
- 3.3229 Exterior lighting shall be in traditional locations. The design of these fixtures should be of an appropriate size and not imitate styles earlier than the building. Sodium vapor lights are not permitted on private property.
- 3.324 Awnings and Canopies — Use of awnings and canopies on entranceways and front facing windows is strongly discouraged.
- 3.325 Windows — Existing historic windows shall be retained and repaired whenever possible. Where replacement is essential, new windows shall match the originals or be in character with the building. The original window type (hung sash, casement, pivot, awning, etc.) shall be retained, as shall be the appearance of the individual lights of glass formed by the muntin grid. The original width and depth of the individual elements (such as exterior molding

and/or casing, exterior frame, exterior sash members and exterior muntin) shall be reproduced or be closely approximated.

3.3251 Replacement windows for original wood windows should be made of wood. Aluminum and vinyl windows are not recommended.

3.3252 The muntin thickness and profile of replacement windows should approximate those of the original historic windows. Also, the proportions of the frame to the sash should be preserved. Windows with removable muntin bars are not acceptable.

3.3253 Only clear-pane, non-tinted glass shall be used (except to replace original stained glass). Mirrored and tinted heat-reflective glass are not appropriate.

3.3254 The frame and decorative window trim should be retained and repaired, if necessary, with materials that duplicate the original as closely as possible. Application of metal or vinyl panning over original wood trim is not allowed.

3.3255 Exterior window shutters may not be appropriate to every architectural style and the Commission should be consulted before action is taken to remove or install them. Where replacement shutters are installed, they shall be wood constructed and match the height and one-half the width of the window opening and replicate a traditional shutter. All shutters shall be properly secured with shutter hardware so as to be operable, not nailed to the window casing.

3.3256 Original skylights should be retained, repaired or replaced in kind. Size, location and materials are important determinants for the acceptability of skylights. Bubble skylights are not permitted.

3.326 Roofs — Features which give the roof its essential historical character shall be preserved or restored to the extent that they are visible from the ground. The principal considerations include the original roof shape; original roofing materials or materials compatible with the old in composition, size, shape and texture; and architectural details such as dormer windows, cupolas, cornices, brackets, chimneys, cresting and weathervanes.

3.3261 Roof replacement materials should be sensitive to the original. Slate roofs should be retained whenever possible. Slate should not be removed without a careful evaluation of the cost of its repair.

3.3262 Wooden or cooper gutters can be an important architectural feature. In older houses, they were often designed as part of the eave moldings. Therefore, gutters should be properly maintained and only replaced in cases of extreme deterioration.

3.3263 New gutters and downspouts should be replaced in an architecturally sensitive manner and match the surface and color on which they are installed.

3.3264 Historic dormers shall be retained and repaired or restored. Expansion of existing dormers or adding new dormers may be approved on a case-by-case basis provided designs are based on historic models.

3.327 Industrial Hardware — Historically significant industrial hardware shall be preserved and contemporary hardware judged to be of a significant design shall be retained.

3.328 Mechanical Equipment — Essential outdoor mechanical equipment (ducts, fans, solar panels, etc.) shall be installed in locations which create the least disturbance to the historical appearance of the building and which involve the minimum alteration to its structural integrity. All mechanical equipment must be screened from public view.

3.329 Solar Panels — Only roof mounted solar panels shall be allowed in the Chelmsford Historic District, provided the following guidelines are met: Installation of solar collectors shall not permanently change any architectural feature. A minimum of two (2) feet of roof surface should be visible surrounding the collector array. Framing, piping insulation, etc. should match the roof surface. Collectors should be mounted to match roof slope (parallel to roof and no more than three (3) inches above the roof surface). Piping should be concealed from view.

A Certificate of Appropriateness is required for all solar panel installations within the Chelmsford Historic District visible from a public way or place. In deciding whether to issue a Certificate of Appropriateness, the Commission will consider, among other things, a building's importance, prominence and historic significance, visual impact and glare.

All equipment should be installed in locations which (a) create the least disturbance to the historic appearance of the building, (b) involve the least additional structural alterations and (c) are screened, hidden or otherwise shielded from view to the extent possible.

Proposed installation of all solar collectors will be subject to the rules and guidelines of the Chelmsford Historic District Commission.

## **4. NEW CONSTRUCTION**

### **4.1 General Principals**

4.10 Character - New Construction on currently vacant sites in the town center shall be encouraged to reinforce the character embodied in the traditional New England town pattern, closely framing the road.

4.11 Continuity — New buildings should not be designed as freestanding objects but instead shall generally conform to the tradition of continuous structures holding the lines of streets, canals, etc.

4.12 Ground-Level Design — On commercial streets, ground-level building design shall generally follow existing patterns created by the type and scale of shops, street facades, sign design, shop window configurations and materials traditional to the town center.

- 4.13 Materials — New buildings shall utilize exterior materials in keeping with the exteriors seen in the district and follow guidelines indicated in Section 3.31 Historic Materials.
- 4.14 New Buildings — New buildings and structures shall reflect the traditional height, scale, preparations, rhythms and mood of historic structures. These traditional architectural values should be interpreted into new building design, but the use of imitation historic building details and ornaments is discouraged. Building design must also be internally consistent and amalgamation of historically unrelated stylistic elements shall be generally prohibited.

**5. SIGNAGE**

5.1 General

- 5.10 All new signs and all changes in the appearance of existing signs displayed so as to be visible from public ways require a Certificate of Appropriateness.
- 5.11 Temporary signs are those intended to be used for a period of thirty (30) days or less and shall not be allowed for more than thirty (30) days. Temporary signs do not require a Certificate of Appropriateness but do require an application for a Certificate of Non-Applicability.
- 5.12 If there is a conflict between these standards and the requirements in the Town Sign Code (Article VII “Signs and Outdoor Lighting”), the stricter shall apply.

5.2 Location and Size of Signs

- 5.20 Signs must not dominate building facades or obscure their architectural features (arches, transom panels, sills, moldings, cornices, windows, etc.).
- 5.21 The size of signs and individual letters shall be an appropriate scale for pedestrians and slow-moving traffic.
- 5.22 Signs on adjacent storefronts should be coordinated in height and proportion and color. The use of a continuous sign-band extending over adjacent shops within the same building is recommended, as a unifying element.
- 5.23 Portable signs located on sidewalks, driveways or in parking lots, or mounted on wheels, trailers, or motor vehicles if those vehicles, trailers, or wheeled signs are regularly located for fixed display, are not allowed. Sandwich boards, blackboards, dry erase boards and other similar temporary freestanding menu displays are not permitted, unless permitted under a Certificate of Appropriateness.
- 5.24 Wall signs shall be located no higher than the windowsill line of the second story. A roof-mounted sign is not permitted.

- 5.25 Signs displayed during business hours only, such as those which are removed every evening and displayed again the following morning, constitute an on-going advertising format and shall be construed as being permanent signs rather than temporary signs, if such display continues for more than fourteen (14) calendar days. The date when such sign was first displayed shall be affixed in a permanent manner to the sign so as to be readily seen.

Signs located within a building and visible from a public way, public street, public park or public body of water, through windows, doors or otherwise, are not permitted unless permitted under the Town Sign Code (Article VII "Signs and Outdoor Lighting").

### 5.3 Messages and Lettering Signs

- 5.30 Messages should be as simple and brief as possible. The use of pictorial symbols or logos is encouraged.
- 5.31 Lettering should be of a traditional block or curvilinear style which is easy to read and not incompatible with the style of the building. No more than two different styles should be used on the same sign.
- 5.32 Letters should be carefully formed and properly spaced, to be neat and uncluttered. Generally, no more than 40% of the total sign area shall be occupied by lettering.

### 5.4 Color

- 5.40 Colors should be chosen to complement, not clash, with the facade color of the building. Signs should normally contain not more than three different colors. Neon and/or florescent colors are not allowed.

### 5.5 Materials and Illumination

- 5.50 The use of durable and traditional materials is strongly encouraged (metal and wood). Signs shall not be made of plastic. All new signs shall be prepared in a professional manner. Paper signs for advertising or identification purposes shall be allowed for not more than fourteen (14) days, as temporary signage.
- 5.51 The date on which a paper sign was first displayed shall be written on the sign, so as to be readily seen.
- 5.52 No neon lighted signs will be permitted if visible from a public way.

### 5.6 Other Stylistic Points

- 5.60 The shape of a projecting sign shall be compatible with the period of the building to which it is affixed and shall harmonize with the lettering and symbols chosen for it.

5.61 Supporting brackets for projecting signs shall complement the sign design and not overwhelm or clash with it. Screw holes must be drilled at points where the fasteners will enter masonry joints to avoid damaging bricks, etc.

## **6. OTHER DEVELOPMENT**

### 6.1 Pedestrian Amenities

6.10 While pedestrian amenities must be compatible with the town's historic character, variations shall be permitted in order to respect the vitality and the variety of the town's different thoroughfares and neighborhoods.

6.11 Different types of public spaces should respond to the following general performance criteria:

- a. Commercial streets shall be treated simply with maximum open sidewalk space, minimal obstruction on the ground and pedestrian preference for street crossing.
- b. Historic, non-commercial pedestrian streets and walks shall have a smaller scale, more intimate design using textures and smaller elements that stimulate interest along the path.
- c. Parking areas must be carefully designed and landscaped due to their large size and first impression impact upon visitors.

### 6.2 Streetscape

#### 6.20 Paving and Planting

- 6.201 Tree corridors or canopies, stonewalls and roadside planting should be extended and strengthened.
- 6.202 The existing streetscape should be enriched, especially around historic buildings and heavily used pedestrian areas. Historically appropriate improvements should create some consistency while avoiding complete uniformity.
- 6.203 Historic paving features shall be retained whenever possible and incorporated into the streetscape improvements.
- 6.204 Subtle variations in paving patterns and materials shall be used to enrich sidewalks and plazas, such as by lighting patterns in streetlights, trees, furniture, street crossings and entryways.
- 6.205 Planting shade trees and shrubs shall be encouraged where they would enhance the historic character or create more inviting spaces. Removal of healthy trees over six (6) inches in diameter, measured ten (10) feet above the ground level, shall be reviewed by the Historic District Commission..

6.206 Shrubs and trees may be planted as screening for modern equipment, i.e. HVAC, and must be maintained by the property owner.

## 6.21 Street Furniture

6.211 Placement of street furniture which is appropriate to the context, attractive and durable shall be encouraged. Placement of furniture shall be based upon careful study of how people tend to use a street.

## 6.22 Lights, Signs and Traffic Signals

6.221 Public signs shall utilize compatible graphics, colors, proportions, dimensions and fabrication methods, in order to create greater consistency and improve their compatibility with their historic setting.

6.222 Streetlights shall be designed to harmonize with their surroundings and traffic signal poles and mounts shall be as unobtrusive as possible, both physically and visually.

6.3 Parking — When possible, parking facilities shall be situated in the rear of a building away from public view.

## 6.4 Open Space

### 6.40 Parks and Public Spaces

6.401 Existing parks and public spaces shall be preserved and enhanced. The addition of structures in existing parks and public spaces shall be prohibited other than historic markers and monuments.

6.402 The removal of existing historic structures to create new parks shall be prohibited.

## 6.5 Fencing and Screening

### 6.50 Fencing

6.501 Fences are significant architectural features. Architecturally important fences should be repaired or replaced with new materials that duplicate the old.

6.502 Fences along the street facades of historic houses were meant to serve a decorative purpose. Such fences should not block a house's view but complement it; they should be in scale to the property and they should be open, not solid.

Narrow pickets (approximately 2 1/2 inches in width) are preferred to wide pickets. Back and side yard fences which serve a screening purpose may be higher and solid.

- 6.503 The design of a residential fence should be sensitive to that of the house. Since Federal architecture stressed delicate proportions, the fence in front of such a house should also be delicate in scale, whereas the fence in front of a more massive Victorian house could be heavier. Elaborate fences are suitable for elaborate houses; simple houses should have simple fences.
- 6.504 If wood is to be used, picket, capped picket or spindle fences are recommended for anywhere around the yard. Capped, flat board fences are most appropriate for side and back yards and dumpsters. The flat board fence with a lattice top is an excellent privacy option for side or rear yards.
- 6.505 The Commission encourages the retention of suitable cast and wrought iron fences. Such fences should be repaired and painted as necessary. If sections are missing and it is financially feasible, replacement sections should be obtained. Otherwise, it is preferable to consolidate the existing sections of the fence than to remove the fence altogether.
- 6.506 Historically, fences were located along the sidewalk and the continuity of such fences is an important asset to the street. The Commission generally discourages the fence relocation to accommodate off-street parking. Gates may be required as an alternative to relocation.
- 6.507 Chain link, stockade, vinyl and wire-type fences are not appropriate in historic districts. Low brick walls and brick planters are also not acceptable unless documented to be an original design feature.

## 6.61 Screening

- 6.611 Outdoor storage areas and other uses which are to be screened from view shall be enclosed with an opaque fence or wall built of traditional materials (such as wood or brick) in a manner which is not inconsistent with the historic character of the district.

## 7. CERTIFICATES OF HARDSHIP

- 7.1 Exceptions — Where the Historic District Commission finds that extraordinary and unnecessary hardships may result from strict compliance with these standards or where there are exceptional circumstances, it may vary these standards so that substantial justice may be done. In order to issue a Certificate of Hardship, the Commission shall make specific factual findings demonstrating that:

- 7.10 Owing to conditions specific to a particular building or structure, but not affecting the historic district generally, failure to approve an application will result in substantial hardship, whether financial or otherwise, to the applicant, and
- 7.11 That granting the application will not involve substantial detriment to the public welfare or substantial derogation from the intent and purpose of the historic by-law.

7.2 Waivers — In granting waivers, the Historic District Commission may require such conditions as will, in its judgment, secure substantially the objectives of the standards which have been waived. A Certificate of Hardship shall then be issued.

#### APPENDIX: LISTING OF FORMS

The following application forms can be obtained by contacting the Clerk of the Historic District Commission:

- Application for a Certificate of Appropriateness
- Application for a Certificate of Hardship

# **Concord Historic Districts Act**

Chapter 345, Special Act approved by the State Legislature May 2, 1960 and amended through April 2010.

## **Town of Concord**

Special Act-Historic Districts Commission

An act establishing an historic districts commission for the town of Concord and defining its powers and duties, establishing historic districts in the town of Concord, and providing for historic zoning districts. Be it enacted etc., as follows:

### **Section 1. Purpose**

The purpose of this Act is to promote the educational, cultural, economic and general welfare of the public through the preservation and protection of buildings, places and districts of historic or literary significance through the development and maintenance of appropriate settings for said buildings, places and districts and through the maintenance of said buildings, places and districts as sites and landmarks compatible with the literary and historic tradition of Concord.

## **Section 2. Establishing of Districts**

There is hereby established in the town of Concord the following historic districts:

- Barrett Farm District
- American Mile District
- North Bridge - Monument Square District
- Main Street District
- Hubbardville District
- Church Street District

The locations and boundaries of the historic districts shall be as shown on the map on file in the office of town clerk entitled "historic districts, town of Concord" scale of 1" = 100', consisting of 15 sheets, dated January 1985 as may be amended from time to time in accordance with section 12.

For purposes of interpretation of the "Historic Districts" map, the following shall apply:

- Boundaries which appear to follow streets, railroad rights of way, or rivers and streams, shall coincide with the center line thereof.
- Where a district boundary appears to divide a lot, the entire lot shall be considered to be within the historic district for the purposes of this act.

## **Section 3. Definitions**

As used in this Act, the following words and terms shall have the following meanings:

- "Building," a combination of materials having a roof and forming a shelter for persons, animals or property.
- "Building inspector," the building inspector of the Town of Concord.
- "Commission," the historic districts commission established by Section 4.
- "Erected," the word "erected" includes the words "built," "constructed," "reconstructed," "restored," "altered," "enlarged," and "moved."
- "Exterior architectural feature," the architectural style and general arrangement of such portion of the exterior of a building or structure as is designed to be open to view from a public street, way or place including the kind, color and texture of the building materials of such portion and the type and style of all windows, doors, lights, signs and other fixtures appurtenant to such portion.
- "Historic districts," the districts established by Section 2.
- "Lot," an area of land in one ownership with definitive boundaries ascertainable from a recorded deed or recorded plan.
- "Person," the word "person" includes an individual, a corporate or unincorporated organization or association and the Town of Concord.
- "Structure," a combination of materials, other than a building, sign or billboard, but including a stone wall.

## **Section 4. Creation and Organization of Historic Districts Commission**

There is hereby created in the Town of Concord an Historic Districts Commission consisting of five unpaid members who shall be residents of the Town of Concord, to be appointed by the Selectmen of the Town. 1 member shall be appointed from 1 of 2 candidates nominated by the Concord Antiquarian Society, doing business as The Concord Museum, the term of such member will expire in the case of the first appointment 1 year from January first following the year of that appointment and every 5 years thereafter. 1 member shall be

appointed from 1 of 2 candidates nominated by the Trustees of the Concord Free Public Library Corporation; the term of such member will expire in the case of the first appointment 2 years from January first following the year of that appointment and every 5 years thereafter. 1 member shall be appointed from 1 of 2 candidates nominated by the Concord Planning Board; the term of such member will expire in the case of the first appointment 3 years from January first following the year of that appointment and every 5 years thereafter. 1 member shall be appointed from 1 of 2 candidates nominated by the Concord Natural Resources Commission; the term of such member will expire in the case of the first appointment four years from January first following the year of that appointment and every 5 years thereafter. 1 member shall be appointed at large by the Selectmen; the term of such member will expire 5 years from January first following the year of that appointment and every 5 years thereafter.

The Selectmen also shall appoint for terms of 5 years from January first following the year of such appointments 5 associate members of the commission selected from candidates nominated by the aforesaid organization, trustees, planning board and commission, each such organization, trustees, board and commission to nominate 2 each when 2 or more associate members are to be appointed and to nominate 1 each when only 1 associate member is to be appointed. In case of the absence, inability to act, or interest on the part of a member of the commission his place may be taken by an associate member designated by the chairman of the commission. In case of a vacancy on said commission the chairman may designate an associate member to serve as a member of the commission until said vacancy is filled as provided in this Section. As the term of any member or associate member expires, his successor shall be appointed in like manner for a term of 5 years. Vacancies in the commission shall be filled in the same manner for the unexpired term. Every member and associate member shall continue in office after the expiration of his term until his successor is duly appointed and qualified. Any member or associate member may be removed for cause by the appointing authority upon written charges and after a public hearing. If the Trustees of the Concord Free Public Library Corporation, the Planning Board, the Natural Resources Commission, or the Concord Antiquarian Society, doing business as the Concord Museum, fail to nominate candidates in accordance with this section within 90 days of a written request by the Select Board for nominees, the Select Board may proceed with an appointment to fill the vacancy.

The commission shall elect a chairman and secretary from its membership. In the case of absence of the chairman from any meeting, the commission shall elect a chairman pro tempore for such meeting.

## **Section 5. Limitations**

1. No building or structure, except as provided under Section 6, shall be erected within the historic districts unless and until an application for a certificate of appropriateness as to exterior architectural features which are subject to view from a public street, way or place shall have been filed with the commission and either a certificate of appropriateness or a certificate that no exterior architectural feature is involved, shall have been issued by the commission.
2. No building or structure within the historic districts, except as provided in Section 6, shall be changed as to exterior color features which are subject to view from a public street, way or place unless and until an application for a certificate of appropriateness as to change in such color features shall have been filed with the commission and such certificate shall have been issued by the commission.
3. No building or structure within the historic districts, except as provided under Section 6, shall be demolished or removed unless and until an application for a permit to demolish or remove the same shall have been filed with the commission, and such permit shall have been issued by the commission.
4. No occupational, commercial or other sign, except as provided under Section 6, and no billboard which is subject to view from a public street, way or place shall be erected or displayed within the historic districts unless and until an application for a certificate of appropriateness shall have been filed with the

commission, and such certificate shall have been issued by the commission. In the case of any such sign or billboard erected or displayed prior to the effective date of this Act, there shall be allowed a period of five years, subsequent to said effective date, in which to obtain such certificate.

5. No landscaping feature which was considered in granting a certificate of appropriateness or permit for demolition or removal and referred to in such certificate or permit as a necessary condition to the granting of such approval shall be changed, except for ordinary maintenance.
6. Except in cases excluded by Section 6:
  - No permit shall be issued by the building inspector for any building or structure to be erected within the historic districts, until a certificate of appropriateness or a certificate that no exterior architectural feature is involved has been issued under Section 9.
  - No permit shall be issued by the building inspector for the demolition or removal of any building or structure within the historic districts until a permit has been issued under Section 9.

## **Section 6. Exclusions**

- Nothing in this Act shall be construed to prevent the ordinary maintenance or repair of any exterior architectural feature of any building or structure within the historic districts; nor shall anything in this Act be construed to prevent landscaping changes except landscaping changes, involving more than ordinary maintenance, which relate to landscaping features considered in granting a certificate of appropriateness or permit for demolition or removal and referred to in such certificate or permit as a necessary condition to the granting of such approval; nor shall anything in this Act be construed to prevent the erection, construction, reconstruction, restoration, alteration or demolition of any such feature which the building inspector shall certify is required by the public safety because of an unsafe or dangerous condition; nor shall anything in this Act be construed to prevent the erection, construction, reconstruction, alteration or demolition of any such feature under a permit issued by the building inspector prior to the effective date of this Act.
- The following structures and signs may be erected or displayed within the historic districts without the filing of an application for, or the issuance of, a certificate of appropriateness:
  - Temporary structures or signs for use in connection with any official celebration or parade, or any charitable drive in the Town; provided, that any such structure or sign shall be removed within three days following the termination of the celebration, parade or charitable drive for which said structure or sign shall have been erected or displayed. Any other temporary structures or signs which the commission shall determine from time to time may be excluded from the provisions of Section 5 without substantial derogation from the intent and purposes of this Act.
  - Real estate signs of not more than 3 square feet in area advertising the sale or rental of the premises on which they are erected or displayed.
  - Occupational or other signs of not more than one square foot in area and not more than one such sign, irrespective of size, bearing the name, occupation or address of the occupant of the premises on which such sign is erected or displayed where such premises are located within a single residence district as defined in the Zoning By-Law of the Town of Concord.
- The exterior color of any building or structure within the historic districts may be changed without the filing of an application for, or the issuance of, a certificate of appropriateness to any color or any combination of colors which the commission shall determine from time to time may be used without substantial derogation from the intent and purposes of this act.

## **Section 7. Application to Be Filed With Commission**

Excepting cases excluded by Section 6, any person who desires to erect, build, construct, reconstruct, restore, alter, move, demolish, remove or change the exterior color features of any building or structure now or hereafter within the historic districts, or to erect or display within the historic districts any sign or billboard for which a certificate of appropriateness is required under paragraph 4 of Section 5, shall file with the commission an application for a certificate of appropriateness or a permit for demolition or removal, as the case may be, together with such plans, elevations, specifications, material and other information drawn to scale, as shall be deemed necessary by the commission to enable it to make a determination on the application.

## **Section 8. Meetings, Hearings, Time for Making Determinations**

Meetings of the commission shall be held at the call of the chairman and also when called in such other manner as the commission shall determine in its rules. 5 members, including associate members, of the commission shall constitute a quorum. The commission shall determine promptly, and in all events within 14 days, after the filing of an application for a certificate of appropriateness as to exterior architectural features, whether the application involves any such features. If the commission determines that such application involves any exterior architectural features, the commission shall hold a public hearing on such application. The commission also shall hold a public hearing on all other applications required to be filed with it under this Act, except that the commission may approve an application for a change in exterior color features without holding a hearing if it determines that the color change proposed is appropriate.

The commission shall fix a reasonable time for the hearing on any application and shall give public notice thereof by publishing notice of the time, place, and purpose of the hearing in a local newspaper at least 14 days before said hearing and also, within 7 days of said hearing, mail a copy of said notice to the applicant, to the owners of all property deemed by the commission to be affected thereby as they appear on the most recent local tax list, to the planning board of the Town, and to such other persons as the commission shall deem entitled to notice.

As soon as convenient after such public hearing but in any event within 60 days after the filing of the application, or within such further time as the applicant shall allow in writing, the commission shall make a determination on the application. If the commission shall fail to make a determination within said 60 days, or within such further time allowed by the applicant, the commission shall be deemed to have approved the application.

## **Section 9. Powers, Functions, and Duties of Commission**

The commission shall have the following powers, functions and duties: It shall pass upon:

- The appropriateness of exterior architectural features of buildings and structures to be erected within the historic districts wherever such features are subject to view from a public street, way or place.
- The appropriateness of changes in exterior color features of buildings and structures within the historic districts wherever such features are subject to view from a public street, way or place.
- The demolition or removal of any building or structure within the historic districts. The commission may refuse a permit for the demolition or removal of any building or structure of architectural or historic interest, the removal of which in the opinion of the commission would be detrimental to the public interest.
- The appropriateness of the erection or display of occupational, commercial or other signs and billboards within the historic districts wherever a certificate of appropriateness for any such sign or billboard is required under paragraph 4 of Section 5.

In passing upon appropriateness, demolition or removal, the commission shall determine whether the features, demolition or removal, sign or billboard involved will be appropriate for the purposes of this Act and, if it shall be determined to be inappropriate, shall determine whether, owing to conditions especially affecting the building, structure, sign or billboard involved, but not affecting the historic district generally, failure to approve an application will involve a substantial hardship, financial or otherwise, to the applicant and whether such application may be approved without substantial detriment to the public welfare and without substantial derogation from the intent and purposes of this Act. If the commission determines that the features, demolition or removal, sign or billboard involved will be appropriate or, although inappropriate, owing to conditions as aforesaid, failure to approve an application will involve substantial hardship to the applicant and approval thereof may be made without substantial detriment or derogation as aforesaid, the commission shall approve the application; but if the commission does not so determine, the application shall be disapproved.

In passing upon appropriateness the commission shall consider, among other things, the historical and literary value and significance of the site, building or structure, the general design, arrangement, texture, material and color of the features, sign or billboard involved, and the relation of such factors to similar factors of sites, buildings and structures in the immediate surroundings. The commission shall consider the appropriateness of the size and shape of the building or structure in relation to:

- the land area upon which the building or structure is situated
- the landscaping and planting features proposed by the applicant
- the neighboring sites, buildings or structures within the district. The commission shall also consider the applicable zoning and other by-laws of the Town. The commission shall not consider detailed designs, interior arrangement and other building features not subject to public view.

In approving an application the commission may impose conditions which, if the certificate of appropriateness is acted upon, shall be binding upon the applicant, the owner of the property and his successors in title. Prior to approving an application subject to conditions, the commission may notify the applicant of its proposed action and permit the applicant to express his opinion thereon. The concurring vote of 3 members, including associate members, of the commission shall be necessary to make a determination in favor of the applicant on any matter upon which the commission is required to pass under this Act.

In the case of an approval by the commission of an application for a certificate of appropriateness or a permit for demolition or removal, or in the event an application is deemed approved through failure to make a determination within the time specified in Section 8, the commission shall cause a certificate of appropriateness or a permit for demolition or removal, as the case may be, dated and signed by its chairman or chairman pro tempore, to be issued to the applicant.

In the case of disapproval of an application for a certificate of appropriateness or a permit for demolition or removal, the commission shall cause a notice of its determination, dated and signed by its chairman or chairman pro tempore, to be issued to the applicant, setting forth therein the reasons for its determination, and, as to applications for a certificate of appropriateness, the commission may make recommendations to the applicant with respect to appropriateness of design, arrangement, texture, material, color and similar factors. Prior to the issuance of any disapproval, the commission may notify the applicant of its proposed action accompanied by recommendations of changes in the applicant's proposal which, if made, would make the application acceptable to the commission. If within ten days of the receipt of such a notice the applicant files a written modification of his application in conformity with the recommended changes of the commission, the commission shall cause a certificate of appropriateness or permit for demolition or removal, as the case may be, dated and signed by its chairman or chairman pro tempore, to be issued to the applicant.

In the case of a determination by the commission that an application for a certificate of appropriateness does not involve any exterior architectural feature, the commission shall cause a certificate of such determination, dated

and signed by its chairman or chairman pro tempore, to be issued forthwith to the applicant.

The commission shall keep a permanent record of its resolutions, transactions, and determinations, and may make such rules and regulations consistent with this Act and prescribe such forms as it shall deem desirable and necessary.

The commission shall file with the Town Clerk a notice of all determinations made by it, and approvals of applications through failure of the commission to make a determination within the time allowed under Section 8, except that no notice of a determination that an application for a certificate of appropriateness does not involve any exterior architectural feature shall be filed.

The commission may incur expenses necessary to the carrying on of its work within the amount of its appropriation.

## **Section 10. Appeals**

Any person aggrieved by a determination of the commission or by an approval of an application through failure of the commission to make a determination within the time allowed under Section 8, whether or not previously a party to the proceeding, or any officer or board of the Town may, within 20 days after the filing of a notice of such determination or approval with the Town Clerk, appeal to the Superior Court sitting in equity for the County of Middlesex. Notice of the action with a copy of the complaint shall be given to the Town Clerk so as to be received within such 20 days. The court shall hear all pertinent evidence and determine the facts and if, upon the facts so determined, such determination or approval is found to exceed the authority of the commission, the court shall annul such determination or approval and remand the case for further action by the commission. The remedies provided by this action shall be exclusive; but the parties shall have all rights of appeal and exception as in other equity cases. Costs shall not be allowed against the commission unless it shall appear to the court that the commission acted in bad faith or with malice in the matter from which the appeal was taken.

Costs shall not be allowed against the party appealing from such determination or approval of the commission unless it shall appear to the court that said party acted in bad faith or with malice in making the appeal in court.

## **Section 11. Enforcement**

Any person who violates any of the provisions of this Act shall be guilty of a misdemeanor, and upon conviction thereof shall be fined not less than ten dollars nor more than \$500.

The Superior Court sitting in equity for the County of Middlesex shall have jurisdiction to enforce the provisions of this act and the determinations, rulings and regulations issued there under and may restrain by injunction violations thereof and issue such other orders for relief of violations as may be required.

## **Section 12. Changes in Historic Districts**

The districts described in Section 2 may be enlarged or reduced and new districts may be created by a two-thirds vote at any regular or special Town Meeting called for the purpose. Prior to any such action, the planning board shall hold a public hearing, duly advertised, thereon and shall report its recommendations to the Town Meeting.

## **Section 13. Historic Zoning**

The Town of Concord by a 2/3 vote at any regular or special Town Meeting called for the purpose may enact additions, changes or amendments to its zoning By-laws to assist in carrying out the purpose of this Act. Prior to any such enactment, the planning board shall hold a public hearing, duly advertised, thereon and shall report its recommendations to the Town Meeting.

## **Section 14. Severability of Provisions**

The provisions of this Act shall be deemed to be severable; and in case any section, paragraph or part of this Act shall be held unconstitutional by any court of competent jurisdiction, the decision of such court shall not affect or impair the validity of any other sections, paragraphs or parts of this Act.

## **Section 15**

This Act shall take effect upon its acceptance by the Town of Concord at an annual Town Meeting or at any special Town Meeting called for the purpose.

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Chapter 22

**PLANNING AND DEVELOPMENT\***

<b>Art. I.</b>	<b>In General, §§ 22-1—22-18</b>
<b>Art. II.</b>	<b>Conservation Commission, §§ 22-19—22-37</b>
<b>Art. III.</b>	<b>Historical Provisions, §§ 22-38—22-79</b>
	<b>Div. 1. Commissions and Districts, §§ 22-38—22-49</b>
	<b>Div 2. Demolition Delay, §§ 22-50—22-59</b>
	<b>Div. 3. Landmarks, §§ 22-60—22-75</b>
	<b>Div. 4. Public Buildings, §§ 22-76—22-79</b>
<b>Art. IV.</b>	<b>Urban Design Commission, §§ 22-80—22-94</b>
<b>Art. V.</b>	<b>Economic Development Commission, §§ 22-95—22-99</b>
<b>Art. VI.</b>	<b>Commission on Disability, §§ 22-100—22-104</b>

**ARTICLE I.  
IN GENERAL**

**Sec. 22-1. Department established; duties.**

- (a) A department of planning and development is hereby established in the city to:
- (1) plan zoning, urban renewal, land use and related municipal functions in the field of city planning;
  - (2) coordinate efforts directed toward the future development of the city;
  - (3) plan its continued improvement consistent with its physical, social and economic conditions and resources;  
and
  - (4) exercise the powers, duties and functions of housing and redevelopment authorities under General Laws, chapter 121B as provided in chapter 705 of the Acts of 1975.

(b) The department shall include the director, the planning and development board established by section 22-3, the historical commission, the conservation commission, the urban design commission and such other boards, committees, commissions, agencies or departments as may from time to time be authorized under state or federal law or by ordinance to undertake community development activities. (Rev. Ords. 1973, § 15-2; Ord. No. 102, 12-15-75)

**Sec. 22-2. Director; powers and duties.**

(a) There shall be a director of planning and development who shall be an executive officer of the city and all provisions of law for the appointment and removal of department heads shall be applicable to the position.

(b) The director shall:

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\***Cross references**—Administration, Ch. 2; buildings, Ch. 5; fire protection and prevention, Ch. 10; health and human services, Ch. 12; parks and recreation commission, Ch. 21; public works department, Ch. 25; streets and sidewalks, Ch. 26; zoning, Ch. 30

**State law reference**—Planning generally, G.L. c. 41, § 81A et seq.

- (1) exercise supervision over and direct the personnel and activities of the department;
- (2) act as technical advisor to the mayor, city council, and committees thereof, and other city agencies or officials on municipal planning and development matters;
- (3) advise and assist the commissioner of inspectional services on zoning and permitting matters;
- (4) participate in the preparation and revision of the capital improvement program provided for in section 5-3 of the city charter;
- (5) assist each board, commission or other entity encompassed by the department in the exercise of its responsibilities and in connection therewith provide necessary staff assistance.
- (6) operate and direct the building and land development service counter established under section 22-5;
- (7) perform such other duties in the field of municipal planning and development as the city council or the mayor may direct.

(c) In addition, the director shall exercise the following powers and duties subject to the review and approval of the planning and development board, acting as a planning and development board:

- (1) initiate and conduct studies of the resources and needs of the city and its relationship to the metropolitan area;
- (2) formulate and recommend to the mayor a comprehensive plan and modifications thereof;
- (3) publish and distribute plans or reports as the mayor or city council may authorize in connection with planning and development activities and policies;
- (4) prepare and submit as part of the department budget such budgetary requests as may be necessary to support each board, commission or other entity encompassed by the department;
- (5) ex officio, act as the single member community development authority established under chapter 705 of the Acts of 1975, as amended. (Rev. Ords. 1973, §§ 15-3 and 15-5; Ord. No. 102, 12-15-75; Ord. No. X-62, 11-17-03)

**State law references**—Acts of 1975, chapter 705; Acts of 1982, chapter 479; Acts of 1989, chapter 499; and Acts of 2007, chapter 73.

### **Sec. 22-3. Building and land development service counter.**

There shall be a building and land development service counter, which shall provide assistance to members of the public concerning the various permits and approvals issued by the inspectional services department, zoning board of appeals, conservation commission, historical commission, and historic district commissions. The land development service counter shall receive applications submitted for such permits and approvals, and promptly forward each such application to the appropriate department, board or commission. (Ord. No. X-62, 11-17-03; Rev. Ord. 2007, § 22-5)

### **Sec. 22-4. Planning and development board; establishment, powers and duties.**

(a) There is hereby established in accordance with chapter 705 of the Acts of 1975, as amended, a planning and development board of five (5) members appointed for five (5) year overlapping terms such that the term of one member expires on February first of each year. In addition to these five members, another member shall be appointed by the

state Secretary of Housing and Economic Development for a three (3) year term; and another member shall be the director of planning and development, ex officio. The planning and development board shall be consulted by the mayor and city council for its recommendations on the comprehensive plan, modification or implementation thereof. Its recommendations to the city council shall be in writing within a time specified by the city council. There shall also be appointed not more than five (5) alternate members. In the event that any member, except the state appointee or the director, is absent or unable to act for any reason, the chair shall designate an alternate member to act.

(b) The director shall submit to the planning and development board, for its review, plans, proposals or agreements for the acquisition of real property and/or the selection of developers thereof.

(c) The planning and development board shall exercise responsibility for the formulation and submission of recommendations for the annual community development plan authorized by federal law, including the conduct of public hearings thereon.

(d) The planning and development board shall exercise authority of review and approval over acts of the director as provided in section 22-2(c).

(e) All boards, commissions, committees and other agencies incorporated in the department and assigned advisory responsibility to the planning and development board, shall be granted a right to appear three (3) times per year before the planning and development board to discuss matters within their purview. (Rev. Ords. 1973, § 15-1; Ord. No. 102, 12-15-75)

**Cross reference**—Rules governing appointments to and service on commissions and boards, § 7-1

**State law references**—Acts of 1975, chapter 705; Acts of 1982, chapter 479; Acts of 1989, chapter 499; and Acts of 2007, chapter 73.

### **Sec. 22-5. Regulation of Scenic Roads.**

(a) Role of the planning and development board. The planning and development board (hereafter planning board) is authorized to promulgate rules and regulations to implement its administration of scenic roads under the provisions of section 15C of Chapter 40 of the General Laws.

#### *(b) Enforcement and Penalties*

- (1) *Failure to obtain approval of the planning board.* Failure to obtain approval of the planning board prior to cutting or removing trees, or tearing down or destruction of stone walls, or portions thereof, within the layout of a designated scenic road shall require the immediate filing of an application with the planning board and shall be subject to restoration of the features or other remediation plan, as the planning board may order. Work under an approved remediation plan must proceed in good faith continuously until completion by any time limit required in the plan, unless amended in writing by the planning board.
- (2) *Penalties.* Each violation of section 15C of Chapter 40 of the General Laws, or of any rule and regulation pertaining to scenic roads shall be punished by a fine of three hundred dollars \$300.00; each tree cut or stone wall removed and each day such violation continues shall constitute a separate offense. The commissioner of inspectional services may revoke or withhold any current or pending permit on the property associated with said violation.
- (3) *Enforcement.* The commissioner of inspectional services and the tree warden shall each have authority to enforce the provisions of this section upon request of and on behalf of the planning board, and shall keep the planning board apprised of the status of any such enforcement. Any person found to be in violation of this section shall receive a written warning and a minimum of thirty (30) days to remediate all violations or to enter into a planning board approved remediation plan prior to the institution of an enforcement action. Unless amended by the planning board, failure to comply with an approved remediation plan, including

failure to proceed in good faith continuously until its completion, may result in an immediate enforcement action. (Ord. No. Z-67, 06-21-10; Rev. Ord. 2007, § 20-71)

**Sec. 22-6. Employment of outside consultants.**

(a) The city council, sitting as the local special permit granting authority, the planning and development board and the zoning board of appeals are authorized to establish reasonable fees to provide said boards with funds to pay for the hiring of outside consultants as needed to carry out the boards' duties and responsibilities in reviewing applications before them, as authorized by G.L. c. 44, s. 53G. The fees to be paid by applicants for particular permits and approvals before said boards shall be set out in each board's rules and regulations, pursuant to G.L. c. 40A, ss. 9 and 12, G.L. c. 40B, s. 21 and G.L. c. 41, s. 81Q. Such fees shall be reasonable and reflect the actual cost for the services of consultants and in the case of the city council, sitting as the local special permit granting authority, shall be set by the Director of the department of planning and development, as the designee of the aforesaid city council.

(b) Such fees shall be deposited in a special account established by the city treasurer in the city treasury and shall be kept separate and apart from the general funds of the city. A separate bank account need not be established for the fees paid by an applicant for each project. All fees collected may be deposited in a common bank account, provided that a separate accounting of activities and interest is made for each project.

(c) The special account, including accrued interest, if any, shall be expended at the direction of the authorized board or authority without further appropriation; provided, however, that such funds are to be expended by it solely for the purpose of hiring outside consultants to assist the boards in carrying out their responsibilities with respect to that particular project under the law. The fees may not be used to pay for the services of city employees. Any excess amount in the account attributable to a specific project, including any accrued interest, shall be repaid to the applicant or to the applicant's successor in interest upon satisfactory proof of the filing of the final action and decision of the board or authority with the city clerk, and a final report of said account shall be made to the applicant or to the applicant's successor in interest.

(d) Each board or its designee which has established fees for hiring consultants must choose consultants subject to the board's own rules and regulations, the city charter, ordinances and the general laws. The board's rules and regulations shall provide for minimum qualifications of any consultant to be hired, including either an educational degree in or related to the field at issue, or three (3) or more years of practice in the field at issue or a related field.

(e) The board's rules and regulations must also provide for an administrative appeal of the selected consultant by the applicant paying the fee. In the case of the planning and development board and the zoning board of appeals, said appeal shall be to the city council, sitting as the city legislative body. In the case of the city council, the rules and regulations shall provide for either reconsideration before the city council, or direct judicial review, if otherwise permitted by law. Any such appeal is limited by law to claims that the selected consultant has a conflict of interest or does not possess the minimum required qualifications.

(f) The required time limits for action upon an application by any of the aforesaid municipal boards or authorities shall be extended by the duration of the administrative or judicial appeal. A decision upon said appeal shall be made by the city council or its designee within thirty (30) days of the filing of the appeal or as soon as practicable. Such an administrative appeal shall not preclude further judicial review, if otherwise permitted by law, on the grounds provided for in subsection (e).

(g) The provisions of this section shall be deemed to be severable. If any of its provisions shall be held to be invalid or unconstitutional by any court of competent jurisdiction, the remaining provisions shall continue in full force and effect.

(Rev. Ords. 1995, Ord. No.W-13, 10-2-00)

**Section 22-7 Statement on Fair Housing Required in Notices of Public Hearings and Meetings Relating to Permitting or Funding of Housing**

(a) In all cases where notice of a public hearing or meeting relating to the permitting or funding of housing is required by the Massachusetts General Laws or the Revised Ordinances, as amended, such notice shall contain a brief statement concerning the City’s policy regarding fair housing practices, the Equal Housing Opportunity logo of the United States Department of Housing and Urban Development, and the name, title, telephone number and email address of a person in the Department of Planning and Development to contact for more information regarding fair housing, as follows:

It is the policy of the City of Newton to see to it that each person shall have equal access to and equal opportunity in housing, regardless of race, color, religion, national origin, disability, age, sexual orientation, gender identity or expression, marital status, familial status (families with children under 18), public assistance (including rental vouchers), genetic information, or military status. Fair housing requirements apply to all types of housing, public and private, with very few limited exemptions, and regardless of whether government financial assistance is received.



For more information regarding fair housing, please contact [name, title, telephone number, email address].

(b) In all cases where notice of a public hearing or meeting relating to the permitting or funding of housing is required to be sent to individuals or specific boards or other agencies by the Massachusetts General Laws or the Revised Ordinances, as amended, such notice shall be accompanied by a copy of the Newton Fair Housing Committee’s “Statement on Fair Housing in Newton.”

(c) This Section applies to any public hearing or meeting concerning: (i) a petition for a development requiring a special permit which is proposed to include or may include at least in one (1) new dwelling unit that satisfies the requirements for the provisions of an affordable housing “inclusionary unit” as set out in Section 5.11; (ii) a petition for a special permit to allow an association of persons to live in a congregate living facility pursuant to the provisions of Chapter 30, Section 6.2.8; (iii) a petition for a comprehensive permit pursuant to M.G.L. Chapter 40B; and (iv) any request for public funding to subsidize the creation or preservation of affordable housing. (Ord. No. A-77, 05-16-16)

**Secs. 22-8—22-18. Reserved.**

**ARTICLE II.  
CONSERVATION COMMISSION**

**Sec. 22-19. Purpose, powers and duties.**

There shall be a conservation commission of seven (7) regular members for the protection, promotion and development of the natural resources of the city. The conservation commission may exercise, but not be limited to, any of the following powers and duties:

- (1) conduct researches into the city's natural resources and seek to coordinate the activities of unofficial bodies organized for similar purposes and may, to the extent of funds appropriated there for, advertise, prepare, print and distribute material which it deems necessary for its work;
- (2) prepare and amend a conservation and passive outdoor recreation plan which shall be, as far as possible, consistent with the comprehensive plan and with any regional plans relating to the area. Such plan shall show the nature and ownership of any open area and whether and how its use is restricted;
- (3) acquire in the name of the city, subject to the approval of the mayor and city council, by gift, purchase, grant, bequest, devise, lease or otherwise the fee or lesser interest in real property, as may be necessary to properly maintain, improve, protect or limit the future use of open spaces within the city, and may manage and control the same;
- (4) adopt rules and regulations governing the use of land and waters under its control and prescribe penalties for any violation thereof. (Ord. No. 102, 12-15-75; Ord. Z-42, 02-17-09)

### **Section 22-20. Composition, appointment of members, alternate members, terms**

(a) The seven (7) regular members shall be appointed by the mayor with the approval of the city council for terms of three years.

(b) There shall also be four (4) alternate members appointed by the mayor with approval by the city council. In order to stagger the expiration of their terms, the initial terms of the alternate members shall be as follows: one member shall be appointed for one (1) year; two members shall be appointed for two (2) years; one member shall be appointed for three (3) years. All alternate member appointments subsequent to the initial appointments shall be for a term of three (3) years.

(c) Both regular and alternate members shall continue to serve after expiration of their terms until their successors shall be duly appointed and qualified. Vacancies in the offices of either regular or alternate members shall be filled in the same manner as the original appointment for any unexpired term.

(d) The regular members shall elect one member as chair. In the event that a regular member is absent or unable to act for any reason, the chair shall designate an alternate member to act. (Ord. Z-42, 02-17-09)

### **Sec. 22-21. Relationship with planning and development board.**

The conservation commission shall function as an advisory body to the planning and development board on all matters affecting the natural resources of the city for the purpose of coordinating a conservation and passive outdoor recreation plan with the comprehensive plan. Nothing contained herein shall be construed to limit the powers of a conservation commission granted under Chapter 40 of the General Laws. (Ord. No. 102, 12-15-75)

### **Sec. 22-22. Newton City Floodplain District.**

(a) *Purpose.* There is hereby established the Newton City Floodplain District (the District), the purpose of which is to regulate development in and around natural resource areas subject to flooding including of streams, ponds, and wetlands that are not included in the Newton Federal Floodplain Ordinance in order to:

- (1) assure the continuation of the natural flow patterns of watercourses within the city;

(2) provide adequate and safe floodwater storage capacity in order to protect persons and property against increase in the hazards of flood inundation; and

(3) protect and preserve the water table and groundwater recharge areas within the city.

(b) *The District.* The District is established. The provisions of this section shall take precedence over any conflicting city ordinance. In the case of a conflict between information derived from maps and information derived from the tables in this section, data in the tables in this section shall take precedence.

The following areas are hereby designated as included in the District and are subject to the provisions of this section and any regulations promulgated by the conservation commission pursuant thereto.

(1) *Brooks with City-Identified Flood Zones.* These areas include the swath of land on both sides of the brook or stream, 30 feet as measured horizontally from the centerline of the brook or stream, as shown on the map titled “City Floodplains by Ordinance Category” with a date of January 23, 2025 (the “City Floodplains Map”), and as listed in the table titled “Table of City Floodplain Areas” with a date of January 23, 2025 (the “City Floodplains Table”).

(2) *Ponds with City-Identified Flood Zones.* These areas include all lands below the listed elevations, as shown on the City Floodplains Map, and as listed in the City Floodplains Table.

(3) *Wetlands with City-Identified Flood Zones.* These areas include all lands below the listed elevations, as shown on the City Floodplains Map, and as listed in the City Floodplains Table.

**Editor’s Note** – The referenced map and table are on file in the office of the city clerk. A copy of the map and table appear in the Appendix at the end of this chapter.

(c) *Performance Standards.*

(1) All development in the District, including structural and non-structural activities, whether permitted by right or by special permit must be in compliance with:

a) Chapter 131, Section 40 of the Massachusetts General Laws;

b) Wetlands Protection Regulations, Department of Environmental Protection (DEP) (currently 310 CMR 10.00);

c) Provisions of the Massachusetts State Building Code which addresses floodplain and coastal high hazard areas (currently 780 CMR 120.G, “Flood Resistant Construction and Construction in Coastal Dunes”);

d) Inland Wetland Restriction, DEP (currently 310 CMR 13.00); and

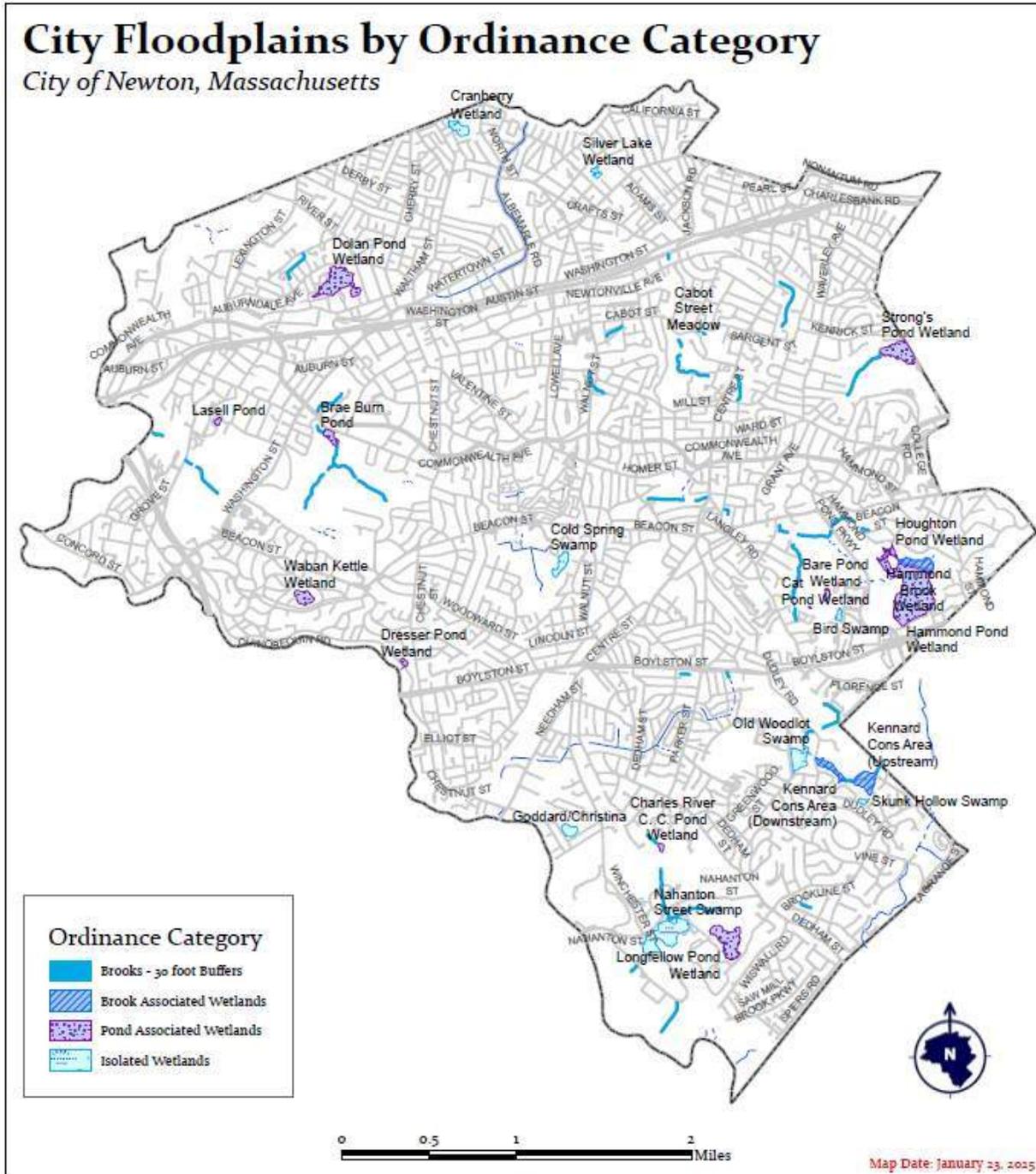
e) Minimum Requirements for the Subsurface Disposal of Sanitary Sewage, DEP currently 310 CMR 15, Title 5).

Any variance from the provisions and requirements of the above referenced state regulations may

only be granted in accordance with the required variance procedures of these state regulations.

- (2) Any uses in the District, whether permitted by right or by special permit or variance, shall be subject to the following:
- a) Except as provided in Sec. 22-22(c)(2)b) and 22-22(c)(4), no building or other structure shall be erected, constructed, altered, enlarged or otherwise created for any residence or other purpose; no dumping of trash, rubbish, garbage or junk or other waste materials shall be permitted; no filling, dumping, excavation, removal or transfer of gravel, sand, loam or other materials which will restrict floodwater flow or reduce floodwater storage capacity shall be permitted.
  - b) Sec. 22-22(c)(2)(a) notwithstanding, after a public hearing, the conservation commission may issue an order of conditions for the following uses in the District:
    - i) Any building or structure for which compensatory storage is provided and for which certification is submitted by a registered professional engineer demonstrating that such building or structure shall not result in any increase in flood levels during the 100-year flood. Compensatory storage shall mean a volume not previous used for flood storage, and shall be incrementally equal to the theoretical volume of flood water at each elevation which would be displaced by the proposed project. Such compensatory volume shall have an unrestricted hydraulic connection to the same waterway or wetland being affected by the proposed project. Further, with respect to waterways, such compensatory volume shall be provided within the same reach of the waterway.
    - ii) Construction, operation, and maintenance of dams and other water-control devices including temporary alteration of the water level for emergency purposes.
    - iii) Bridges and like structures permitting passage between lands of the same owner, except that such bridges and structures shall be constructed, maintained, and used at the expense and risk of such owner, and shall be designed and constructed so as to minimize the effect of such structures on water storage and water flow.
    - iv) Parking lots, driveways, and walkways ancillary to permitted or existing uses within the district.
    - v) Recreation, including golf courses, municipal, county or state parks (but not an amusement park), boating, fishing, and any other noncommercial open-air recreation uses and structures ancillary to these uses.
    - vi) Ancillary structures for farms, stock farms, truck gardens, nurseries, orchards, and tree farms.
  - c) No order of conditions shall be issued under Sec.22-22(c)(2)(b) unless it is demonstrated to the satisfaction of the conservation commission that the cumulative effect of the proposed project, when combined with all other existing and anticipated development, will not increase the water surface elevation of the 100-year flood at any point within the city.
- (3) The construction, reconstruction or enlargement of any building or structure in the District shall also be subject to the following provisions:

- a) All construction of residential structures shall have the lowest floor (including the basement) at or above the pertinent flood elevation established within City Floodplains Table, and all construction of non-residential structures shall have either the lowest floor (including the basement) at or above the pertinent flood elevation of said subsection (g), or along the attendant utility and sanitary facilities shall be floodproofed, i.e. designed so that below the established flood elevation the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.
  - b) Where watertight floodproofing of a structure is permitted, a registered professional engineer or architect shall certify that the methods used are adequate to withstand the flood depths, pressures and velocities, impact and uplift forces and other factors associated with the pertinent flood levels.
- (4) Nothing in this section shall be deemed to prohibit the reconstruction (but not enlargement) of any building or structure destroyed by fire or natural disaster; provided, however, that such a reconstruction shall be pursuant to an order of conditions issued by the conservation commission.
- (d) *Permitting Process.* In its discretion, the conservation commission may accept a single notice of intent, conduct a single hearing, and issue a single order of conditions pursuant to its jurisdiction under this section and its jurisdiction under the Wetlands Protection Act, G.L. c. 131, sec. 40; provided, however, that in the event that the provisions of this section are more restrictive than those of the said Wetlands Protection Act and the regulations promulgated pursuant thereto, the provisions of this section shall control.



CITY OF NEWTON, MASSACHUSETTS  
Mayor - Ruthanne Fuller

The information on this map is from the Newton Geographic Information System (GIS). The City of Newton cannot guarantee the accuracy of this information. Each user of this map is responsible for determining its suitability for his or her intended purpose. City departments will not necessarily approve applications based solely on GIS data.

**Table of City Floodplain Areas**  
January 23, 2025

Key: *NAVD88* = North American Vertical Datum of 1988

*Width* = Width of floodplain, measured laterally in feet on either side of the centerline of the brook

<b>BROOKS:</b> Sections covered by City Ordinance, not FEMA Ordinance (per City Ordinance)	<b>Width</b> (feet from center line)
<b>Brunnen Brook</b>	30
<b>Cheese Cake Brook:</b> Brae Burn Golf Club → end of Oldham Rd	30
<b>College Brook</b>	30
<b>Edmands Brook</b>	30
<b>Hahn Brook</b>	30
<b>Hammond Brook</b>	30
<b>Hyde Brook</b>	30
<b>King Brook</b>	30
<b>Lacy Brook</b>	30
<b>Laundry Brook</b>	30
<b>Paul Brook:</b> Rt. 9 → 150' south of Rt. 9	30
<b>Runaway Brook</b>	30
<b>South Meadow Brook:</b> Newton/Brookline line → 350' into Kennard Cons. Area	30
<b>South Meadow Brook:</b> connecting wetlands in Kennard Cons. Area	30
<b>Stearn's Brook</b>	30
<b>Strong's Brook</b>	30
<b>Thompsonville Brook</b>	30

<b>WETLANDS associated with BROOKS</b> (elevations from LIDAR)	<b>Elevation</b> (NAVD88)
<b>Hammond Brook wetland</b> – east end of Houghton Garden Conservation Area Wetland, Suffolk Road	167.0
<b>South Meadow Brook wetland</b> – eastern (upstream) side of Kennard Conservation Area, Dudley Road	143.0
<b>South Meadow Brook wetland</b> – western (downstream) side of Kennard Conservation Area, Dudley Road	130.5

<b>PONDS and their associated WETLANDS</b> <i>(elevations from LIDAR)</i>	<b>Elevation</b> <b>(NAVD88)</b>
<b>Bare Pond (and wetland)</b> , Webster Cons. Area, Hammond Pond Pkwy	227.5
<b>Brae Burn Pond (and wetland)</b> , Brae Burn Country Club, Fuller Street	91.5
<b>Cat Pond</b> , DCR Hammond Pond Reservation, Hammond Pond Parkway	221.5
<b>Charles River Country Club Pond</b> , CRCC, Dedham Street (associated with Lacy Brook)	175.5
<b>Dolan Pond (and wetland)</b> , Dolan Pond Conservation Area, at end of Cumberland Rd.	45.5
<b>Dresser Pond</b> , off Quinobequin Rd	76.5
<b>Hammond Pond (and wetland)</b> , Webster Conservation Area of the Green Line tracks	166.0
<b>Houghton Pond (and wetland)</b> , Houghton Garden Conservation Area, off Suffolk Road	166.5
<b>Lasell Pond</b> , Lasell Village, Aspen Ave. and Lake Ave.	69.5
<b>Longfellow Pond (and wetland)</b> , UMass Mt Ida, Carlson Ave.	116.0
<b>Strong's Pond</b> , Newton Comm. Golf Course, off Kenrick St.	58.5
<b>Waban Kettle Pond (and wetland)</b> , off Waban, Carlton, and Nehoiden Rds.	115.5

<b>WETLANDS (isolated)</b> <i>(elevations from LIDAR)</i>	<b>Elevation</b> <b>(NAVD88)</b>
<b>Bird Swamp</b> , west of Hammond Pond Pkwy at mall entrance	208.5
<b>Cabot Street Meadow (east)</b> , Cabot Street	73.5
<b>Cabot Street Meadow (west)</b> , Cabot Street	72.5
<b>Cold Spring Swamp (east)</b> , adjacent to aqueduct	104.0
<b>Cranberry Wetland</b> , Calvary Cemetery, Driftwood Road	23.5
<b>Goddard-Christina Swamp</b> , Goddard and Christina Streets	98.5
<b>Nahanton Street Swamp</b> , Nahanton Street	95.0
<b>Old Woodlot Swamp</b> , Greenwood Street	118.5
<b>Silver Lake Wetland</b> , Nevada Street	39.5
<b>Skunk Hollow Swamp</b> , Drew and Nardell Roads	146.0

**Sec. 22-23. Newton FEMA Floodplain District.**

(a) *Purpose.* The purpose of the Newton FEMA Floodplain District (the “District”) is to:

- (1) Enhance public health and safety through reducing the threats to life and personal injury, eliminating new hazards to emergency response officials, preventing the occurrence of public emergencies resulting from water quality contamination and pollution due to flooding, avoiding the loss of utility services which if damaged by flooding would disrupt or shut down the utility network and impact regions of the community beyond the site of flooding, and reducing damage to public and private property resulting from flooding waters;
- (2) Eliminate costs associated with the response and cleanup of flooding conditions; and
- (3) Allow the city to maintain compliance with the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973, and the regulations promulgated pursuant thereto.

The degree of flood protection required by this ordinance is considered reasonable but does not imply

total flood protection.

*(b) Applicability.*

- (1) Any proposed construction, grading, tree cutting, paving, or other land-disturbing development in the District, including new construction or changes to existing buildings, placement of manufactured homes, placement of agricultural facilities, fences, sheds, storage facilities or drilling, mining, paving and any other development that might increase flooding or adversely impact flood risks to other properties requires a conservation commission Order of Conditions as the primary permit for development in the District.
- (2) Nothing in this section shall be deemed to prohibit the reconstruction (but not enlargement) of any building or structure destroyed by fire or natural disaster; provided, however, that such a reconstruction shall be pursuant to an Order of Conditions issued by the conservation commission.

*(c) Jurisdiction and Sources of Jurisdictional Information.*

- (1) *The District.* The Newton FEMA Floodplain District is herein established.
- (2) *Precedence.* The provisions of this section shall take precedence over any less restrictive conflicting city ordinance.
- (3) *Regulatory Categories Included in this Ordinance.* Jurisdictional areas covered by this ordinance are defined by the FEMA regulatory areas listed below.

The District includes all special flood hazard areas designated as Zone AE and A and floodways within Newton. These areas are defined by the Middlesex County Flood Insurance Rate Map (FIRM) dated July 8, 2025 issued by the Federal Emergency Management Agency (FEMA) for the administration of the National Flood Insurance Program. The FIRM and Middlesex County Flood Insurance Study (FIS) are incorporated herein by reference and are available on-line through the FEMA Map Service Center. The District also includes FEMA Floodways as shown on the cited FIRM maps, shown on the map titled “Map of FEMA Areas Subject to Jurisdiction in Newton” with a date of January 25, 2005 (the “FEMA Floodplains Map”), tabulated in the table titled “Table of FEMA Flood Zones, in Newton” (the “FEMA Flood Zones Table”), and tabulated in the table titled “Newton’s FEMA Floodway Data Tables” (the “FEMA Floodway Table”).

- a) *Numbered AE Zones. The 1%-chance regulatory floodplain.* The exact boundaries of these areas shall be defined by the 1%-chance base flood elevations shown on the FIRM and further defined by the (FIS) report dated July 8, 2025.

Note: FEMA Flood Elevations listed in the table in the FEMA Flood Zones Table are the City’s extrapolations from the FEMA Flood Insurance Rate Maps for Newton (panels 25017C0532F, 25017C0534F, 25017C0551F, 25017C0552F, 25017C0553F, 25017C0554F, 25017C0556F, 25017C0558F, 25017C0561F, 25017C0562F, and 25017C0566F) and the 2025 FEMA Flood Insurance Study Flood Profiles (volumes 25017CV010D and 25017CV014D) all of which can be found at the FEMA Map Service Center website. When a range of elevations is cited, the higher listed elevation applies to the upstream end of the designated area, the lower elevation applies to the downstream end of the designated area. The floodplain elevation for any land is determined by interpolation of the floodplain elevation on the basis of its relative distance in feet from the upstream and downstream elevations. It is the obligation of the user to independently confirm elevations.

- b) *Unnumbered A Zones. The 1%-chance regulatory floodplain.* Since no Base Flood Elevation (BFE) has been provided, the building department will attempt to obtain, review and reasonably utilize base flood elevation data available from a Federal, State, or other source as criteria for requiring new construction, substantial improvements, or other development in Zone A and as the basis for elevating residential structures to or above base flood level, for flood-proofing or elevating nonresidential structures to or above base flood level. [44CFR 60.3(b)(4)]. Alternatively, the permitting authority can require that the proponent pay for resources to determine the base flood elevation when a development is being proposed. Historical records can be used, as well as any other data that reasonably indicates the 1% chance flood event. If a subdivision or other development proposal is greater than 50 lots or 5 acres [44CFR 60.3(b)(3)] is proposed in the District where there are not already base flood elevations (BFEs) for each parcel, then the developer must provide BFEs for each parcel so that flood-resistant standards can be appropriately applied. The developer is responsible for providing the necessary technical data to support the base flood elevations shown on his/her design drawings.
- c) *FEMA Floodways. Areas shown on the FEMA maps and Floodway tables.* FEMA Floodway information can be found on the 2025 FEMA Flood Insurance Rate Maps and in the 2025 FEMA Flood Insurance Study Floodway Data Tables in volumes 25017CV005D pages 372-376 377 and 25017CV006D page 515 at the FEMA Map Service Center website. If no floodway elevation information is available, the building department will attempt to obtain, review and reasonably utilize base flood elevation data available from a Federal, State, or other source as criteria for requiring new construction, substantial improvements for prohibiting encroachments in floodways. See the FEMA Floodway Table.

**Editor’s Note** – The referenced map and tables are on file in the office of the city clerk. A copy of the map and tables appear in the Appendix at the end of this chapter.

- (d) *Permitting Requirements.* Any uses in the District, whether permitted by right or by special permit or variance, shall be subject to the following:
- (1) Any proposed construction or other development in the District, including new construction or changes to existing buildings, placement of manufactured homes, placement of agricultural facilities, fences, sheds, storage facilities or drilling, mining, paving and any other development that might increase flooding or adversely impact flood risks to other properties within an area subject to the jurisdiction of this Ordinance shall obtain an Order of Conditions from the conservation commission.
  - (2) In its discretion, the conservation commission may accept a single Notice of Intent, conduct a single hearing, and issue a single Order of Conditions pursuant to its jurisdiction under this Ordinance, the City Floodplain Ordinance, and the Wetlands Protection Act, G.L. c. 131, sec. 40, provided, however, that in the event that the provisions of this ordinance are more restrictive than those of the said Wetlands Protection Act and the regulations promulgated pursuant thereto, the provisions of this ordinance shall control. After a public hearing the conservation commission may issue an order of conditions and the Inspectional Services Department may issue building permits for work subject to this Ordinance.
- (e) *Performance Standards.* Any permit applicant under this ordinance, whether permitted by right or by special permit, must conform with the following standards:

- (1) Any permit applicant under this ordinance must acquire all local, state and federal permits that will be necessary to carry out the proposed development in the District and must demonstrate that all necessary permits have been acquired prior to the initiation of work. Relevant permits may include: the state wetland act and regulations, building code regulations, and the city's stormwater management ordinance and regulations.
  - (2) Any permit applicant under this ordinance must provide, document, and certify compensatory storage at each foot of elevation. Certification shall be submitted by a professional engineer licensed in Massachusetts.
  - (3) Bridges shall be constructed, maintained, and used at the expense and risk of such owner, and shall be designed and constructed in compliance with the state Stream Crossing Standards.
  - (4) No building or other structure, road, parking lot, or driveway shall be erected, constructed, altered, enlarged or otherwise created and no material shall be placed or dumped which will restrict floodwater flow or reduce floodwater storage capacity shall be permitted.
  - (5) The construction, reconstruction or enlargement of any building or structure in the District shall conform with sections of the State Building Code addressing floodplain standards.
  - (6) Projects subject to the city's Stormwater Management Ordinance and Rules and Regulations will be required to obtain an appropriate Stormwater Management permit.
  - (7) In Zones A and AE, along watercourses that have not had a regulatory floodway designated, the best available Federal, State, local, or other floodway data shall be used to prohibit encroachments in floodways which would result in any increase in flood levels within the community during the occurrence of the base flood discharge.
  - (8) In Zones AE, along watercourses that have a regulatory floodway designated on the reference the Middlesex County FIRM, encroachments are prohibited, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge.
  - (9) All subdivision proposals and development proposals in the District shall be reviewed to assure that:
    - a) Such proposals minimize flood damage.
    - b) Public utilities and facilities are located & constructed so as to minimize flood damage.
    - c) Adequate drainage is provided.
    - d) Any subdivisions or other developments greater than 50 lots or 5 acres (whichever is less) have provided technical data to determine base flood elevations for each developable parcel shown on the design plans.
  - (10) *Recreational vehicles.* In A and AE Zones all recreational vehicles to be placed on a site must be elevated and anchored in accordance with the zone's regulations for foundation and elevation requirements or be on the site for less than 180 consecutive days or be fully licensed and highway ready.
- (f) *Variances.* A variance from this ordinance must meet the requirements set out by State law, and may only be granted if: 1) good and sufficient cause and exceptional non-financial hardship exist; 2) the variance will not result in additional threats to public safety, extraordinary public expense, or fraud or victimization of the public; and 3) the variance is the minimum action necessary to afford relief.

- (g) *Severability.* If any section, provision or portion of this ordinance is deemed to be unconstitutional or invalid by a court, the remainder of the ordinance shall be effective.
- (h) *Enforcement.* The conservation commission and the Inspectional Services Department shall enforce this Ordinance through their standard channels of detailed project review, permitting, and compliance checks and with Enforcement Orders (for Orders of Conditions) and Stop Work Orders (for construction projects). In addition to the foregoing, the Floodplain Administrator is authorized to enforce the provisions of this ordinance. Any violation of this ordinance shall be punishable by a fine of three hundred (\$300.00) dollars per day for each day the violation continues. Each day a violation continues shall constitute a separate offense. Where noncriminal disposition of this ordinance by civil fine has been provided for in Sec. 17-22 and 17-23 of these ordinances, as amended, pursuant to the authority granted by M.G.L. c. 40, section 21D, said violation may be enforced in the manner provided in such statute.
- (i) *Designation of Community Floodplain Administrator.* The city of Newton hereby designates the position of Chief Environmental Planner to be the official Floodplain Administrator (FPA) for the city. The FPA is responsible for things such as the following:
- (1) Ensuring that the community is complying with minimum NFIP standards
  - (2) Enforcing any locally-imposed higher standards
  - (3) Ensuring that permits are applied for when development of any kind is proposed in the District
  - (4) Addressing compliance issues and enforcement actions with the appropriate local staff
  - (5) Maintaining records of floodplain development
  - (6) Keeping current and historic FEMA maps available for public inspection
  - (7) Maintaining and updating flood data and maps to reflect Letters of Map Amendment (LOMAs) and Letters of Map Revision--Based on Fill (LOMR-Fs)
  - (8) Explaining Letter of Map Change (LOMC) procedures and results to property owners and developers and maintaining LOMC records
- (j) *Required Notifications.*
- (1) In a riverine situation, the planning department shall notify the following of any alteration or relocation of a watercourse:
    - a) Adjacent communities
    - b) NFIP State Coordinator, MA Department of Conservation and Recreation
    - c) NFIP Program Specialist, Federal Emergency Management Agency, Region I
  - (2) If the city acquires data that changes the base flood elevation in the FEMA mapped Special Flood Hazard Areas, the city will, within 6 months, notify FEMA of these changes by submitting the technical or scientific data that supports the change(s). Notification shall be submitted to the NFIP State Coordinator (Massachusetts Department of Conservation and Recreation) and the NFIP Program Specialist (Federal Emergency Management Agency, Region I).
- (k) *State issued variances to the flood-resistant standards as found in the state building code.*
- (1) If the State issues variances to the flood-resistant standards as found in the state building code, the city will request from the State Building Code Appeals Board a written and/or audible copy of the portion of the hearing related to the variance and will maintain this record in the city's files. The city shall also issue a letter to the property owner regarding potential impacts to the annual premiums for the flood insurance policy covering that property, in writing over the signature of a community official that:

- a) The issuance of a variance to construct a structure below the base flood level will result in increased premium rates for flood insurance up to amounts as high as \$25 for \$100 of insurance coverage, and
- b) Such construction below the base flood level increases risks to life and property.

Such notification shall be maintained with the record of all variance actions for the referenced development in the District.

(l) *Definitions of Flood Zones (from the US Code of Federal Regulations, Title 44, Part 64.3).*

*Zone A.* An area of special flood hazard without water surface elevations determined

*Zone AE.* An area of special flood hazard with water surface elevations determined

*Zone X.* An area of minimal or moderate flood hazards or areas of future-conditions flood hazard.

(m) *Definitions not found in the State Building Code.*

*Compensatory Storage.* A volume not previously used for flood storage and shall be incrementally equal to the theoretical volume of flood water at each elevation which would be displaced by the proposed project plus 10%. Such compensatory volume shall have an unrestricted hydraulic connection to the same waterway or wetland being affected by the proposed project. Further, with respect to waterways, such compensatory volume shall be provided within the same reach of the waterway.

*Development.* Any man-made change to improved or unimproved real estate, including but not limited to building or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials. [US Code of Federal Regulations, Title 44, Part 59].

*Floodway.* The channel of the river, creek or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. [Base Code, Chapter 2, Section 202].

*Functionally Dependent Use.* A use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. The term includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and ship building and ship repair facilities, but does not include long-term storage or related manufacturing facilities. [US Code of Federal Regulations, Title 44, Part 59] Also [Referenced Standard ASCE 24-14].

*Highest Adjacent Grade.* The highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure. [US Code of Federal Regulations, Title 44, Part 59].

*Historic Structure.* Any structure that is:

- (a) Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;
- (b) Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;
- (c) Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of the Interior; or
- (d) Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either:
  - (1) By an approved state program as determined by the Secretary of the Interior or

(2) Directly by the Secretary of the Interior in states without approved programs.

[US Code of Federal Regulations, Title 44, Part 59].

*New Construction.* Structures for which the start of construction commenced on or after the effective date of the first floodplain management code, regulation, ordinance, or standard adopted by the authority having jurisdiction, including any subsequent improvements to such structures. New construction includes work determined to be substantial improvement. [Referenced Standard ASCE 24-14].

*Recreational Vehicle.* A vehicle which is:

- (a) Built on a single chassis;
- (b) 400 square feet or less when measured at the largest horizontal projection;
- (c) Designed to be self-propelled or permanently towable by a light duty truck; and
- (d) Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.

[US Code of Federal Regulations, Title 44, Part 59].

*Regulatory Floodway* - see FLOODWAY.

*Special Flood Hazard Area.* The land area subject to flood hazards and shown on a Flood Insurance Rate Map or other flood hazard map as Zone A, AE, A1-30, A99, AR, AO, and AH [Base Code, Chapter 2, Section 202].

*Start of Construction.* The date of issuance for new construction and substantial improvements to existing structures, provided the actual start of construction, repair, reconstruction, rehabilitation, addition, placement or other improvement is within 180 days after the date of issuance. The actual start of construction means the first placement of permanent construction of a building (including a manufactured home) on a site, such as the pouring of a slab or footings, installation of pilings or construction of columns.

Permanent construction does not include land preparation (such as clearing, excavation, grading or filling), the installation of streets or walkways, excavation for a basement, footings, piers or foundations, the erection of temporary forms or the installation of accessory buildings such as garages or sheds not occupied as dwelling units or not part of the main building. For a substantial improvement, the actual “start of construction” means the first alteration of any wall, ceiling, floor or other structural part of a building, whether or not that alteration affects the external dimensions of the building. [Base Code, Chapter 2, Section 202].

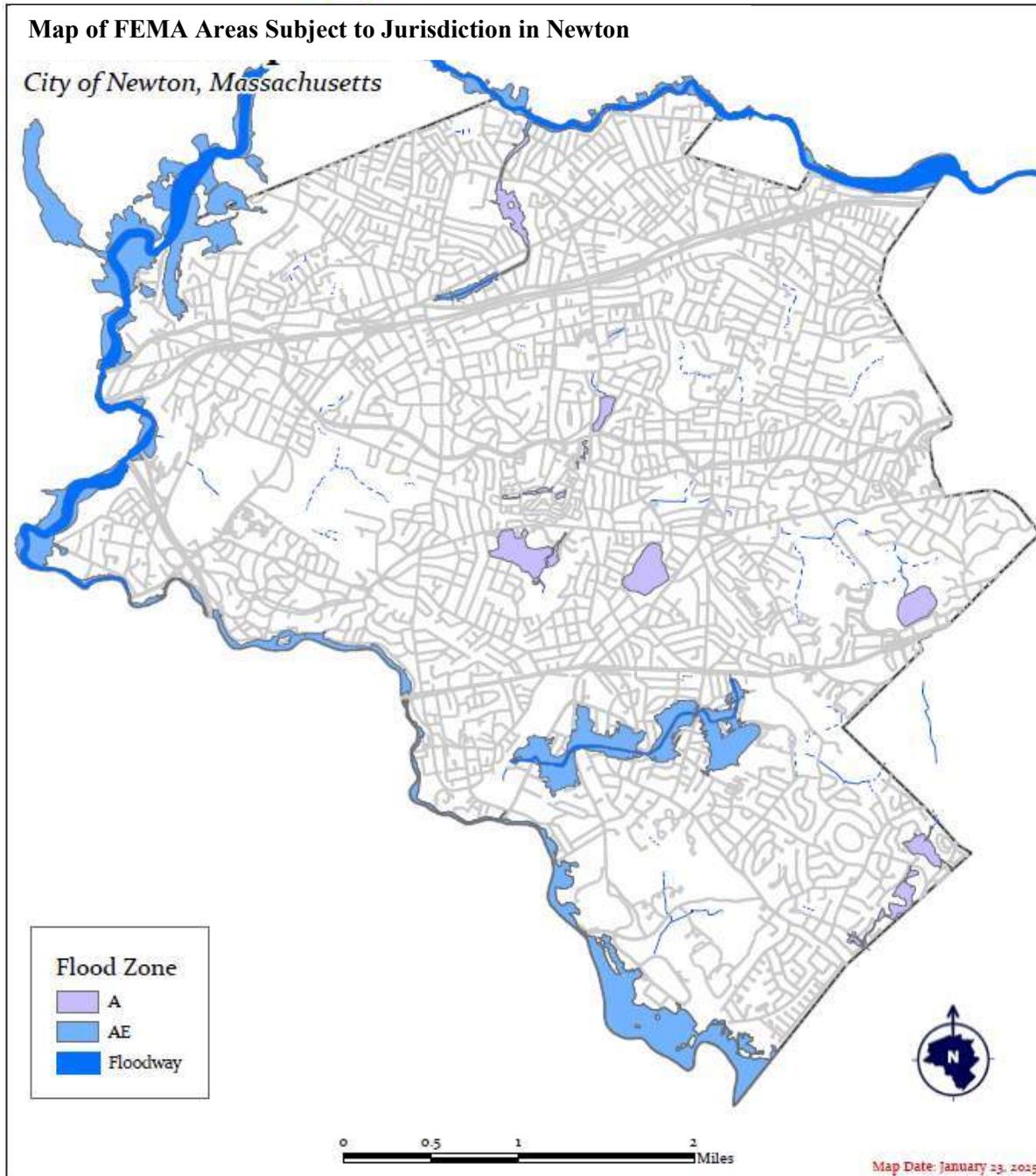
*Structure for floodplain management purposes.* A walled and roofed building, including a gas or liquid storage tank, that is principally above ground, as well as a manufactured home. [US Code of Federal Regulations, Title 44, Part 59].

*Substantial Repair of a Foundation.* When work to repair or replace a foundation results in the repair or replacement of a portion of the foundation with a perimeter along the base of the foundation that equals or exceeds 50% of the perimeter of the base of the foundation measured in linear feet, or repair or replacement of 50% of the piles, columns or piers of a pile, column or pier supported foundation, the building official shall determine it to be substantial repair of a foundation. Applications determined by the building official to constitute substantial repair of a foundation shall require all existing portions of the entire building or structure to meet the requirements of 780 CMR. [As amended by MA in 9th Edition BC].

*Variance.* A grant of relief by a community from the terms of a flood plain management regulation. [US Code of Federal Regulations, Title 44, Part 59].

*Violation.* The failure of a structure or other development to be fully compliant with the city's flood plain management regulations. A structure or other development without the elevation certificate, other certifications, or other evidence of compliance required in §60.3 is presumed to be in violation until such

time as that documentation is provided. [US Code of Federal Regulations, Title 44, Part 59].



CITY OF NEWTON, MASSACHUSETTS  
Mayor - Ruthanne Fuller

The information on this map is from the Newton Geographic Information System (GIS). The City of Newton cannot guarantee the accuracy of this information. Each user of this map is responsible for determining its suitability for his or her intended purpose. City departments will not necessarily approve applications based solely on GIS data.

**Table of FEMA Flood Zones in Newton**

Note: Elevations listed in **Appendix B** are extrapolated from the FIS Stream Profiles and are advisory only; in the case of a conflict, elevations from the most current FEMA Flood Insurance Rate Maps (FIRM) and FEMA Flood Insurance Study (FIS) will be used.

**KEY:** NAVD88 = North American Vertical Datum of 1988

RIVERS, BROOKS, and their associated WETLANDS	Elevation Range (NAVD88)	
	Upstream	Downstream
<b>Charles River</b>		
<i><b>FEMA Flood Elevation (Zone AE) (from FIS pages 122P-129P)</b></i>		
Newton St. Roxbury line – Nahanton/Kendrick St. bridge	90.2	89.9
Nahanton St. bridge – Silk Mill Dam (crest) <i>Note: profile shows drop associated with the dam in the wrong location</i>	89.9	89.0
Silk Mill Dam (foot) – Metropolitan Circular Dam (crest)	73.8	73.8
Metropolitan Circular Dam (foot) – Route 9 bridge	65.8	65.8
Route 9 bridge – Route 128 bridge (crest)	65.8	65.4
Route 128 bridge (foot) – Walnut St. bridge (crest)	65.0	64.0
Walnut St. bridge (foot) – Cordingly Dam and Falls (crest)	62.8	62.7
Cordingly Dam/Falls (foot) – Newton Lower Falls Dam (crest)	50.1	46.2
Newton Lower Falls Dam (foot) – Washington St. Rt 16 bridge	43.4	43.4
Washington St. Route 16 bridge – DCR trestle footbridge	43.4	42.8
DCR trestle footbridge – Concord St. bridge	42.8	41.4
Concord St. bridge – Comm. Ave./Route 30 Bridge	41.3	39.2
Comm. Ave./Rt 30 Bridge – Corporate limit (Stony Brook, Waltham)	39.2	38.4
Ware’s Cove/Purgatory Cove/225 Riverview	38.4	38.0
“Flowed Meadow Conservation Area Wetland” (from FEMA map)	38.0	38.0
Corp. limit (downstream of North St) – Cheese Cake Brook	21.5	20.8
Cheese Cake Brook – Bridge St./Beamis dam (crest)	20.8	16.5
Bridge St./Beamis dam (foot) – Corporate limit (Riverdale Ave)	16.1	12.3
Watertown Dam (crest-foot) (in Watertown)	11.5	8.0
Corporate limit (Maple St) – Corp. limit (Daly Field)	5.4	4.4
<b>FEMA Floodway -- See Appendix C</b>		

RIVERS, BROOKS, and their associated WETLANDS (cont'd)	Elevation Range (NAVD88)	
	Upstream	Downstream
<b>Cheese Cake Brook</b>		
<i>FEMA Flood Elevation (Zone AE) (from FIS page 134P)</i>		
Watertown St. culvert – Dunstan St. (upstream of culvert)	40.2	40.2
Dunstan St. (downstream of culvert) – Cross St. (upstream of culvert)	38.6	38.6
Cross St. (downstream of culvert) – Parsons St. (upstream of culvert)	37.7	37.7
Parsons St. (downstream of culvert) – Eddy St.	35.7	35.3
<i>FEMA Flood Zone A (from LIDAR)</i>		
Eddy St. – Watertown St. (downstream of culvert)	32.5	31.0
Watertown St. (upstream of culvert) – 311 Albemarle Rd	30.0	29.0
311 Albemarle Rd – 293 Albemarle Rd	29.0	28.0
293 Albemarle Rd – Fessenden driveway	28.0	27.5
Fessenden driveway – Crafts St. (downstream of culvert)	27.5	25.5
Crafts St. (upstream of culvert) – North St. (downstream of culvert)	25.5	24.5
North St. (upstream of culvert) – Across from Joseph Rd	24.5	22.5
Across from Joseph Rd – Across from Nevada St	22.5	20.8
<i>FEMA Flood Elevation (Zone AE) (from FEMA map)</i>		
Across from Nevada St. – Charles River	20.8	20.8
<i>FEMA Floodway -- See Appendix C</i>		
<b>Cold Spring Brook</b>		
<i>FEMA Flood Zone A: "Cold Spring Swamp" (from LIDAR)</i>	105.0	
<b>Hammond Brook</b>		
<i>FEMA Flood Zone A: "Hammond Pond" (from LIDAR)</i>	165.0	
<b>Paul Brook</b>		
<i>FEMA Flood Elevation (Zone AE) (from FIS pages 462P-463P)</i>		
Route 9 – Hagen Rd.	120.2	119.2
Hagen Rd. – Haynes Rd. (north side of culvert)	119.1	119.1
Haynes Rd. (south side of culvert) – Olde Field Rd.	117.1	116.2
“Great Meadow Swamp”, Brandeis Rd. (from LIDAR)	116.0	
Olde Field Rd. – Great Meadow Rd. (upstream)	115.8	115.8
Great Meadow Rd. (downstream) – Parker St. (upstream of culvert)	115.2	114.8
Parker St. (downstream of culvert) – Mildred Rd.	114.0	113.9
Mildred Rd. – the confluence of South Meadow Brook	113.9	113.7
<i>FEMA Floodway -- See Appendix C</i>		

RIVERS, BROOKS, and their associated WETLANDS (cont'd)	Elevation Range (NAVD88)	
	Upstream	Downstream
<b>Sawmill Brook (north-south branch)</b>		
<i>FEMA Flood Zone A (from LIDAR)</i>		
200 feet from Corporate boundary – headwall at 22 Hollywood Dr	141.0	135.0
“Bald Pate and Kennard Conservation Area Wetland”	135.0	
Vine St. -- Conservation Area boundary with 63 Grace Rd	134.0	115.0
“Saw Mill Brook Conservation Area Wetland” (Vine St./Wayne St.)	133.0	120.0
63 Grace Rd – Marla Circle (upstream of culvert)	115.0	108.0
Marla Circle (downstream of culvert) – Corporate boundary	105.0	103.5
<b>South Meadow Brook</b>	<b>Upstream</b>	<b>Downstream</b>
<i>FEMA Flood Elevation (Zone AE) (from FIS page 462P)</i>		
Confluence Paul Brook – Dedham St. (upstream of culvert)	113.7	113.6
Dedham St. (downstream of culvert) – Upland Ave	112.4	112.4
Upland Ave – Winchester St. (upstream of culvert)	112.2	112.0
Winchester St. (downstream of culvert) – Needham St. (trash rack)	112.0	111.6
Needham St. (downstream of culvert) – 29 Tower Rd. culvert	108.6	108.5
<i>FEMA Floodway -- See Appendix C</i>		

PONDS and their associated WETLANDS	Elevation (NAVD88)
<i>FEMA Flood Elevation (Zone AE) (from FEMA map)</i>	
<b>Rumford Ave. Landfill pond and marsh</b>	38.0
<b>Woods’ Pond (Zone AE), off Islington Rd.</b>	38.6
<i>FEMA Flood Elevation (Zone A) (from LIDAR)</i>	
<b>Bullough's Pond, off Comm. Ave, Walnut St.</b>	87.0
<b>Crystal Lake, Rogers St, Lake Ave, Norwood St.</b>	143.0
<b>Hammond Pond, off Hammond Pond Pkwy &amp; Route 9</b>	165.5
<b>Newton Cemetery Pond (western), Walnut St.</b>	106.0
<b>Newton Cemetery Ponds (middle), Walnut St.</b>	103.0
<b>Newton Cemetery Pond (eastern), Walnut St.</b>	102.0
<b>Newton City Hall Ponds, City Hall, off Walnut St.</b>	90.0
<b>Newton Library Pond, off Homer St.</b>	91.0

**Newton’s FEMA Floodway Data Tables** (cross-sections are from the FEMA FIRM maps)

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION ( FEET NAVD88)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
L	7,662	824	3,689	1.2	4.3	4.3	4.3	0.0
M	9,058	500	3,004	1.5	4.5	4.5	4.5	0.0
N	10,246	341	1,630	2.7	4.7	4.7	4.7	0.0
O	12,054	151	1,244	3.6	5.4	5.4	5.5	0.1

<sup>1</sup>Feet above Cambridge/Watertown corporate limits

TABLE 23	FEDERAL EMERGENCY MANAGEMENT AGENCY	<b>FLOODWAY DATA</b>
	<b>MIDDLESEX COUNTY, MA</b> (ALL JURISDICTIONS)	

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION ( FEET NAVD88)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Z	15,612	226	1,284	3.5	12.2	12.2	12.2	0.0
AA	16,360	202	1,069	4.2	12.7	12.7	12.8	0.1
AB	16,513	190	922	4.8	12.8	12.8	12.8	0.0
AC	17,333	130	750	5.9	14.0	14.0	14.2	0.2
AD	18,187	138	1,072	4.2	15.1	15.1	15.4	0.3
AE	19,162	134	973	4.6	15.7	15.7	16.1	0.4
AF	19,928	57	381	11.7	16.0	16.0	16.2	0.2
AG	21,002	138	1,116	4.0	19.8	19.8	20.3	0.5
AH	21,787	170	1,455	3.1	20.4	20.4	20.8	0.4
AI	22,275	185	1,338	3.3	20.6	20.6	21.0	0.4
AJ	22,538	162	1,276	3.5	20.8	20.8	21.1	0.3
AK	22,722	173	1,547	2.7	21.0	21.0	21.3	0.3
AL	23,201	111	1,087	3.8	21.1	21.1	21.4	0.3
AM	24,041	138	1,271	3.2	21.5	21.5	21.9	0.4

<sup>1</sup>Feet above Cambridge/Watertown corporate limits

TABLE 23	FEDERAL EMERGENCY MANAGEMENT AGENCY	<b>FLOODWAY DATA</b>
	<b>MIDDLESEX COUNTY, MA</b> (ALL JURISDICTIONS)	

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION ( FEET NAVD88)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BN	37,487	647	7,755	0.5	38.0	38.0	38.2	0.2
BO	39,562	149	1,377	3.0	38.0	38.0	38.1	0.1
BP	43,447	206	1,966	1.9	38.9	38.9	39.0	0.1
BQ	44,632	211	1,954	1.9	39.0	39.0	39.2	0.2
BR	45,622	412	3,262	1.2	39.1	39.1	39.3	0.2
BS	46,464	131	1,373	2.7	39.4	39.4	39.5	0.1
BT	46,926	176	1,624	2.3	39.5	39.5	39.7	0.2
BU	47,329	216	2,106	1.8	39.7	39.7	39.8	0.1
BV	47,722	237	1,882	2.0	39.8	39.8	39.9	0.1
BW	48,077	173	1,522	2.5	39.9	39.9	40.0	0.1
BX	48,551	123	1,229	3.1	40.3	40.3	40.5	0.2
BY	48,786	103	1,180	3.2	40.6	40.6	40.8	0.2
BZ	49,247	250	2,558	1.5	40.7	40.7	41.0	0.3
CA	49,464	262	2,499	1.5	40.8	40.8	41.0	0.2
CB	49,943	199	1,902	2.0	40.8	40.8	41.1	0.3
CC	50,357	321	2,927	1.3	41.0	41.0	41.2	0.2
CD	50,947	420	3,161	1.2	41.1	41.1	41.3	0.2
CE	52,286	386	2,932	1.3	41.2	41.2	41.4	0.2
CF	53,412	313	2,265	1.7	41.2	41.2	41.5	0.3

<sup>1</sup>Feet above Cambridge/Watertown corporate limits

TABLE 23	FEDERAL EMERGENCY MANAGEMENT AGENCY	<b>FLOODWAY DATA</b>
	<b>MIDDLESEX COUNTY, MA</b>	
	(ALL JURISDICTIONS)	
		<b>FLOODING SOURCE: CHARLES RIVER</b>

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION ( FEET NAVD88)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
CG	54,113	236	2,002	1.9	41.3	41.3	41.6	0.3
CH	54,391	312	2,611	1.4	41.4	41.4	42.1	0.7
CI	55,084	220	1,822	2.1	41.4	41.4	42.2	0.8
CJ	55,789	181	1,518	2.5	41.5	41.5	42.3	0.8
CK	56,239	261	1,760	2.1	41.5	41.5	42.5	1.0
CL	56,544	218	1,731	2.2	41.6	41.6	42.6	1.0
CM	57,636	198	1,379	2.7	42.0	42.0	43.0	1.0
CN	58,650	111	1,029	3.7	42.6	42.6	43.4	0.8
CO	59,054	156	1,370	2.8	43.1	43.1	43.8	0.7
CP	59,662	121	900	4.2	43.4	43.4	44.0	0.6

<sup>1</sup>Feet above Cambridge/Watertown corporate limits

TABLE 23	FEDERAL EMERGENCY MANAGEMENT AGENCY	<b>FLOODWAY DATA</b>
	<b>MIDDLESEX COUNTY, MA</b>	
	(ALL JURISDICTIONS)	
		<b>FLOODING SOURCE: CHARLES RIVER</b>

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION ( FEET NAVD88)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	5,742	30	183	4.4	35.3	35.3	36.3	1.0
B	5,892	30	166	4.8	35.5	35.5	36.5	1.0
C	6,202	30	187	4.3	37.7	37.7	37.7	0.0
D	6,578	30	202	4.0	38.6	38.6	38.6	0.0
E	7,158	30	164	4.9	38.6	38.6	39.0	0.4

<sup>1</sup>Feet above confluence with Charles River

TABLE 23	FEDERAL EMERGENCY MANAGEMENT AGENCY <b>MIDDLESEX COUNTY, MA</b> (ALL JURISDICTIONS)	<b>FLOODWAY DATA</b>
		<b>FLOODING SOURCE: CHEESE CAKE BROOK</b>

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION ( FEET NAVD88)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	1,922	50	502	2.5	108.5	108.5	109.4	0.9
B	2,865	50	535	2.4	111.6	111.6	112.4	0.8
C	4,148	80	524	2.4	112.0	112.0	112.9	0.9
D	4,691	40	458	2.8	112.4	112.4	113.4	1.0
E	6,060	50	389	2.6	113.6	113.6	113.8	0.2
F	6,942	40	295	2.1	113.9	113.9	114.2	0.3
G	7,892	60	329	1.9	114.0	114.0	114.7	0.7
H	8,655	40	235	2.6	114.8	114.8	115.0	0.2
I	9,560	40	144	4.3	115.8	115.8	115.9	0.1
J	10,310	40	189	3.3	119.1	119.1	119.1	0.0

<sup>1</sup>Feet above confluence with Charles River

TABLE 23	FEDERAL EMERGENCY MANAGEMENT AGENCY <b>MIDDLESEX COUNTY, MA</b> (ALL JURISDICTIONS)	<b>FLOODWAY DATA</b>
		<b>FLOODING SOURCE: SOUTH MEADOW BROOK – PAUL BROOK</b>

I. That the Revised Ordinances of Newton, Massachusetts, 2017, as amended, be and are hereby further amended with respect to **Chapter 17 Fees for Licensing and Permits; and Civil Fines Generally** by **INSERTING** after **Sec. 17-23(h) BERDO ADMINISTRATOR** a new subsection (i) as follows:

(i) FLOODPLAIN ADMINISTRATOR: The Floodplain Administrator, and/or his or her designee, shall be authorized to issue written notice of the following violations:

Sec. 22-23. Newton FEMA Floodplain District.

( ) Any offense.....\$300.00

(Ord. c-59, 02/18/2025)

**Secs. 22-23—22-37. Reserved.**

**ARTICLE III.  
HISTORICAL PROVISIONS**

**DIVISION 1. COMMISSIONS AND DISTRICTS**

**Sec. 22-38. Historical commission— establishment, purpose, appointment, officers.**

(a) There is hereby established under General Laws chapter 40, section 8D a Newton Historical Commission for the preservation, promotion and development of the historical or archeological assets of the city, to be governed by and operated in accordance with the provisions relative thereto of the General Laws or any special act or amendment thereto.

(b) Said commission shall consist of seven members, including one member from two nominees submitted by the Jackson Homestead Trustees; one member who is a registered architect from two nominees submitted by the Boston Society of Architects; one member from two nominees submitted by the Newton Board of Realtors; and four members who shall be appointed at large. If within thirty (30) days after submission of a written request for nominees to any of the organizations herein named no such nominations have been made, the mayor may proceed to appoint the commission without nomination by such organization. There also shall be appointed no more than seven alternate members, who shall be selected at large.

(c) The permanent members shall elect one member as chair and one member as secretary. In the event a member is absent or unable to act for any reason, the chair shall designate an alternate member to act.

(d) Members and alternate members of the historical commission shall by their appointment to the historical commission also be appointed as members and alternate members respectively of the historic district commission(s) established under section 22-40. (Ord. No. 102, 12-15-75; Ord. No. X-17, 4-16-02)

**Cross references**—Division of city into zoning districts, §1-4; regulations governing appointment to and service on commissions and committees, §2-8

**Sec. 22-39. Same—Powers and duties.**

(a) The historical commission shall be possessed of powers and subject to duties in accordance with the provisions of the General Laws relative thereto, as they may be amended, to the extent of monies given, granted, contributed, bequeathed and appropriated.

(b) The historical commission shall have in addition to the powers and duties of an historical commission under the General Laws the following further powers and duties, subject to appropriation or other receipt of monies, and may, in exercise of any of its powers or duties accept and expend such monies and employ clerical and technical assistants and consultants:

- (1) to cooperate with, consult, and serve as an advisory body on matters affecting the historical assets of the city to officers, departments, boards, commissions, committees and other agencies of the city, and to assure that the comprehensive plan embodies appropriate preservation of those assets;
- (2) to conduct a survey of Newton buildings and sites for the purpose of determining those of historic significance architecturally or otherwise;
- (3) to propose as it deems appropriate the establishment of additional historic districts and changes in existing historic districts;
- (4) upon recommendation of the historic district commission(s) established under section 22-40, and in accordance with the Historic Districts Act, to act as the historic district study committee for the establishment of additional historic districts;
- (5) to offer assistance to and advise owners and occupants of historic buildings and structures on problems of preservation;
- (6) acquire in the name of the city by gift, purchase, grant, bequest, devise, lease or otherwise the fee or lesser interest in real or personal property of significant historical value and may manage the same; and may administer on behalf of the city any properties or easements, restrictions or other interests in real property which the city may have or may accept as gifts or otherwise and which the city may designate the commission as the administrator thereof. (Ord. No. 102, 12-15-75)

**Sec. 22-40. Historic district; purpose, governance, appointments, officers.**

(a) *Purpose.* The purpose of this section is to promote the preservation and protection of the distinctive characteristics of buildings and places significant in the history of the City of Newton, the maintenance and improvement of settings of such buildings and settings, and the encouragement of design compatible with the existing architecture.

(b) *Definitions.* As used in this section, the following terms shall be defined as set forth herein unless otherwise stated:

*To alter, alteration:* To rebuild, reconstruct, restore, remove, demolish or other similar activities, including a change in exterior color.

*Building:* A combination of materials forming a shelter for persons, animals or property.

*Certificate of Appropriateness:* The certificate issued by a commission if it determines that the construction or alteration for which an application for a certificate of appropriateness has been filed will be appropriate for or compatible with the preservation or protection of the district.

*Certificate of Non-applicability:* The certificate issued by a commission if it determines that the construction or alteration for which a certificate of appropriateness or a certificate of non-applicability has been filed does not involve any exterior architectural feature or involves an exterior architectural feature which is not subject to review by the

commission.

*Certificate of Hardship:* The certificate issued by a commission if it determines that owing to conditions especially affecting the building or structure involved, but not affecting the historic district generally, failure to approve an application will involve a substantial hardship, financial or otherwise, to the applicant and such application may be approved without substantial detriment to the public welfare and without substantial derogation from the intent and purposes of this section. A certificate of hardship shall also be issued by the commission in the event that it fails to make a determination on an application within sixty (60) days of filing.

*Commission:* An historic district commission as established hereunder.

*To construct, construction:* To build, erect, install, enlarge, move and other similar activities.

*District:* An historic district established pursuant to chapter 40C and these ordinances consisting of one or more district areas.

*Exterior architectural features:* Such portion of the exterior of a building or structure as is open to view from a public street, public way, public park or public body of water, including but not limited to the architectural style and general arrangement and setting thereof, the kind, color and texture of exterior building materials, the color of paint or other materials applied to exterior surfaces and the type and style of windows, doors, lights, signs and other appurtenant exterior fixtures.

*Person aggrieved:* The applicant, an owner of adjoining property, an owner of property within the same historic district located within one hundred (100) feet of said property lines and any charitable corporation which has as one of its purposes the preservation of historic structures or districts.

*Sign:* Any symbol, design, or device used to identify or advertise any place of business, product, activity or person.

*Structure:* A combination of materials other than a building, including a sign, fence, wall, terrace, walk or driveway, and all supporting assemblies, supporting structures, equipment and facilities ancillary or accessory to antennae and wireless communication equipment as described in Sec. 30-18A of the Newton Revised Ordinances, entitled Wireless Communications Devices.

(c) *Districts.*

- (1) A district shall consist of one or more district areas as delineated in the map or maps identified in subsection (c)(4) hereof.
- (2) Prior to the establishment of additional districts, an investigation and report on the historical and architectural significance of the buildings, structures or sites to be included in the proposed district shall be made by the existing district commission(s) or by the historical commission acting as an historic district study commission pursuant to the provisions of G.L. C. 40C, sections 3 and 4, as set forth in subsections (c)(2) - (4) of this section. The buildings, structures or sites to be included in the proposed district may consist of one or more parcels or lots of land, or one or more buildings or structures on one or more parcels or lots of land. Copies of the report shall be transmitted to the planning board and to the Massachusetts Historical Commission for their respective consideration and recommendations. Not less than sixty (60) days after such transmittal, the study committee shall hold a public hearing on the report after due notice given at least fourteen days prior to the date thereof, which shall include a written notice mailed postage prepaid, to the owners as they appear on the most recent real estate tax list of the board of assessors of all properties to be included in such district or districts. The committee shall submit a final report with its recommendations, a map of the proposed district or districts and a draft of the proposed ordinance to the city council for its consideration. Adoption of such

ordinance shall require a two-thirds (2/3) vote of the city council.

- (3) In the case of the enlargement or reduction of an existing district, the investigation, report and hearing shall be conducted by the historic district commission having jurisdiction over such district. In the case of a creation of an additional historic district, the investigation, report and hearing shall be conducted by the existing historic district commission or commissions acting jointly if there is more than one historic district commission, provided, however, that the existing historic district commission(s) may relinquish all power relative to the establishment of an additional district(s) as permitted by G.L. C. 40C, section 3, in which event the historical commission shall serve as an historic district study committee to perform all acts required of historic district commission(s) for the establishment of additional districts.
- (4) A district created pursuant to this ordinance or any amendment to the boundaries of an existing district shall not become effective until a map or maps setting forth the boundaries of the new district, or the change in the boundaries of an existing district has been filed with the city clerk and recorded in the Middlesex South Registry of Deeds.

(d) *District Commissions.*

- (1) Each district shall be administered by a commission consisting of seven (7) members, appointed by the mayor subject to confirmation by the city council. Initial terms shall be as follows: two (2) members shall be appointed for one (1) year; two (2) members shall be appointed for two (2) years and three (3) members shall be appointed for three (3) years. The mayor shall fill the vacancies in membership arising from expired terms by appointments for a term of three (3) years. Appointments to membership shall be so arranged that the term of at least one member will expire each year, and their successors shall be appointed in the same manner as the original appointment. Any vacancy in the membership of the commission shall be filled for the unexpired portion of any member's term by the mayor.
- (2) A commission shall include one member from two nominees submitted by the local chapter of the American Institute of Architects; one attorney; one realtor from two nominated by the local Board of Realtors; one member or alternate member of the historical commission; one additional member or alternate member of the historical commission or one member nominated by the Newton Historical Society; and two residents or property owners from the district administered by the commission. If within thirty (30) days after submission of a written request for nominees to any of the organizations herein named no such nominations have been made, the mayor may proceed to appoint members without nomination by such organization.
- (3) The mayor shall appoint at least two and no more than seven alternate members to each commission. Alternate members need not be from nominees of organizations entitled to nominate members. In the event that a permanent member is absent or unable to act for any reason, the chairman of the commission shall designate an alternate member to act in place of a permanent member. The initial appointments of alternate members shall be for terms of two or three years, with appointments thereafter being for three year terms.
- (4) Each member and alternate member to a commission shall continue to serve in office after the expiration date of his or her term until a successor is duly appointed, except as provided in subsection (d)(5) hereof.
- (5) The term of the historical commission member shall be coterminous with his or her membership on the historical commission. Any member of a commission appointed by virtue of his or her residence or ownership of property within the district who removes his/her residence or property ownership from such district shall be considered to have resigned from his membership on such commission.
- (6) A commission shall at the beginning of each fiscal year hold an organizational meeting and elect a chairman, a vice chairman, and secretary from among the permanent members, and file notice of such election with the

city clerk.

(7) Meetings of a commission shall be held at the call of the chairman, at the request of two permanent members and in such other manner as a commission shall determine.

(8) Four (4) members of a commission shall constitute a quorum.

(e) *District Commission Powers and Duties.*

(1) A commission shall regulate the construction and/or alteration of any building(s) or structure(s) within the district over which it has jurisdiction in accordance with the provisions of G.L. c. 40C and the procedures and criteria established by this ordinance. Except as otherwise provided in subsection (h) hereof or in the ordinance provision establishing a specific district, no building or structure within a district shall be constructed or altered in any way that affects exterior architectural features unless the commission having jurisdiction over that district shall first have issued a certificate of appropriateness, a certificate of non-applicability or a certificate of hardship with respect to such construction or alteration.

(2) A commission may adopt and/or amend reasonable rules and regulations which are consistent with the provisions of this section and with G.L. c. 40C, and which set forth such procedures as it deems desirable and necessary for the regulation of and conduct of its business, including requirements for the contents and form of applications for certificates, fees, hearing procedures, and other matters. The commission shall file a copy of any such rules and regulations with the city clerk. All fees imposed by the commission shall be approved in advance by the city council.

(3) A commission shall keep a permanent record of its decisions, transactions, resolutions, and of the vote of each member participating therein.

(4) A commission shall cooperate with, consult and advise officers, departments, boards, commissions, committees and other agencies of the city on matters affecting the administration of the district under its jurisdiction.

(5) A commission shall offer assistance to and advise owners and occupants of historic buildings and structures within the district of its jurisdiction on problems of preservation.

(6) A commission may propose as it deems appropriate enlargements and reductions to the district under its jurisdiction; and in accordance with the provisions of this section and G.L. c. 40C, conduct investigations, prepare reports and conduct public hearings concerning enlargements or reductions to the district.

(7) A commission may act relative to the establishment of additional historic district(s) as permitted by G.L. c. 40C, or may relinquish all its powers relative to the establishment of additional historic districts and recommend that the historical commission act as an historic district study committee to perform all acts required of an historic district commission(s) for the establishment of additional historic districts.

(8) A commission may, subject to appropriation or receipt of other monies, employ clerical and technical assistants and consultants and incur other expenses appropriate to the carrying on of its work and may accept money gifts and expend the same for such purposes.

(f) *Procedures for Review of Applications for Certificates of Appropriateness, Non-Applicability and Hardship.*

(1) Any person who desires to obtain a certificate from a commission shall file an application with a commission. The application shall be accompanied by such plans, elevations, specifications, photographs, and other

information, including in the case of demolition or removal a statement of the proposed condition and appearance of the property thereafter, as may be reasonably deemed necessary by the commission to enable it to make a determination on the application. The date of the filing of an application shall be the date on which a copy of such application with all supporting documentation is received at the city's department of planning and development. A commission shall determine within fourteen (14) days after the filing of an application for a certificate whether the application involves any exterior architectural features which are subject to approval by the commission.

- (2) If the application involves any features which are subject to approval, a commission shall hold a public hearing at its next regularly scheduled meeting after the filing of a completed application for a certificate of appropriateness or a certificate of hardship unless additional time is agreed to by the applicant in writing or unless such hearing is dispensed with as provided in subsection (f)(3) hereof. Copies of the public notice of the time, place and purposes of the public hearing shall be mailed to the applicant, to the owners of all adjoining property and to other property owners deemed by the commission to be materially affected thereby, to the planning and development board, to any person filing written request for notice of hearings and to such other persons as the commission shall deem entitled to notice.
- (3) A public hearing on an application need not be held if such hearing is waived in writing by all persons entitled to notice thereof. In addition, a public hearing on an application may be waived by a commission if the commission determines that the exterior architectural feature involved or its category, as the case may be, is so insubstantial in its effect on the district that it may be reviewed by the commission without public hearing on the application, provided, however, that if the commission dispenses with a public hearing on an application, notice of the application shall be given to the owners of all adjoining property and other property deemed by the commission to be materially affected thereby as above provided and ten (10) days shall elapse after the mailing of such notice before the commission may act upon such application.
- (4) A commission shall render a decision within sixty (60) days after the filing of a completed application for a certificate of appropriateness unless further time for a decision is allowed, in writing, by the applicant. If the commission shall fail to make a determination within sixty (60) days, the commission shall thereupon issue a certificate of hardship.
- (5) In the case of a disapproval of an application for a certificate of appropriateness, a commission shall place upon its records the reasons for such determination and shall forthwith cause a notice of its determination, accompanied by a copy of the reasons therefore as set forth in the records of the commission, to be issued to the applicant, and the commission may make recommendations to the applicant with respect to appropriateness of design, arrangement, texture, materials, and similar features. Prior to the issuance of any disapproval, the commission may notify the applicant of its proposed action accompanied by recommendations of changes in the applicant's proposal which, if made, would make the application acceptable to the commission. If within fourteen (14) days of the receipt of such notice the applicant files a written modification of his application in conformity with the recommended changes of the commission, the commission shall cause a certificate of appropriateness to be issued to the applicant.
- (6) The concurring vote of four members of a commission shall be required to issue a certificate. All other matters that may come before a commission may be determined by a majority vote of the commission members present at the meeting.
- (7) In issuing certificates, a commission may, as it deems appropriate, impose certain conditions and limitations, and may require architectural or plan modifications consistent with the intent and purpose of this section.
- (8) If a commission determines that the construction or alteration for which an application for a certificate of appropriateness has been filed will be appropriate for or compatible with the preservation or protection of the

district, the commission shall issue a certificate of appropriateness.

- (9) If a commission determines that an application for a certificate of appropriateness or for a certificate of non-applicability does not involve any exterior architectural feature, or involves an exterior architectural feature which is not subject to review by the commission, the commission shall cause a certificate of non-applicability to be issued to the applicant.
- (10) If the construction or alteration for which an application for a certificate of appropriateness has been filed shall be determined to be inappropriate and therefore disapproved, or in the event of an application for a certificate of hardship, a commission shall determine whether, owing to conditions especially affecting the building or structure involved, but not affecting the district generally, failure to approve an application will involve a substantial hardship, financial or otherwise, to the applicant and whether such application may be approved without substantial detriment to public welfare and without substantial derogation from the intent and purposes of this section. If the commission determines that owing to such conditions failure to approve the application will involve substantial hardship to the applicant and approval thereof may be made without such substantial detriment or derogation, the commission shall issue a certificate of hardship.
- (11) Each certificate issued by the commission shall be dated and signed by the chairman or such other person designated by the commission to sign such certificates on its behalf.
- (12) The commission shall send a copy of certificates and disapprovals issued to the applicant and shall file a copy with the city clerk and the commissioner of inspectional services.
- (13) Any person aggrieved by a determination of a commission, may, within twenty (20) days of the filing of the notice of such determination with the city clerk, file a written request with the commission for a review by a person or persons, not exceeding three, of competence and experience in such matters, designated by the Metropolitan Area Planning Council. The finding of the reviewers shall be filed with the City Clerk within forty-five (45) days after the request, and shall be binding on the applicant and the commission, unless further appeal is sought in superior court as provided in G.L. c. 40C, section 12A. The filing of such further appeal shall occur within twenty (20) days after the finding of the reviewers has been filed with the city clerk.

(g) *Criteria for Determinations.*

- (1) In deliberating on applications for certificates, a commission shall consider, among other things, the historic and architectural value and significance of the site, building or structure, the general design, arrangement, texture, material and color of the features involved, and the relation of such features to similar features of buildings and structures in the surrounding area.
- (2) In the case of new construction or additions to existing buildings or structures, a commission shall consider the appropriateness of size and shape of the building or structure both in relation to the land area upon which the building or structure is situated and to buildings and structures in the vicinity, and a Commission may in appropriate cases impose dimensional and set-back requirements in addition to those required by applicable zoning ordinances.
- (3) A commission shall not consider interior arrangements or architectural features not subject to public view.
- (4) A commission shall not make any recommendation or requirement except for the purpose of preventing developments incongruous to the historic aspects or the architectural characteristics of the surroundings and of the district.
- (5) Nothing in this section shall be construed to prevent the ordinary maintenance, repair or replacement of any

exterior architectural feature within a district which does not involve a change in design, material or the outward appearance thereof, nor to prevent landscaping with plants, trees or shrubs, nor construed to prevent the meeting of requirements certified by a duly authorized public officer to be necessary for public safety because of an unsafe or dangerous condition, nor construed to prevent any construction or alteration under a permit duly issued prior to the effective date of any ordinance provision or amendment thereto listing a specified district.

- (6) A commission shall not review and shall issue a certificate of non-applicability for the reconstruction, substantially similar in exterior design, of a building, structure or exterior architectural feature damaged or destroyed by fire, storm or other disaster, provided such reconstruction is begun within one (1) year thereafter and carried forward with due diligence.
- (7) With the exception of applications submitted pursuant to subsection (f), nothing in the design controls authorized by this section shall be construed as giving a commission the power to require restoration of any building or structure or portion of any building or structure to any particular historic appearance or style of said building or structure or said portion of building or structure had already been substantially removed or lost or changed prior to the adoption of the initial ordinance provision establishing historic commissions, to-wit, December 15, 1975.
- (8) A commission is authorized to deny any application for a certificate of appropriateness, non-applicability or hardship for the proposed construction or alteration of any building or structure within the district over which it has jurisdiction upon a determination that there is an unremediated violation of this ordinance in existence at the subject building or structure, regardless of whether said violation is attributable to the present owner or a predecessor in title to the subject premises. Upon proper remediation of any such violation, as verified by said commission with the assistance of and review by the commissioner of inspectional services, or building official, if necessary, any such application shall proceed through the established procedure for commission review, subject to the established administrative criteria for determinations, as set out in subsections 22-40(f) and 22-40(g).

(h) *Exclusions.*

- (1) A commission shall have no jurisdiction to review the following categories of exterior architectural features, and shall issue a certificate of non-applicability for:
  - a) temporary structures and signs erected for a period of sixty (60) days or less;
  - b) one residential identification sign which is not more than one foot square in area provided that:
    - i) the sign consists of letters and/or street identification numbers painted or otherwise suitably inscribed on wood, brass or stone without a symbol or trademark; and
    - ii) if illuminated, such sign is illuminated only indirectly (indirectly meaning by a light source directed at the sign surface and not contained within the sign or its structure).
  - c) a second set of residential building numbers affixed or inscribed on buildings in order to comply with Section 26-7, Numbering of buildings, shall not be subject to review by nor shall they require a certificate of non-applicability from said commission.
  - d) signs for professional or security purposes which are not more than one foot square in area; provided that:
    - i) only one sign is displayed for each building or structure;

- ii) the sign consists of letters painted on wood or brass without a symbol or trademark;
  - iii) if illuminated, it is illuminated only indirectly.
- e) terraces, walks, and sidewalks so long as such structure is substantially at grade level;
- f) storm doors, storm windows, screens, lightning protection, window boxes, window air conditioners and lighting fixtures, except for freestanding lighting fixtures;
- g) paint colors;
- h) colors of roof materials.
- i) antennae designed to receive television broadcast signals; antennae designed to receive direct broadcast satellite services, including direct-to-home satellite services, but only if one meter or less in diameter; antennae designed to receive video programming services via multipoint distribution services, including multichannel multipoint distribution services, instructional television fixed services, and local multipoint distribution services, but only if one meter or less in diameter or diagonal measurement, as set out in Section 207 of the Federal Telecommunications Act of 1996 and rules and regulations promulgated thereunder, 47 C.F.R. Ch.1, Subpart S, §1.4000, and any successor laws, rules or regulations; satellite earth station antennae, as detailed in FCC rules and regulations, 47 C.F.R. 25.104 and any successor laws, rules and regulations; and any antennae in a non-residential building or structure which are not visible because they are concealed within the building, structure or its physical appurtenances, including, but not limited to a steeple, belfry, or the like. Supporting assemblies, supporting structures, equipment and facilities ancillary or accessory to such antennae as described in Sec. 30-18A of the Newton Revised Ordinances are not exempt nor excluded from historic district commission and historic commission jurisdiction and review pursuant to M.G.L. c. 40C and Sec. 22-40 through 22-44 of the Newton Revised Ordinances.

(i) *Enforcement.*

The commission, as defined herein, is authorized to institute any and all actions and proceedings, in law or in equity, in any court of competent jurisdiction, consistent with the provisions of G.L. c. 40C, s. 13, as amended, or its successor, as it deems necessary and appropriate to obtain compliance with the requirements of this ordinance and the determinations, rulings and regulations issued pursuant thereto. Whoever violates any of the provisions of this ordinance shall be punished by a fine not exceeding three hundred dollars (\$300.00) for each offense. Each day any violation of this ordinance shall continue shall constitute a separate offense.

(j) *Building Permits.*

The commission shall notify the commissioner of inspectional services or building official in writing of any violation of the requirements of this ordinance or its determinations, rulings and regulations with regard to a specific building or structure, and shall instruct said commissioner or building official to make a permanent record of such violation in the corresponding property file maintained in the department of inspectional services as required by law. Prior to the issuance of any building permit for the construction, reconstruction, alteration, renovation, repair, removal, demolition, or change of use or occupancy of any building or structure, said commissioner or building official shall review the property file and ascertain whether a notice of unremediated violation of this ordinance is on record. To the extent allowed by law, including but not limited to the provisions of the state building code, 780 CMR 111.1 (6<sup>th</sup> ed.) or its successor, unless the commissioner or building official is satisfied there is no outstanding unremediated violation of this ordinance, he or she shall reject such application for a building permit for such

building or structure in writing, stating the reasons therefor.

(k) *Severability.*

The provisions of this section shall be deemed to be severable. If any of its provisions shall be held to be invalid or unconstitutional by any court of competent jurisdiction the remaining provisions shall continue in full force and effect. (Ord. No. 102, 12-15-75; Ord. No. V-157, 12-15-97; Ord. No. V-214, 12-21-98; Ord. No. V-300, 5-15-00; Ord. No. X-197, 03-20-06; Ord. No. X-209, 05-01-06; Ord. No. B-13, 07-09-18)

**Sec. 22-41. Newton Upper Falls Historic District; established, boundaries.**

There is hereby established an historic district to be known as the Newton Upper Falls Historic District, bounded and described as shown on the map entitled "Newton Upper Falls Historic District Expansion, July 11, 1985." (Ord. No. 102, 12-15-75; Ord. No. 274, 6-5-78; Ord. No. R-190, 11-16-81; Ord. No. S-133, 10-21-85; Ord. No. T-155, 6-17-91)

**Editor's Note** – The referenced map is on file in the office of the City Clerk. A copy of the map appears in the Appendix at the end of this chapter.

**Sec. 22-42. Chestnut Hill Historic District; established, boundaries.**

(a) There is hereby established an historic district to be known as the Chestnut Hill Historic District, bounded and described as shown on the map entitled, "Chestnut Hill Historic District, March 19, 1991."

(b) As authorized by the General Court in chapter 49 of the Acts of 1996, the following definition of "exterior architectural features" shall control in the Chestnut Hill Historic District only:

*Exterior architectural features:* Such portion of the exterior of a building or structure as is open to view from a public street, public way, public park, public body of water or private way, including but not limited to the architectural style and general arrangement and setting thereof, the kind, color and texture of exterior building materials, the color of paint or other materials applied to exterior surfaces and the type and style of windows, doors, lights, signs and other appurtenant exterior fixtures.

(c) Notwithstanding the provisions of this section and section 22-40 in general and section 22-40(e)(i) in particular, the Chestnut Hill Historic District Commission may make only non-binding recommendations regarding changes to the exterior architectural features open to view from a private way of properties located on Essex Road and from Nos. 147 through 256 Chestnut Hill Road, with the following exceptions where such decisions of the commission shall be fully binding in the ordinary course:

- (1) demolition of a building or structure so long as such demolition occurs after such property ceases to be legally or beneficially owned by the owner of record as of the effective date of the 1996 amendment to Sec. 22-42;
- (2) any lot created by subdivision of such properties where its required frontage lies on a way whose properties are not then subject to such limited commission review;
- (3) any property where the legal or beneficial owner of record files with the city clerk a certificate indicating irrevocable consent on behalf of such owner and of successor owners to submit to the jurisdiction of the historic district commission and to be bound by its decisions, subject to any statutory rights of appeal;
- (4) all of such properties on Essex Road or on the portion of Chestnut Hill Road identified above, if at any time not less than seventy-two and one-half percent of the total number of owner-occupied properties on the

specific road under consideration have been made the subject of a filing described in subsection (c), at which time the limits on commission review established by the above provisions shall lapse and shall not be reestablished for such specific road. It shall also be sufficient for such lapse to occur if the owner-occupants of all but four of the owner-occupied properties on the specific road under consideration have made the filing described in subsection (c).

(d) No owner of any property claiming the benefit of this exemption shall have standing as an aggrieved person for the purpose of appealing any decision of the district commission concerning property other than his own, other than a decision relating to changes to architectural features visible from a public way.

(e) The limited commission review herein established shall not affect the district commission's authority to regulate exterior architectural features open to view from a public street, way, park or body of water, even if such features are located on property containing exterior architectural features subject to such limited review, nor shall it affect the commission's authority under sections 22-60 et seq., and 22-50 of the Newton Revised Ordinances relating to landmark preservation and the demolition of structures, respectively. (Ord. No. T-155, 6-17-91; Ord. No. V-100, 12-16-96)

**Editor's Note** – The referenced map is on file in the office of the City Clerk. A copy of the map appears in the Appendix at the end of this chapter.

#### **Sec. 22-43. Newtonville Historic District; established, boundaries.**

(a) There is hereby established an historic district to be known as the Newtonville Historic District, bounded and described as shown on the map entitled “Proposed Newtonville Local Historic District,” prepared by Newton Geographic Information System (GIS), with a date of 12-Aug-2002. (Ord. No. X-29, 9-3-02)

**Editor's Note** – The referenced map is on file in the office of the City Clerk. A copy of the map appears in the Appendix at the end of this chapter.

#### **Sec. 22-44. Auburndale Historic District; established, boundaries.**

(a) There is hereby established an historic district to be known as the Auburndale Historic District, bounded and described as shown on the map entitled “Auburndale Proposed Local Historic District,” prepared by Newton Geographic Information System (GIS), with a date of January 05, 2005. (Ord. No. X-135, 03-21-05)

**Editor's Note** – The referenced map is on file in the office of the City Clerk. A copy of the map appears in the Appendix at the end of this chapter.

#### **Secs. Reserved 22-45—22-49. Reserved.**

### DIVISION 2. DEMOLITION DELAY

#### **Sec. 22-50. Demolition of historically significant buildings or structures.**

(a) *Intent and Purposes.* This section is adopted in furtherance of the policy set forth in the Newton Comprehensive Plan to assure the preservation and enhancement of the City of Newton's historical and cultural heritage by preserving, rehabilitating or restoring whenever possible, buildings or structures which have distinctive architectural features or historical associations that contribute to the historic fabric of the City.

(b) *Definitions.* For the purposes of this section, the following words and phrases have the following meanings:

*Commission:* The Newton Historical Commission, or if the regulated building or structure is in a local historic district established pursuant to G.L. c. 40C, the local historic district commission.

*Commission staff:* The person(s) regularly providing staff services for the commission whom the commission has designated commission staff for the purposes of this ordinance.

*Commissioner:* The commissioner of inspectional services.

*Application:* An application to the commissioner for a demolition permit as defined by this ordinance.

*Demolition permit:* Any permit issued by the commissioner which is required by the State Building Code and which authorizes the total or partial demolition of a building or structure (excluding interior demolition) regardless of whether such permit is called a demolition permit, alteration permit, building permit, etc.

*Total demolition:* The pulling down, razing or destruction of the entire portion of a building or structure which is above ground regardless of whether another building or structure is constructed within the original footprint of the destroyed building or structure.

*Partial demolition:* The pulling down, destruction or removal of a substantial portion of the exterior of a building or structure or the removal of architectural elements which define or contribute to the historic character of the structure.

- (1) Items requiring review by the commission at a hearing. Partial demolition of any architecturally significant features which would alter the massing of the existing structure including, but not limited to the following items.
  - a) Additions or eaves determined to be architecturally significant by commission or commission staff.
  - b) Roofs, including flat roofs, determined to be architecturally significant by commission or commission staff.
  - c) Porches determined to be architecturally significant by commission or commission staff, except open decks, staircases, and entryways, which are excluded from review.
  - d) Removal or envelopment by subsequent additions of 50% or more of any single exterior wall surface. Each wall is calculated by square footage individually.
  - e) Demolition of any architectural detail determined to be architecturally significant by commission or commission staff.
    - i) Brackets
      - ii) Crown molding
      - iii) Porch columns and railings
      - iv) Bay windows
      - v) Dormers
      - vi) Chimneys
- (2) Items requiring review by the commission that may be reviewed and approved by commission staff without a hearing if plans indicate
  - a) Removal or alteration of the roof structure.

- b) Repair or replacement of existing and original porches with similar materials to match existing.
- c) Demolition or construction of additions or alterations not visible from a public way.
- d) Removal or envelopment by subsequent additions of 50% to 100% of any single exterior wall surface. Each wall is calculated by square footage.

(3) *Items considered to be de minimis and requiring no commission or commission staff review:*

- a) Open porches and entryways consisting of only a set of stairs, an entrance platform and a roof which are utilitarian in design or do not contribute to the architectural significance or character of the building.
- b) Demolition or construction of new additions which remove, alter, or envelop 50% or less of a single exterior wall.
- c) Removal or alteration of less than 50% of the roof structure
- d) Normal maintenance of a building's exterior, including, but not limited to repair or replacement of roof surfaces, repair or replacement of gutters, and repair or replacement of existing doors and windows, including casings and frames, repair or replacement of existing exterior cladding (clapboards, shingles, masonry, etc.).

*Historically significant building or structure:* Any building or structure which is in whole or in part fifty or more years old and which

- (1) is in any federal or state historic district, or if in any local historic district, is not open to view from a public street, public park or public body of water; or
- (2) is listed on or is within an area listed on the National Register of Historic Places or eligible for such listing, or listed on or is within an area listed on the State Register of Historic Places, or eligible for such listing; or
- (3) has been determined by the commission or its designee to be a historically significant building after a finding that it is:
  - a) importantly associated with one or more historic persons or events, or with the architectural, cultural, political, economic or social history of the City of Newton, the Commonwealth of Massachusetts or the United States of America: or
  - b) historically or architecturally important by reason of period, style, method of building construction or association with a particular architect or builder, either by itself or in the context of a group of buildings or structures; or
  - c) located within one hundred fifty (150) feet of the boundary line of any federal or local historic district and contextually similar to the buildings or structures located in the adjacent federal or local historic district.

*Preferably preserved:* An historically significant building or structure which the commission has determined should be preserved, rather than totally or partially demolished, in accordance with the standards set forth in subsection (c)(5) below.

(c) *Procedure.*

- (1) No demolition permit for a building or structure which is in whole or in part fifty or more years old shall be issued by the commissioner except in conformity with the provisions of this section, as well as any other applicable law, statute, ordinance or regulation.
- (2) If any applicant and the owner of the building or structure, if different from the applicant seeks to demolish, in whole or in part, a building or structure which is in whole or in part fifty or more years old, the owner of the building or structure shall file a demolition review application with the commission for a determination as to whether the building or structure is historically significant and shall provide the commission with the following information:
  - a) a site plan or a copy of that portion of the tax assessor's map which shows the building or structure to be demolished and the property on which it is located;
  - b) photographs of all existing façade elevations of the building or structure to be totally or partially demolished;
  - c) a description of the proposed plans for demolition and the reason(s) therefore.
- (3) Within fifteen (15) days after the commission's receipt of a demolition review application, the commission shall make a determination as to whether the building is or is not historically significant and shall notify, in writing, the commissioner and the applicant of this determination. The commission may delegate the determination that a building or structure is historically significant to commission staff or to a designated commission member. In the event that the commission delegates the determination to the commission staff or to a designated commission member, the commission shall adopt criteria to be followed by the staff or the member in making this determination.

A determination that a building or structure is or is not historically significant made by the commission staff or a designated commission member may be appealed to the full commission by filing a notice of appeal with the commission not later than fifteen (15) days after the written notice that the building or structure is or is not historically significant has been filed with the commissioner. Filing the appeal of the determination shall not stay the effect of such determination. Following a hearing before the commission, which may, but is not required to be conducted in conjunction with the hearing on whether the building or structure is preferably preserved, the commission shall affirm or reverse the determination and file notice of such determination with the commissioner. If the appeal of the determination is made independent of the preferably preserved hearing, the commission shall follow the same procedure for such hearing as that set forth in subsection (c)(5) below. If the commission fails to conduct a hearing on the appeal of said determination or fails to rule on the appeal within forty-five (45) days from the filing of the appeal, the determination that a building or structure is or is not historically significant shall remain unchanged, and the commissioner shall not issue a demolition permit until the procedural requirements of subsection (c)(5) below have been satisfied.

- (4) No demolition permit shall be issued by the commissioner for a building or structure determined to be historically significant until the procedural requirements of subsection (c)(5) of this ordinance have been satisfied. The commissioner may grant the demolition permit if the commissioner:
  - a) does not receive written notice within forty-five (45) days after the commission's receipt of a demolition permit application that the building or structure is historically significant; or
  - b) receives written notice from the commission that the building either is not historically significant, or is historically significant, but clearly would not be deemed preferably preserved by the commission.

- (5) When a building or structure is determined to be historically significant, the commission shall hold a public hearing to determine whether the building or structure, or the portion of the building or structure to be demolished, is preferably preserved. The applicant shall provide the commission with the following information for this determination:
- a) in the case of partial demolition involving alteration(s) or addition(s) to a building or structure, (i) proposed plans and elevation drawings for the affected portion of the building or structure; and (ii) a plot plan of the property, if the same is required to obtain a permit under the State Building Code for the proposed alteration(s) or addition(s); and
  - b) if the site of the building or structure to be demolished is to be redeveloped, plans showing the use or development of the site after demolition together with a statement identifying all zoning variances and/or special permits which may be required in order to implement the proposed use or development.

The date the commission receives all the above information shall be stamped on the information received and shall be considered the submission date. Following public notice as set forth in subsection (c)(8) of this ordinance, the commission shall hold a public hearing within forty-five (45) days of the submission date to determine whether the building or structure should be preferably preserved, based on the criteria set forth in this paragraph. If the commission finds that the demolition proposed in the application would result in the demolition of a historically significant building or structure whose loss would be detrimental to the historical or architectural heritage or resources of the City of Newton, then the commission shall find that the building or structure should be preferably preserved.

- (6) Upon a determination that the building or structure which is the subject of an application for a demolition permit is preferably preserved, the commission shall give written notice of the determination to the commissioner. A copy of the commission's determination shall also be sent to the applicant for the demolition permit and to the owner of the building or structure if different from the applicant.
- a) For a building or structure listed in the National Register of Historic Places or determined eligible for listing in the National Register of Historic Places by the Massachusetts Historical Commission no demolition permit shall be issued for a total demolition or a partial demolition of a building or structure until eighteen (18) months after the date of such determination by the commission, unless the commission informs the commissioner prior to the expiration of such eighteen (18) month period that the commission is satisfied that the applicant for the demolition permit and the owner of the building or structure, if different from the applicant, has:
    - i) made a bona fide, reasonable and unsuccessful effort to locate a purchaser for the building or structure who is willing to preserve, rehabilitate or restore the building or structure; or,
    - ii) has agreed to accept a demolition permit on specified conditions approved by the commission.
    - iii) If the specified conditions involve approved plans and elevations, then no demolition permit shall be issued by the commissioner unless the applicant provides, as part of his application for a demolition permit, a complete set of plans and elevation drawings which have been signed and stamped by the commission or commission staff.
    - iv) The applicant shall have two (2) years from the date of the expiration of the eighteen (18) month period in which to apply for and obtain a demolition permit. No demolition permit shall be issued for such building or structure after the expiration of this two (2) year period, unless the procedural requirements of subsection (c)(5) hereof have been satisfied.

- v) In order to encourage applications that preserve, restore, reuse, or rehabilitate historic buildings and structures, no application for a total demolition of a building or structure which has been unfavorably and finally acted upon by the commission shall be acted favorably upon within four months after the date of final unfavorable action unless the said commission finds
    - (a) by a vote of two-thirds (2/3) of those members present, substantial and material changes in said resubmitted application; or,
    - (b) by a majority vote of those members present, that the resubmitted application proposes to preserve the building or structure.
  - vi) Due notice shall be given to parties in interest of the time and place of the proceedings when the resubmitted application will be considered.
- b) For all other buildings and structures not covered under section (6)a) above, no demolition permit shall be issued for a total demolition or a partial demolition of a building or structure found preferably preserved until one (1) year after the date of such determination by the commission, unless the commission informs the commissioner prior to the expiration of such one (1) year period that the commission is satisfied that the applicant for the demolition permit and the owner of the building or structure, if different from the applicant, has:
- i) made a bona fide, reasonable and unsuccessful effort to locate a purchaser for the building or structure who is willing to preserve, rehabilitate or restore the building or structure; or,
  - ii) agreed to accept a demolition permit on specified conditions approved by the commission.
  - iii) If the specified conditions involve approved plans and elevations, then no demolition permit shall be issued by the commissioner unless the applicant provides, as part of his application for a demolition permit, a complete set of plans and elevation drawings which have been signed and stamped by the commission or commission staff.
  - iv) The applicant shall have two (2) years from the date of the expiration of the one (1) year period in which to apply for and obtain a demolition permit. No demolition permit shall be issued for such building or structure after the expiration of this two (2) year period, unless the procedural requirements of subsection (c)(5) hereof have been satisfied.
  - v) In order to encourage applications that preserve, restore, reuse, or rehabilitate historic buildings and structures, no application for a total demolition of a building or structure which has been unfavorably and finally acted upon by the commission shall be acted favorably upon within four months after the date of final unfavorable action unless the said commission finds
    - (a) by a vote of two-thirds (2/3) of those members present, substantial and material changes in said resubmitted application; or,
    - (b) by a majority vote of those members present, that the resubmitted application proposes to preserve the building or structure.
  - vi) Due notice shall be given to parties in interest of the time and place of the proceedings when the resubmitted application will be considered.
- (7) In the event a transfer of ownership of a preferably preserved property occurs during the applicable

demolition delay period, the full applicable demolition delay period will restart from the date of the transfer of ownership.

- (8) In the event a transfer of ownership of a preferably preserved property occurs after the applicable demolition delay period expires but prior to the issuance of a demolition permit, no demolition permit shall issue until the new owner complies with the procedures set forth in section 22-50 (c) (5).
- 9) Upon a determination by the commission that a building or structure is not preferably preserved or upon the commission's failure to make any determination within forty-five (45) days of the submission date, the commissioner may grant a demolition permit for the building or structure.
- (10) Public notice of commission hearings shall provide the date, place and time of the hearing and the addresses of the properties to be considered at the hearing. Public notice shall include, at a minimum, posting with the city clerk and notification to the director of planning and development, to the applicant, to the owners of all abutting property and to other property owners deemed by the commission to be materially affected.
- (11) If the applicant is someone other than the owner or his designated agent a demolition review application cannot be filed until the commission receives written authorization from the owner that the applicant may apply for changes to their property.

(d) *Emergency Demolition.* If a building or structure poses an immediate threat to public health or safety due to its deteriorated condition, the owner of such building or structure may request issuance of an emergency demolition permit from the commissioner. As soon as practicable after the receipt of such request, the commissioner shall arrange to have the property inspected by a board consisting of himself or his designee; the city engineer or his designee; the fire chief or his designee; the chairman of the commission or his designee; and one (1) disinterested person chosen by the commissioner. After inspection of the building or structure and consultation with the other members of the board, the commissioner shall determine whether the condition of the building or structure represents a serious and imminent threat to public health and safety and whether there is any reasonable alternative to the immediate demolition of the building or structure which would protect public health and safety. If the commissioner finds that the condition of the building or structure poses a serious and imminent threat to public health and safety and that there is no reasonable alternative to the immediate demolition of the building or structure, then the commissioner may issue an emergency demolition permit to the owner of the building or structure. Whenever the commissioner issues an emergency demolition permit under the provisions of this section of the ordinance, he shall prepare a written report describing the demolition of the building or structure and the basis of his decision to issue an emergency permit with the commission. Nothing in this section shall be inconsistent with the procedures for the demolition and/or securing of buildings and structures established by M.G.L. c. 143, sections 6-10.

In the event that a board of survey is convened under the provisions of M.G.L. c. 143, section 8 with regard to any historically significant building or structure, the commissioner shall request the chairman of the commission or his designee to accompany the board during its inspection. A copy of the written report prepared as a result of such inspection shall be filed with the commission.

(e) *Non-Compliance.* Anyone who demolishes a historically significant building or structure without first obtaining and complying fully with the provisions of a demolition permit issued in accordance with this section shall be subject to a fine of not more than three hundred dollars (\$300.00) for each day of violation of this ordinance.

In addition, unless a demolition permit issued in accordance with this section was obtained and unless such permit was fully complied with, including full compliance with plans and elevation drawings signed and stamped by the commission, the commissioner may elect to (1) issue a stop work order halting all work on the building or structure until the commission notifies the commissioner in writing that the applicant has appeared before the commission to address such non compliance, and the commission has accepted the applicant's plans to remediate such

noncompliance; (2) refuse to issue any certificates of occupancy, temporary or final, until any noncompliance has been remediated; and/or (3) refuse to issue a permit required by the State Building Code pertaining to any property on which an historically significant building or structure has been demolished for a period of two (2) years from the date of demolition, provided that this provision shall not prevent the commissioner from issuing any permit required to insure the safety of persons and property.”

The commission may, upon application to and determination by the commission that reuse of the property in accordance with building plans prepared by the owner and submitted to the commission and all relevant agencies will substantially benefit the neighborhood and provide compensation for the loss of the historic elements of the property either through reconstruction of the lost historic elements or significant enhancement of the remaining historic elements of the site or the surrounding neighborhood, waive the fine, in whole or in part, and/or the ban on issuance of a building permit in order to allow the issuance of a building permit for construction or reconstruction of a building or structure approved by the commission. An owner receiving a waiver of the fine and/or ban on issuance of a building permit under this provision shall execute a binding agreement enforceable against all heirs, assigns and successors in interest with the commission to insure that any reuse of the site undertaken during the two-year ban shall be implemented in accordance with the plans, terms, and conditions approved by the commission. Any reuse of the site undertaken during the two-year ban which fails to comply with the terms of the commission's approval granted under this provision shall also permit reinstatement of the fine for non-compliance with this ordinance.

(f) *Securing Historically Significant Buildings and Structures.* If, following an application for a demolition permit, a building or structure has been determined to be historically significant, and the building or structure is subsequently destroyed by fire or other cause before any determination is made by the commission as to whether the building or structure is preferably preserved, a rebuttable presumption shall arise that the owner voluntarily demolished the building or structure without obtaining a demolition permit in accordance with the provisions of this ordinance. In such cases, the commissioner shall not issue any permit required under the State Building Code pertaining to the property on which the historically significant building or structure was located (except as necessary to secure public safety or health) for a period of two (2) years from the date of destruction of the building or structure, unless the owner can provide evidence satisfactory to the commissioner that he took reasonable steps to secure the building or structure against fire or other loss or that the cause of the destruction was not otherwise due to the owner's negligence.

(g) *Securing Preferably Preserved Buildings and Structures.* If during the period of demolition delay for a building or structure determined to be preferably preserved, such building or structure is destroyed through fire or other cause, the commissioner shall not issue any permit required under the State Building Code pertaining to the property on which the preferably preserved building or structure was located (except as necessary to secure public safety or health) until the end of the period of demolition delay, unless the owner can provide evidence to the commission that he took reasonable steps to secure the building or structure against fire or other loss or that the cause of the destruction was not otherwise due to the owner's negligence.

(h) *Buildings and Structures located in Local Historic Districts.* The provisions of this ordinance shall not apply to any building or structure located in a local historic district established pursuant to M.G.L. c. 40C and subject to regulation by the local historic district commission under the provisions of Sec. 22-40 of the Revised Ordinances.

(i) *Severability.* In case any section, paragraph, or part of this section is declared invalid or unconstitutional by any court of competent jurisdiction, every other section, paragraph, or part of this ordinance shall continue in full force and effect.

(j) *Enforcement.* The commission is authorized to institute any and all actions and proceedings, in law or in equity, in any court of competent jurisdiction, as it deems necessary and appropriate to obtain compliance with the requirements of this section.

(k) *Applicability.*

(1) Notwithstanding the foregoing, this section shall not apply and a demolition permit shall be issued for the reconstruction substantially similar in exterior design of a building structure or exterior architectural feature damaged or destroyed by fire, storm, or other disaster, provided such reconstruction is begun within six (6) months thereafter and is carried forward with due diligence. This exception shall be limited to reconstruction of only that portion of the building or structure damaged by such catastrophic event.

(2) This subsection shall not apply to buildings or structures which have been designated as landmarks pursuant to Sec. 22-60 of the revised ordinances.

(Ord. No. S-230, 12-1-86; Ord. No. S-315, 6-20-88; Ord. No. T-252, 12-7-92; Ord. No. U-19, 6-20-94; Ord. No. V-98, 12-16-96; Ord. No. V-99, 12-16-96; Ord. No. X-205, 5-1-06; Ord. No. Z-22, 04-22-08; Ord. No. Z-76, 02-07-11; Ord. No. A-74, 04-04-16)

**Secs. 22-51—22-59. Reserved.**

### DIVISION 3. LANDMARKS

#### **Sec. 22-60. Landmark Preservation—enactment and purpose.**

This division is enacted pursuant to the authority derived from section 6 of the Home Rule Amendment to the Constitution of the Commonwealth of Massachusetts, and Charter of the City of Newton.

The purpose of this enactment is to promote the educational, cultural, economic and general welfare of the public through:

- (a) the preservation and protection of the distinctive architecture and other characteristics of buildings, structures, landscapes, and places significant in the history and prehistory of the City of Newton, Commonwealth of Massachusetts and the United States of America;
- (b) the maintenance and improvement of settings for such buildings, structures, landscapes, and places; and
- (c) the discouragement of destruction of or damage to such resources and the encouragement of compatible development. (Ord. T-288, 9-9-93)

#### **Sec. 22-61. Definitions.**

For purposes of this Division 3. Landmarks, the following words shall be defined as follows:

*Altered*: changed, rebuilt, reconstructed, restored, removed, or remodeled.

*Building*: a combination of materials forming a shelter for persons, animals, or property.

*Commission*: the Newton Historical Commission or particular Historic District Commission acting under the provisions hereof.

*Constructed*: built, erected, installed, enlarged, or moved.

*Demolished*: destroyed or altered in such a substantial manner as to constitute destruction.

*Exterior architectural feature*: such portion of the exterior of a building or structure as is open to view from a public or private street, way, park, or body of water which is identified for preservation by its designation by the commission as a landmark, including but not limited to the architectural style and general arrangement and setting thereof, the kind and texture of exterior building materials, and the type and style of windows, doors, lights, signs,

and other appurtenant exterior fixtures.

*Formally listed as eligible for listing:* a determination has been made by the Keeper of the National Register of Historic Places that the property is eligible for listing on the National Register.

*Historic district:* any area containing distinctive buildings, structures, landscapes, and places as established in accordance with G.L. c. 40, s. 8D and chapter 22 of the Revised Ordinances.

*Landmark:* any building, structure, landscape or place which has been designated for preservation for reasons of its historic significance in accordance with Section 22-64.

*Landscape:* a streetscape or an arrangement of land for human use and enjoyment, including placement of structures, vehicular and pedestrian ways and plantings.

*Person aggrieved:* all record owners of the subject property, an owner of adjoining property, an owner of property within the same historic district or of property within one hundred (100) feet of the property lines of the subject property, and any charitable corporation having as one of its purposes the preservation of historic buildings or places.

*Structure:* a combination of materials other than a building, including, but not limited to, a bridge, tower or other engineering work, sign, fence, wall, terrace, walk or driveway. (Ord. No. T-288, 9-9-93)

#### **Sec. 22-62. Eligibility for nomination.**

- (a) All buildings, structures, landscapes and places are eligible to be nominated for landmark designation if such property:
- (1) is individually listed on the National Register of Historic Places, or formally listed as eligible for listing on said National Register, individually;
  - (2) is listed on the National Register of Historic Places as part of an historic district, but not individually, or formally listed as eligible for listing on said National Register as part of an historic district, but not individually; or
  - (3) has been determined by the commission or its designee to be historically significant after a finding that it is:
    - i. importantly associated with one or more historic persons or events, or with the architectural, cultural, political, economic or social history of the City of Newton, the Commonwealth of Massachusetts or the United States of America; or
    - ii. historically or architecturally important by reason of period, style, method of building construction or association with a particular architect or builder, either by itself or in the context of a group of buildings or structures.
- (b) Any land which, as of August 9, 1993, is contained in the same lot upon which a building or structure eligible for landmark designation is located regardless of whether such lot is later divided, subdivided or redrawn, or any land which, as of August 9, 1993, is contained in an adjoining or surrounding lot(s) held in common

ownership or control or used in connection with the lot upon which the building or structure eligible for landmark designation is located, shall be subject to inclusion in the landmark designation as a Newton Landmark Preservation Site, where the preservation and maintenance of such land is necessarily and reasonably related to the stated legislative goal of landmark preservation. Any such designation of land shall include a statement of the reason(s) for the inclusion of the land in the landmark designation pursuant to the legislative standards established herein.

- (c) Should any owner, subsequent owner, lessee, heir or assign seek to place a new building or structure on a lot which has been included in a designation as a landmark, the design, size, shape and location of said new building or structure shall be subject to the full review authority of the commission as set out in sections 22-66 and 22-67 as a condition to any building permit to insure that such new building or structure is not detrimental to the landmark status of any pre-existing building or structure, and does not undermine the purpose and intent of this division of the preservation of any building, structure, landscape or place of historic significance. (Ord. No. T-288, 9-9-93; Ord. No. U-25, 9-7-94; Ord. No. X-159, 07-11-05; Ord. No. X-240, 11-6-06)

### **Sec. 22-63. Nomination**

- (a) Petitions for nomination of buildings, structures, landscapes and places for consideration of designation as a landmark shall only be submitted to the commission, on a form provided by the department of planning and development, by any of the following:
  - (1) all record owners of the nominated property;
  - (2) a member of the city council, provided that at least one (1) member of the commission must co-petition the nomination;
  - (3) the mayor, the director of planning and development, or the commissioner of inspectional services, provided that at least one (1) member of the commission must co-petition the nomination; or
  - (4) any two (2) members of the commission.
- (b) Upon receipt of a petition for nomination, the commission shall schedule a meeting to consider the nomination, which meeting shall be held not less than forty-five (45) days nor more than ninety (90) days from the date of the commission's receipt of the petition. Within fourteen (14) days after the receipt of a petition for nomination, the commission shall send a notice to the city clerk and to each councilor for the ward in which the nominated property is located, record owner(s) of the property by certified mail, and a notice to the immediate abutters by regular mail. The notice shall include the petition for nomination and the date of the commission meeting.
- (c) At this or a subsequent meeting, the commission shall determine whether to accept the nomination and conduct further study of the nominated property. The commission may accept the nomination of buildings, structures, landscapes and places upon an initial determination that such property may meet one or more of the following criteria:
  - (1) the property significantly represents an architectural type, style or design distinguished by innovation, rarity, uniqueness, or overall quality of design, detailing, materials or craftsmanship;

- (2) the property is meaningfully associated with a person or persons who significantly contributed to the cultural, historic, architectural or archeological aspect of the development of the City of Newton, Commonwealth of Massachusetts, or the United States of America;
  - (3) the property's identification as a notable work of an architect, designer, engineer or builder whose work is significant in the history or development of the City of Newton, Commonwealth of Massachusetts or the United States of America; or
  - (4) historic events or activities occurred at the property that have made an outstanding contribution to, or which best represent some important aspect of, the history of the City of Newton, Commonwealth of Massachusetts or the United States of America.
- (d) Upon an initial determination to accept the nomination, the commission shall notify the planning and development board of such acceptance.

**Sec. 22-64. Designation.**

- (a) If the commission determines to accept the nomination of a property, the commission shall hold a public hearing prior to a vote on whether to designate the property as a landmark. The public hearing shall be held not less than thirty (30) days and not more than ninety (90) days from the date of the commission's determination to accept the nomination. The commission shall give not less than fourteen (14) days' notice of such public hearing by publication in a newspaper of general circulation in Newton and by mailing notice to the record owner(s) of the property by certified mail and notice to abutters by regular mail. The term abutters as used in this paragraph shall mean the record owners (each such owner to be determined from the then current records of the assessing department) of those properties within three hundred (300) feet of the property line of the nominated property. The commission shall also give not less than fourteen (14) days' notice of such public hearing to the mayor, the planning and development board, and the city clerk.
- (b) At or after the public hearing, the commission by three-quarters (3/4) vote, but in no instance less than four (4) votes in the affirmative, may designate as a landmark any property within the city being or containing a building, structure or landscape which it determines to meet one or more of the following criteria:
  - (1) the property significantly represents an architectural type, style or design distinguished by innovation, rarity, uniqueness, or overall quality of design, detailing, materials or craftsmanship;
  - (2) the property is meaningfully associated with a person or persons who significantly contributed to the cultural, historic, architectural or archeological aspect of the development of the City of Newton, Commonwealth of Massachusetts, or the United States of America;
  - (3) the property's identification as a notable work of an architect, designer, engineer or builder whose work is significant in the history or development of the City of Newton, Commonwealth of Massachusetts or the United States of America; or
  - (4) historic events or activities occurred at the property that have made an outstanding contribution to, or which best represent some important aspect of, the history of the City of Newton, Commonwealth of Massachusetts or the United States of America.

- (c) In determining whether to designate a property as a landmark, the commission shall also consider the following conditions:
- (1) that the distinguishing characteristics of significance are for the most part original and intact or capable of restoration;
  - (2) that the property, location and setting is compatible with future preservation and maintenance; and
  - (3) the property's context in relation to the City's policies and adopted plans and the property's surrounding area.
- (d) The planning and development board may make a recommendation which evaluates the relationship of the proposed designation to the City's adopted policies and plans and the effect of the proposed designation on the surrounding area. The planning and development board shall also make recommendations regarding any other planning considerations relevant to the proposed designation. The planning and development board may make recommendations to the commission any time prior to the public hearing.
- (e) Amendment or rescission of any designation shall be upon the request of a person or persons authorized to nominate a property for landmark designation and shall follow the procedures set forth in Sections 22-63 and 22-64. If a request for amendment or rescission of a designation is acted upon unfavorably, no new request for amendment or rescission shall be submitted for the identical property or area for a period of one (1) year from the date of such unfavorable action, except upon a showing of substantial and material newly discovered information.
- (f) Designation of a landmark or amendment or rescission of a previous designation shall include a statement of the reasons for such designation, amendment or rescission relevant to the criteria and conditions set forth in Sections 22-64(b) and (c).
- (g) The Newton Landmark Preservation Sites shall be recorded as follows:
- (1) The office of the city clerk shall record with the Middlesex County recorder the legal description of all buildings, lands, sites or areas designated as Newton Landmark Preservation Sites by the commission, and shall send a copy to the commissioner of inspectional services. In addition, the same may be made available to the public in form and fashion as the commission deems appropriate.
  - (2) Newton Landmark Preservation records.
    - a) The commission shall keep current and public a list of all properties designated as Newton Landmark Preservation Sites, or included in the State or National Register of Historic Places and make the same available to the public in form and fashion as the commission or city council deems appropriate.
    - b) The commission will provide the commissioner of inspectional services and the director of planning and development with current lists and maps showing Newton Landmark Preservation Sites and Districts for their use in referring applications to the commission. (Ord. No. T-288, 9-9-93; Ord. No. X-228, 9-18-06)

**Sec. 22-65. Additional powers and duties of the commission.**

The commission shall have the following powers and duties in addition to those otherwise specified herein:

- (a) The commission shall have the authority to provide general preservation plans and guidelines to owners of Newton Landmark Preservation Sites regarding maintenance, restoration, and rehabilitation.
- (b) The commission shall have the authority to promote public recognition and appreciation for Newton Landmark Preservation Sites. It shall periodically publish a register of designated and potential Newton Landmark Preservation Sites, along with guidelines and preservation programs available at that time.
- (c) The commission shall have the authority to initiate solicitation of gifts and contributions to be made to the city to support the activities and purposes of the commission. The commission shall assist the city staff in the preparation of applications for grant funds made by the city to outside funding sources for the purpose of city landmark preservation. (Ord. No. T-288, 9-9-93)

**Sec. 22-66. Review authority.**

- (a) Except as this division may otherwise provide, unless the commission shall first have issued a certificate of appropriateness, a certificate of non-applicability, or a certificate of hardship, no building, structure, exterior architectural feature or landscape of a landmark shall be altered or demolished nor any building or demolition permit issued therefor by the city or any department thereof. Alterations to the color or paint on exterior surfaces of a building, structure, or exterior architectural feature of a landmark shall require a certificate of appropriateness, a certificate of non-applicability, or a certificate of hardship, only if such color or paint to be altered is identified for preservation by the commission's designation of the landmark.
- (b) Any person who desires to obtain a certificate from the commission shall file with the commission an application for a certificate of appropriateness, a certificate of non-applicability, or a certificate of hardship, as the case may be, in such form as the commission may reasonably determine, together with such plans, elevations, specifications, materials, or other information the commission deems necessary to enable it to make a determination on the application. When such an application involves the proposed alteration to or demolition of a Newton Landmark Preservation Site that is located within a local Historic District, the commission shall have the option of delegating its review authority to the local Historic District Commission which has the review authority over that local historic district.
- (c) The commission shall issue a certificate of appropriateness to the applicant:
  - (1) if the commission determines that the construction, alteration or demolition for which an application of appropriateness has been filed will be appropriate for or compatible with the preservation or protection of the landmark, or
  - (2) if prior to the issuance of any disapproval, the commission, as it may, notifies the applicant of the commission's proposed action and includes, as it may, recommendations for changes in the applicant's proposal, which may include recommendations as to appropriateness of design, arrangement, texture, material and similar features, that, if made, would make the application acceptable to the commission and within fourteen days of the receipt of such notice, the applicant files a written modification of his application in conformity with the recommended changes of the commission.
- (d) The commission shall issue a certificate of non-applicability to the applicant if the commission determines that an

application for a certificate of appropriateness or for a certificate of non-applicability:

- (1) does not involve any exterior architectural feature or landscape of a landmark; or
  - (2) involves an exterior architectural feature or landscape of a landmark that is not then subject to review by the commission in accordance with the provisions hereof.
- (e) If a certificate of hardship has been applied for, or if the commission determines that the construction or alteration for which a certificate of appropriateness has been applied for is inappropriate, the commission shall issue a certificate of hardship to the applicant if the commission determines that:
- (1) owing to conditions especially affecting the building, structure, landscape, or place involved, but not affecting the landmark's general historic qualities, failure to approve an application will involve a substantial hardship, financial or otherwise, to the applicant;
  - (2) such application may be approved without substantial derogation from the intent and purpose of this ordinance; and
  - (3) the application may be approved without substantial detriment to the public welfare.
- (f) The commission shall issue a certificate of appropriateness to the applicant if the commission fails to make a determination on an application within the time specified in paragraph three of section 22-67. (Ord. No. T-288, 9-9-93; Ord. No. X-240, 11-6-06)

**Sec. 22-67. Factors to be considered by the commission.**

In passing upon matters before it, the commission shall consider, among other things:

(a) *In general:*

- (1) the historical and architectural value, and significance of the building, structure, landscape, or place; (2)

the general design, arrangement, texture, and material of the features involved; and

- (3) the relation of such features to similar features of buildings and structures in the surrounding area.

(b) *In the case of new construction or additions to existing buildings or structures:* the appropriateness of the size, shape, and location of the building or structure, both in relation to the land area upon which the building or structure is situated and to buildings and structures in the vicinity.

(c) *In the case of demolition or removal:*

- (1) whether the demolition or removal of a building or structure of such architectural or historic significance would impair the public interest and the general welfare of the people of the city, town, or state;

- (2) whether the demolition or removal of the building or structure would undermine the purpose and intent of this division and the objectives of local preservation plans;

- (3) whether the building or structure has so deteriorated that preservation or restoration is not structurally or economically feasible, provided that the owner's self-created hardship or failure to maintain the property in good

repair shall not qualify as a basis for the issuance of a certificate of hardship.

The commission shall not make any recommendations or requirements except for the purpose of preventing developments incongruous to the historical or architectural characteristics of a building, structure, landscape or site, or their surroundings.

The commission may impose dimensional and set-back requirements in addition to those required by the applicable ordinance or by-law. (Ord. No. T-288, 9-9-93)

#### **Sec. 22-68. Determination.**

The commission shall determine promptly, and in all events within forty-five (45) days after the filing of an application for a certificate of appropriateness, a certificate of non-applicability or a certificate of hardship, as the case may be, whether the application involves any exterior architectural features, or landscapes that are subject to approval by the commission. If the commission determines that such application involves any such features or landscapes, the commission shall hold a public hearing on such application, unless such hearing is dispensed with as hereinafter provided in paragraph four of this section.

The commission shall fix a reasonable time for the hearing on any application and shall give public notice of the time, place, and purposes thereof at least fourteen (14) days before said hearing in such manner as it may determine, and shall give notice by mailing, postage prepaid, a copy of said notice to: (a) the applicant, (b) the owners of all adjoining property and other property deemed by the commission to be materially affected thereby as they appear on the most recent real estate tax list of the board of assessors; (c) the planning board; (d) any person filing a written request for notice of hearings, such request to be renewed yearly in December, and (e) such other persons as the commission shall deem entitled to notice.

As soon as convenient after such public hearing but in any event within sixty (60) days after the filing of the application, or within such further time as the applicant may allow in writing, the commission shall make a determination on the application. If the commission fails to make a determination within such period of time, the commission shall thereupon issue a certificate of appropriateness.

A public hearing on an application need not be held if such a hearing is waived in writing by all persons entitled to notice thereof. In addition, a public hearing on an application may be waived by the commission if the commission determines that the exterior architectural feature, landscape or archeological feature of the landmark is so insubstantial in its effect on the landmark that it may be reviewed by the commission without a public hearing on the application, provided, however, that if the commission dispenses with a public hearing on an application, notice of the application shall be given to the owners of all adjoining property and other property deemed by the commission to be materially affected thereby as above provided, and ten days shall elapse after the mailing of such notice before the commission may act upon such application.

A certificate of appropriateness, a certificate of non-applicability or a certificate of hardship shall be issued upon majority vote of the members of the commission, except in the case of inaction by the commission within the time specified in this section, in which case a certificate of appropriateness shall be automatically issued.

Each certificate of appropriateness, non-applicability or hardship issued by the commission shall be dated and signed by its chairman, vice chairman, secretary, or such other person designated by the commission to sign such certificates on its behalf.

The commission shall file with the city clerk, and with any department of the city having authority to issue building or demolition permits, a copy of notice of all certificates and determinations of disapproval issued by the commission. (Ord. No. T-288, 9-9-93)

**Sec. 22-69. Ordinary maintenance.**

Nothing in this division shall be construed to prevent: (a) the ordinary maintenance or repair of any building, structure or landscape; (b) the ordinary maintenance, repair or replacement of any exterior architectural feature of a landmark that, with respect to either (a) or (b), does not involve a change in design or material, or the appearance thereof; if such features have been included in the findings of the Landmark Commission at the time of designation; (c) landscaping with plants, trees or shrubs, provided that such landscaping does not affect any significant landscape feature; (d) meeting of requirements certified by a duly authorized public officer to be necessary for public safety because of an unsafe or dangerous condition; (e) any construction or alteration under a permit duly issued prior to the effective date of the landmark ordinances, except as provided herein. (Ord. No. T-288, 9-9-93)

**Sec. 22-70. Administrative review.**

- (a) There shall be a landmark review commission to review final determinations of the Newton historical commission at the request of any person aggrieved by such determination.
- (b) The landmark review commission shall consist of three (3) members as follows:
  - (1) The current chair of the urban design commission, or their designee selected from the current members of the urban design commission;
  - (2) The current chair of the zoning board of appeals, or their designee selected from the current members of the zoning board of appeals; and
  - (3) A current chair of a historic district commission, or their designee selected from the current members of their respective historic district commission.
    - i. The member from a historic district commission shall serve for a single administrative review under this Section 22-70.
    - ii. The historic district commission from which a member shall be selected shall alternate in the following order: Newton Upper Falls historic district commission; Chestnut Hill historic district commission; Newtonville historic district commission; and Auburndale historic district commission.
- (c) A person aggrieved by a final determination of the Newton historic commission may, within twenty (20) days after the filing of the notice of such determination with the city clerk, file a written request with the commission for a review by the landmark review commission. The review fee of \$500.00 must be paid with the filing of the written request.
- (d) The landmark review commission shall hold a public hearing prior to rendering a finding on the written request for administrative review. The landmark review commission shall give not less than fourteen (14) days' notice of such public hearing by publication in a newspaper of general circulation in Newton and by mailing notice to the record owner(s) of the subject property by certified mail and notice to abutters by regular mail. The term abutters as used in this paragraph shall mean the record owners (each such owner to be determined from the then current records of the assessing department) of those properties within three hundred (300) feet of the property line of the subject property. The commission shall also give not less than

fourteen (14) days' notice of such public hearing to the mayor, the planning and development board, and the city clerk.

- (e) After the public hearing and within forty-five (45) days after the request was filed, the landmark review commission shall file with the city clerk its finding, which shall be binding on the requestor of the administrative appeal and the commission, unless a further appeal is sought in the superior court as provided herein. The forty-five (45) day deadline may be extended by written agreement between the Newton historic commission, the landmark review commission and the requestor.
- (f) The landmark review commission shall hear all pertinent evidence and shall uphold the Newton historic commission's decision unless it finds the action to be arbitrary, capricious, or based on legally untenable grounds.

**Sec. 22-71. Judicial review.**

Any person aggrieved by a determination of the commission, or by the finding of a person or persons making an administrative review as provided herein, may, within twenty (20) days after the filing of the notice of the aforesaid determination or finding with the city clerk, appeal to the superior court sitting in equity for Middlesex County. The court shall hear all pertinent evidence and shall uphold the determination of the commission unless it finds the action to be arbitrary, capricious, or based on legally untenable grounds, or may remand the case for further action by the commission, or make such other decree as justice and equity may require. The burden of proof shall be on the aggrieved person. The remedy provided by this section shall be exclusive, but the parties shall have all other rights of appeal and exception as in other equity cases. Costs shall not be allowed against the party appealing such determination of the commission unless it shall appear to the court that the appellant acted in bad faith or with malice in making the appeal to the court. (Ord. No. T-288, 9-9-93)

**Sec. 22-72. Enforcement.**

Middlesex Superior Court sitting in equity shall have jurisdiction to enforce the provisions of this division and any regulations enacted hereunder and the determinations, rulings, and regulations issued pursuant thereto and may, upon the petition of the mayor or of the city council or of the commission, restrain by injunction violations thereof; and, without limitation, such court may order the removal of any building, structure, or exterior architectural feature constructed in violation thereof, or the substantial restoration of any building, structure, exterior architectural feature or landscape of a landmark altered or demolished in violation thereof, and may issue such other orders for relief as may be equitable.

Whoever violates any of the provisions of this division shall be punished by a fine of three hundred dollars (\$300.00). Each day during any portion of which a violation continues to exist shall constitute a separate offense. (Ord. No. T-288, 9-9-93)

**Sec. 22-73. Advisory review.**

The review process set out in section 22-65 shall be advisory only for properties containing from one through four family dwellings which continue to be owned and occupied by the legal owner-occupants of record as of August 9, 1993, unless full review as set out in section 22-65 is voluntarily agreed to by said owner-occupants. Such advisory review shall cease, and the commission shall have authority to impose the full review set out in section 22-65 when and if such occupancy ceases or when legal or equitable ownership is transferred, whether by sale, an agreement to

sell, or a transfer in trust, but excluding the grant of a mortgage. (Ord. No. T-288, 9-9-93; Ord. No. U-1, 2-7-94)

**Sec. 22-74.  
Severability.**

The provisions of this division shall be severable. If any of its provisions shall be held to be invalid or unconstitutional by any court of competent jurisdiction, the remaining provisions shall continue in full force and effect. (Ord. No. T-288, 9-9-93; Ord. No. T-288, 8-9-93)

**Sec. 22-75. Demolition by Neglect.**

(a) Purpose and Intent

It is the intent of this section to preserve from deliberate or inadvertent neglect the exterior features of landmarked buildings and structures, or the interior portions thereof when such maintenance is necessary to prevent deterioration and decay of the exterior of the building or structure.

(b) Definition

“Demolition by neglect” shall mean neglect in maintaining, repairing, or securing a landmark that results in (i) loss of the character of a documented exterior architectural feature of the building or structure that contributes to its status as a landmark; (ii) deterioration of an exterior feature of the building or structure; or (iii) the loss of the structural integrity of the building or structure.

(c) Owner’s Obligations

The owner of a landmark shall preserve such landmark against decay and deterioration through prompt correction of any of the following defects:

- (1) Deteriorated or inadequate foundation, defective or deteriorated flooring or floor supports, deteriorated walls or other vertical structural supports;
- (2) Structural components of ceilings, roofs, floors, ceiling, roof and floor supports or other horizontal structural components which sag, split or buckle due to defective material or deterioration;
- (3) Deteriorated or ineffective waterproofing or weatherproofing of exterior walls, roofs, foundations, or floors, including broken or missing windows or doors, siding, trim, shingles or cladding, or windows left open when weather conditions do not warrant it;
- (4) Defective or insufficient weather protection for exterior wall covering, including lack of paint or weathering due to lack of paint or other protective covering;
- (5) Any fault or defect in the building which renders it structurally unsafe, whether interior or exterior;
- (6) Deterioration of exterior chimney or chimney support system;
- (7) Deterioration of external plaster, stucco, masonry or mortar;
- (8) Deterioration of rainwater drainage systems whether interior or exterior;
- (9) Deterioration of any documented exterior architectural feature which in the judgment of the commission

produces a detrimental effect upon the character of the building;

(10) Failure to adequately heat the premises to avoid freezing of heating and/or plumbing fixtures, or failure to properly drain heating and/or plumbing systems before the advent of freezing temperatures;

(11) Failure to adhere to any preservation plan or guideline regarding maintenance provided by the commission pursuant to section 22-65(a); or

(12) Deterioration of any other elements which, if not adequately maintained, would eventually cause the building or structure to crack, bulge, buckle, sag, rot, crumble or collapse, in whole or in part.

(d) Any owner who fails to maintain such building or structure in compliance with this section shall be subject to the remedial procedures of subsection (e)(1) as well as the penalties under section 22-72.

(e) (1) Upon receipt of a complaint that an historic landmark is threatened by demolition by neglect, or on the commission's own initiative, the commission shall request the commissioner of inspectional services or his designee to inspect such landmark. If the commissioner of inspectional services concludes that the landmark is threatened by demolition by neglect, he shall make a written report of his findings to the commission.

(2) Upon the receipt of such written finding of the commissioner of inspectional services, the commission shall hold a public hearing after giving such notice as provided under section 22-64(a). If the Commission finds that the landmark is threatened by demolition by neglect, and the owner has not requested and received a hardship exemption under section (g) herein, the Commission may vote to:

a) require the owner to repair all conditions contributing to demolition by neglect by a date certain;

b) secure the building or structure against further deterioration or other loss;

c) provide the owner with a preservation plan and maintenance guidelines as authorized under Sec. 22-65, and require the owner to undertake such plan according to a timeline set by the commission;

d) assess penalties as set forth in section 22-72; and

e) seek such injunctive relief as it deems necessary and appropriate to preserve such landmark in cases where there is imminent danger of the loss of a landmark.

These remedies shall be cumulative and not exclusive.

(3) For purposes of this ordinance, if a landmark threatened by demolition by neglect is located within a local historic district, then reference to "commission" hereunder shall refer to the local historic district commission of the local historic district in which such landmark is located.

#### (f) Building Permits

The commission shall notify the commissioner of inspectional services or building official in writing of any landmark found to be threatened by demolition by neglect, and shall instruct said commissioner or building official to make a permanent record of such determination in the corresponding property file maintained in the department of inspectional services as required by law. Prior to the issuance of any building permit for the construction, reconstruction, alteration, renovation, repair, removal, demolition, or change of use or occupancy of any landmark, said commissioner or building official shall review the property file and ascertain whether a notice of unremediated violation of this ordinance is on record. To the extent allowed by law, including but not limited

to the provisions of the state building code, 780 CMR 111.1 (6<sup>th</sup> ed.) or its successor, unless the commissioner or building official is satisfied there is no outstanding unremediated violation of this ordinance, he or she shall reject such application for a building permit for such landmark in writing, stating the reasons therefor; provided, however, that he or she shall not reject such application if the work intended to be performed is required by the commission to remediate such violation.

(g) Exemptions

(1) The owner may request exemption from this ordinance if the owner can prove to the commission that maintenance of the landmark will cause substantial hardship according to the standards set forth in Section 22-66(e); provided, however, that the owner's self-created hardship shall not qualify as a basis for a hardship exemption.

(2) In situations where, in the commission's view, it is impracticable to immediately repair an architectural feature, or prohibitively expensive to replace it, then the owner shall remove and store such architectural feature safely, until such time as it becomes financially possible to recreate the feature from the original pieces. The owner shall make temporary repairs in its place to protect the structure and/or provide for the safe use of the landmarked premises. (Ord. No. X-179, 12-19-2006)

#### DIVISION 4. CITY-OWNED BUILDINGS

#### **Sec. 22-76. Preservation of city-owned properties subject to funding under the Community Preservation Act.**

(a) Purpose and Intent:

The purpose of this section is to encourage (1) the preservation and protection of city-owned buildings, structures and properties (2) the maintenance and improvement of landscapes, grounds and settings of such buildings and structures and (3) compatible development to preclude destruction or damage of such resources

(b) Definitions:

For the purpose of this division, the following words and phrases shall be defined as follows:

*Alter/alteration:* Rebuilding, reconstructing, restoring, removing, demolishing or similar actions relating to regulated buildings, structures and properties including a change to the exterior paint color or colors.

*Building:* A combination of materials including a roof forming a shelter for persons, animals or property.

*Certificate of Appropriateness:* The certificate issued by the commission if it determines that the construction or alteration for which an application for a certificate of appropriateness has been filed will be appropriate for or compatible with the preservation or protection of the city-owned building or structure.

*Certificate of hardship:* The certificate issued by the commission if it determines that owing to the conditions especially affecting the building or structure involve failure to approve an application will involve a substantial hardship to a city department or agency and that such application may be approved without substantial detriment to the public welfare and without substantial derogation from the intent and purpose of this section.

*Certificate of non- applicability:* The certificate issued by the commission or its designee if it determines that the construction or alteration for which a certificate of appropriateness or a certificate of non-applicability has been filed does not involve any exterior architectural feature, any interior primary space, or involves an exterior architectural feature which is not subject to review by the commission.

*City:* The City of Newton.

*Commission:* The Newton Historical Commission.

*Commissioner:* The Commissioner of the Newton Inspectional Services Department.

*Demolish/Demolition:* To destroy or to alter in such a substantial manner as to constitute destruction.

*Structure:* Any construction, erection, assemblage or other combination of materials other than a building at a fixed location upon the land including but not limited to, a bridge, tower or other engineering work, sign, fence, wall, terrace, walk, or driveway.

(c) Application of this section to city-owned properties of Newton:

This section shall apply to the exterior and the interior of those historically significant city-owned buildings or structures including such structures and buildings owned by the city but leased to third parties for which community preservation funds are expended as necessary for the rehabilitation or restoration of historic resources pursuant to the provisions of the Community Preservation Act, G. L. c. 44B. However, such interior spaces shall be classified as either primary or secondary spaces, as follows:

(1) Primary spaces:

Spaces designated not only based on function, but also on their architectural features, details, surface finishes and design proportions that together serve to define the historic character of the building. These spaces are generally open to public access with formal areas designed to contribute to the historic character created by the structure as a whole. Primary spaces within city hall include but are not limited to the following:

- a) rotunda/lobby;
- b) first and second floor hallways;
- c) staircases;
- d) city council chambers;
- e) conference rooms 203, 205, 211 and 204;
- f) mayor's office, hallway and reception area; and
- g) War Memorial and hallway museum displays.
- h) Such other primary spaces as shall be determined by the commission or may be delegated to the commission staff.

(2) Secondary spaces:

Spaces defined chiefly by their function with little or no architectural detail or decoration. These spaces are usually designed to be easily adaptable and can be extensively altered without affecting the historic nature of the structure.

Public access is generally limited. Secondary spaces within city hall include, but are not limited to the following:

- a) departmental offices;
- b) cafeteria;
- c) basement hallways; and
- d) storage and building maintenance areas.
- e) Such other secondary spaces as shall be determined by the commission or commission staff.

(3) Landscapes, grounds and setting:

Outdoor spaces, such as landscapes, grounds and settings by themselves, such as burying grounds, cemeteries, and playground fields, or by their relation and historical context to one or more buildings or structures erected thereon or adjoining. Outdoor spaces are designated not only based on function, but also on their features, details, decoration and design including their being created by or associated with a particular landscape architect, architect, designer or historic person or events, or with the architectural, cultural, political, economic or social history of the city of Newton, the Commonwealth of Massachusetts or the United States of America.

(d) Mandated review and approval:

Any proposed alteration or demolition of the exterior or the interior primary spaces of any city-owned building or structure shall require an application for prior review and commission approval except for temporary alterations which do not permanently change the exterior of the city-owned building or structure, such as the seasonal installation of door or window screens, seasonal window air conditioning units, and temporary signs.

The commission shall review and approve in advance all proposed plans for alteration or demolition of city-owned properties in accordance with the procedural standards set forth in subsection (d)(1) below.

(1) Procedure:

- a) No building permit or demolition permit for a historically significant city-owned building, structure or property shall be issued by the commissioner except in conformity with the provisions of this section.
- b) The public buildings department is encouraged to submit plans and proposed materials directly to the commission while still in the planning and development stage. Before receiving a building or demolition permit for a proposed alteration or demolition of the exterior or the interior primary spaces of a city-owned building or structure or the alteration of city-owned property such as landscapes, grounds or settings, the city, or the applicant for such permit if other than the city, shall file an application with all plans as required by the commissioner to the commission for a certificate of appropriateness for the proposed plans of alteration or demolition.
- c) The commission shall hold a public hearing with due public notice within forty-five (45) days after the filing of the completed application for a certificate of appropriateness or a certificate of hardship unless both the applicant and the commission agree to additional time.
- d) The commission shall use its best efforts to render a decision within forty-five (45) days after the filing

of a completed application for a certificate of appropriateness unless additional information is deemed necessary by the commission.

- e) Provided there is a quorum present, the concurring vote of a majority of the members in attendance shall be required to issue a certificate.
- f) In issuing certificates, the commission may as it deems appropriate impose certain conditions and limitations and may require architectural or plan modifications consistent with the intent and purpose of this section.
- g) If the construction or alteration for which an application for a certificate of appropriateness has been filed shall be determined to be inappropriate and therefore disapproved, or in the event of an application for a certificate of hardship, the commission shall determine whether, owing to conditions especially affecting the building or structure involved, failure to approve an application will involve a substantial hardship, financial or otherwise, to the applicant. If the commission determines that owing to such conditions, failure to approve the application will involve substantial hardship to the applicant and approval thereof may be made without detriment or derogation to the purpose of this section, the commission shall issue a certificate of hardship.
- h) If the commission or its designee determines that an application for a certificate of appropriateness or for a certificate of non-applicability does not involve any exterior architectural feature, any interior primary space, or involves an exterior architectural feature which is not subject to review by the commission, the commission shall cause a certificate of non-applicability to be issued to the applicant.
- i) Reconstruction, construction or alteration of secondary interior spaces may be performed by the public buildings department or its authorized agent without review by and approval of the commission upon satisfaction of all requirements for receipt of a building or demolition permit from the inspectional services department. The public buildings department shall consult with the commission staff, if necessary, on a determination whether the interior space in question is deemed a primary or secondary space as defined herein.
- j) The commission shall send a copy of the certificates and disapprovals issued to the applicant and shall file a copy with the city clerk and the commissioner of inspectional services. The decision of the commission shall be final.

(e) Factors to be considered by the commission:

The commission shall consider among other things the following factors when determining whether the proposed demolition or alteration plans are appropriate for or compatible with the preservation of the city-owned building or structure:

- (1) In general: (1) the historical and architectural value, and significance of the area to be altered on the building, structure or property; (2) the general design, arrangement, texture, materials, color finishes, and condition of the features involved; and (3) the relation of such features to similar features of buildings, structures and property in the surrounding area.
- (2) Specifically, the commission, in considering architectural features and finishes may examine (1) all materials utilized in flooring, walls and ceilings, (2) furniture which has been built into the room (3) light fixtures or other decorative elements which were designed specifically for the space, and (4) paint color, stains, varnishes and other finishes which could alter or affect the visual impact of the space. The commission may also consider structural systems including but not limited to framing elements, exposed

load-bearing walls or columns and stone foundations, and mechanical systems which directly relate to the historic nature of the building or decorative elements which contribute to the historic nature of the building and which are part of a mechanical system including but not limited to grills, radiators, light fixtures and switch plates.

- (3) In the case of new construction or additions to existing buildings or structures, the commission may consider the appropriateness of the size, shape, and location of the building or structure, both in relation to the land area upon which the building or structure is situated and to buildings and structures in the vicinity.

(f) Non-compliance

Any agency of the city or any entity that alters or demolishes a city-owned historically significant building, structure or property without first obtaining and complying fully with a certificate of appropriateness issued in accordance with this section shall not be permitted to obtain any further building or demolition permits for the same building, structure, or site. This ban on the issuance of any further building or demolition permits can only be waived by a majority vote of the commission if the commission determines that new plans submitted to the commission will substantially benefit the neighborhood and provide compensation for the loss of the historic elements of the property.

(g) Legal Effect

This section shall not be construed to abrogate, diminish nor replace the protective measures already adopted in the City of Newton, but is designed to provide further protection and to assure preservation of city-owned buildings, structures and properties

(h) Severability

If any section, paragraph or part of this section is declared invalid or unconstitutional by any court of competent jurisdiction, every other section, paragraph, or part of this section shall continue in full force and effect. (Ord. No. X-188, 12-19-05; rd. No. X-204, 04-03-06)

**Secs. 22-77—22-79. Reserved**

#### **ARTICLE IV. URBAN DESIGN COMMISSION**

**Sec. 22-80. Purpose, composition.**

There shall be an urban design commission of eight (8) members for the preservation, improvement and development of the physical environment of the city. The members of the commission shall, so far as practicable, be selected to provide representation from the fields of city planning, landscape architecture, horticulture, arboriculture, architecture, landscaping and related fields of specialization, and so far as practicable, be selected to provide representation from as many wards of the city as possible. (Ord. Z-43, 02-17-09)

**Sec. 22-81. Powers and duties.**

The commission established by this article shall conduct studies of urban design or beautification programs, techniques and methods currently used in Newton and elsewhere and make recommendations to responsible city agencies on the implementation of such programs; conduct periodic meetings and seminars for interested private and public groups; give advice, upon request of the mayor, director of planning and development, the city council, the planning and development board, or the school committee, upon specific matters affecting urban design and

beautification, including but not limited to: landscaping of streets, parks, playgrounds and public areas, public and private parking lots; air rights construction; municipal buildings; private buildings; gasoline station design and landscaping; requests for zoning changes and special permits; signs; setback, height and bulk of new public and private construction, as may be required to assure that the aforementioned are aesthetically designed, located and landscaped; advise the parks, recreation and culture commissioner and the public works commissioner in the carrying out of their responsibilities; study the availability of public and private sources of funding for urban design and beautification programs and projects; and perform other such functions as may be delegated to it by ordinance. (Ord. Z-43, 02-17-09; Ord. No. B-53, 03-02-20)

**Secs. 22-82—22-94 Reserved.**

## **ARTICLE V. ECONOMIC DEVELOPMENT COMMISSION**

### **Sec. 22-95. Economic Development Commission: establishment, purpose, membership, officers.**

(a) There is hereby established under General Laws chapter 40, section 8A, a development and industrial commission to be known as the Newton Economic Development Commission for the promotion and development of business and industry within the City of Newton, for the purpose of strengthening the local economy, thereby providing additional jobs and expanding the city's tax base, so as to enable the city to maintain existing service levels and if possible, enhance them; said commission to be governed and operated in accordance with the provisions relative thereto of the General Laws or any special act or amendment thereto.

(b) Said commission shall consist of fifteen (15) members who shall be residents of the city and who shall be appointed by the mayor subject to section 3-3 of the Charter. Initial terms shall be as follows: three (3) for a term of one year, three (3) for a term of two years, three (3) for a term of three years, three (3) for a term of four years, and three (3) for a term of five years. The mayor shall fill the vacancies in membership, arising from expired terms, by appointments for a term of three (3) years. Any vacancy in the membership of the commission shall be filled for the unexpired portion of any member's term by the mayor. Each member shall serve until his or her successor is appointed and duly qualified.

(c) The members of the commission shall elect annually one (1) member of said commission to be chairman, another to be vice-chairman, and a third to be secretary.

(d) The members of the commission shall receive no compensation for their services.

(e) Said commission shall be staffed by the city's department of planning and development, such staff to be provided for in the city's budget. The economic development director shall serve as executive director to the commission. Said commission may hire consultants and purchase materials and supplies necessary for the discharge of its duties, within the limits of any sum appropriated for such purpose.

(f) Said commission may apply for and receive funds through gifts, grants, and donations for the purposes of carrying out its activities, subject to the approval of the city council.

(g) Said commission shall have the power and duty:

- (1) to study, investigate, and appraise economic conditions and trends affecting Newton industry, business and commerce;
- (2) to promote, assist, and encourage the preservation and development of existing Newton industry, business and commerce;

- (3) to promote, assist, and encourage the location and development of new industry, business and commerce in the city;
- (4) to investigate and assist in the establishment of commercial projects, including projects involving private enterprises, for the purpose of strengthening the local economy; to identify appropriate commercial areas and zones for the establishment of said commercial projects; to consider and evaluate the environmental and traffic impacts of commercial developments;
- (5) to prepare, collect, compile, advertise and distribute books, maps, charts, pamphlets and graphic material for the purpose of furthering the objectives for which the commission was established;
- (6) to cooperate with, and seek to coordinate the activities of, all official and unofficial civic, neighborhood, research and promotional agencies, commissions, groups, associations and organizations having like or kindred economic development functions and concerns;
- (7) to confer and cooperate with agencies of the state and federal government in the exercise of the aforesaid powers and duties;
- (8) to confer and cooperate with other municipal departments and official and unofficial groups, associations and organizations in Newton, including but not limited to neighborhood associations and organizations, in order that industrial, business, and commercial development shall be appropriately related to residential, recreational, and municipal land uses in the city;
- (9) to advise and make recommendations to appropriate officials, agencies, boards, departments and commissions of the City of Newton, including the mayor, the city council and the department of planning and development, regarding actions which, in said commission's judgment, would affect or improve the economic conditions and development of the city;
- (10) to prepare and transmit to the city council, annually during the month of February, a report of said commission's activities and of its recommendations for improving the economic condition and development of the city. (Ord. No. S-71, 5-21-84; Ord. No. V-52, 12-4-95)

**Secs. 22-96—22-99. Reserved.**

## **ARTICLE VI. COMMISSION ON DISABILITY**

**Sec. 22-100. Created, membership, terms, removal, chairperson, officers.**

There is hereby established within the city a commission on disability, consisting of not less than five (5) and not more than thirteen (13) members to be appointed by the mayor with the approval of the city council. Such members shall be residents of the city and shall serve without compensation. A majority of said commission members shall consist of people with disabilities, one member shall be a member of the immediate family of a person with a disability and one member of said commission shall be either an elected or appointed official of the city. The terms of the first members of said commission shall be for one, two or three years, and so arranged that the term of one-third of the members expires each year, and their successor shall be appointed for terms of three years each. Any member of said commission may, after a public hearing, if so requested, be removed for cause by the appointing authority. A vacancy occurring otherwise than by expiration of a term shall be filled for the unexpired term in the same manner as an original appointment. The chairperson and other officers shall be chosen by a majority vote of said commission members. (Ord. No. Z-74, 01-18-11; Ord. No. A-26, 08-12-13)

**Sec. 22-101. Purposes.**

It shall be the purpose of this commission to cause the full integration and participation of people with disabilities in the city consonant with the enabling legislation contained in chapter 40, section 8J of the Massachusetts General Laws. In accordance with this legislation, the commission shall:

- (a) research local problems of people with disabilities;
  - (b) advise and assist municipal officials and employees in ensuring compliance with state and federal laws and regulations that affect people with disabilities;
  - (c) coordinate or carry out programs designed to meet the problems of people with disabilities in coordination with programs of the Massachusetts office on disability;
  - (d) review and make recommendations about policies, procedures, services, activities and facilities of departments, boards and agencies of the city as they affect people with disabilities;
  - (e) provide information, referrals, guidance and technical assistance to individuals, public agencies, businesses and organizations in all matters pertaining to disabilities;
  - (f) coordinate activities of other local groups organized for similar purposes.
- (Ord. No. Z-74, 01-18-11)

**Sec. 22-102. Authority to establish rules and regulations.**

The commission may, with the approval of the mayor and the knowledge of the director of planning and development establish its own rules and regulations to assure the greatest effectiveness in its organization and functions consistent with the purpose of this article and the provisions of the enabling legislation. (Ord. No. Z-74, 01-18-11)

**Sec. 22-103. Meetings; reports.**

The commission shall meet as such not less often than once in every month, excepting July or August. The director of planning and development shall be given notice of said meetings and he or his designee shall have the right to be present. The commission shall keep accurate records of its meetings and actions, and shall file a report of its plans and actions to the mayor with such frequency and at such times as the mayor may request, but not less often than annually. The commission shall file an annual report with the city council which shall be printed in the city's annual report. (Ord. No. Z-74, 01-18-11)

**Sec. 22-104. Gifts, grants.**

The commission is legally empowered to receive gifts of property, both real and personal, in the name of the city, subject to the approval of the city council. Such gifts shall be managed and controlled by the commission for the purposes of this section. Any federal or state grants and private gifts or donations received for these purposes shall be reflected by the commission in its annual budget to be approved by the mayor and city council. The commission may expend, with the approval of the mayor, such funds as may be appropriated for the purposes of this article. The commission shall annually prepare an operating budget, in a timely manner to permit formulation of the overall department of planning and development budget. (Ord. No. Z-74, 01-18-11)





# Auburndale Local Historic District

City of Newton, Massachusetts



MAP DATE: January 10, 2007

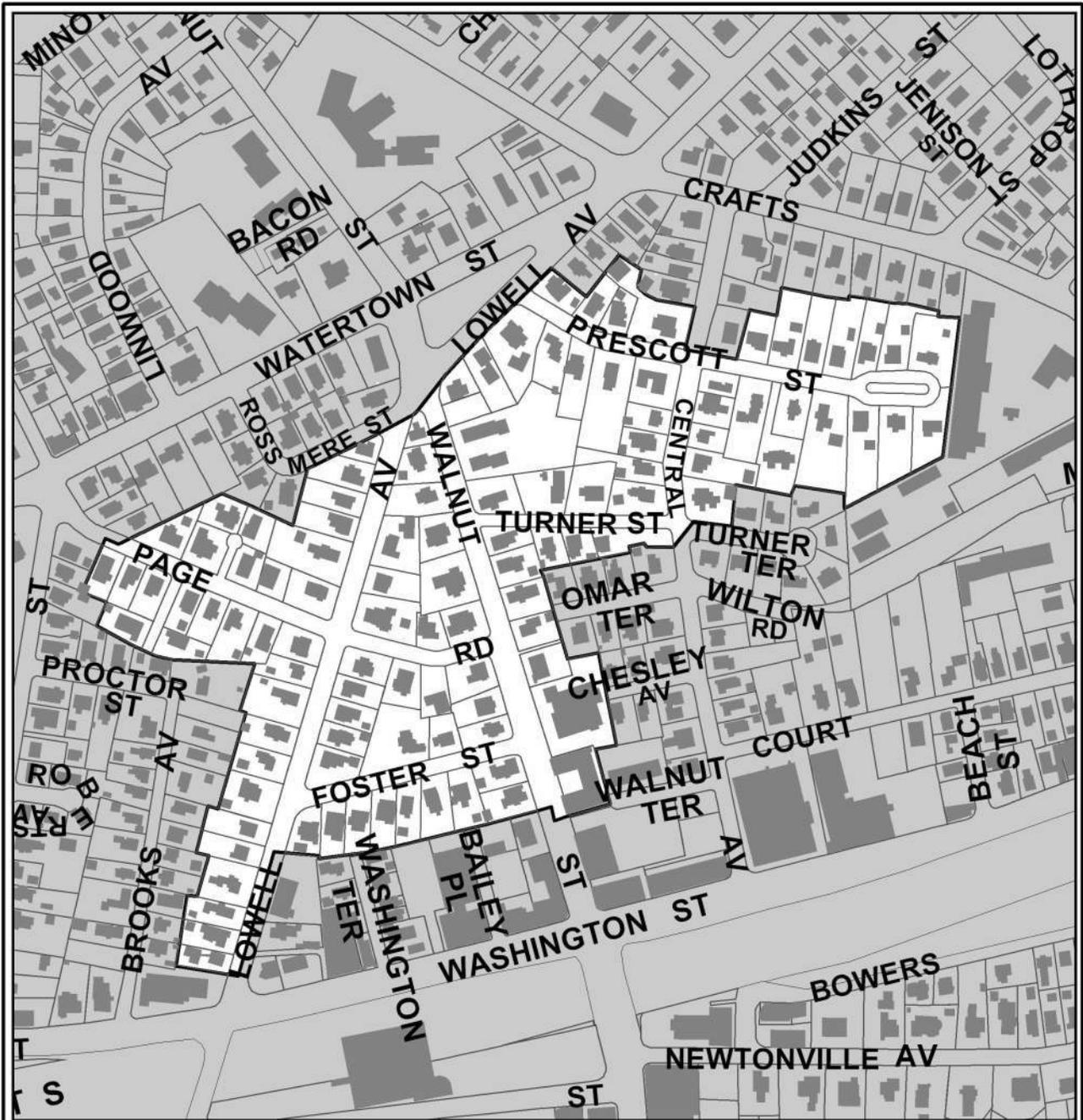


# Chestnut Hill Local Historic District

City of Newton, Massachusetts



MAP DATE: January 10, 2007

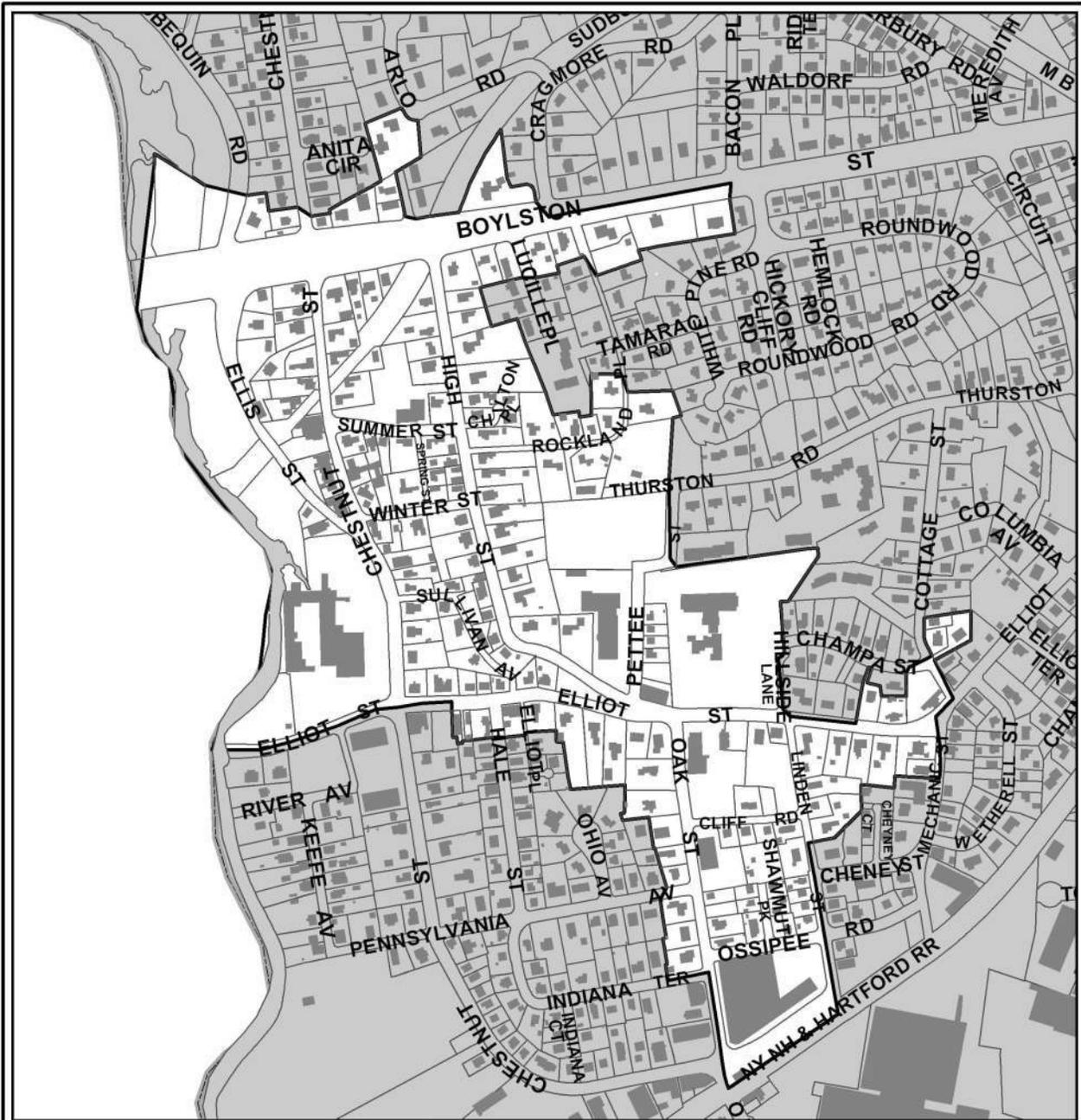


# Newtonville Local Historic District

City of Newton, Massachusetts



MAP DATE: January 10, 2007



# Newton Upper Falls Local Historic District

City of Newton, Massachusetts



MAP DATE: January 10, 2007

**United States Department of the Interior  
National Park Service**

**National Register of Historic Places  
Inventory—Nomination Form**

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received **OCT 13 1983**

date entered

See instructions in *How to Complete National Register Forms*  
Type all entries—complete applicable sections

**1. Name**

historic Billerica Mills Historic District (preferred)

and/or common North Billerica

**2. Location** Roughly bounded by Concord River, Treble Cove

Terr., Kohlrausch Ave, Indian Rd., Holt, Ruggles, and  
street & number Multiple--see continuation sheet N/A not for publication Rogers

city, town Billerica N/A vicinity of

state Massachusetts code 025 county Middlesex code 017

**3. Classification**

Category	Ownership	Status	Present Use
<input checked="" type="checkbox"/> district	<input type="checkbox"/> public	<input checked="" type="checkbox"/> occupied	<input type="checkbox"/> agriculture
<input type="checkbox"/> building(s)	<input type="checkbox"/> private	<input type="checkbox"/> unoccupied	<input checked="" type="checkbox"/> commercial
<input type="checkbox"/> structure	<input checked="" type="checkbox"/> both	<input type="checkbox"/> work in progress	<input checked="" type="checkbox"/> educational
<input type="checkbox"/> site	<b>Public Acquisition</b>	<b>Accessible</b>	<input type="checkbox"/> entertainment
<input type="checkbox"/> object	<input checked="" type="checkbox"/> in process	<input checked="" type="checkbox"/> yes: restricted	<input type="checkbox"/> government
	<input type="checkbox"/> being considered	<input type="checkbox"/> yes: unrestricted	<input checked="" type="checkbox"/> industrial
		<input type="checkbox"/> no	<input type="checkbox"/> military
			<input type="checkbox"/> museum
			<input checked="" type="checkbox"/> park
			<input checked="" type="checkbox"/> private residence
			<input type="checkbox"/> religious
			<input type="checkbox"/> scientific
			<input type="checkbox"/> transportation
			<input type="checkbox"/> other:

**4. Owner of Property**

name Multiple--see continuation sheet

street & number

city, town Lowell vicinity of state Massachusetts

**5. Location of Legal Description**

courthouse, registry of deeds, etc. Middlesex County Registry of Deeds

street & number Gorham Street

city, town Lowell state Massachusetts

**6. Representation in Existing Surveys**

title Inventory of the Historic Assets of the Commonwealth has this property been determined eligible?  yes  no

date 1973  federal  state  county  local

depository for survey records Massachusetts Historical Commission, 294 Washington Street

city, town Boston state Massachusetts

## 7. Description Billerica Mills Historic District, Billerica, Massachusetts

<b>Condition</b>		<b>Check one</b>	<b>Check one</b>
<input type="checkbox"/> excellent	<input type="checkbox"/> deteriorated	<input checked="" type="checkbox"/> unaltered	<input checked="" type="checkbox"/> original site
<input checked="" type="checkbox"/> good	<input type="checkbox"/> ruins	<input type="checkbox"/> altered	<input type="checkbox"/> moved date <u>N/A</u>
<input type="checkbox"/> fair	<input type="checkbox"/> unexposed		

### Describe the present and original (if known) physical appearance

Located in the northwest corner of the town of Billerica and approximately 20 miles north of Boston, Billerica Mills Historic District is a rural industrial community lying on either side of the Concord River and a mill pond dammed since 1708. The district comprises approximately 75 acres and is roughly bounded by Colson Street (west), Rogers Street (east), Cove Terrace (south) and Indian Road (north). Topography is defined by the Concord River; the west bank slopes gently away from the river and pond, while the east bank rises more sharply. Streets roughly parallel the river and are lined with single and multi-family residences dating from the early 19th through early 20th century (Federalist, Greek Revival, Italianate and Colonial Revival), interspersed with several institutional buildings; two brick mill complexes face each other on opposite river banks at the head (west) of the mill pond. Included within the district bounds are 123 structures, of which 15 are intrusions due to a construction dated after 1933 or extreme modification. The sense of spaciousness created by the river and pond is echoed in two additional major open areas, the Kohlrausch playground (ball field) and the Talbot Oval, both of which have historically served the community. In addition, the district is further distinguished by Middlesex Canal associations (1793-1852; NR 1972); some of the trench is visible.

None of the several industries that have been drawn to the district over time because of its power source and proximity to transportation has been so large in scale or so intense as to obliterate all traces of the past agricultural, canal-related and industrial land use. Although the streetscapes suffer from the recent loss of elms, a pleasing balance remains between buildings and surroundings; a satisfying contrast between the large brick mills and the repeated units of small frame dwellings. The district is, in spite of the deterioration of some of the housing stock, still very pleasant and coherent. The river, road, and bridge pattern define the district clearly. Much of the credit for the enhancement of the physical environment of the district is due to the planning and design of the nationally known landscape architect, Warren Manning (see Manning Manse; NR 1982).

The most prominent structures within the district, both historically and visually, are the two mill complexes. On the southwest bank of the river stands the C. P. Talbot Mill Complex (No. 601; Photo 1), built in 1857 (et seq.). The main (and earliest) building of brick construction rises five stories, capped by a shallow pitch roof. It is distinguished by its rows of 12/12 windows set in rectangular and segmentally arched openings trimmed with granite lintels and sills; by single moulded brackets at the cornice line; and by its central entry tower which rises a full story above the roof surmounted with a balustrade and octagonal open arcaded belfry with paired brackets, conical roof and weathervane. Other period structures in the complex are equally well preserved as is the iron fence along Faulkner Street.

The Faulkner Mill Complex (No. 701; Photo 2), located across the river and dating from 1865 (et seq.) is a more modest three-story design, also of brick, which repeats many elements of the Talbot mill: 12/12 windows set in segmentally arched openings with granite sills, cornice brackets, as well as rectangular plan and entry tower. The latter features decorative brick work of inset panels, corbelling and dog tothing.

Both complexes are on the whole excellently preserved, although their continuing industrial and commercial use has resulted in more recent additions. The old Talbot buildings house

(Continued)

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National Park Service**

**National Register of Historic Places  
Inventory—Nomination Form**

Billerica Mills Historic District,  
Billerica, Massachusetts

Continuation sheet

Item number 7

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several small manufacturing and other industrially related concerns. The Faulkner buildings, now owned by the North Billerica Company, are still used for the manufacture of woolen cloth. Parking lots associated with these businesses occupy land along the river on either side of the Elm Street Bridge and along Elm Street west of the old mill buildings.

Apart from the mill buildings, the district is very much as it was when developed as an industrial community--primarily residential. One building is a combined store/residence that served the community in the late 19th century and continues in business today. Public buildings include two churches; the Talbot elementary school building currently unused; and an endowed kindergarten housed in a remodeled Faulkner residence.

While the earliest remaining buildings in the district reflect the Middlesex Canal period, and some are associated with the Faulkner textile enterprise, by far the greatest number are associated with the Talbot Company. These are usually referred to as mill buildings, or mill housing, because textile manufacturing was the dominant part of the Talbot enterprise. The company originally manufactured dyes. A chemical works and the mill were later additions. Employees of all of these lived in Talbot-owned housing. Strictly speaking, the earlier housing should also therefore, be regarded as company housing.

Buildings with Talbot associations fall into four categories: buildings connected with the textile manufacturing process; buildings built by or at one time owned by the company and rented to employees; non-company owned residences, many, however, with company associations; and public buildings, again, most with strong Talbot associations.

Buildings in the district will be discussed street by street rather than chronologically to emphasize the streetscape that, seen as a whole, has a charm and identity that is more powerful than any of its contributing houses seen alone. The regular repetition of similar structures with similar setbacks is an outstanding element in the district's distinction. Especially important is the life and vigor given this unity of form by the variation in color, massing, siding type, and additions, that has developed over time.

Wilson Street (nearest the river on the west bank) is almost entirely Talbot-related housing. The street itself, originally a land that did not penetrate through to the Fordway, was improved and extended for the housing. Only six buildings standing today were not, at any time, Talbot property. The west side of the street is, with one exception at the Elm Street corner (No. 635), entirely lined with the small duplex that forms the bulk of Talbot Company employee housing.

The basic type--the most numerous and earliest built as mill housing--dates from the early 1860s. It is a 1½-story gable-ended structure with a four-bay facade facing the street. Two small windows lighting the attic are placed directly above the center paired doors. Eight of these duplexes (Nos. 627-634) stand together on the west side of the street; two more (Nos. 614 and 615) are opposite on the east bank (Photo 6).

One variant appears four times (Nos. 625 and 617 through 619): three in a row on the east side, one opposite on the west. They were built between 1875 and 1881 and are 2½ stories with a deep center gable. A second variant, filling out the street, is also

(Continued)

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Billerica, Massachusetts

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2½ stories. A simple, gable-ended structure, it is similar to the basic type, but has four windows lighting the full second story. Four of these stand on the west side of the street (Nos. 626 and 622 through 624); one is on the east side. The two to the north appear on the 1875 map; two others were built in 1885, and one in 1892. A seventh (1892, No. 641) is on Elm Street.

Company housing includes six multi-family blocks. Two stand side-by-side at the south end of Wilson Street (No. 620 built in 1885; No. 621 built in 1889). An older one (1860s) known as "Cork City" (No. 612) is about half way down Wilson Street set back near the river. All are six-unit 2½-story clapboard buildings.

Other buildings on Wilson Street are late 19th century single and multi-family residences with one exception - the Salter House (ca.1846, No.613). It is a 2½-story dwelling whose center entrance three-bay facade faced south as late as 1887. It has since been turned to face the street.

Housing condition at the north end of Wilson Street is relatively poor; it improves greatly to the south. A number of the houses have had their original clapboards replaced with siding. Porches and porticos have been added in variety. Elm and Lowell Streets have similar housing: nine more of the early 60s basic type stand on these streets. Some have been modified with dormers, as well as porches or porticos (Photos 4 and 5).

Talbot Avenue, next west from Wilson Street, was laid out in 1894. A handsome row of large mill duplex housing stands on its east side. In 1899 six of the large duplexes were constructed and in 1901 and 1902, four more completed the row (Nos. 650-659; Photo 7). They were all designed by the Lowell firm of Stickney and Austin and it was a particular point of pride that they were not uniform. Although all have porches or piazzas, their placement and the roof shape varies. They remain, in general, in good condition. The west side of the Avenue contains mid-20th century, non-mill single-family residences similar in scale, massing and materials to the mill row on the east.

Three of the district's largest public buildings stand together on the west side of Talbot Avenue at the southern end of the district. The Talbot School (1902; No. 664) is a square brick Georgian Revival building currently unused. It may be recycled as housing for the elderly. The St. Andrew's Roman Catholic Church rectory (1920; No. 663) is next door. Next to this Colonial Revival building is St. Andrew's Church itself (1920; No. 662), a Spanish-influenced stucco building that stands on a triangular lot and forms a welcoming and distinctive entrance to the district.

Talbot Avenue itself is wider than its flanking neighborhood streets. The Talbot Oval (1903; No. 697; Photo 7) lying in its center, was designed by Warren Manning, a landscape architect retained by the Talbots for many years at the beginning of the century. In its prime, the Oval was planted with a variety of labeled trees and shrubs. It was intended to be instructive as well as beautiful. It has not been maintained to Manning's high standards, although some of the planting, paths and the center flagpole remain.

(Continued)

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Continuation sheet Billerica, Massachusetts Item number 7 Page 3

The Kohlrausch Playground (1913-1917; No. 696) on Colson Street is also Manning's design. Colson Street is the westernmost street in the district; it is also a segment of the 18th century road through this part of North Billerica. With one exception, however, its housing is much later--it is primarily late 19th and early 20th century single and two-family structures, none Talbot-owned, but many lived in by mill employees.

The notable exception to these predominating types is the handsome Oliver Farmer House (No. 681; Photo 9). One of three "brick-enders" surviving in Billerica, it is also one of the finest examples of the style. The symmetrical five-bay clapboard facade and paired end chimneys reflect a center hall plan. The center entry displays a graceful fanlight and sidelights. Its barn (approximately 1803; No. 682) has been converted into a residence.

Elm Street, at its eastern end, has several Middlesex Canal-related buildings that were later owned by the Talbots. A multi-family clapboard structure known as the Canal block (1830s; No. 649; Photo 3) is the oldest of the six multi-family blocks in the district. Its four recessed entrances have fluted trim and corner blocks. Dormers light the third floor. Its condition is poor; it is still used as a residence.

Across the street is the much modified Mears Tavern (ca.1812; No. 637) which at one time had a larger addition--Middlesex Hall. Only the original section remains. At one time a classic Georgian/Federal 2½-story five-bay center entrance type, its windows have been modified. The Captain Joel Dix House (1815; No. 636) is next door. It is a similar type and has also been modified. These two are thought to be the latest examples of center chimney plan dwellings remaining in Town.

The west end of Elm Street is dominated by the Baptist Church (1870; No. 643; Photo 8) and its parish house across the street. The church is a small wooden Victorian Gothic building designed by Alexander R. Esty of Boston. It has a small addition; some trim has been lost to new siding. It has, however, retained its essential character.

Its parish house--the Wilson House (1848; No. 642) was built by Forrest Coburn and originally owned by "Boss" Wilson, a legendary Canal employee. It is a handsome Greek Revival dwelling near the Farmer House. Although the broad corner boards are no longer visible under the vinyl siding, the Ionic portico with transom and sidelights is well preserved. It is a Greek Revival type common in Billerica. The organization is the familiar Georgian/Federal symmetrical arrangement with the entrance centered on the Broad facade flanked by two window bays. Greek Revival influence is seen in the heavier proportions of the trim, especially under the eaves, and in the emphasis on the classical elements of the entry porch.

The Faulkner Company dominated the east side of the river in the 19th century. Today, their buildings and the Canal-related buildings once owned by them are among the outstanding district structures.

Next to the mill is the Faulkner Kindergarten (1826; No. 702). Originally a Faulkner residence, it is a Georgian/Federal clapboard building with corner quoins and Ionic portico in good, original condition.

(Continued)

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Down Rogers Street there are two ex-Faulkner buildings side by side. One, the Calvin Rogers House (1807; No. 717) a brick-ender, its four square shape much modified, stands near the bridge crossing a water filled section of the Middlesex Canal. It is here that the spit of land, constructed to connect to the floating tow path bridge, still extends part way across the Mill Pond. A fine view of the two mill buildings can be had from the Historical Society-owned spit (No. 719).

Just on the other side of the bridge south of the spit are two more multi-family blocks, once Talbot housing known as "The Acre." One has four units, one six. They were built in 1875 and are in residential use today (nos. 720 and 721). Additional contemporary Faulkner Mill housing is located at the northern extremity of the district along Latchworth Street (Nos. 707-710). Nearby on Carleton Street stands the Boston and Lowell Railroad depot and two related structures, now in residential use, dating from the 1870s; all are in fair, original condition (Nos. 712, 713 and 714).

# 8. Significance

Billerica Mills Historic District, Billerica, Massachusetts

Period	Areas of Significance—Check and justify below					
<input checked="" type="checkbox"/> prehistoric	<input checked="" type="checkbox"/> archeology-prehistoric	<input checked="" type="checkbox"/> community planning	<input checked="" type="checkbox"/> landscape architecture	<input type="checkbox"/> religion		
<input type="checkbox"/> 1400–1499	<input checked="" type="checkbox"/> archeology-historic	<input type="checkbox"/> conservation	<input type="checkbox"/> law	<input type="checkbox"/> science		
<input type="checkbox"/> 1500–1599	<input type="checkbox"/> agriculture	<input type="checkbox"/> economics	<input type="checkbox"/> literature	<input type="checkbox"/> sculpture		
<input type="checkbox"/> 1600–1699	<input checked="" type="checkbox"/> architecture	<input type="checkbox"/> education	<input type="checkbox"/> military	<input type="checkbox"/> social/		
<input checked="" type="checkbox"/> 1700–1799	<input type="checkbox"/> art	<input checked="" type="checkbox"/> engineering	<input type="checkbox"/> music	<input type="checkbox"/> humanitarian		
<input checked="" type="checkbox"/> 1800–1899	<input checked="" type="checkbox"/> commerce	<input checked="" type="checkbox"/> exploration/settlement	<input type="checkbox"/> philosophy	<input type="checkbox"/> theater		
<input checked="" type="checkbox"/> 1900–	<input type="checkbox"/> communications	<input checked="" type="checkbox"/> industry	<input type="checkbox"/> politics/government	<input checked="" type="checkbox"/> transportation		
		<input type="checkbox"/> invention		<input type="checkbox"/> other (specify)		

**Specific dates** Multiple **Builder/Architect** Warren E. Manning, landscape architect; Alexander E. Esty, architect; Stickney and Austin, architects

**Statement of Significance (in one paragraph)**

The Billerica Mills Historic District retains integrity of location, design, setting, materials, workmanship, feeling and association. Forming a distinctive and carefully designed grouping characterized by architectural variety, orderly street and building arrangement, use of open spaces and attractive natural setting, the district remains one of the finer examples of rural industrial development in Massachusetts during the 19th and early 20th centuries. Within the district are several buildings of local importance, either as well preserved examples of their type and period in Billerica or as representing the work of notable area architectural firms. Furthermore, much of the district's design quality--streetscapes and open spaces--was created by the nationally known landscape architect, Warren Manning (1860-1935). The district is additionally distinguished for its historical associations with the textile industry and the Middlesex Canal (NR 1972), as well as persons of local and state prominence. The Billerica Mills Historic District thus meets criteria A, B and C of the National Register of Historic Places.

Topography, particularly the Concord River, has played a constant and determining role in the historical development of land use in the Billerica Mills area. The river has provided fish and transportation, as well as adjacent rich meadow soils to both Native Americans and early colonists; it supplied water and water power to the developing settlement, to the Middlesex Canal and to industries. A further attraction for settlement was the Fordway, located just south of the district, one of the few places where the Concord/Merrimack Rivers complex could be crossed without bridge or boat. That this was known and taken advantage of by Native Americans is indicated by the discovery of stone tools (period unknown) here in the 19th century.

Initial English settlement in Billerica concentrated in the southern reaches of town; however, common land in the north was allocated as early as 1658. The first mill dam was built above the falls by Christopher Osgood in 1708. The mill pond thus formed supplied water power to a number of mills and to an iron works. The same Mill Pond was subsequently the primary source of water for the Middlesex Canal, constructed in 1794. As the highest point on the Canal route between Boston and Lowell (then Chelmsford), the pond furnished water to the Canal in both directions. The fabrication and supply center for the Canal was located here. A bridge carried the animals across the Mill Pond consisting of a detachable floating tow path which connected to a man-made spit of land (extant) on the east bank with the west bank. A segment of Canal trench, still water filled, remains nearby.

Construction of the Middlesex Canal linked Billerica to the port of Charlestown and had a tremendous impact on the development of the area. The mill pond was enlarged with a higher dam; stores, taverns, boarding houses and Canal-related industrial structures clustered near the Canal and mill pond. Although the Canal Proprietors made no particular

(Continued)

## 9. Major Bibliographical References

See continuation sheet.

## 10. Geographical Data

Acreage of nominated property approximately 75

Quadrangle name Billerica, Mass.

Quadrangle scale 1:25,000

### UTM References

A 

1	9	3	1	2	6	6	0	4	7	1	8	0	5	0
Zone			Easting				Northing							

B 

1	9	3	1	2	9	6	0	4	7	1	7	5	3	0
Zone			Easting				Northing							

C 

1	9	3	1	2	6	3	0	4	7	1	7	5	6	0
Zone			Easting				Northing							

D 

1	9	3	1	2	2	8	0	4	7	1	7	1	2	0
Zone			Easting				Northing							

E 

1	9	3	1	2	2	0	0	4	7	1	7	8	0	0
Zone			Easting				Northing							

F 

Zone			Easting				Northing							

G 

Zone			Easting				Northing							

H 

Zone			Easting				Northing							

### Verbal boundary description and justification

See continuation sheet.

### List all states and counties for properties overlapping state or county boundaries

state	code	county	code
N/A			

state	code	county	code

## 11. Form Prepared By

name/title Virginia A. Fitch, Preservation Planner (MHC) with Mary E. Myer, Northern Middlesex Area Commission and Dr. Charles E. Stearns, Billerica Historical Commission

organization Massachusetts Historical Commission date July, 1983

street & number 294 Washington Street telephone (617) 727-8470

city or town Boston state Massachusetts 02108

## 12. State Historic Preservation Officer Certification

The evaluated significance of this property within the state is:

national  state  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 Peter H. Westlake 9/30/83

title State Historic Preservation Officer date  
Massachusetts Historical Commission

For NPS use only

I hereby certify that this property is included in the National Register

Entered in the  
National Register

date 11/10/83

for Eleanor Byers  
Keeper of the National Register

Attest: \_\_\_\_\_ date

Chief of Registration

United States Department of the Interior  
National Park ServiceNational Register of Historic Places  
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Continuation sheet Billerica Mills Historic District,  
Billerica, Massachusetts Item number 8

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effort to provide housing for their workers, they did divide the land along Elm Street into 4x10 rod lots. Several structures remain in the district as reminders of this early growth: the Oliver Farmer House, 1803 (No. 681; Photo 9) and Rogers House, 1807 (No. 717)---two of the three Federal period "brickenders" extant in Billerica-- the Mears Tavern, 1812 (No. 637), and the Captain Joel Dix House, 1815 (No. 636). Among the notable Greek Revival houses are the Wilson House, 1848 (No. 642) built for "Boss Wilson" of canal fame and the Canal Block, ca.1830 (No. ).

The most far-reaching event affecting the district, however, was the introduction of textile manufacturing. This occurred in 1811 when Francis Faulkner of Watertown established a woolen mill on the east bank of the Concord River, joined in 1839 by the C. P. Talbot Comapny on the west bank. Together these two enterprises, attracted by waterpower and good transportation, largely determined the growth and appearance of the Billerica Mills area to the present day.

The Faulkner mill was one of the earliest textile manufacturies in New England. Initially, Faulkner leased an existing fulling mill from the Canal Proprietors for the manufacture of woolen products. By 1825 he was able to purchase this as well as 21 acres on the east side of the river (under mortgage from Harvard College). At the same time, in 1826, James Faulkner, brother of Francis, erected his house on Faulkner Street (No. 702), later (1927) given by Anne Faulkner to the children of Billerica and still a thriving kindergarten.

A persistently and remarkably stable family business, the firm of J. R. Faulkner & Company grew steadily throughout the 19th century, with a major expansion in 1865, until 1914 when it was sold and became the North Billerica Company which continues to operate the mill.

With the construction of the Boston and Lowell Railroad in 1834 along the eastern edge of the district (roughly parallel to the canal), additional transportation was possible and industry further encouraged. The ca.1870 railroad depot and a building associated with it, now a residence, still stand (Nos. 712, 713 and 714). These favorable conditions attracted Charles Talbot to the area in 1839 where he engaged in dyewood manufacturing, operated a chemical works (1849) and woolen mill (1857). The latter (No. 601; Photo 1) was possible through the purchase of the lower water power rights of the fading Canal Company. Operations began with eight sets of cards; six were added in 1870 and as many in 1880. By the last quarter of the 19th century C. P. Talbot and Comapny had expanded to employ 200 hands with a monthly payroll of \$7,000. The smaller, more conservative Faulkner Company, on the other hand, used eight sets of cards and employed 72 hands with a monthly payroll of \$2,500. According to one contemporary historian, in 1882 the Talbot manufacturing complex was the largest in Billerica.

One of the most significant aspects of the historical development of the district lies in the contrast between the Faulkner Company and C. P. Talbot and Company. While both were paternalistic, family-owned and family-run enterprises, differences in resources, policies and visions are clearly evident in areas of physical impact on the character of the district and personal prominence, both in the community and statewide.

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The major period of development for both companies began about 1860 and continued until the beginning of the 20th century, aided by improved technology, greater market demand and a growing immigrant (English and Irish) labor force. Expansion of the Faulkner mill operations followed traditional patterns in a somewhat haphazard manner. Consequently, the east bank of the Concord River retains a landscape in which industrial features overlap earlier agricultural foundations. The first workers' accommodations were existing farmhouses, such as the Calvin Rogers House (No. 717), purchased about 1860. Later, some modest new housing was constructed in the area north of the mill known as "Kilbenny" (Nos. 707-710), and at the southeast extremity of the district at "The Acre" (Nos. 720 and 721); however, these efforts were relatively limited in scope, reflecting the size and needs of mill operations. Richard Faulkner, who died in 1914, was the last resident manager of the Faulkner family.

Similarly, the west bank of the Concord River reflects the hand of the Talbots. Following initial purchase in 1860 of a farmhouse, the Salter House, ca. 1846 (No. 613), construction of workers' housing proceeded rapidly along newly laid out streets. Housing dating from the 1860s, including those along Wilson Street and at adjacent "Cork City" (No. 612), served both the dyewood and chemical works as well as the mill. The area to the west remained in agricultural use until the 1890s. The individual most active in responding to the broad spectrum of community needs during the period was Thomas Talbot (brother of Charles); he was elected Governor of Massachusetts in 1878. In 1870, the year the mill doubled in size, he gave land and money to build the Baptist Church (No. 643; Photo 8). Designed by Boston architect Alexander R. Esty, it is Billerica's only wooden Gothic Revival church. Coinciding with further mill expansion in 1880, a library was founded for employees. First housed in the mill offices, it later shared a building (no longer extant) with the village post office.

Upon the death of Charles Talbot (1884) and Thomas Talbot (1885), the Talbot Mills became a public corporation which continued to prosper under the guidance of Frederick S. Clark, son-in-law of Thomas, and Treasurer of the Talbot Mills Co. He initiated an era of high quality planned development and one of extraordinary flowering of community pride. In addition, a new element entered the landscape pattern around the turn of the century--space specifically dedicated as park or recreation land. Land had always been used for these purposes informally; as open land diminished, it was seen as desirable to secure some of it for permanent open space.

Talbot Avenue, with its carefully designed Oval, was laid out in 1894. In 1899, six of the large duplexes on the east side of the Avenue were constructed and in 1901 and 1902, four more completed the row. They were all designed by the prominent Lowell firm of Stickney and Austin. At this time, (1902) the Town also built the new larger Georgian Revival Talbot School (No. 664) on the west side of the Avenue. The Company sewered the village concurrently and sidewalks were laid throughout the village.

To serve the social needs of the community, Talbot Memorial Hall (no longer extant) was erected near the railroad station in 1891 and the Faulkner Kindergarten (No. 702) opened in 1897. An electric streetcar line provided convenient transportation to neighboring communities and to Lowell.

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Through the efforts and enthusiasm of Talbot Co. owners, management, and employees in conjunction with the skills of the nationally known landscape architect and descendant of an early Billerica family, Warren Manning, Billerica Village became a model living and working environment at the turn of the 20th century. These local developments were related to the widespread interest in town improvement that developed together with the growth of mechnaized industry and capitalism.

The Billerica Village Improvement Association was formed around 1880 and incorporated in 1902 as the Billerica Improvement Association in order "to acquire parcels of land as public pleasure grounds and to preserve the banks of the Concord, the beautiful river slipping lazily along through field and meadow, its banks bordered by meadow grasses or by trees and shrubs."

Among the members was Frederick S. Clark, Treasurer of the Talbot Mills Co. and a member of the Committee on Local Improvement in the American Park and Outdoor Art Association. Mill workers had always been encouraged to keep their grounds tidy and were permitted to borrow the lawnmower owned by the mill. It is interesting to note that stereopticon slides were shown at an Improvement Society meeting in North Billerica in order to rouse enthusiasm for beautification.

Improvement efforts were many; bulbs and seeds were distributed for use in the schools, and prizes were offered for window boxes, vegetable and flower gardens, as well as for well kept grounds. The Talbot employees, encouraged by Mr. Clark, participated with enthusiasm.

This emphasis on horticulture and park planning was given direction and professional polish by the involvement of Warren Manning, descendant of Samuel Manning, one of Billerica's first 17th century settlers (see Manning Manse; Nr 1982). An early advocate of regional and town planning, Manning was associated with the Olmsted firm from 1887-1896, after which he worked as an independent practitioner. His projects included public park systems and private gardens across the country, many for notable clients. At the time of his work in Billerica Village, Manning had acquired a national reputation for excellent and innovative landscape design. His contributions to Billerica Mills included design of the Talbot Oval, the Fordway Park and the Kohlrausch Playground (named after a prominent Talbot employee), as well as a gardening booklet (1907) for distribution in the community. No opportunity for combining aesthetic enjoyment with education was overlooked; even the electric car poles around the Oval were each planted with a different vine. A series of Community Days, sponsored by the Talbot Co., between 1913 and 1917 drew as many as 400 people to help implement these projects.

By 1915, the west bank of the Concord River had achieved essentially the appearance which it retains today. Colson Street was being built up with houses executed in popular styles of the period; for the most part they were privately, rather than mill, owned. The last major institutional building to be erected in the district was St. Andrew's Church and rectory (Nos. 662 and 663) in 1920. Although the Middlesex Canal had ceased operations by the last quarter of the 19th century, good roads, electric car and train service now provided easy access to both Billerica Center (south) and Lowell. It was, in fact, a

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transportation related scheme which brought the last major development to the area: relocation of the railroad repair shops and planning of the first Garden Suburb in the country, which abuts the northern boundary of the Billerica Mills Historic District.

The characteristics which the Faulkner and Talbot families manifested in their commercial endeavors--the former conservative and cautious, the latter aggressive, expansive and daring--and which defined much of the district's development also influenced the companys' fates in the 20th century. While the North Billerica Company (Faulkner Company) eventually survived through the 1930s and post-war period to the present to become one of the oldest textile manufactories in New England still operating in its original location, the Talbot Company, after a modest recovery during World War II, eventually went under. It currently houses a number of light manufacturing industries.

Archaeology

The Billerica Mills Historic District should be expected to contain cultural materials and subsurface structural remains associated with the area's development from an agricultural community in the early 17th century to its early 20th century industrial prime. Scientific investigation of these resources can potentially provide information valuable to our understanding of past land use, lifeways and industrial techniques. Located on the banks of a major drainage, the Concord River, the area is also highly sensitive for the presence of prehistoric sites as supported by a reported find of unidentified stone tools in the vicinity during the 19th century.

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Warren H. Manning Material

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GEOGRAPHICAL DATA: VERBAL BOUNDARY DESCRIPTION

The proposed Billerica Mills Historic District includes land associated with the industrial use of the site from the first documented grist mill (1708) to the 19th century mill community. It includes approximately seventy-five acres. An 18th century road now known as Rogers' Street, Faulkner Street, Elm Street, and Colson Street generally define the district. The Rogers' Street section--about 1,500 feet--runs from the Canal Bridge north along the Mill Pond, bends west over the mill bridge, continues west for about 1,500 feet and returns south to the Fordway Bridge. The Fordway was a potentially significant Native American location.

The exact boundaries run along property lines of significant properties abutting these roads and abutting the section of Lowell Street along the triangle of land once known as the Common; and along the banks of the Concord River.

The district contains very few non-contributing properties, as there has not been extensive replacement of demolished buildings.

Please refer to the attached assessor's map.

601	Talbot Mill buildings Faulkner Street	1857 and later	608	Talbot Mill housing 28-28 <sup>1</sup> / <sub>2</sub> Wilson Street	after 1889 (15-23)
	Cambridge Tool and Mfg. Co. Faulkner Street, North Billerica, 01862			John and James Hughes Watch Street, Rochdale, Mass.	
602	Talbot Mill housing 4-6 Wilson Street	(9-128) betw. 1875/1887	609	Talbot Mill (?) housing 30-32 Wilson Street	after 1889 (15-23)
	Peter J. and Sherri L. Baudanza 4 Wilson Street, North Billerica, 01862 Richard, Jr. and Barbara Smith 6 Wilson Street, North Billerica, 01862			Anna M. McNulty 30 Wilson Street, North Billerica, 01862	
603	Talbot Mill housing 8-10 Wilson Street	(9-130) betw. 1875/1887	610	Lawrence E. Gannon house 34 Wilson Street	betw. 1875/1889 (15-24)
	George K. Malden, Tr., Advance Realty Trust 95 Montvale Avenue, Stoneham, MA 02180			Grace F. Sliger 34 Wilson Street, North Billerica, MA 01862	
604	Talbot Mill housing 12-14 Wilson Street	(9-131) betw. 1885/1887	611	Lawrence B. Gannon store 38-40 Wilson Street	before 1875 and later (15-28)
	Judith K. Sullivan Coventry, Rhode Island			Eva M. Fultz 40 Wilson Street, North Billerica, 01862	
605	Mrs. Auty Store 16 Wilson Street	(9-132) betw. 1875/1887	612	Cork City Wilson Street	circa 1865 (15-25)
	Gary E. and Ellen F. Trudelle 16 Wilson Street, North Billerica, 01862			Daniel D. and Irene G. Hughes 21 Robbins Street, Waltham, Mass.	
606	Talbot Mill housing (?) 20-22 Wilson Street	(9-133) after 1889	613	Joseph Salter house 42 Wilson Street	1846 (15-224)
	Theodore W. and Marion V. Wyman 22 Wilson Street, North Billerica, 01862			John V. and Susan P. Greska 42 Wilson Street, North Billerica, 01862	
607	Elizabeth Mahoney house 24-26 Wilson Street	before 1875	614	Talbot Mill housing 44-46 Wilson Street	circa 1865 (15-225)
	Anthony A. and Anthony D. Marek 26 Wilson Street, North Billerica, 01862			Thomas E. and Elia Gordon 44 Wilson Street, North Billerica, 01862	
608	Talbot Mill housing (?) 28-28 <sup>1</sup> / <sub>2</sub> Wilson Street	(15-23) after 1889	615	Talbot Mill housing 48-50 Wilson Street	circa 1865 (15-226)
				Frank and Blanche Gagnon 48 Wilson Street, North Billerica, 01862	

- 616 Talbot Mill housing circa 1870  
52-54 Wilson Street (15-227)  
Katherine M. Kerwin  
52 Wilson Street, North Billerica, 01862
- 617 Talbot Mill housing betw. 1875/1881  
56-58 Wilson Street (15-228)  
Richard E. MacDonald, Tr., Alston Realty Trust  
90 Montvale Avenue, Stonham, MA 02180
- 618 Talbot Mill housing betw. 1875/1881  
60-62 Wilson Street (15-229)  
George and Deborah Smith  
60 Wilson Street, North Billerica, 01862
- 619 Talbot Mill housing betw. 1875/1881  
64-66 Wilson Street (115-230)  
John and Ruth Terris  
66 Wilson Street, North Billerica, 01862
- 620 Talbot Mill housing 1885/6  
68-78 Wilson Street (15-231)  
John and James Hughes  
234 Heard St. Worcester, MA 01601
- 621 Talbot Mill housing after 1889  
80-90 Wilson Street (15-232)  
R. Bruce Baldwin, Tr., Baldwin Family Trust  
14 Dignon Road, Billerica, 01821
- 622 Talbot Mill housing 1892  
53-55 Wilson Street (15-213)  
Marion Mahoney  
P. O. Box 263, North Billerica, 01862
- 623 Talbot Mill housing 1885  
49-51 Wilson Street (15-214)  
Richard S. and Deborah A. Hutchinson  
51 Wilson Street, North Billerica, 01862
- 624 Talbot Mill housing 1885  
45-47 Wilson Street (15-215)  
Ralph M. Krau and Deborah L. Parent  
45 Wilson Street, North Billerica, 01862
- 625 Fairbrother-Brown house circa 1875  
41-43 Wilson Street (15-216)  
Charles E., Jr. and Mary Fairbrother  
43 Wilson Street, North Billerica, 01862
- 626 Talbot Mill housing circa 1870  
37-39 Wilson Street (15-217)  
Ethel and Mark M. Themis  
660 Bridge Street, Lowell, Mass.
- 627 Talbot Mill housing circa 1865  
33-35 Wilson Street (15-218)  
Eugene and Rose E. Ryan  
35 Wilson Street, North Billerica, 01862
- 628 Talbot Mill housing circa 1865  
29-31 Wilson Street (15-219)  
Thomas J. and Lana Holland  
31 Wilson Street, North Billerica, 01862
- 629 Talbot Mill housing circa 1860  
25-27 Wilson Street (15-220)  
Fred S. and Mary A. Whittington  
25 Wilson Street, North Billerica, 01862
- 630 Talbot Mill housing circa 1860  
21-23 Wilson Street (15-221,222)  
Michael J. Miller  
23 Wilson Street, North Billerica, 01862

- 631 Talbot Mill housing circa 1860  
17-19 Wilson Street (15-223)  
Scott A. and Gail A. Stevens  
19 Wilson Street, North Billerica, 01862
- 632 Talbot Mill housing circa 1860  
13-15 Wilson Street (15-224)  
John V. and Susan P. Greska  
42 Wilson Street, North Billerica, 01862
- 633 Talbot Mill housing circa 1860  
9-11 Wilson Street (9-126)  
Roland and Lona K. Demers  
11 Wilson Street, North Billerica, 01862
- 634 Talbot Mill housing circa 1860  
5-7 Wilson Street (9-125)  
Herbert J. and Patsy Vacca  
5 Wilson Street, North Billerica, 01862
- 635 Talbot Mill housing circa 1880  
1-3 Wilson Street (9-123)  
Robert and Beatrice Feverill  
3 Wilson Street, North Billerica, 01862
- 636 Capt. Joel Dix house 1815  
2 Elm Street (9-129)  
William A. and Deborah V. Souza  
19 Wyman Road, Billerica, MA 01821
- 637 Mears Tavern 1815  
12 Elm Street (9-127)  
Michael H. and Ruth E. Tafalo  
12 Elm Street, North Billerica, 01862
- 638 Talbot Mill (?) housing ?  
18-20 Elm Street (9-121)  
Stephen J. Gillis  
31 Marston Street, Medford, Mass.
- 639 Isaiah Bussey house circa 1830  
22 Elm Street (9-120)  
Robert J. and Jane L. Dufault  
22 Elm Street, North Billerica, 01862
- 640 not yet named circa 1860  
24 Elm Street (9-119)  
Carl L. and Ruth Ann Whitala  
24 Elm Street, North Billerica, 01862
- 641 Hannon house 1892  
34-36 Elm Street (9-113)  
Alice E. Hannon  
36 Elm Street, North Billerica, 01862
- 642 Daniel Wilson house 1848  
38 Elm Street (9-112)  
North Billerica Baptist Church  
North Billerica, MA 01862
- 643 North Billerica Baptist Church 1869  
Elm and Colson Streets (9-111)  
North Billerica Baptist Church  
North Billerica, MA 01862
- 644 Alma Wilson house circa 1885  
37 Elm Street (9-110)  
O. Edward and Mary Dutille  
37 Elm Street, North Billerica, 01862

645	Talbot Mill housing 31-33 Elm Street (9-109)	"early 60's"	653	Talbot Mill housing 14-16 Talbot Avenue (15-21)	1899
	William J. and Nancy A. Smith 7 1/2 Maple Avenue, Billerica, MA 01821			David G. and Doris Grady 16 Talbot Avenue, North Billerica, MA 01862	
646	Talbot Mill housing 27-29 Elm Street (9-108)	"early 60's"	654	Talbot Mill housing 18-20 Talbot Avenue (15-203)	1902
	David and Doris Grady 16 Talbot Avenue, North Billerica, 01862			Mr. and Mrs. Thomas Paskiewicz Mr. and Mrs. William Paskiewicz 98 Boston Road, North Billerica, MA 01862	
647	Talbot Mill housing 23-25 Elm Street (9-100)	"early 60's"	655	Talbot Mill housing 22-24 Talbot Avenue (15-204)	1899
	Frank, Jr., and Margaret St. John 25 Elm Street, North Billerica, 01862			Nelson J. and Josephine McDermott 24 Talbot Avenue, North Billerica, 01862	
648	Talbot Mill housing 19-21 Elm Street (9-101)	"early 60's"	656	Talbot Mill housing 26-28 Talbot Avenue (15-205)	1902
	C. R. T. Development Company Faulkner Street			Patrick and Donna McNulty 28 Talbot Avenue, North Billerica, 01862	
649	The Canal Block 1, 3, 5, 7 Elm Street (9-207)	circa 1835	657	Talbot Mill housing 30-32 Talbot Avenue	1902
	Judith A. Sullivan Covenry, Rhode Island			Ida M. and Robert W. Tobey 25 Mason Avenue, North Billerica, 01862	
650	Talbot Mill housing 2-4 Talbot Avenue (9-116)	1899	658	Talbot Mill housing 34-36 Talbot Avenue (15-207)	1899
	Richard Hajjar 14 Judith Road, Chelmsford, MA 01824			Paul and Doreen Cumiff 34 Talbot Avenue, North Billerica, 01862	
651	Talbot Mill housing 6-8 Talbot Avenue (9-117)	1899	659	Talbot Mill housing 38-40 Talbot Avenue (15-208)	1899
	Robert and Mary Faria 6 Talbot Avenue, North Billerica, 01862			John and Vicki McNulty 40 Talbot Avenue, North Billerica, 01862	
652	Talbot Mill housing 10-12 Talbot Avenue (9-118)	1899	I-660	residence 42 Talbot Avenue (15-209)	after 1937
	Brian and Cheryl LaFrance, Brian W. Bourque 12 Talbot Avenue, North Billerica, 01862			Charles and Theresa Gibbons 42 Talbot Avenue, North Billerica, 01862	

I-661 residence after 1937  
44 Talbot Avenue (15-210)  
  
Catherine Burke  
44 Talbot Avenue, North Billerica, 01862

662 St. Andrews R. C. Church circa 1915  
Talbot Avenue (15-192)

663 St. Andrews Rectory circa 1915  
Talbot Avenue (15-192)  
  
(both) R. C. Archbishop of Boston

664 Talbot School 1902, 191x  
Talbot Avenue (15-193)  
  
Town of Billerica

I-665 residence after 1937  
29 Talbot Avenue  
  
Andrew A. and Phyllis J. Jennings  
29 Talbot Avenue, North Billerica, 01862

I-666 residence after 1937  
25 Talbot Avenue (15-199)  
  
Margaret T. and Hazel C. Nugent, et al.  
25 Talbot Avenue, North Billerica, 01862

I-667 residence after 1937  
23 Talbot Avenue (15-198)  
  
Roland J. and Eleanor L. Poirier  
23 Talbot Avenue, North Billerica, 01862

I-668 residence after 1937  
21 Talbot Avenue (15-197)  
  
Edgar W. and Hazel Santamour  
21 Talbot Avenue, North Billerica, 01862

I-xxx residence 1983  
Talbot Avenue (15-20)  
  
house under construction, ownership uncertain

I-669 office building circa 1970  
7 Talbot Avenue (9-115)  
  
Atty. John J. Lynch  
115 Westview Road, Lowell, Mass.

I-670 residence circa 1954  
29 Colson Street (15-19)  
  
Anna Baxter  
29 Colson Street, North Billerica, 01862

671 Kohlrausch house 1886  
25-27 Colson Street (15-196)  
  
Michael J. and Theresa M. Sopranovicz  
25-27 Colson Street, North Billerica, 01862

672 Talbot Mill housing 1888  
21-23 Colson Street (15-195)  
  
David P. and Barbara L. Melvin  
21 Colson Street, North Billerica, 01862  
William H. and Mary J. Rouine  
23 Colson Street, North Billerica, 01862

I-673 residence 1950's  
19 Colson Street (15-265)  
  
Martin Marderosian  
19 Colson Street, North Billerica, 01862

674 Baptist Parsonage circa 1925  
17 Colson Street (15-194)  
  
North Billerica Baptist Church  
North Billerica, Mass. 01862

- 675 residence  
12 Colson Street (15-188)  
  
Thomas and Velma L. Montgomery  
12 Colson Street, North Billerica, 01862
- 676 residence  
16 Colson Street (15-189)  
  
Fred and Agnes Wain  
16 Colson Street, North Billerica, 01862
- 677 residence  
18 and 20 Colson Street (15-190)  
  
Eddie and Ida Morel  
20 Colson Street, North Billerica, 01862
- 678 residence  
22-24 Colson Street (15-191)  
  
Frederic M. and Susan J. Gilligan  
24 Colson Street, North Billerica, 01862
- 679 M. Kohlrausch house 1901  
30 Colson Street (15-267)  
  
George A. and Janet Lyna  
30 Colson Street, North Billerica, 01862
- 680 residence  
32 Colson Street (15-18)  
  
Ralph S. and Frances L. Brigham  
32 Colson Street, North Billerica, 01862
- 681 Oliver Farmer II house 1803  
34 Colson Street (9-192)  
  
Peter W. and Shirley M. Woodbury  
34 Colson Street, North Billerica, 01862

only 679 adequately dated, the others only dated between 1900 and 1920

- 682 remodeled Farmer house barn 18xx and later  
36 Colson Street (9-181)  
  
Robert L. and Elizabeth Bradford  
36 Colson Street, North Billerica, 01862
- 683 residence  
40-42 Colson Street (9-180)  
  
Richard and Virginia C. Garvey  
40 Colson Street, North Billerica, 01862
- 684 residence circa 1915  
44 Colson Street (15-179)  
  
Robert C. and Margaret E. Newell  
44 Colson Street, North Billerica, 01862
- 685 Lyons house circa 1894  
10-12 Lowell Street (9-178)  
  
John J. and Mary Clare Lyons  
16 Corthell Road, North Billerica, 01862
- 686 Talbot Mill housing circa 1865  
8 Lowell Street (9-104)  
  
Gail J. Logsdon and Wayne R. Taylor  
8 Driftwood Lane, North Billerica, 01862
- 687 Father Matthew Hall 1886  
6 Lowell Street (9-105)  
  
Billerica Disabled Veterans Bldg. Corp.  
6 Lowell Street, North Billerica, 01862
- 688 Talbot Mill housing circa 1865  
2-4 Lowell Street (9-107)  
  
Domenic and Dorothy DiSalvo  
4 Lowell Street, North Billerica, 01862

689	Talbot Mill housing 1-3 Lowell Street (9-99)	circa 1865	701	Faulkner Mill buildings Faulkner Street (9-93)	1865 and after
	Elmer F. and Catherine E. Beard 1 Lowell Street, North Billerica, 01862			North Billerica Manufacturing Company Faulkner Street, North Billerica, 01862	
690	Talbot Mill housing 5-7 Lowell Street (9-98)	circa 1865	702	Faulkner Kindergarten Faulkner Street (10-29)	1826
	Forrest R. and Violet Stickney 7 Lowell Street, North Billerica, 01862			J.R. and C.R. Faulkner Kindergarten for North Billerica Fred Preston, P. O. Box 644, Ashland, Ohio	
691	Talbot Mill housing 9-11 Lowell Street (9-97)	circa 1865	703	James Faulkner house 1 Faulkner Street (10-32)	1859
	Robert A., Sr., and Jean L. Stickney 9 Lowell Street, North Billerica, 01862			Madelyn M. Gdekowski and Robert A. Nurmi 1 Faulkner Street, North Billerica, 01862	
692	Talbot Mill housing 13-15 Lowell Street (9-96)	circa 1865	I-704	Williams cottage Faulkner Street? (10-33)	circa 1930
	Robert M. Tegen and Martha C. McFadden 12 Prospect Street, Milford, N.H. 03055 Martha C. McFadden 15 Lowell Street, North Billerica, 01862			George and Josephine Tareila 94 Marshall Street, Tawksbury	
I-693	residence 17 Lowell Street (9-95)	after 1962	I-705	two-family house 4 Letchworth Avenue (10-31)	circa 1915?
	John J., Jr., and Eileen M. Faria 17 Lowell Street, North Billerica, 01862			Edward T. and Violet H. Sullivan 4 Letchworth Avenue, North Billerica, 01862	
696	Kohlrausch playground Colson Street (15-187)	1913	706	remodelled Faulkner barn 6-8 Mason Avenue (10-30)	1859 and later
	Town of Billerica			Mychelyne F. Charbonneau 8 Mason Avenue, North Billerica, 01862	
697	Talbot Oval Talbot Avenue (15-202)	1903	707	unidentified house 3 Mason Avenue (10-20)	circa 1825?
	Town of Billerica			George W. and Eileen Halley 3 Mason Avenue, North Billerica, 01862	

708 Faulkner Mill housing after 1887  
2-4 Letchworth Avenue (10-19)  
Leonard C. and Alice A. Haines  
2 Letchworth Avenue, North Billerica, 01862

709 Faulkner Mill housing betw. 1875/1887  
6-8 Letchworth Avenue (10-18)  
Phillip E. and Bernadette L. Quinlin  
6 Letchworth Avenue, North Billerica, 01862

710 Faulkner Mill housing betw. 1875/1887  
10-12 Letchworth Avenue (10-17)  
Clifford W. and Mary B. Terrell  
10 Letchworth Avenue, North Billerica, 01862

I-711 residence 1982  
6 Carleton Street (10-47)  
Karen McClellan  
6 Carleton Street, North Billerica, 01862

712 Railroad Depot 1870 (older?)  
Carleton Street (10-225)  
John Wilson (building only)  
P. O. Box 366, Nuttings Lake, MA 01865  
Hughes Lumber Company, Inc. (land)  
15 Letchworth Avenue, North Billerica, 01862

713 Railroad buildings before 1853  
Ruggles Street (10-51)  
Ann and Paul O'Brien  
Ruggles Street, North Billerica, 01862

714 Station agent's house (?) betw. 1875/1887  
11 Carleton Street (10-50)  
Dennis Georges  
2000 Middlesex Street, Lowell, MA 01851

I-715 sewer pumping station recent  
Rogers Street (10-232)  
Town of Billerica

~~I-716 residence recent  
10 Rogers Street (10-54)~~  
deleted Edward I. and Loretta A. Cibulski  
10 Rogers Street, North Billerica, 01862

716 Faulkner Mill housing betw. 1875/1887  
14-16 Rogers Street (10-55)  
Walter and Phyliss Cibulski  
16 Rogers Street, North Billerica, 01862

717 William Rogers house 1807  
18 Rogers Street (10-57)

718 Middlesex Canal circa 1800

719 towpath, Middlesex Canal circa 1800

720 Talbot Mill housing circa 1865  
3, 5, 7 Rogers Court (10-38)  
Richard F. and Elaine A. Hajjar  
14 Judith Road, Chelmsford, MA 01824

721 Salter Block circa 1865  
4-6 Rogers Court (10-37)

722 Salter house no. 2 circa 1850  
27-29 Rogers Street (10-36)

(both) Harold D. and Patricia Hill  
84 Meadowbrook Road, Chelmsford, MA 01824

723 residence rebuilt 1940  
31 Rogers Street (10-35)  
Michael and Agnes Ceglanski  
31 Rogers Street, North Billerica, 01862

Timothy John, Jr. and Elizabeth McCarthy  
18 Rogers Street, North Billerica, 01862

NATIONAL REGISTER OF HISTORIC PLACES  
EVALUATION/RETURN SHEET

Billerica Mills Historic District  
Middlesex County  
MASSACHUSETTS

Working No. OCT 13 1983

Fed. Reg. Date: 2-5-85

Date Due: 11/10/83 - 11/27/83

Action:  ACCEPT 11/10/83

RETURN

REJECT

Federal Agency: \_\_\_\_\_

Entered in the  
National Register

- resubmission
- nomination by person or local government
- owner objection
- appeal

Substantive Review:  sample  request  appeal  NR decision

Reviewer's comments:

Recom./Criteria \_\_\_\_\_

Reviewer \_\_\_\_\_

Discipline \_\_\_\_\_

Date \_\_\_\_\_

\_\_\_\_\_ see continuation sheet

Nomination returned for: \_\_\_\_\_ technical corrections cited below  
\_\_\_\_\_ substantive reasons discussed below

1. Name

2. Location

3. Classification

Category	Ownership	Status	Present Use
	Public Acquisition	Accessible	

4. Owner of Property

5. Location of Legal Description

6. Representation in Existing Surveys

Has this property been determined eligible?  yes  no

7. Description

Condition		Check one	Check one
<input type="checkbox"/> excellent	<input type="checkbox"/> deteriorated	<input type="checkbox"/> unaltered	<input type="checkbox"/> original site
<input type="checkbox"/> good	<input type="checkbox"/> ruins	<input type="checkbox"/> altered	<input type="checkbox"/> moved date _____
<input type="checkbox"/> fair	<input type="checkbox"/> unexposed		

Describe the present and original (if known) physical appearance

- summary paragraph
- completeness
- clarity
- alterations/integrity
- dates
- boundary selection





W-C-C

NO  
PARKING

NO  
PARKING

THE LO

TALBOT MILL

Faulkner Street

Talbot and Faulkner Mills Historic District  
Billerica, MA

Photo by M.G. Myer, 1981

Negative with Billerica Historical Commission

Photo #1 of 9

Talbot Mill from the South



FAULKNER MILL

FAULKNER MILL

Faulkner Street

Talbot and Faulkner Mills Historic District

Billerica, MA

Photo: M.G. Myer, 1981

Negative with Billerica Historical Comm.

Photo #2 of 9

Faulkner Mill from the Southwest



ELM STREET , looking west

Talbot and Faulkner Mills Historic District  
Billerica, MA

Photo: M.G. Myer, 1981

Negative with Billerica Historical Commission

Photo #3 of 9

Right foreground, Canal Block; left foreground  
mill housing; middle ground, mill housing,  
Type 1; background, spire of Baptist Church.

middle ground, mill housing, Type 1

background, spire of Baptist Church



LOWELL STREET

LOWELL STREET

Talbot and Faulkner Mills Historic District  
Billerica, MA

Photo: M.G. Myer, 1981

Negative with Billerica Historical Commission

Photo #4 of 9

Lowell Street, looking Northwest from Post  
Office Square

Talbot Mill housing, type 1

Talbot Mill housing, type 1



LOWELL STREET

Talbot and Faulkner Mills Historic District  
Billerica, MA

Photo by M.G. Myer, 1981  
Negative with Billerica Historical Commission

Photo #5 of 9  
Lowell Street, looking Northwest  
Talbot Mill housing, Type 1

Talbot Mill housing, type 1



WILSON STREET [48-50, 52-54, 56-58]

North Billerica, MA (Billerica Mills)

WILSON STREET (48-50, 52-54, 56-58)

Talbot and Faulkner Mills Historic District  
Billerica, MA

Photo: M.G. Myer, 1981

Negative with Billerica Historical Commission

Photo #6 of 9

Talbot Mill Housing: Foreground, Type I;  
middle ground, intermediate; right back-  
ground, Type II (gable).

foreground, Type I

middle ground, intermediate  
right background, Type II (gable)



Talbot Avenue  
Talbot and Faulkner Mills Historic District  
Billerica, MA

Photo by M.G. Myer, 1981  
Negative with Billerica Historical Commission

Photo #7 of 9  
Talbot Avenue, East of Talbot Avenue, Talbot  
Mill housing, Talbot oval in right middle.

TALBOT MILL HOUSING (late), pt.  
Talbot Oval in right middle ground



NORTH BILLERICA BAPTIST CHURCH  
Corner of Elm and Colson Streets  
Talbot and Faulkner Historic District  
Billerica, MA

Photo by M.G. Myer, 1981

Negative with Billerica Historical Comm.

Photo #8 of 9



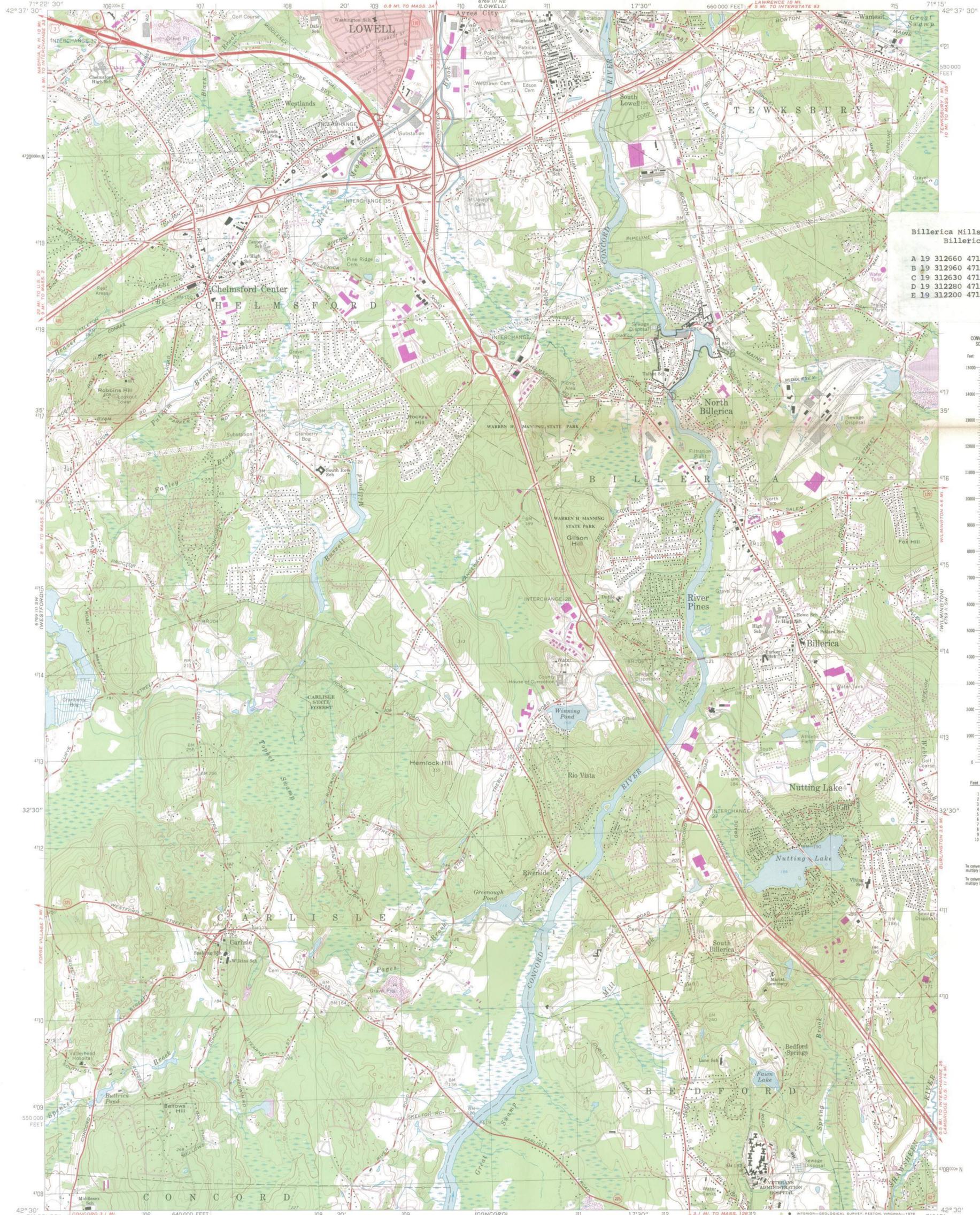
Oliver Farmer II House  
34 Colson Street  
Billerica MA (Talbot and Faulkner Mills)

Photo: M.G. Myer, 1981  
Negative with Billerica Historical Comm.

Photo #9 of 9



BILLERICA MILLS HISTORIC DISTRICT  
BILLERICA, MASS.  
SCALE - 1" = 200'  
DATE - 1960  
SOURCE - ASSESSOR'S



Billerica Mills Historic District  
Billerica, MA

- A 19 312660 4718050
- B 19 312960 4717530
- C 19 312630 4717560
- D 19 312280 4717120
- E 19 312200 4717800

CONVERSION  
SCALES

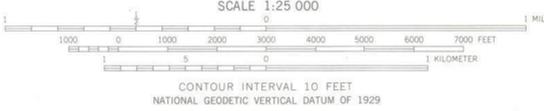


Feet	Meters
1	0.3048
2	0.6096
3	0.9144
4	1.2192
5	1.5240
6	1.8288
7	2.1336
8	2.4384
9	2.7432
10	3.0480

To convert feet to meters multiply by 0.3048  
To convert meters to feet multiply by 3.2808

Mapped, edited, and published by the Geological Survey  
Control by USGS, USC&GS, and Massachusetts Geodetic Survey  
Topography by planetable surveys 1939. Revised 1965  
Polyconic projection. 1927 North American datum  
10,000-foot grid based on Massachusetts coordinate system,  
mainland zone  
1000-meter Universal Transverse Mercator grid,  
zone 19

Red tint indicates areas in which only landmark buildings are shown  
There may be private inholdings within the boundaries of  
the National or State reservations shown on this map  
Revisions shown in purple compiled in cooperation with State of  
Massachusetts agencies from aerial photographs taken 1977 and other  
source data. This information not field checked. Map edited 1979



CONTOUR INTERVAL 10 FEET  
NATIONAL GEODETIC VERTICAL DATUM OF 1929



BILLERICA, MASS.  
N4230-W7115/7.5  
1965  
PHOTOREVISED 1979  
AMS 6769 III SE—SERIES V814

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS  
FOR SALE BY U. S. GEOLOGICAL SURVEY, RESTON, VIRGINIA 22092  
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

# There's a Difference

---

There are substantial differences between a Local Historic District and a National Register District.

## National Register Districts

A National Register District is part of the National Register of Historic Places. The National Register of Historic Places is the list of individual buildings, sites, structures, objects, and districts, deemed important in American history, culture, architecture, or archaeology. It is a federal designation and is administered by the Secretary of the Interior through the Massachusetts Historical Commission as the State Historic Preservation Office.

### Listing in the National Register:

- Recognizes that the area is important to the history of the community, state, or nation.
- Allows the owners of income-producing properties certain federal tax incentives for rehabilitation.
- Provides limited protection from adverse effects by federal or state involved projects.

If there is no state or federal involvement in a project (such as federal licenses, permits, or funding) and no pertinent local or regional regulations (such as a local historic district), then listing in the National Register of Historic Places does not in any way limit an owner's handling of the property.

There are over 900 National Register Districts in Massachusetts.

The National Register of Historic Places, begun in 1966, promotes an appreciation of our diverse cultural heritage. Communities with National Register Districts take great pride in this federal designation.

Note: A National Register District cannot be listed if a majority of the property owners submit notarized objections. Every owner of record of private property has the opportunity to comment and/or object to the nomination, and has one vote regardless of whether they own a single property, multiple properties, or a portion of a property.

---

## Local Historic Districts

In general, local historic districts are far more effective at preventing inappropriate changes than a National Register District. In a local historic district, a locally appointed Historic District Commission reviews proposed changes to exterior architectural features visible from a public way. For instance, if a building addition is proposed in a local historic district, the property owner must submit an application to the Historic District Commission. The Historic District Commission holds a public hearing and makes a determination on whether the new addition is appropriate. If the addition is deemed appropriate, the Historic District Commission issues a Certificate, allowing the work to progress. Many Historic District Commissions have prepared Historic District Design Guidelines that clarify how proposed projects should respect the existing historic character.

Local Historic Districts in Massachusetts were first established on Beacon Hill and Nantucket in 1955. There are now over 200 local historic districts in Massachusetts. Local Historic Districts have been very effective at saving historic structures, neighborhoods, and villages from inappropriate alteration and demolition.

Following the steps outlined in Massachusetts General Laws Chapter 40C, Local Historic Districts are established by a two-thirds majority city council or town meeting vote.

By establishing a local historic district, a community recognizes the importance of its architectural heritage and how vulnerable it is to inappropriate alterations without this local regulation.

Many proposed changes are exempt from review. In a local historic district, there is no review of interior features. In addition, a variety of exterior features are often exempt such as air conditioning units, storm doors, storm windows, paint color, and temporary structures. The decision on which features are exempt from review depends on how the local bylaw or ordinance is written and passed by your city council or town meeting vote.

## Can a property be designated both as part of a National Register District and as a part of a Local Historic District?

Yes, in this case property owners receive all the benefits from the federal listing and the assurance that the local bylaw or ordinance will protect the historic area from inappropriate alteration.

---

## If my property is within a National Register District, will it eventually be designated a Local Historic District as well?

Not necessarily. An M.G.L. Chapter 40C Local Historic District is established only by a two-thirds majority vote of your city council or town meeting. It is a completely separate local process.

---

## State Register of Historic Places

Properties within Local Historic Districts and National Register Districts are automatically included in the State Register of Historic Places.

Listing in the State Register:

- Provides limited protection from adverse effects by state-involved projects.
- When available, provides owners of municipal or private non-profit properties opportunity to apply for 50% matching state grants through the Massachusetts Preservation Projects Fund.

If you would like more information on historic district designation, contact either your local historical commission or the Massachusetts Historical Commission, 220 Morrissey Boulevard, Boston, MA 02125 [\(617\) 727-8470](tel:6177278470), [www.state.ma.us/mhc](http://www.state.ma.us/mhc)

### William Francis Galvin

Secretary of the Commonwealth of Massachusetts

1 Ashburton Place  
Boston, MA 02108  
1-800-392-6090  
[cis@sec.state.ma.us](mailto:cis@sec.state.ma.us)

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## The Dam

---

**From** Ted Sheehan <horseshoelane@gmail.com>

**Date** Thu 12/4/2025 7:00 PM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

A number of folks have listed all the very legitimate reasons to take the dam down and I agree with all of those reasons. The idea that it has historic value that should override all the valid reasons to take it down doesn't make any sense. If you go back far enough in history the real history says there was no dam there at all. There is serious liability issues to the owner(s) and this should be a major reason alone to bring it down. The environmental issues related to the health of the river are only going to improve with the river flowing like it was flowing originally.

It seems that 90% of the organizations are in favor of removal of the dam. This should be enough.

Thank you,

Dr Edward Sheehan

---

## Derogation. Appeal Hearing, Dec. 1, 2025

---

From J. Jeremiah Breen <jbreen5@verizon.net>

Date Thu 12/4/2025 8:33 PM

To Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Jennifer Raitt  
Executive Director, NMCOG

Dear Director Raitt:

A better explication of non-applicability than in the bylaw is at [General Law - Part I, Title VII, Chapter 40C, Section 8](#). In particular, removing the dam and draining the summit pond are a substantial derogation from the intent and purposes of the Historic Districts Act.

The Town bylaw has two requirements for a certificate of hardship, (1) Substantial Hardship for CRT Development Realty LLC, and (2), "granting the application will not involve . . . substantial derogation from the intent and purpose" of the bylaw.

1. CRT has owned the dam for decades without hardship. Perhaps like the owner of the Centennial Dam three miles down river who sells hydropower at a preferred rate, CRT could put a turbine in the place of the former Faulkner Mill turbine and make money.

The Centennial Dam has a fishway.

2. The Town of Billerica is fortunate to have passed a bylaw which protects the locally and nationally significant dam and summit pond of John Hancock's Middlesex Canal from the substantial derogation of destroying the dam and summit pond.

J. Jeremiah Breen, president  
[Middlesex Canal Association](#)

Appendix  
[General Law - Part I, Title VII, Chapter 40C, Section 8](#)

**Section 8:** Review authority of commission over certain categories of buildings, structures or exterior architectural features limited; authorization

Section 8. (a) Any city or town may provide in the ordinance or by-law establishing a district or in any amendment thereof that the authority of the commission shall not extend to the review of one or more of the following categories of buildings or structures or exterior architectural features in the historic district, and, in

this event, the buildings or structures or exterior architectural features so excluded may be constructed or altered within the historic district without review by the commission:

(1) Temporary structures or signs, subject, however, to such conditions as to duration of use, location, lighting, removal and similar matters as the commission may reasonably specify.

(2) Terraces, walks, driveways, sidewalks and similar structures, or any one or more of them, provided that any such structure is substantially at grade level.

(3) Walls and fences, or either of them.

(4) Storm doors and windows, screens, window air conditioners, lighting fixtures, antennae and similar appurtenances, or any one or more of them.

(5) The color of paint.

(6) The color of materials used on roofs.

(7) Signs of not more than one square foot in area in connection with use of a residence for a customary home occupation or for professional purposes, provided only one such sign is displayed in connection with each residence and if illuminated is illuminated only indirectly; and one sign in connection with the nonresidential use of each building or structure which is not more than twelve square feet in area, consist of letters painted on wood without symbol or trademark and if illuminated is illuminated only indirectly; or either of them.

(8) The reconstruction, substantially similar in exterior design, of a building, structure or exterior architectural feature damaged or destroyed by fire, storm or other disaster, provided such reconstruction is begun within one year thereafter and carried forward with due diligence.

(b) A commission may determine from time to time after public hearing that certain categories of exterior architectural features, colors, structures or signs, including, without limitation, any of those enumerated under paragraph (a), if the provisions of the ordinance or by-law do not limit the authority of the commission with respect thereto, may be constructed or altered without review by the commission without causing substantial derogation from the intent and purposes of this chapter.

(c) A city or town may provide in its ordinance or by-law, or in any amendment thereof, that the authority of the commission shall be limited to exterior architectural features within a district which are subject to view from one or more designated public streets, public ways, public parks or public bodies of water, although other portions of buildings or structures within the district may be otherwise subject to public view, and, in the absence of such provision of the ordinance or by-law, a commission may determine from time to time after public hearing that the authority of the commission may be so limited without substantial derogation from the intent and purposes of this chapter.

(d) Upon request the commission shall issue a certificate of nonapplicability with respect to construction or alteration in any category then not subject to review by the commission in accordance with the provisions of paragraph (a), (b) or (c).

## Talbot dam removal

---

**From** Jason Jones <jjones1@gmail.com>

**Date** Thu 12/4/2025 9:27 PM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Hi Jennifer,

As a concerned citizen, I support the removal of the Talbot dam for the benefit of the environment and to restore the migration of indigenous fish.

Dam removal is happening all over the country for good reason. It is a way we can support the environment for the greater good.

Thank you for listening and please support the removal of the Talbot dam.

Thank you,

Jason Jones

## Removal of Talbot Mills Dam

---

**From** Morgan Blum <blumroe@gmail.com>

**Date** Thu 12/4/2025 10:10 PM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Hi Ms. Raitt,

I am writing to extend my full and enthusiastic support for the proposed demolition and removal of the Talbot Mills Dam in Billerica. The dam is man made--was constructed for a purpose which no longer exists--and has no practical or historical importance at this present time. The environmental and ecological benefits far outway any perceived significance.

Emphatically,

Morgan Blum and the entire Blum Family

## Talbot Mills Dam removal

---

**From** Aram Hintlian <ahintl@comcast.net>

**Date** Thu 12/4/2025 11:44 PM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Ms. Raitt,

I support taking down the Talbot Mills Dam in Billerica, MA. I am sure you have received other letters of support and I encourage you to consider all the positive reasons for removing the dam, including the improved conditions for the spawning of fish, restoring the river to a healthier condition, allowing for water recreation including canoeing and kayaking, improving safety, restoring natural river flows, and the dam has no current purpose.

Thank you for considering my support for removing the dam.

Aram Hintlian



---

## preservation of Talbot Mills Dam

---

From Lenore & Howard <lenhow@aol.com>

Date Fri 12/5/2025 11:20 AM

To Jennifer Raitt <jrait@nmcog.org>

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

From: Howard Winkler, Board Member, Middlesex Canal Association

To: Jennier Raitt, Executive Director, NMCOG

NOAA and OARS have unilaterally decided that the movement of fish into the upper reaches of the Concord River is of greater importance than preservation of the Mill Pond at the Talbot Mills Dam. The Mill Pond is on the National Register of Historic Places, and yet NOAA and OARS are both ready to destroy this significant artifact of Industrial America.

With NOAA and OARS' tunnel vision, there is the possibility that Talbot Mills Dam will be destroyed, the Mill Pond drained and there will be no fish in the upper Concord. Can fish get by the Essex Dam in Lawrence and over the Centennial Dam located below Talbot Mills Dam? These two dams are impediments to fish migration. The presence of these dams was not considered at the NOAA and OARS meetings that I attended.

Fish at Essex Dam are preyed upon by birds and the fishway at Centennial Dam is under construction. It is unknown if fish will even use this fishway to swim upstream. If fish cannot get by the Essex Dam and over the Centennial Dam, then why destroy the Talbot Mills Dam? If fish reach the Talbot Mills Dam, then build another fishway. NOAA and Oars have not considered this eminently sensible idea, which would achieve win-win for both the fish and the historic Mill Pond.

Thus, fish will be able to swim into the upper reaches of the Concord River, and the Middlesex Canal's historic Mill Pond will not be destroyed.

I hope that my argument bears weight on your decision to preserve Talbot Mills Dam.

-30-

## Comment on Talbot Mills Dam

---

**From** Petit de Mange, Andrew M <Andrew\_Petit\_de\_Mange@nps.gov>

**Date** Fri 12/5/2025 3:38 PM

**To** Jennifer Raitt <jraitt@nmcog.org>

**Cc** Planning@billerica.gov <Planning@billerica.gov>; marlies.henderson@gmail.com <marlies.henderson@gmail.com>

 1 attachment (223 KB)

SuAsCo\_RSC\_Letter\_NMCOG\_2025\_12\_03\_SIGNED.pdf;

**Caution:** This email originated from outside of the organization. **Do not reply, click links, or open attachments** unless you can confirm the sender and know the content is safe.

Hello Jennifer,

Please find attached a letter from the Wild and Scenic Sudbury, Assabet, and Concord River Stewardship Council regarding the Appeal of Billerica Historic District Commission Denial of Application for Talbot Dam Removal.

Thank you for this opportunity to comment on this important project.

Sincerely,

Andrew Petitdemange

*(on behalf of the Wild and Scenic Sudbury, Asbury, Concord Rivers Stewardship Council)*

*Reminder: My working hours may not be your working hours. Please do not feel obligated to reply outside of your normal work schedule.*

*Andrew Petitdemange | he/him*

*Community Planner*

*[Rivers, Trails, Conservation Assistance Program](#)*

*[Partnership Wild & Scenic Rivers Program](#)*

*National Park Service*

*Northeast Region, [Unceded Lands and Waters of Indigenous People](#)*

*Cell: 617-283-3111*

*Hours: Monday - Friday, 7:30AM - 4:00PM*

"There is light in darkness, you just have to find it." — bell hooks

**December 3, 2025**

Northern Middlesex Council of Governments

Jennifer Raitt, Executive Director

RE: Appeal of Decision denying Application to Billerica Historic Districts Commission for the Talbot Mills Dam Removal

Dear Jennifer Raitt:

The Sudbury, Assabet, and Concord (SuAsCo) Rivers were granted Wild & Scenic River status in April 1999 after years of community advocacy and in-depth study of the watershed. The Wild & Scenic Concord River segment begins in Billerica just a short distance upstream of the Talbot Mills Dam. Being a part of the National Wild and Scenic River System comes with the responsibility to steward the river, protect and enhance the values for which it was designated, and ensure it can be enjoyed by future generations. This is a balancing act. The SuAsCo River Stewardship Council (SuAsCo RSC) is committed to improving habitat for aquatic life and ensuring the river keeps it Wild and Scenic integrity and wherever possible improves its quality.

The SuAsCo RSC concurs with US Fish and Wildlife Service, Massachusetts Fish and Wildlife, and other authors in the recommendations of their *Merrimack River Watershed Comprehensive Plan for Diadromous Fishes* (2021). Among its most urgent recommendations, the Talbot Mills Dam is named a Type I priority for removal. Its removal would “provide access to 35 miles (740 acres) of historical mainstem river habitat for diadromous fish in the upper Concord, and lower Assabet and Sudbury Rivers.” This is a significant improvement to both free flow and habitat on the Concord River providing restored aquatic connectivity for many river species that had historically been abundant into the far headwater reaches of the river but for the Talbot Dam.

When protecting the river and river-dependent features that were so high-quality they were named in the National Wild and Scenic River designation, the SuAsCo RSC aims for a holistic approach. This means balancing all the river’s Outstandingly Remarkable Values (ORVs), historic, biological, geologic, free flow, and others. A survey of studies and plans of the watershed consistently site the Talbot Mills Dam as a barrier to free flow and to fish passage, as well as a safety concern. On the contrary, over the course of a multiyear study prior to



**member organizations**

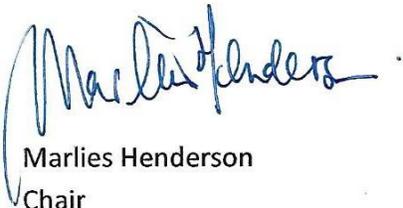
Bedford, Billerica, Carlisle, Concord, Lincoln, Sudbury, Wayland, Framingham,  
OARS, Sudbury Valley Trustees, Commonwealth of Massachusetts,  
National Park Service, US Fish and Wildlife Service.

designation it was determined that the Talbot Mills Dam should be excluded from the designation because it did not meet the high standards for an historic ORV and was a barrier to the free flow of river. It is not an historic structure the SuAsCo RSC is in favor of restoring. Protecting the Talbot Mills Dam would not serve the river and would likely be a costly and less effective approach to river management when compared to removal.

While we sympathize with the challenging process the BHDC has been engaged in to grant removal of an old structure, we urge that NMCOG overturn the decision of BHDC and allow the removal of the dam. We encourage BHDC to consider the best way to commemorate the history of the dam without leaving it in place as an impediment to a healthy river. Communities across the country have found creative and meaningful ways to teach local river and industrial history using site specific artifacts and environmental elements. We have faith that the BHDC can do the same here in Billerica. There may even be opportunities for organizations like the SuAsCo RSC to support the development of such projects and we would welcome the invitation.

With respect, we ask that NMCOG overturn the denial of the application and approve the proposed project for the removal of the Talbot Mills Dam.

Sincerely,



Marlies Henderson  
Chair

*Sudbury, Assabet, and Concord  
Wild and Scenic River Stewardship Council*



**member organizations**

*Bedford, Billerica, Carlisle, Concord, Lincoln, Sudbury, Wayland, Framingham,  
OARS, Sudbury Valley Trustees, Commonwealth of Massachusetts,  
National Park Service, US Fish and Wildlife Service.*