

EMERGENCY ACTION PLAN

for

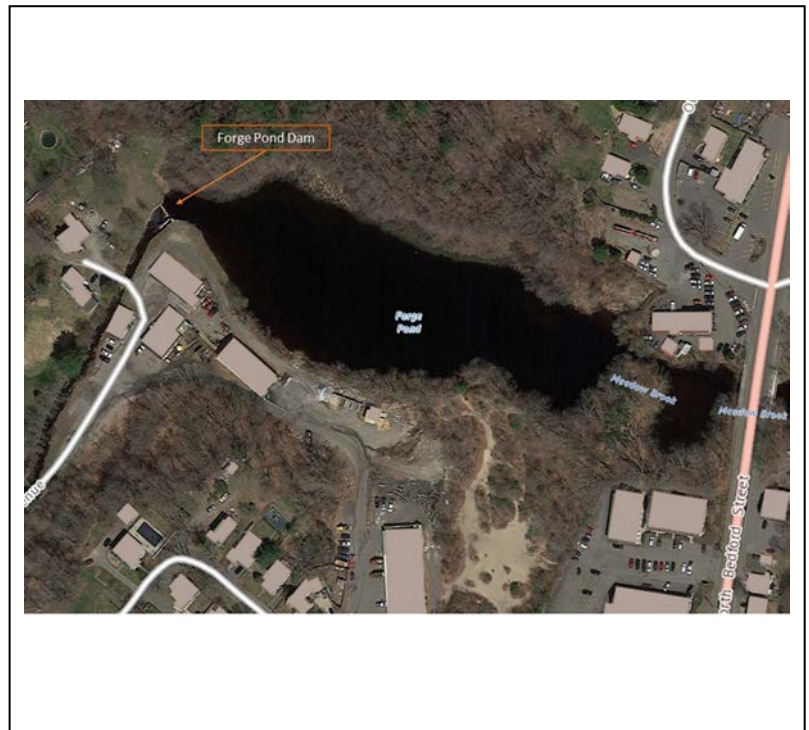
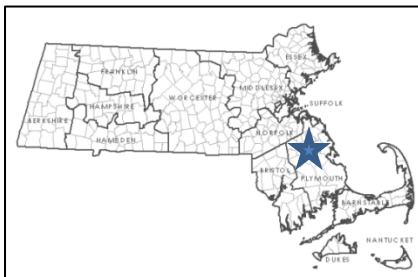
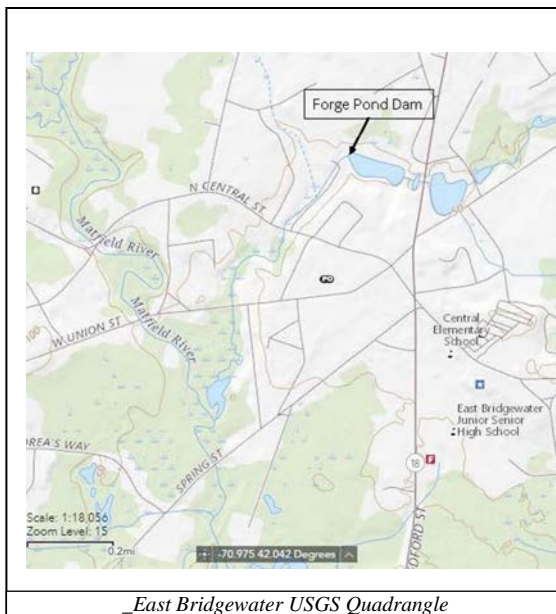
Forge Pond Dam

East Bridgewater, Plymouth County, Massachusetts

National I.D. Number: MA00427

State ID Number: 7-12-83-3

Dam Location: 42.0368° N / 70.9595° W



Dam Owner:

Board of Selectmen
175 Central Street, East Bridgewater MA
Owner Daytime Phone: 508-378-1614
Owner Emergency Phone: 508-922-6433

Dam Caretaker:

John Haines, Director of Public Works
100 Willow Avenue
Caretaker Daytime Phone: 508-378-1620
Caretaker Emergency Phone: 508-962-5987

Plan Developed 2019-12

Revision Number # Date YYYY / MM

Forge Pond Dam
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PREAMBLE

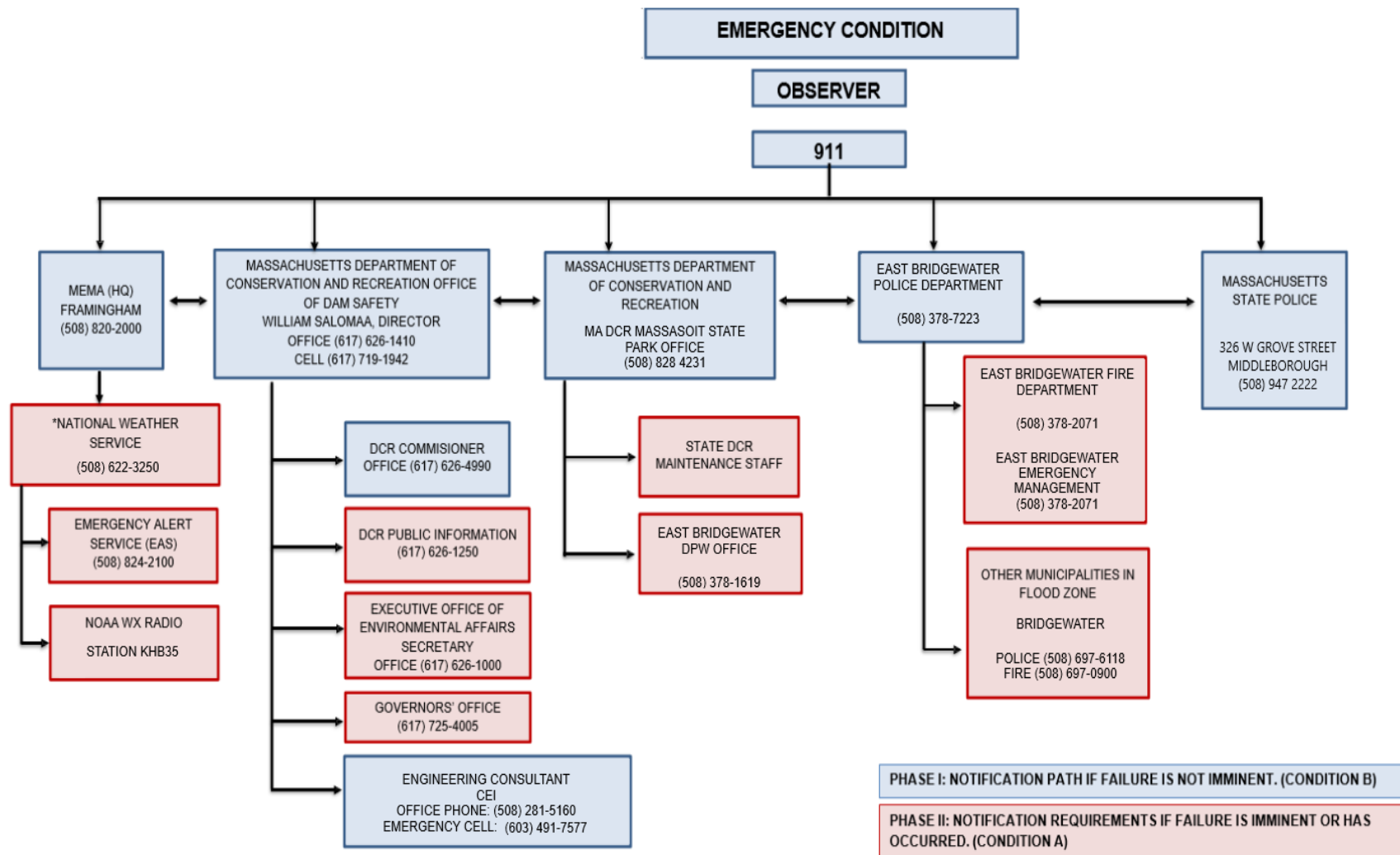
This Emergency Action Plan was prepared for the Owner of the Forge Pond Dam in accordance with the Commonwealth of Massachusetts General Laws, M.G.L. 253, Section 44, Chapter 302 C.M.R. 10.00, “Dam Safety, dated February 10, 2017” to establish a basic plan of action if conditions at the dam indicate the potential for dam failure or if any individual observes and reports that a dangerous condition is developing at the dam. The development of this EAP has been primarily based on the Federal Emergency Management Agency (FEMA) “Federal Guidelines for Dam Safety: Emergency Action Planning for Dam Owners,” dated October 1998, the Federal Energy Regulatory Commission (FERC) “Emergency Action Plan Guidelines,” dated November 1998, 2006 NRCS recommendations for developing EAPs, and other publicly available EAP templates from state dam safety programs.

The purpose of this plan is to define responsibilities and provide procedures for identifying unusual and unlikely conditions, which may endanger the Forge Pond Dam and infrastructure downstream of the dam, in time to take mitigated action and to notify the appropriate emergency management officials of possible, impending, or actual failure of the dam in order to minimize property damage and loss of life.

This Emergency Action Plan should not be viewed as a substitute for implementing standard dam maintenance, inspections and repairs in accordance with good dam operations.

It is important to note that the condition of the dam depends on numerous and constantly changing internal conditions and is evolutionary in nature. It would be incorrect to assume that the condition of the dam will remain the same over time. Only through continued care and inspection can there be any chance of detecting unsafe conditions before they result in an emergency condition.

The EAP is housed in a three-ring binder to easily facilitate updates to the plan. The EAP should be updated and exercised annually to ensure that the information is current. Most importantly, the names and telephone numbers of emergency response personnel listed in the Notification Flowchart shall be updated periodically. The general layout of an emergency response is as follows:

NOTIFICATION FLOWCHART

1.0 NOTIFICATION PROCEDURES

Notification Flowchart

The Notification Flowchart (located at the front of this report, before the table of contents) indicates the chain of communication to be followed in the event of an Emergency. The Notification Flowchart indicates a Phase I and Phase II type of notification to be implemented depending on the emergency classification level (Emergency Condition Watch or Dam Failure Warning) as determined necessary based upon the judgment of the personnel monitoring the emergency condition at the dam (see Section 4 for additional descriptions).

- **Dam Safety Watch: “Potential failure is developing”**: This is a situation where a failure may eventually occur if left unattended. This situation will require a Phase I response with continuous monitoring of the situation.
- **Dam Failure Warning: “Failure is Imminent or has occurred”**: This is a situation where a failure either has occurred, is occurring, or is just about to occur. This situation will require Phase I and II responses that will proceed with evacuation procedures.

During the highest emergency level (Dam Failure Warning), procedures are to evacuate the downstream residents using a combination of the telephone, augmented by police cruising the area broadcasting the evacuation message and going door to door to homes that cannot be reached by telephone. To ease this burden somewhat, the National Weather Service can be alerted at (508) 823-1983 and they will make a general broadcast about the evacuation over the airways. ***The National Weather Service will call the Fire Department to verify the emergency. Therefore, the Fire Department should be called before the National Weather Service is contacted. MEMA can also be contacted to activate the Emergency Alert Service.***

The flowchart should be updated yearly to account for local or state personnel changes. Any new personnel should be informed and trained to perform their responsibilities under this plan.

This Notification Flowchart is contained within the opening pages of this report.

Emergency Notification Template

Once the emergency condition has been identified, and the appropriate response level has been determined, the following template can be used as a guide for notification announcements:

“This is (your name, title, affiliation)

You are being contacted per the Emergency Action Plan for the Forge Pond Dam.

Please be advised: A Dam (Dam Safety / Warning / Watch) condition has been identified at the Forge Pond Dam.

The observation was made at (time and date)

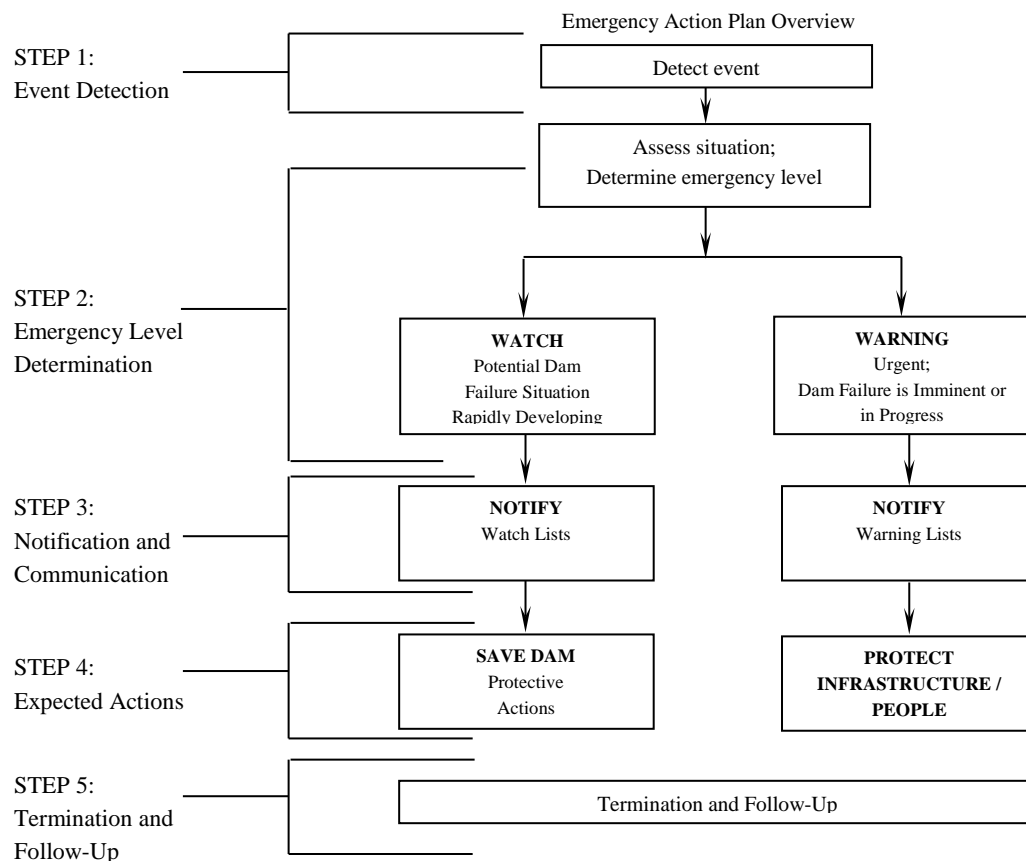
The situation is (provide brief description)

It is recommended that (Remain on alert; Prepare for Evacuation; Evacuate the area and move to higher ground)”

Impact Summary / Road Closures

The reservoir and downstream modeling of a complete failure of Forge Pond Dam was estimated by CEI using the GeoHEC-RAS 2D software, made available by CivilGEO (see Section 4.0). Based on the results of this analysis, reservoir flooding and backflow is expected to have the most severe impacts on private properties in the surrounding areas. Additionally, structures along Meadow Brook and the dam spillway will be affected by inundation. Downstream, as Meadow Brook flows into the Matfield River, wetlands and floodplains serve to protect the majority of houses and businesses from flooding risks. Minimal damages will be seen in Bridgewater as downstream flooding flows out of East Bridgewater. See Section 4.0 for inundation maps and a detailed description of roadways and buildings within the inundation zone.

General Response Flowchart



2.0 PROJECT DESCRIPTION

Dam Name: Forge Pond Dam Hazard Classification: Significant
 STATE-ID #: 7-12-83-3 Federal ID (NID): MA00427
 City/Town: East Bridgewater County: Plymouth
 Size Classification: Intermediate

Location & Access (provide a location map & directions to the dam from a major highway): Forge Pond Dam is located in the Town of East Bridgewater in Plymouth County, Massachusetts about 0.7 miles southeast of the town center. The center of the dam is located at latitude 42° 02' 11" North and longitude -70° 57' 44" West (WGS 84 datum) as determined from Google Earth. From the center of East Bridgewater (Town Hall), take Central Street north to Willow Avenue. Take a right and follow the road to the end and enter the East Bridgewater Department of Public Works garage yard and offices. The dam is at the end of a dirt road.

Lot No: _____ Block No: _____
 Latitude: 42.0366 Longitude: -70.9617
 River/Stream/River Basin: Meadow Brook
 Quad Sheet: _____ Nearest City/Town: East Bridgewater
 Hydraulic/Structural Height (ft): 6.5/12 Normal Surface Area (ac): 8.4
 Embankment Length (ft): 150 Normal Storage (ac-ft): 24.5
 Dam Type: Earth Maximum Storage (ac-ft): 66.1
 Spillway Type: Broad Crested Ogee Spillway Capacity (cfs): 1,365
 Type Dike: _____ Drainage Area (sq. mi.): 7.5
 Outlet Type (other than spillway): a sluice gate with a low-level outlet elevation of 38.95
 Year Built: 1726 Last Rehabilitation: 2013

Purpose/Operation of Dam (attach additional sheets if necessary): The dam was originally built in 1726 as part of the Captain Jonathan Bass forge site. Two forges were built at this site, the first being lost to a fire. This site continued in operation to about 1890. Blooms were made from scrap iron. It is now the site of the Town Highway Department Barn. The Department of Conservation and Recreation Office of Dam Safety records indicate the dam was built in 1937. It is assumed that, at this time, the spillway was rebuilt to its current configuration. The dam impounds the Meadow Brook to form a pond approximately 8.4 acres normal surface area for the primary purpose of flood control and recreation.

Forge Pond Dam is owned by the Town of East Bridgewater Board of Selectmen and the Department of Public Works is responsible for the maintenance of the dam. There are no written formal operating procedures for Forge Pond Dam. In effect, the crest of the ogee spillway weir controls the level of the pond.

Instrumentation (if any): _____

Upstream Dams: There is one dam upstream of Forge Pond, Harding's Pond Dam. It is near the beginning of Meadow Brook and is within the Town of Whitman. It is also classified as a significant hazard dam.

Downstream Dams: There are no dams directly downstream of Forge Pond Dam

Description of Inundation Area and Downstream Hazards: Town DPW offices directly downstream. Suburban residential area, some commercial buildings along MA-18. Spring Street Conservation Area borders the southern meander of Meadow Brook. It is densely populated in areas some areas along Meadow Brook and the Matfield River.

Method of emergency drawdown: Slide gate adjacent to fish ladder at Elevation 38.95

3.0 GENERAL RESPONSIBILITIES

3.1 Summary of Responsibilities

Entity	Responsibilities
Dam Owner: East Bridgewater Board of Selectmen 508-378-1614	<ol style="list-style-type: none"> 1. Notify local authorities. Upon receiving report of an incident, contact the Emergency Management Director (EMD) and identify the report. 2. Evaluate the extent/nature/severity of the incident. Update the EMD as to the need to implement the EAP. 3. Monitor the situation at the dam for the duration of the emergency. Update the EMD and other local and state authorities of developing conditions at the dam for the duration of the emergency situation.
Local Emergency Management: Timothy M. Harhen 508-378-2071	<ol style="list-style-type: none"> 1. Contact and warn population in area of potential impacts; Coordinate efforts with other parties involved in the EAP as necessary. 2. The EMD/Incident Commander will serve as the contact point for disseminating all updates concerning the condition of the emergency.
Local Police Department: East Bridgewater Police 508-378-7223 or 9-1-1	<ol style="list-style-type: none"> 1. Assist in securing the site and implementing evacuation if necessary (i.e. coordinating barricades, street closures, traffic flow). 2. Utilize appropriate and/or necessary evacuation procedures, which may include but are not limited to, multilingual broadcasts, slow-speed broadcasts, and coordinated efforts with other emergency responders..
Local Fire Department East Bridgewater Fire Department 508-378-2071 or 9-1-1	<ol style="list-style-type: none"> 1. Assist in the evacuation of special needs and/or elderly citizens. 2. Provide additional evacuation support as needed. 3. Assist EMD as needed.
Massachusetts Emergency Management Agency (MEMA) 24 hrs: 508.820.2000	<ol style="list-style-type: none"> 1. Coordinate broadcast notification as <u>requested</u> by the local Fire/Police/EMD. 2. Mobilize necessary equipment as <u>requested</u> by the local Police/Fire/EMD.
Massachusetts State Police Framingham, MA 24hrs: 508-820-2300	<ol style="list-style-type: none"> 1. Assist in securing the site, implementing evacuation, and controlling traffic flow in and out of the impacted area as <u>requested</u> by the local Police Department.

3.2 Emergency Response Coordination

During an emergency situation, **Emergency Management Director [Incident Commander]** will be responsible for the proper organization and operation of the Emergency Action Plan. He/she will coordinate all activities with state and local authorities.

4.0 INUNDATION MAPS

Inundation Map Development

To evaluate the extent of flooding due to a full dam breach and failure at Forge Pond Dam in East Bridgewater, CEI conducted a modeled simulation of the hypothetical failure using GeoHEC-RAS 2D software. This software was created and is administered by CivilGEO, an authorized Autodesk engineering software firm.

Inputs to the model include dam location, length, and height, the watershed size that feeds the reservoir, reservoir storage, a flow hydrograph based on hypothetical peak flows for a 100-yr storm event, and terrain elevation data. The program models unsteady flow using an adaptive 2D mesh that reflects complex contour, terrain, and land cover surface roughness data. Outputs include flood depths, velocities, and arrival times.

For the simulation of Forge Pond Dam failure, the following inputs were used to create the model. Please note that an actual full dam breach may present different characteristics than presented.

- GeoHEC-RAS 2D Failure Mode: Full Dam Breach
- Pool Elevation at Failure (ft, NAD83): 51 (at top of berm and dam)
- Time to Failure: 5.1 hrs
- Peak flow: 1,300 cfs
- Length of storm event: 24 hrs

Note that the inundation zone from the dam breach may be affected by antecedent flooding from rainfall on waterways that originate outside of the watershed for Forge Pond but converge downstream of the dam, as well as other culverts and bridges downstream. Culverts that fail are seen overtopping the adjacent roadways in inundation imagery.

Impacted Area Summary

The discharge from the spillway and low-level outlet is confined by concrete training walls for approximately 7 ft from the downstream end of the ogee weir. There, it is approximately 36 ft wide and narrows to a width of 16 ft, roughly 75 ft downstream of the spillway. There is a bridge (20 ft long by 18 ft wide) over the channel that provides access to three residences on Willow Avenue, to the west of Forge Pond. The training walls are stone masonry and are about 6 ft in height. The bridge is approximately 6 ft high and there is a small 1.3 ft high weir beneath the bridge that creates a stilling basin and fish pool below the spillway. On the east side of the channel, approximately 20 ft upstream of the bridge, a 20 ft long section of the wall that had collapsed was rebuilt during 2013-2014 Stantec repairs. Downstream of the bridge, about 10 ft east of the channel, is the East Bridgewater DPW office. The masonry wall ends about 100 ft downstream of the DPW building. Willow Avenue parallels the discharge channel for about 1,200 ft until the intersection with North Central Street. The west shoulder of Willow Avenue has been eroded in several areas due to high water flow in the channel. The channel passes beneath North Central Street through a culvert and continues to the south into an open, low area, eventually flowing into the Matfield River approximately one mile south of Forge Pond. The area bordering the channel downstream of the DPW building is heavily wooded with trees and brush. The west side of the discharge channel

consists of mowed/maintained lawns associated with the adjacent residences. During flood events, this bridge culvert has historically restricted flow and created a backwater effect, causing flooding in the area of the DPW office. During flood events, the North Central Street Bridge has caused backwater effects that resulted in flooding of the lower portions of Willow Avenue up to the Highway Garage Building.

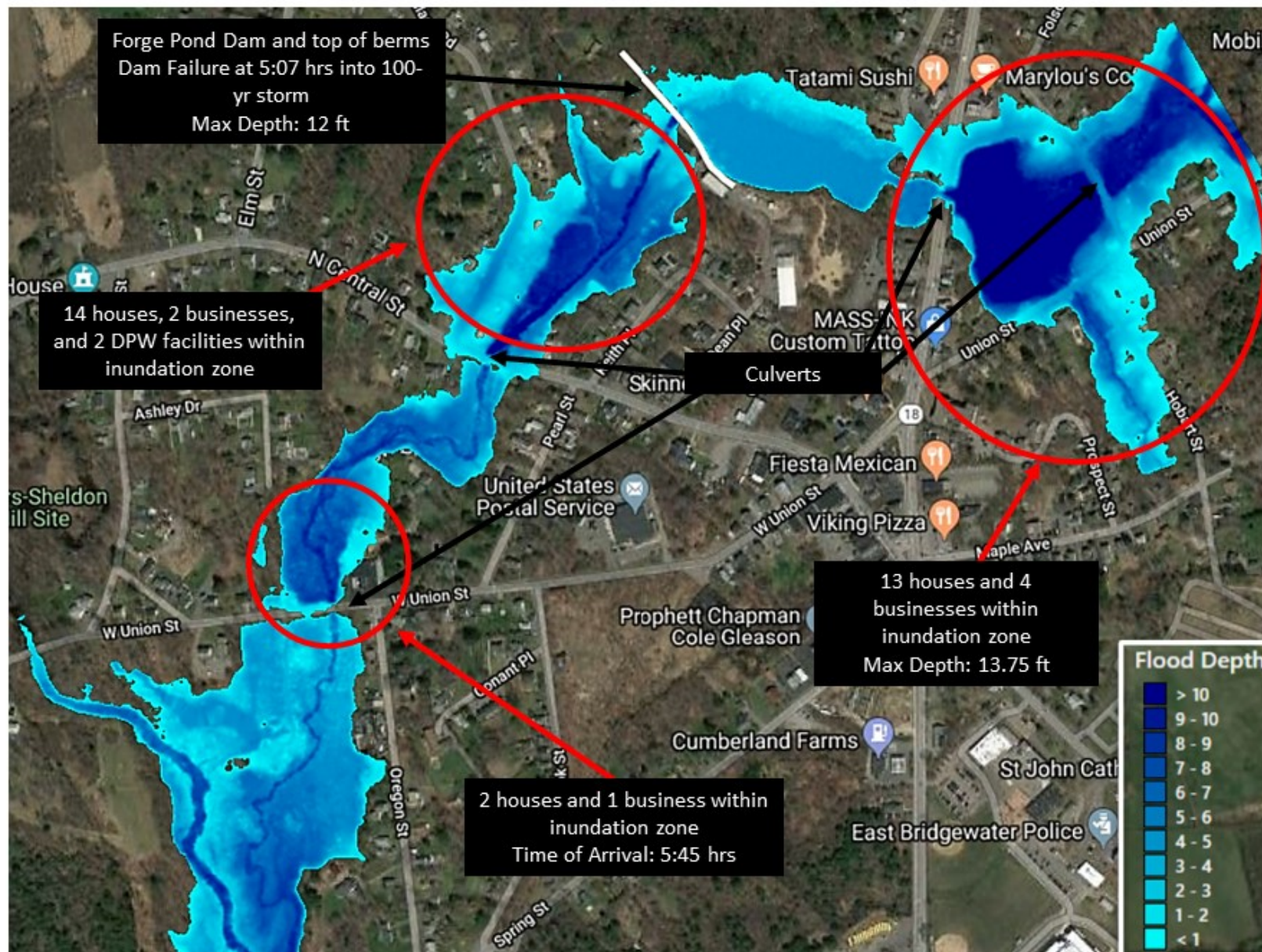
Estimated peak flow through the dam is 1,300 cfs for a 100-yr 24-hr storm event. A full dam breach occurred in hour 5 of the modeled storm event, reaching a peak velocity of 10 ft/s down the spillway.

Upon completion of inundation mapping, three severely impacted areas of concern were identified. The intersection of Water Street, Hobart Street, and Union Street blocks surrounding the eastern side of Forge Pond is a spot where multiple privately-owned structures will be impacted by flooding depths exceeding 5 ft. Water Street will be completely overtopped by the bottleneck effect of the culverted portion of Forge Pond that is underneath N Bedford Street. Similarly, New Water St, to the north, will be inundated with flood waters. The flooding of Union Street will serve as a barrier for emergency services access to the area.

The second area of concern is the dam-adjacent Willow Avenue and privately owned structures to the west and south of Meadow Brook, which runs parallel to Willow Avenue. Flood depths will cut off emergency access and evacuation routes for 4 single-family homes at the dead end of Willow Avenue and will inundate N Central Street where it intersects with Willow Ave. The final area of concern is downstream, where Meadow Brook feeds into the Matfield River, and further down past the border between East Bridgewater and the Elmwood neighborhood of Bridgewater. While the Matfield River has an adequate bordering floodplain, there are a number of businesses that sit very close to the banks of the river and would be subject to flooding risk in the event of a dam breach. Businesses along Spring Street and Bedford Street that lie close to MAHW levels for the Matfield River may experience structural flooding damage. The following roadways in East Bridgewater will likely experience culvert failure, resulting in roadway flooding and impacted vehicular access: Water Street, Union Street, Bedford Street, Willow Ave, N Central Street, W Union Street.

The Spring Street, Matfield River Frontage, East Street, and Trudeau Lane Site Conservation areas bordering the Matfield River serve as adequate floodplains to accommodate much of the inundation area and thus limits property damage downstream.

INUNDATION MAPPING



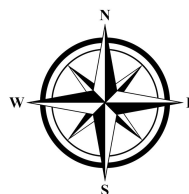
NOTES:

1. AERIAL PHOTO FROM GEOHECRAS 2D ESRI (DATE OF IMAGERY IS 2016-2019)
2. ALL MUNICIPAL FACILITY LOCATIONS FROM ESRI
3. THE INUNDATION AREAS SHOWN ON THIS MAP REFLECT EVENTS OF AN EXTREMELY REMOTE NATURE. THESE RESULTS ARE NOT IN ANY WAY INTENDED TO REFLECT UPON THE INTEGRITY OF FORGE POND DAM.
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7. DAM FAILURE WAS SIMULATED WITH IMPOUNDMENT AT TOP OF DAM AND WITHOUT ANTECEDENT FLOODING DOWNSTREAM

Inundation Map 1.

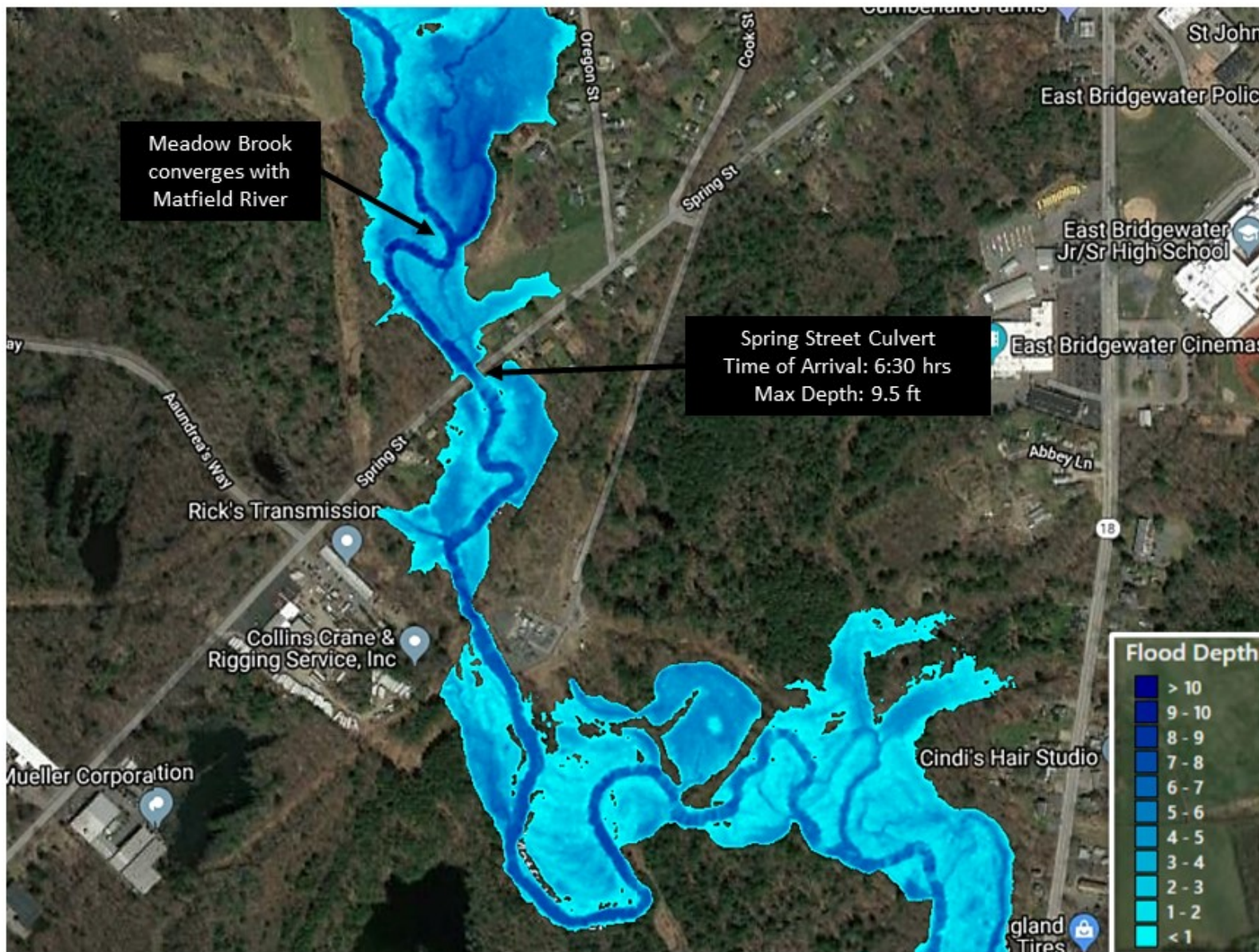
Flood Depths

Forge Pond Dam, East Bridgewater



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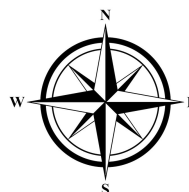
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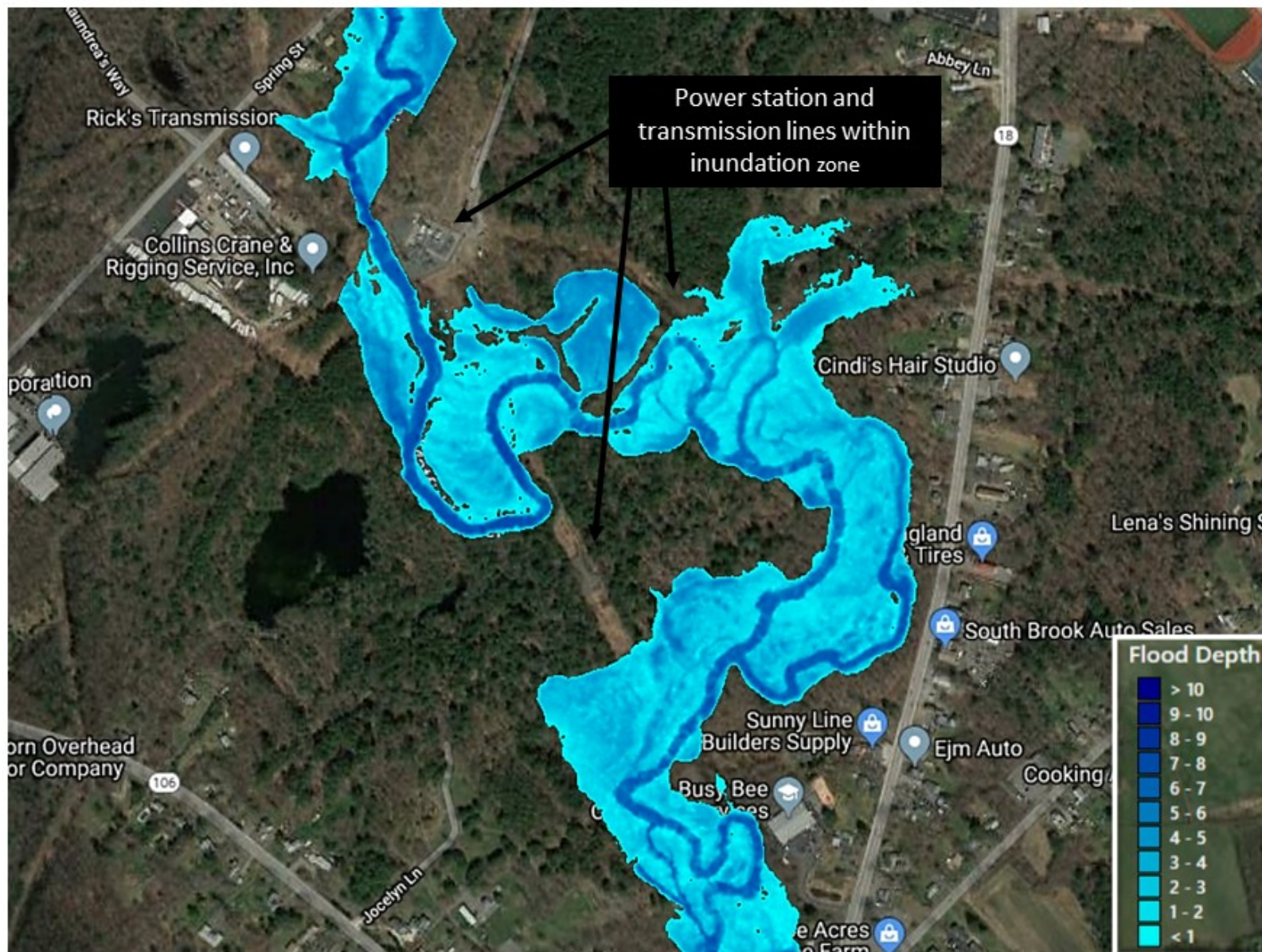
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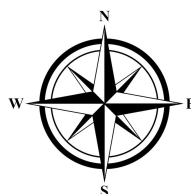
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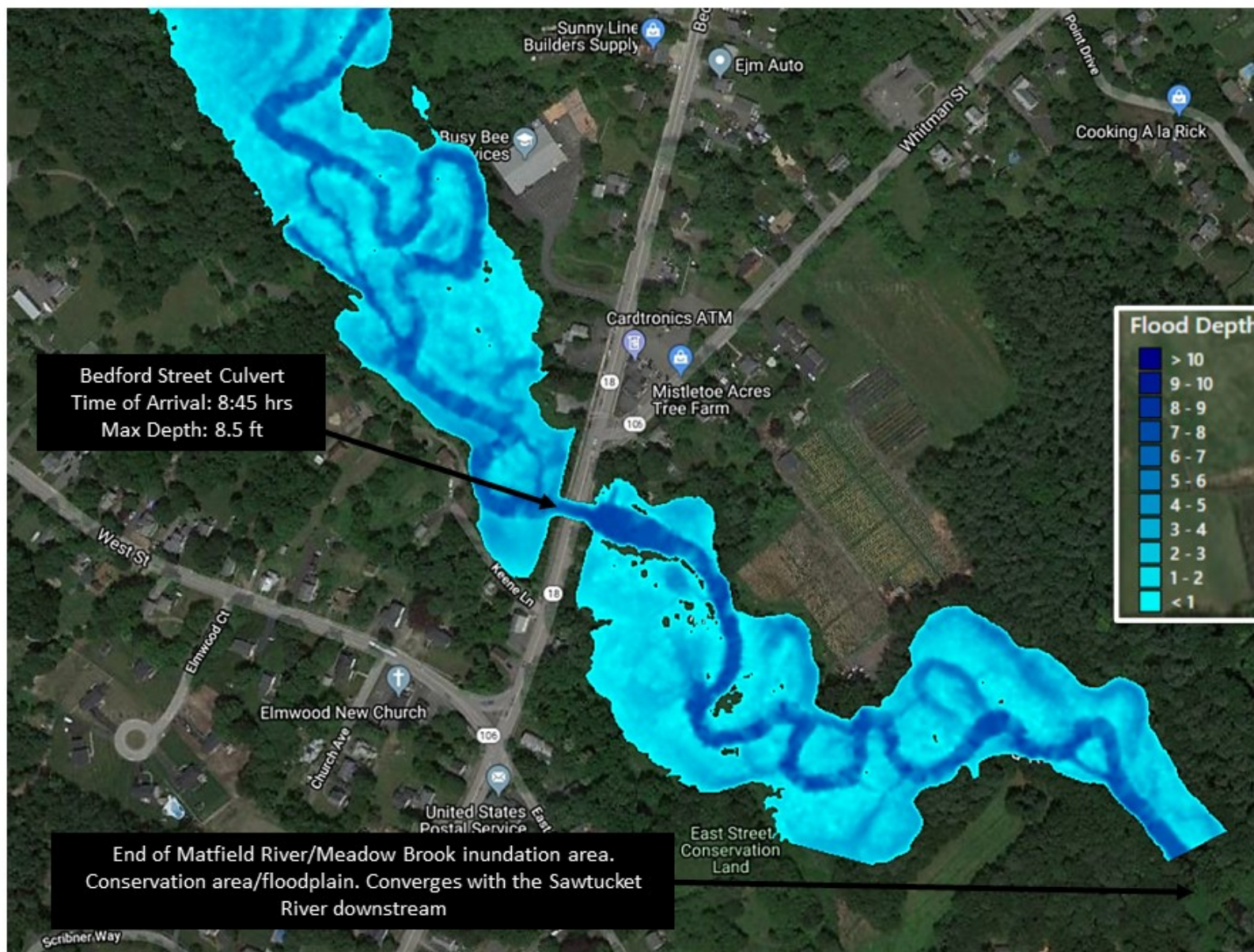
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Forge Pond Dam, East Bridgewater



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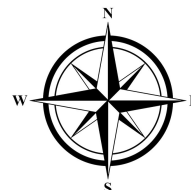
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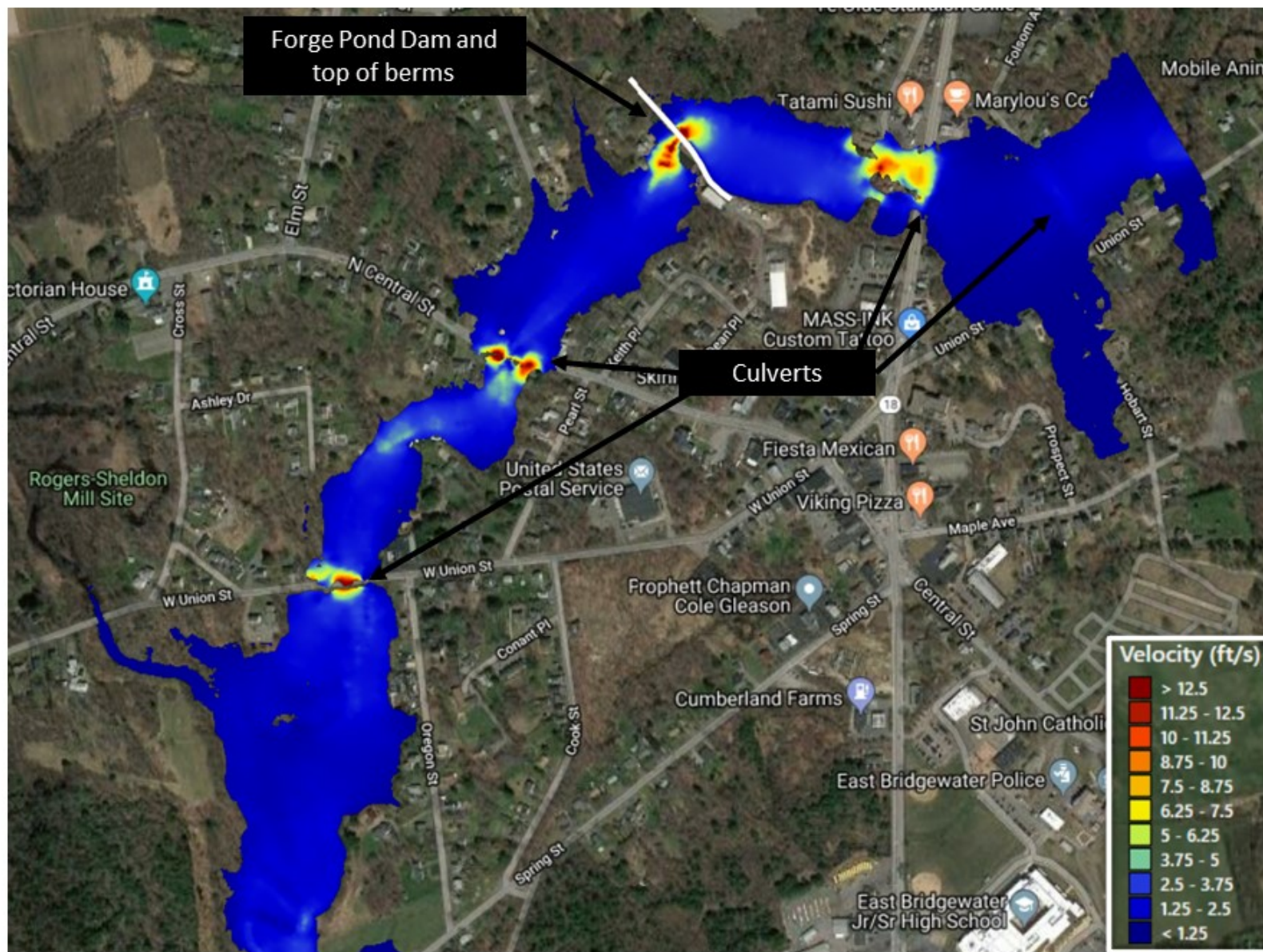
Flood Depths

Forge Pond Dam, East Bridgewater



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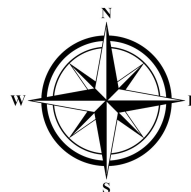
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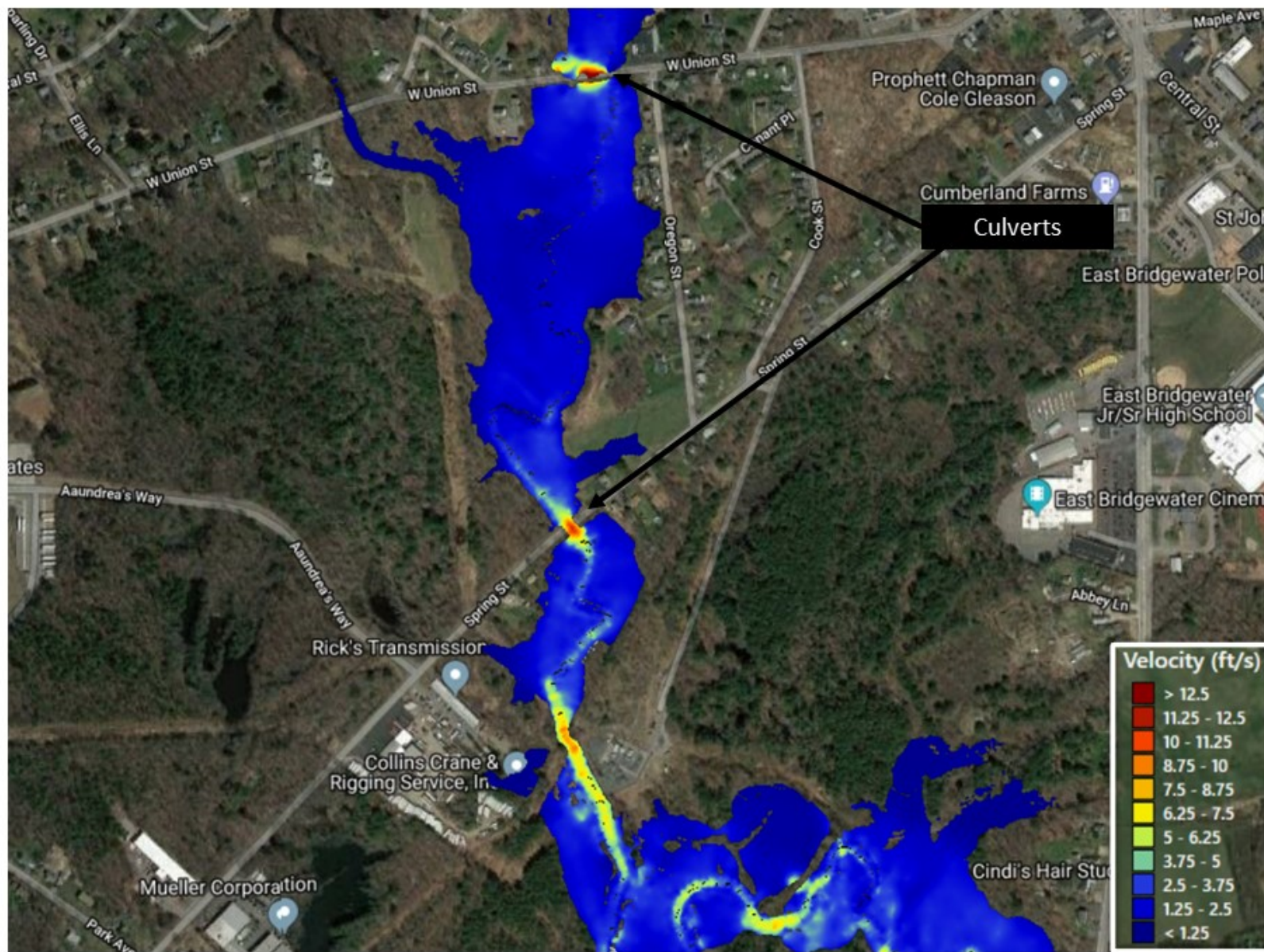
Flood Velocities

Forge Pond Dam, East Bridgewater



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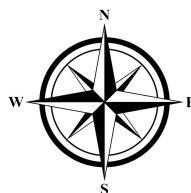
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Inundation Map 6.

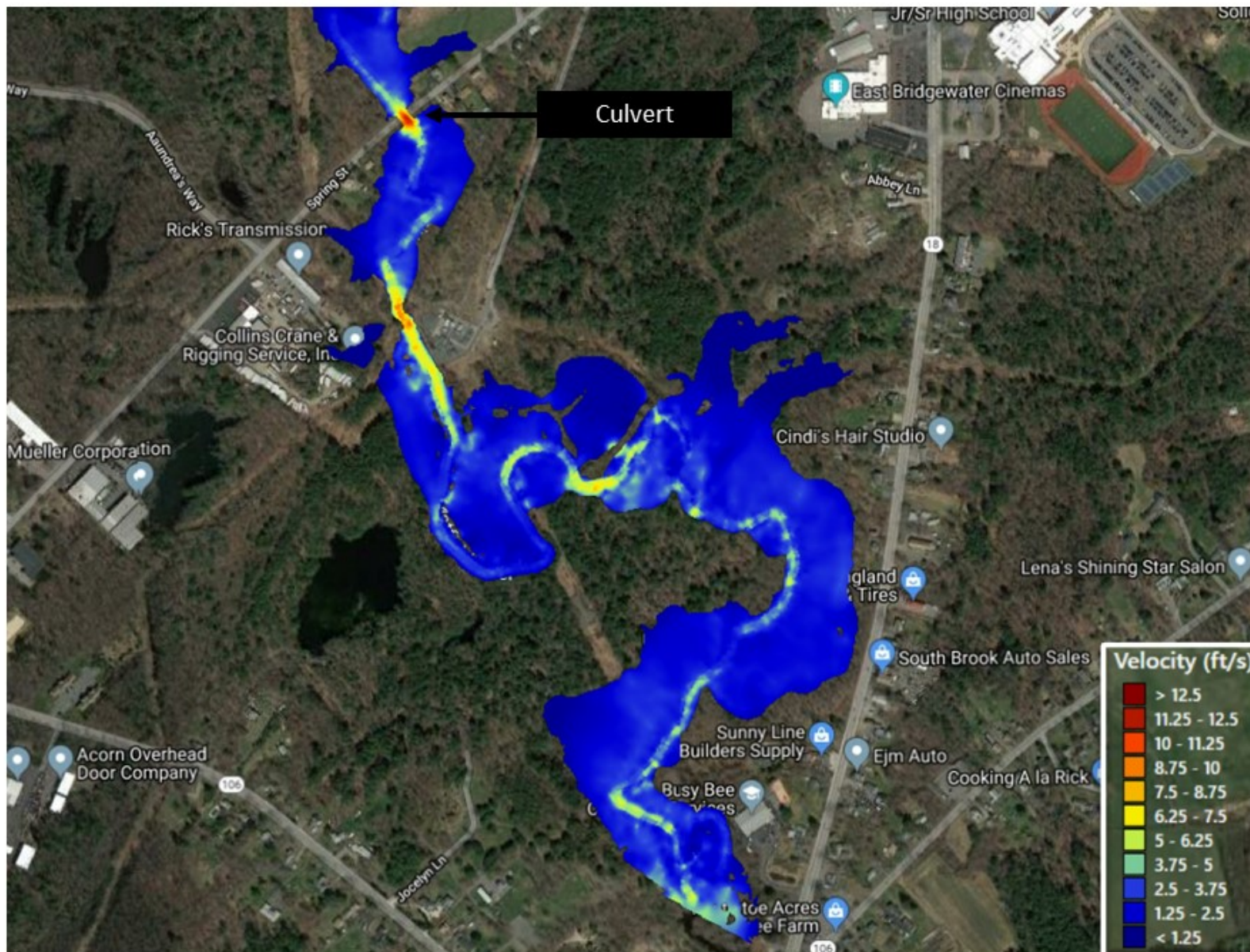
Flood Velocities

Forge Pond Dam, East Bridgewater



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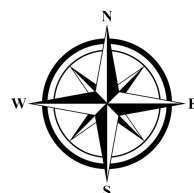
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Inundation Map 7.

Flood Velocities

Forge Pond Dam, East Bridgewater



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41 MAIN STREET
BOLTON MA 01740



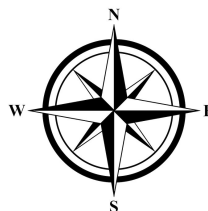
NOTES:

1. AERIAL PHOTO FROM GEOHECRAS 2D ESRI (DATE OF IMAGERY IS 2016-2019)
2. ALL MUNICIPAL FACILITY LOCATIONS FROM ESRI
3. THE INUNDATION AREAS SHOWN ON THIS MAP REFLECT EVENTS OF AN EXTREMELY REMOTE NATURE. THESE RESULTS ARE NOT IN ANY WAY INTENDED TO REFLECT UPON THE INTEGRITY OF FORGE POND DAM.
4. THE INUNDATION AREA SHOWN IS APPROXIMATE SHOULD BE USED AS A GUIDELINE FOR ESTABLISHING EVACUATION ZONES.
5. ACTUAL INUNDATION AREA WILL DEPEND ON ACTUAL FAILURE CONDITIONS AND MAY DIFFER FROM THIS MAP
6. INUNDATION AREA WAS CALCULATED BY SIMULATING A FULL DAM BREACH FAILURE WITH GEOHECRAS 2D SOFTWARE.
7. DAM FAILURE WAS SIMULATED WITH IMPOUNDMENT AT TOP OF DAM AND WITHOUT ANTECEDENT FLOODING DOWNSTREAM

Inundation Map 8.

Flood Velocities

Forge Pond Dam, East Bridgewater



41 MAIN STREET
BOLTON MA 01740

COMPREHENSIVE
ENVIRONMENTAL
INCORPORATED

FIGURES



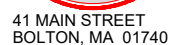
1:18,056

0 0.1 0.2 0.4 mi

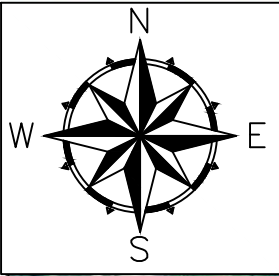
0 0.17 0.35 0.7 km

2. LOCUS SCALE IS APPROXIMATE

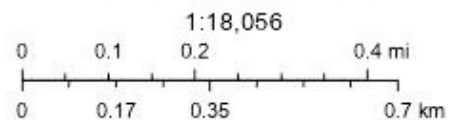
Figure 1. Topographic Locus Map



COMPREHENSIVE
ENVIRONMENTAL
INCORPORATED



12/19/2019, 11:33:15 AM



GENERAL NOTES

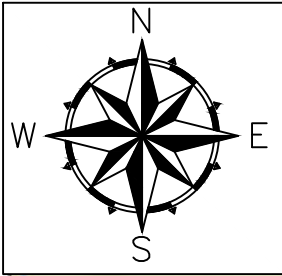
1. LOCUS MAP BASED ON USGS TOPOGRAPHY IMAGE GENERATED BY THE NATIONAL MAP ADVANCED VIEWER, USGS (C).
2. LOCUS SCALE IS APPROXIMATE

FORGE POND DAM,
TOWN OF EAST
BRIDGEWATER
Figure 2. Aerial Photo Locus Map



COMPREHENSIVE
ENVIRONMENTAL
INCORPORATED

41 MIAN STREET
BOLTON MA 01740



12/19/2019, 11:30:07 AM

1:18,056

0 0.1 0.2 0.4 mi
0 0.17 0.35 0.7 km

GENERAL NOTES

1. LOCUS MAP BASED ON USGS TOPOGRAPHY IMAGE GENERATED BY THE NATIONAL MAP ADVANCED VIEWER, USGS (C).
2. LOCUS SCALE IS APPROXIMATE

FORGE POND DAM, TOWN OF EAST BRIDGEWATER

Figure 3. Street Locus Map



41 MIAN STREET
BOLTON MA 01740

COMPREHENSIVE
ENVIRONMENTAL
INCORPORATED

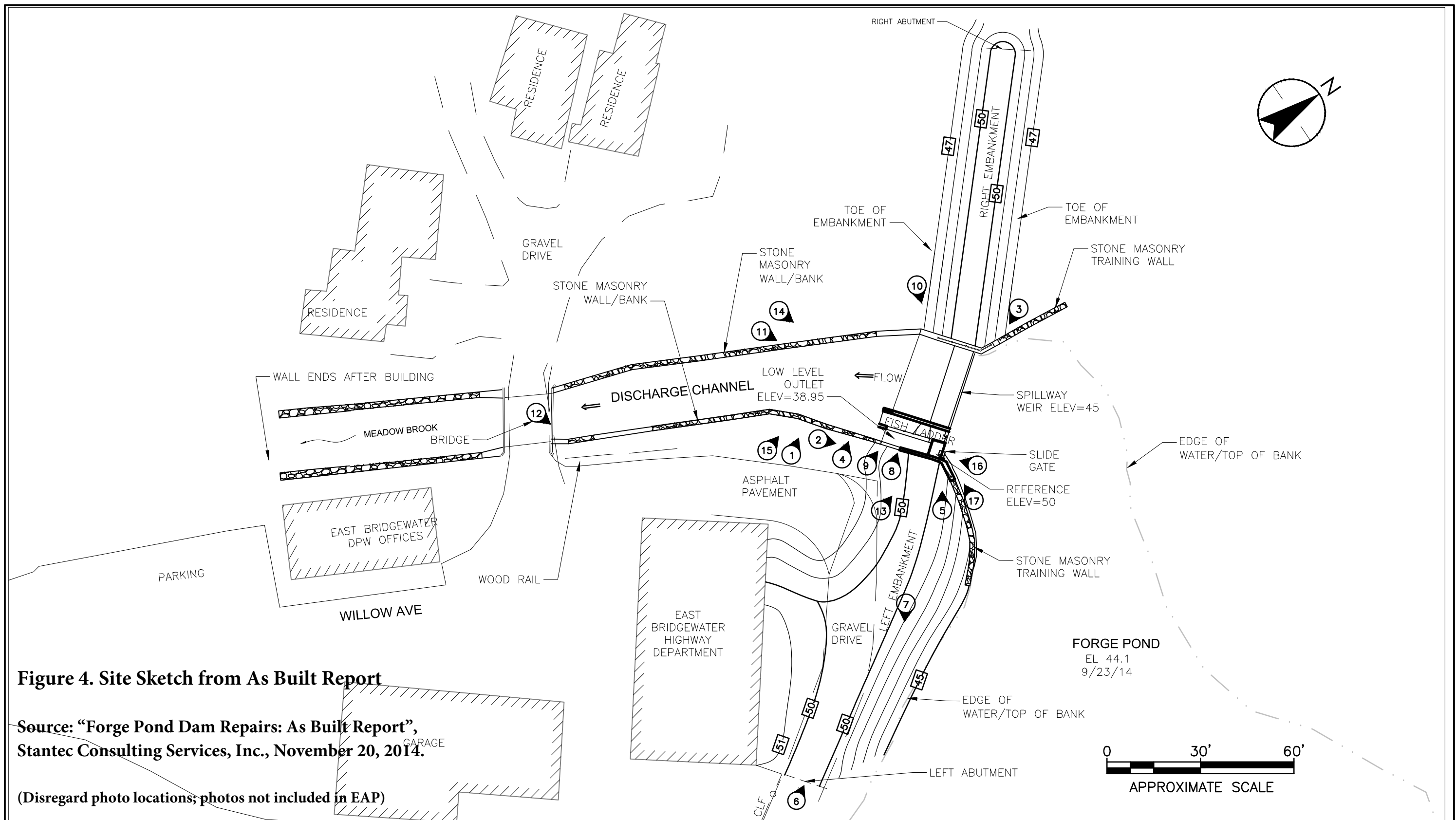


Figure 4. Site Sketch from As Built Report

**Source: “Forge Pond Dam Repairs: As Built Report”,
Stantec Consulting Services, Inc., November 20, 2014.**

(Disregard photo locations; photos not included in EAP)

Notes

FORGE POND DAM REPAIRS OCCURRED
BETWEEN AUGUST 12 AND OCTOBER 24,
2013

File: Figure 5 Site Plan w
photos 11-24-14.dwg

Legend

(X) PHOTO LOCATION

CONSTRUCTION PROGRESS
PHOTO LOCATION PLAN
FORGE POND DAM
NID ID# MA 00427

TOWN OF EAST BRIDGEWATER, MA



5 LAN DRIVE, SUITE 300
WESTFORD, MA 01886

AS BUILT REPORT

Appendix A

Preparedness

PREPAREDNESS

Preparedness actions are taken to prevent an emergency situation from developing or to minimize the extent of damage caused from a developed emergency situation. The preparedness actions may be by providing response procedures to emergency situations and/or arranging for equipment, labor, and materials for use in emergency situations.

4.1 Surveillance

The most important part of the EAP is the identification of a problem at the dam. If a problem is not identified, the plan cannot be implemented. Problem identification will be much easier if knowledgeable personnel regularly monitor the dam closely.

The dam owner and dam operator must continue to monitor the dam on a regular basis. This is especially important during high rainfall events and during spring runoff conditions when large amounts of snow melting occur. Appendix B identifies some potential hazards that could lead to dam failure.

It is impossible to predict when an emergency situation will develop, therefore it is important that emergency contact information be posted at the site so that a casual observer can contact emergency personnel if they observe an unusual condition.

4.2 Access to Site

The dam can be accessed by taking N Central Street in East Bridgewater to Willow Avenue (a left turn when coming from the west, and a right turn when coming from the east). Towards the end of Willow Avenue, the Town's DPW offices and garage are to the right of the dam, which is directly ahead, accessible via dirt road. Access to the western edge of the dam can be gained by continuing down Willow Avenue and crossing the bridge over the spillway channel.

4.3 Operations and Maintenance Manual

East Bridgewater's DPW is responsible for implementing operational and maintenance activities for Forge Pond Dam. O&M activities for Forge Pond Dam include monthly operation of the gate, keeping the dam structures free of vegetation, clearing debris from the top of the dam, and ensuring the gate operator is accessible. Currently, no formal written O&M manual or plan exists.

4.4 Response during Periods of Darkness

The embankment, spillway, low level outlet, and any distressed areas of the dam should be illuminated if an emergency condition develops during a period of darkness. A portable light tower is accessible from the Department of Public Works. Dam Owner and Caretaker should be notified. The Fire Department should issue a CODERed notification to affected citizens.

4.5 Response during Evenings, Weekends, and Holidays

The Notification Flowchart can be used for emergency events that occur during evenings, weekends, and holidays. A CODERed notification should be issued by the Fire Department, if necessary.

4.6 Response during Periods of Adverse Weather

The Department of Public Works is responsible for maintaining safe access to the dam during snowstorms, rain, and wind events, as well as monitoring the status of the dam during and after any intense weather events.

4.7 Training and Testing

Training and testing of the EAP is the responsibility of the dam owner. The dam owner should coordinate training and testing with local responders and emergency personnel within the municipalities impacted by a dam failure. Training seminars should be held for all operators, attendants and other personnel (i.e. police and fire) responsible for the implementation of the plan. After the initial training seminar, it is recommended that a special meeting be held to explain the plan to the downstream residents and elected officials. The meeting with downstream residents will be extremely beneficial at a time of emergency.

It is recommended that EAP or components of the plan be tested periodically. The testing should be conducted through the use of drills and exercises. Testing should include operators, attendants, police, fire and other personnel responsible for the implementation of the plan. Downstream residents shall not be included in the test.

Below is a list of suggested training exercises, the frequencies they should be conducted, and the topics they should cover:

Seminars with Emergency Personnel

- Frequency: As needed
- Topics:
 - New hires should be briefed on their duties during an emergency response
 - At a minimum a read through of the EAP and a brief assessment should be conducted.

Emergency Management Workshop

- Frequency: Annually
- Attendees: *To be developed*
- Topics:
 - Authorities responsible for executing the EAP should gather to discuss the EAP.
 - Review and updating of the Notification Flowchart, Emergency Contracts, and Emergency Warning systems should be conducted at this time.
 - Parties should discuss the response effort specifically the Notification Flowchart and the corrective actions to be taken at the dam during various scenarios.
 - Lines of communication should be streamlined such that a developing condition at the dam can be assessed and handled

Public Meetings

- Frequency: Every 2 Years
- Topics:

- The public should be educated on the EAP and how they can facilitate the rapid and safe execution of the EAP during an emergency.
- Evacuation routes should be discussed.
- Emergency Warning systems (i.e. Connect-CTY) should be discussed and updated.
- Preparation and situational awareness techniques during an emergency situation. (i.e. Areas of high ground within the town, keeping a cell phone charged, supplies needed for an extended evacuation, navigation of flooded roads, etc.)

Table Top Exercise

- Frequency: Every 3-4 Years
- Topics:
 - Emergency management personnel should gather and discuss different emergency scenarios to assess plans, policies, and procedures.

Functional Exercise

- Frequency: Every 5 Years
- Topics:
 - A functional exercise is conducted to test and validate the coordination, command, and control between the EOC, EMD, and all agencies involved with carrying out the EAP.
 - This type of exercise does not include any “boots on the ground”

After each of the tests mentioned above, a “lessons learned” discussion and evaluation should be conducted. The discussions should highlight procedures that work well and those that did not; as well as inaccurate information (within the flowchart, inundation maps, resident contacts, assigned responsibilities, equipment, etc.). Results should be written down and distributed to the associated parties and any corrections and updates should be made.

The training and testing activities should be fully documented.

4.8 Updating and Posting

All aspects of the EAP should be reviewed and updated once per year in accordance with the applicable guidelines. During the review, a determination of any new developments or other changes downstream or elsewhere should be made to determine whether any revisions to the current EAP are necessary. It is imperative that all other holders of the EAP receive updates to the EAP immediately upon becoming aware of necessary changes to keep the EAP workable. This includes revisions when phone numbers and/or names change for notification flow chart personnel and downstream residents.

An up-to-date copy of the flowchart and notification list should be in prominent locations in the offices of the personnel responsible for the EAP Implementation.

A copy of the complete up-to-date EAP should also be available to all operators and personnel responsible for the implementation of the EAP. At a minimum, a full copy of the EAP should be located at the following locations:

- Owner: Board of Selectmen, 175 Central Street, East Bridgewater, MA

- Local Emergency Management Agency: Timothy Harhen, 268 Bedford Street, East Bridgewater, MA
- Massachusetts Emergency Management Agency (MEMA): 12 Admin Road, Bridgewater, MA 02324
- Massachusetts Department of Conservation and Recreation, Office of Dam Safety: William Salomaa, Director, 251 Causeway Street, Boston, MA 02114
- *Additional Agencies as locally appropriate*

4.9 Emergency Response Coordination

During an emergency situation, the **Incident Commander** will be responsible for the proper organization and operation of the Emergency Action Plan. He/she will coordinate all activities with state and local authorities.

4.10 Contact Lists

Contact lists should be maintained for facilities, structures, and other properties that may be impacted by a flood wave. Dependent upon the nature of the inundated area, the contact lists may include residents to be evacuated due to shallow flooding, facilities requiring special considerations, and other facilities. Contact lists should also consider special needs in the impacted area such as multilingual communications.

Hard copies of the list should be kept at the EOC and within each EAP binder. At a minimum, annual reviews and updating of the contact list should be completed to keep the list current.

4.11 Alternative Systems of Communication

If there is an interruption in telephone service during an emergency condition, emergency response personnel should broadcast over their radio communications system and cellular phones as necessary. Cell phone/telephone numbers for the emergency responders should be maintained and updated in the notification flowchart on a regular basis.

4.12 Emergency Labor, Supplies and Equipment

Once an emergency condition has been identified, mobilization of the appropriate equipment is key to addressing the situation. The following lists provide partial equipment lists for the conditions described above. This list should be modified as required to address actual conditions at the time of the emergency. Additional equipment, not listed below may be necessary. Actual condition and estimated response time versus the rate of deterioration of the dam may preclude the repair of the structure and necessitate full evacuation. The primary goal is to protect human life and minimize property damage.

- Emergency lights and generators for dam work or evacuation.
- Construction equipment if the dam is repairable:
- Loaders
- Excavators
- Gravel hauling trucks

- High wheel trucks
- Sandbags
- Shovels
- Tree removal equipment
- Barriers, barricades and personnel transportation to facilitate evacuation

The provision of labor, equipment and materials is the responsibility of the dam owner. As such the following sections provide recommendations for establishing relationships and agreements with local contractors, vendors, and suppliers.

4.12.1 Subcontractors

The dam owner should develop/maintain open-ended contracts with a number of general contractors and/or suppliers. These contracts allow the dam owner to hire equipment as needed at a set hourly rate. Materials could be purchased from any of the contractors.

4.12.2 Potential Borrow Areas Around the Town

Potential borrow areas should be identified that could be utilized as sources of fill material in the event of an emergency condition at the dam requiring extra material. The owners of these and any other gravel pits that may be utilized during an emergency should be contacted.

4.12.3 Massachusetts Water/Wastewater Agency Response Network (MA WARN)

[IF APPLICABLE] The MA WARN program allows for participating water and wastewater public utilities to receive rapid response aid (in the form of equipment or supplies) from other participating towns in the event of an emergency, natural or man-made. MA WARN members are allowed exclusive access to information (equipment lists and contact information) about other members through the “Members Only” section on the MA WARN website (www.mawarn.org). The Dam Owner should familiarize themselves with specific MA WARN operating procedures, so that in the event of an emergency the required assistance can be mobilized.

APPENDIX B

Emergency Detection, Evaluation, & Classification

EMERGENCY DETECTION, EVALUATION & CLASSIFICATION

The detection, evaluation and classification of a potential emergency situation are crucial in determining the level of response and notification required in order to minimize the response time.

The following emergency classification system is proposed for this site:

- **Dam Safety WATCH: “Potential failure is developing”**: This is a situation where a failure may eventually occur if left unattended. This situation will require a Phase I response with continuous monitoring of the situation. This emergency classification level was formerly titled “Condition I”.
- **Dam Failure WARNING: “Failure is Imminent or has occurred”**: This is a situation where a failure either has occurred, is occurring, or is just about to occur. This situation will require Phase I and II responses that will proceed with evacuation procedures. This emergency classification level was formerly titled “Condition II”.

Examples of the preplanned procedures and notification that should be followed based on the various conditions observed during either storm or fair weather conditions are outlined below. These are examples and are not intended to describe all possible conditions, nor are they intended to limit the actions taken during a given event.

B.1 Dam Safety WATCH Examples

Notify: Dam Owner, Local EMD, Engineer, and MADCR ODS

- Any seismic event regardless of how slight
- Other situations which may lead to damage at the structure
 - Evidence of vandalism
 - Bomb threat
 - A civil disorder near the reservoir
 - Any aircraft accident near the reservoir
- Water level of the impoundment is at an unsafe level and is rising threatening to overtop the dam
- Discharges resulting in significant erosion and/or scour
- Any developing erosion, settlement, or upheaval occurring on the downstream slope or at the toe of the dam that is considered to be controllable
- Any undocumented leakage through any dam structure considered to be controllable

B.2 Dam Safety WARNING Examples

Notify: ALL PARTIES LISTED ON THE NOTIFICATION FLOWCHART

- Water has overtopped or will overtop the dam
- Any uncontrollable erosion, settlement, or upheaval occurring on the downstream slope or at the toe of the dam
- Any uncontrollable leakage through any dam structure resulting in degradation to the structural integrity of the dam
- A dislocation or failure of any structure which allows for an expanding, uncontrollable discharge of water through the spillway or dam indicating a breach is occurring
- Dam is failing, is about to fail, or has failed

An Emergency Condition Watch may be declared initially with gradual transition into a Dam Failure Warning or a Dam Failure Warning may be declared immediately, depending on the actual conditions.

While these actions attempt to generalize responses to the observed conditions, the judgment of the primary observer and/or knowledgeable person(s) must be utilized. While some conditions such as breaching, overtopping and severe piping can dictate an immediate evacuation; others will require the observer to determine the extent of the concern and the probability of the concern being addressed within a timely fashion.

B.3 Additional Guidance for Determining the Emergency Level¹

TABLE B.1: Possible Failure Modes

Event	Situation	Emergency Level
Structural Cracking	New cracking along the concrete structure with radial, transverse, or vertical displacement	--
	New cracks in the concrete with seepage	Watch
	New cracks/old cracks with actively progressing displacements	Warning
Foundation Weakness	New cracks at the abutment greater than 1/4-inch wide without seepage	Watch
	Cracks in the abutment with seepage	Watch
	Visual movement/slippage of the embankment slope	Warning
Construction Joint Cracking	Cracking at the construction joint	--
	Cracked construction joint with displacement and seepage	Watch
Sinkholes	Rapidly enlarging sinkhole	Warning
Embankment Cracking	New cracks in the embankment greater than 1/4-inch wide without seepage	--
	Cracks in the embankment with seepage	Watch / Warning
Earthquake	Earthquake resulting in visible damage to the dam or appurtenances	Watch
	Earthquake resulting in uncontrolled release of water from the dam	Warning
Security Threat	Verified bomb threat that, if carried out, could result in damage to the dam	Warning
	Detonated bomb that has resulted in damage to the dam or appurtenances	Warning
Sabotage/Vandalism	Damage to dam or appurtenances with no impacts to the functioning of the dam	--
	Damage to dam or appurtenances that has resulted in seepage flow	Watch
	Damage to dam or appurtenances that has resulted in uncontrolled water release	Warning
<i>Add additional conditions and warning levels as appropriate for specific dam site</i>		

B.4 Potential Hazards That Can Lead to Dam Failure

¹ Based upon the NRCS Recommendations for Developing EAPs, 2006.

The purpose of the section is to educate the user of the EAP as to some of the common causes of dam instability and possible failure. A short definition of each hazard is listed along with typical causes. This is not intended to be an exhaustive list of all failure mechanisms as each dam has a unique set of conditions which will influence the development of conditions and concerns.

1. Flow Erosion

- Wash out of spillways, embankment sections
- Causes: poor compaction of silt backfill; lack of riprap or concrete protection at interface between soil embankment and concrete structure; erosion by flow over embankment, spillway, or through outlet.

2. Embankment Leakage, Piping

- Excessive seepage resulting in internal erosion followed by formation of a "pipe" through the embankment which once formed causes rapid flow erosion and wash out of the embankment.
- Causes: poor compaction of soil along interface with concrete structures; lack of seepage control collars around pipe; root and rodent holes; inadequate or nonexistent filters between fine and coarse soils; cracks or voids within the concrete structure.

3. Foundation Leakage, Piping

- Wash-out of foundation material below dam causing undermining.
- Causes: poor interface with bedrock and concrete structures; excessive seepage at dam toe carrying soil with it.

4. Sliding

- Serious movement in foundation or concrete structure which either result in dam failure or significantly weaken the dam structure.
- Causes: Foundation material weak; excessive water pressure in structure or foundation

5. Deformation

- Gross deformation of dam or outlet structures resulting in immediate failure or cracking of the dam, and subsequent washouts.
- Causes: excessive settlement in foundation, ice jacking (Pressure exerted by expanding/contracting ice structures).

6. Blowing of Trees from Embankment

- Blowing of trees on and near the embankment would result in substantial cracks and scour of the embankment and subsequent washout of the embankments.
- Causes: Heavy rain associated with gusty winds and natural aging and poor root system of the trees on and near the embankments.

7. Reduction of Crest Elevation

- Deterioration or washout of Dam crest

- Causes: Poor concrete condition; heavy rain runoff.

8. Dam Overtopping

- Water flows over the crest of the dam causing erosion and subsequent reduced dam height with time. If overtopping continues for any length of time it may lead to a total failure of the dam.
- Causes: Heavy rain; blocked or inadequately sized spillway.

9. Cracking

- Longitudinal cracking can be due to movements and/or settlements of the dam and can allow water to infiltrate the concrete.
- Transverse cracking can be due to horizontal and/or vertical movement and can result in a flow path across the concrete structure.
- Thin cracks can be very deep and intersect the phreatic surface.

APPENDIX C

Termination & Recovery

APPENDIX C

TERMINATION & RECOVERY

If the EAP has been placed into action and the event has been deemed to not be an emergency, or the threat has been mitigated, termination of the emergency response under the EAP will be the sole responsibility of the incident commander. Termination process should include, but not be limited to, the following steps:

- Notify all agencies and parties contacted during the response of the situation termination
- Issue public notification
- Complete post-situation dam inspection

Implement post-situation recovery including restoring impacted areas such that they are safe for public use and repairing or otherwise addressing damaged infrastructure

APPENDIX D
Materials & Equipment

APPENDIX D
AVAILABLE MATERIALS & EQUIPMENT

Town Owned Equipment:

Front-end Loader
Portable Light Tower
Backhoe
Mini Excavator
Skid Steer
Multiple 6-Wheel Dump Trucks
Pumps
Sand /Sand Bags
Stone/Rip Rap

Contractors for additional emergency equipment:

Contractor	Phone Number
Eric Watson Excavation	508-378-4543
Little Dryden Enterprises	508-378-7545
Claude Dubord & Sons, Inc.	508-697-2621

APPENDIX E
Signoff Sheets

RECORD OF TRAINING

[illegible]

APPENDIX F

Common Dam Safety Definitions

APPENDIX F

COMMON DAM SAFETY DEFINITIONS

For a comprehensive list of dam engineering terminology and definitions refer to 302 CMR 10.00 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 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.

REFERENCES

REFERENCES

The following references were utilized during the preparation of this report and the development of the recommendations presented herein:

1. “Design of Small Dams”, United States Department of the Interior Bureau of Reclamation, 1987
2. “ER 110-2-106 - Recommended Guidelines for Safety Inspection of Dams”, Department of the Army, September 26, 1979.
3. “Guidelines for Reporting the Performance of Dams” National Performance of Dams Program, August 1994.
4. Commonwealth of Massachusetts General Laws, M.G.L. 253, Section 44, Chapter 302 CMR 10.00, Dam Safety, February 10, 2017.
5. “Forge Pond Dam Repairs: As Built Report”, Stantec Consulting Services, Inc., November 20, 2014.
6. “Forge Pond Dam: Phase 1 Inspection/Evaluation Report”, Stantec Consulting Services, Inc., September 23, 2014.
7. GeoHECRAS 2D (Version 2.7.0.23550; CivilGEO Engineering Software ©). Accessed 9/9/19-12/10/19
8. StreamStats, United States Geological Survey, <https://streamstats.usgs.gov/ss/> , accessed October 29, 2019.