

PROJECT**Emergency Action Plan****Queen Lake Dam MA00648**

The following verification of EAP review is required under MGL Chapter 253 and 302 CMR 10.0. This verification of review is to become a part of the Emergency Action Plan and is to accompany the Plan copies submitted to the Department of Conservation and Recreation, Office of Dam Safety and the Massachusetts Emergency Management Agency. The purpose of this verification is to document that the local Emergency Management Director has received and reviewed a draft copy of the Plans.

Signing of this document by the local Emergency Management Director acknowledges that the above described review process has taken place.

EMERGENCY MANAGEMENT DIRECTOR

Name:

Donald J Smith

Title:

Emergency Management Director

Signature:

Donald J Smith

Date:

May 16, 2022

EAP 2022

EMERGENCY ACTION PLAN

for

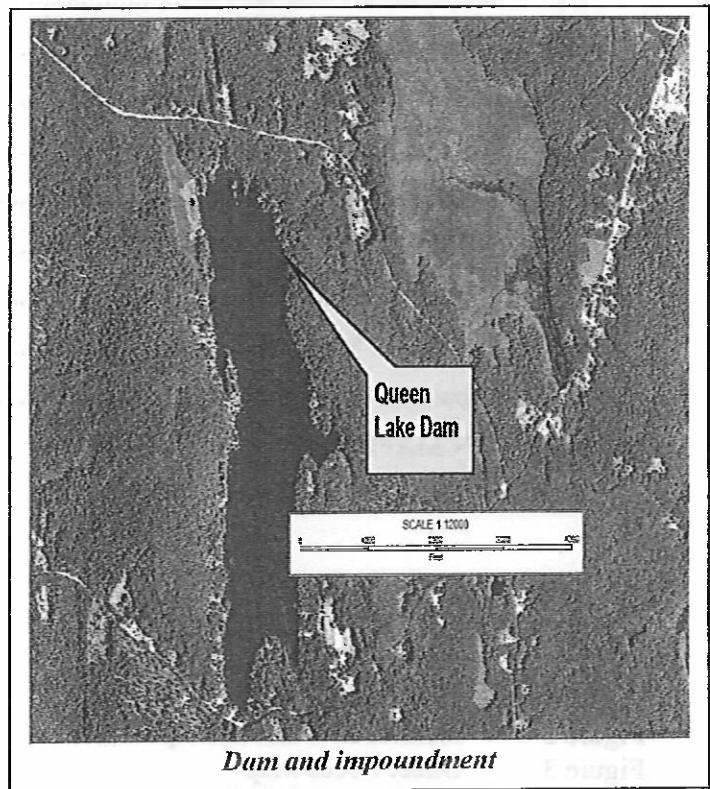
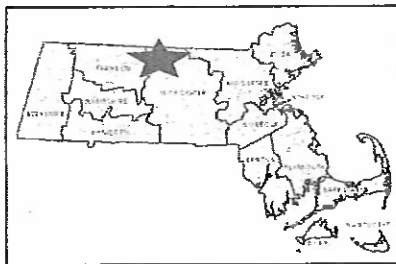
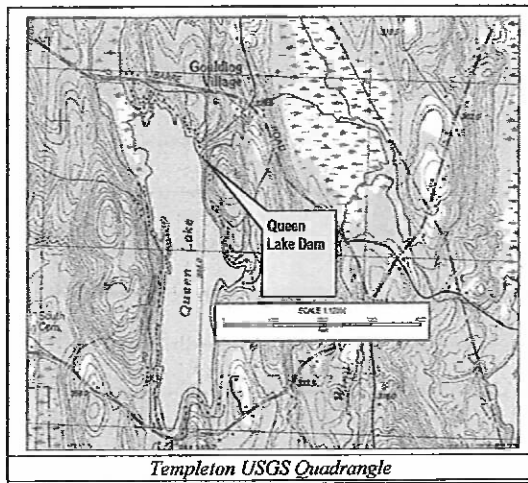
QUEEN LAKE DAM

PHILLIPSTON, WORCESTER COUNTY, MASSACHUSETTS

National I.D. Number: MA00648

State ID Number: 3-14-235-13

Dam Location: 42.5019° N/-72.43621° W



Dam Owner:

Town of Phillipston
Board of Selectmen
50 The Common
Phillipston, MA 01331

Daytime Phone: 978-249-6828
Emergency Phone: 911

Dam Caretaker:

Phillipston Highway Department
Rick Tenny
70 Templeton Road
Phillipston, MA 01331

Daytime Phone: 978-249-6851
Emergency Phone: 413-895-6547

Plan Developed 2019-November
Revision Number 1: Date April 2022

QUEEN LAKE DAM
EMERGENCY ACTION PLAN
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PREAMBLE

This Emergency Action Plan was prepared for the Town of Phillipston, owner of the Queen Lake 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 Queen Lake 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

EMERGENCY LEVEL NOTIFICATIONS

EMERGENCY EVENT

DAM OPERATOR'S REPRESENTATIVE

QUEEN LAKE DAM
CARETAKER
RICK TENNY, SUPT.
PHILLIPSTON HIGHWAY DEPARTMENT
TEL. 978-249-6851
TEL: 978-895-6547

MEMA - HEADQUARTERS
FRAMINGHAM
TEL. 508-820-2000

NATIONAL WEATHER
RIVER FORECAST SERVICE
TEL. 508-622-3250

EMERGENCY ALERT SERVICE
TEL. 508-824-2100

NOAA WX RADIO
TV/RADIO
TEL. 508-828-2672

PHILLIPSTON
EMERGENCY MANAGEMENT
DIRECTOR
Don Smith
TEL. 978-895-1236
911 (EMERGENCY)

PHILLIPSTON FIRE CHIEF
911 (EMERGENCY)
TEL. 978-249-6302
Dispatch: 978-939-8875

PHILLIPSTON POLICE CHIEF
911 (EMERGENCY)
TEL. 978-249-3560
Dispatch: 978-939-8875

TEMPLETON
EMERGENCY MANAGEMENT
DIRECTOR
TEL. 978-939-5140
Tel: 978-580-6620
911 (EMERGENCY)

DAM SAFETY OFFICIAL
MASSACHUSETTS DCR
OFFICE OF DAM SAFETY
WILLIAM SALOMAA
TEL. 617-719-1942
EDWARD CONNOR
TEL: 774-261-0207

MASSACHUSETTS
STATE POLICE
ATHOL BARRACKS
TEL. 978-249-4341

PHILLIPSTON HIGHWAY
DEPARTMENT
DPW DIRECTOR
TEL. 978-249-6851

DAM OWNER'S
TECHNICAL REPRESENTATIVE
LENART CONSULTING SERVICE, LLC
DAVID M. LENART, P.E.
TEL. 413-535-5754 (Office)
TEL. 413-592-1289 (Alternate)

PHASE I
NOTIFICATION PATH IF FAILURE
IS NOT IMMINENT. (CONDITION B)

PHASE II
NOTIFICATION PATH IF FAILURE
IS IMMINENT OR OCCURRED
(CONDITION A)
INCLUDES PHASE I

1.0 NOTIFICATION PROCEDURES

1.1 Notification Flowchart

The Notification Flowchart (located preceding this section) indicates that 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 Appendix B 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.

1.2 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 Queen Lake Dam.

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

The observation was made at (time and date)

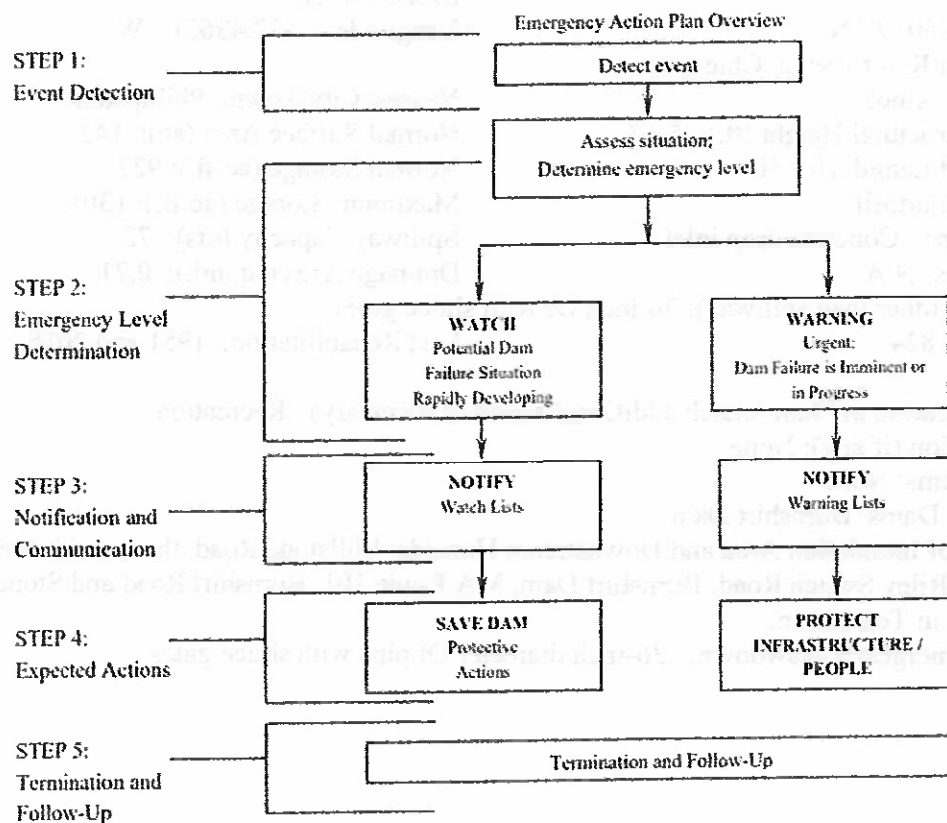
The situation is (provided brief description)

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

1.3 Impact Summary / Road Closures

The downstream flooding from failure of Queen Lake Dam was estimated by Lenart Consulting Service, LLC. Based on the analysis, the downstream flooding is expected to impact the Town of Phillipston along Millstone Road and a tributary to the Burnshirt River, into Templeton. The estimated peak flow through the dam breach is 720 cfs. See Section 4.0 for an inundation map as well as more information on roadways and buildings in the downstream inundation zone.

1.4 General Response Flowchart



2.0 PROJECT DESCRIPTION

Dam Name: Queen Lake Dam
STATE-ID#: 3-14-235-13
City/Town: Phillipston
Size Classification: Large

Hazard Classification: Significant
Federal ID (NID): MA00648
County: Worcester

Location: The Queen Lake Dam is located in the Town of Phillipston, Worcester County, Massachusetts. The lake is located on a tributary to the Burnshirt River. The dam is situated on Millstone Road, a private road, off Barre Road in Phillipston. The dam is located at 42.5019 ° N and -72.43621 ° W on the Athol, Massachusetts USGS quadrangle.

Access: Access to the Queen Lake Dam is by way of Millstone Road off of Barre Road. See Figures 1 and 2 appended to this report for the USGS site locus map and an aerial photography of the dam, respectively.

Lot No: 55
Latitude: 42.5019 ° N
River/Stream/River Basin: Chicopee
Quad Sheet: Athol
Hydraulic/Structural Height (ft.): 5 / 7
Embankment Length (ft): 50
Dam Type: Earthfill
Spillway Type: Concrete drop inlet
Type of Dike: N/A
Outlet Type (other than spillway): 36-inch DI with sluice gates
Year Built: 1824

Block No: 10
Longitude: -72.43621 ° W
Nearest City/Town: Phillipston
Normal Surface Area (ac): 142
Normal Storage (ac-ft.): 927
Maximum Storage (ac-ft.): 1308
Spillway Capacity (cfs): 72
Drainage Area (sq. mi.): 0.71
Last Rehabilitation: 1951 and 2018

Purpose/Operation of Dam (attach additional sheets if necessary): Recreation
Instrumentation (if any): None
Upstream Dams: None

Downstream Dams: Burnshirt Dam

Description of Inundation Area and Downstream Hazards: Millstone Road, three residences, Barre Road, Riley Switch Road, Burnshirt Dam, MA Route 101, Burnshirt Road and Stoney Bridge Road in Templeton.

Method of emergency drawdown: 36-inch diameter DI pipe with sluice gates

3.0 GENERAL RESPONSIBILITIES

3.1 Summary of Responsibilities

Entity	Responsibilities
Dam Owner: Town of Phillipston Selectmen Phone: 978-249-6828 Dam Caretaker: Highway Department Phone: 978-895-6547 Phone: 978-249-6851	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: Phillipston Emergency Management Director Phone: 978-895-1236 or 9-1-1	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 Fire Department: Phillipston Fire Chief Phone: 978-249-6302 Dispatch: 978-939-8875 or 9-1-1	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 Police Department: Phillipston Police Chief Phone: 978-249- 3560 Dispatch 978-249-8875 or 9-1-1	1. Assist in the evacuation of special needs and/or elderly citizens. 2. Provide additional evacuation support as needed. 3. Assist EMD as needed.
Templeton Emergency Management Director Templeton Emergency Management Director Phone: 978-580-6620 Phone: 978-939-5140 or 9-1-1	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.
Massachusetts Emergency Management Agency (MEMA) 24 hrs: 508-820-2000	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 Athol Barracks 24 hrs: 978-249-4341	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

4.1 Inundation Map Development

To evaluate the extent of flooding due to a partial dam failure at Queen Lake Dam, Lenart Consulting Service, LLC performed a simulation of the hypothetical dam break utilizing the National Weather Service (NWS) Simplified Dam Break (SMPDBK) Flood Forecasting Model.

Inputs to the program include dam location, length and height, reservoir storage volume, estimates of final depth and width of the dam breach, the time required for breach formation, Manning's roughness coefficient, and elevation vs. width data for downstream channel cross sections. Outputs from the program include the peak outflow at the dam, downstream flood zone, peak flow, maximum depth at downstream locations, and the arrival time of the flood waters.

Note that the inundation zone from the dam failure may be affected by antecedent flooding (i.e. flooding from rainfall) and downstream bridges and dams. Lenart Consulting Service, LLC's simulation does not include antecedent flooding in the downstream area. Downstream bridges and dams are represented in the model by the terrain. If the terrain data did not capture the bridge opening, the simulation assumes the bridge is blocked.

4.2 Impacted Area Summary

The estimated peak flow through the Queen Lake Dam breach is 720 cfs. The impacted area is shown on the Inundation Map following.

Note that roadways that are in the inundation zone but not overtopped should be used with caution. The dam breach flood wave may still adversely affect these roadways (e.g., by scour / erosion) and travel along roadways above the flood wave is not recommended or should be monitored.

The input parameters used for the model are listed below. The centerline of the failure was selected to occur in center of the embankment. Note that this is a conservative and hypothetical estimate and an actual breach may have different characteristics.

Failure Mode - Overtopping

Top of Dam – 1,130.00 ft

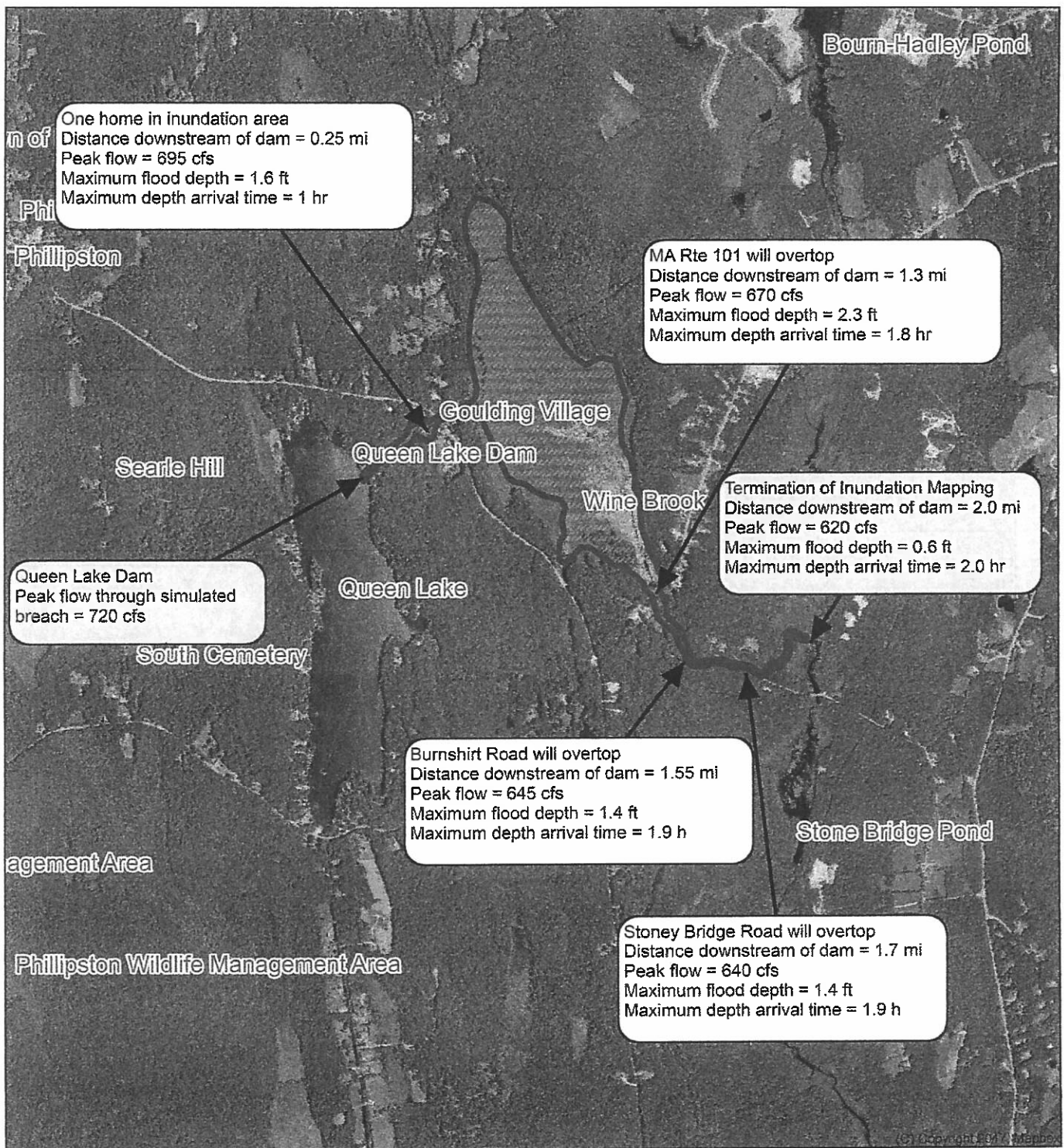
Breach Bottom Elevation – 1,122.00 ft Breach

Bottom Width - 10 ft

Breach Formation Time – 1.0 hr

Water Elevation at Failure – 1,130

Based on the analysis, the downstream flooding is expected to impact the Town of Phillipston along Millstone Road, three residences at the intersection of Barre Road and Riley Switch Road, Burnshirt Dam, MA Route 101, Burnshirt Road and Stone Bridge Road in Templeton.

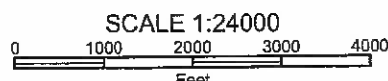


1. The inundation area shown on this map is approximate and should be used as a guide to establish evacuation zones.
2. The inundation area from an actual dam failure will depend on failure conditions and may differ from this map.
3. The results shown are not intended to reflect on the integrity of Queen Lake Dam.
4. Dam failure was simulated with impoundment elevation at the top of dam and without antecedent downstream flooding.

Map Name: Satellite Image
 Created: 10/31/19 04:57:37 PM



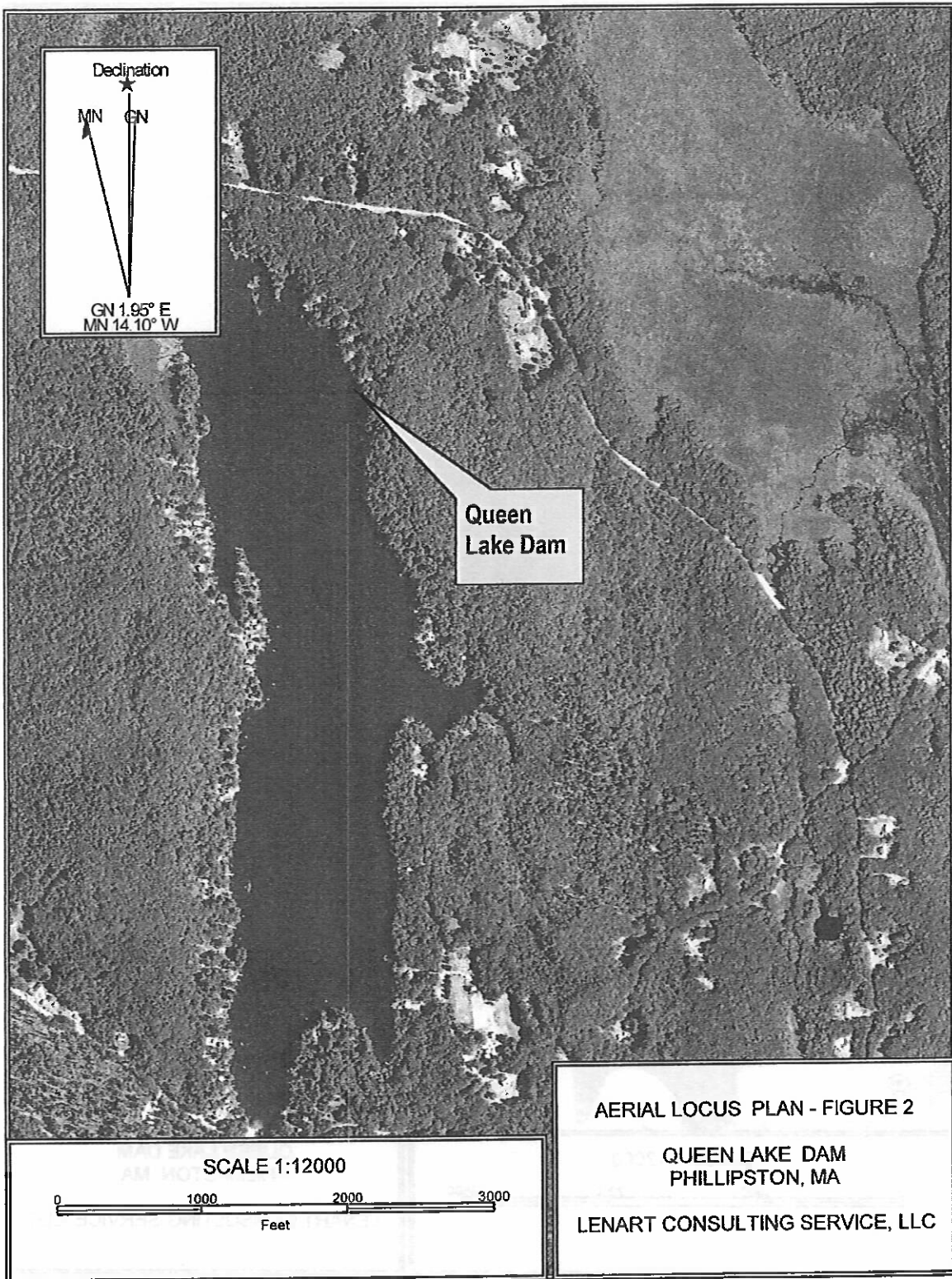
Decl. 14.11° W
 Datum: NAD27

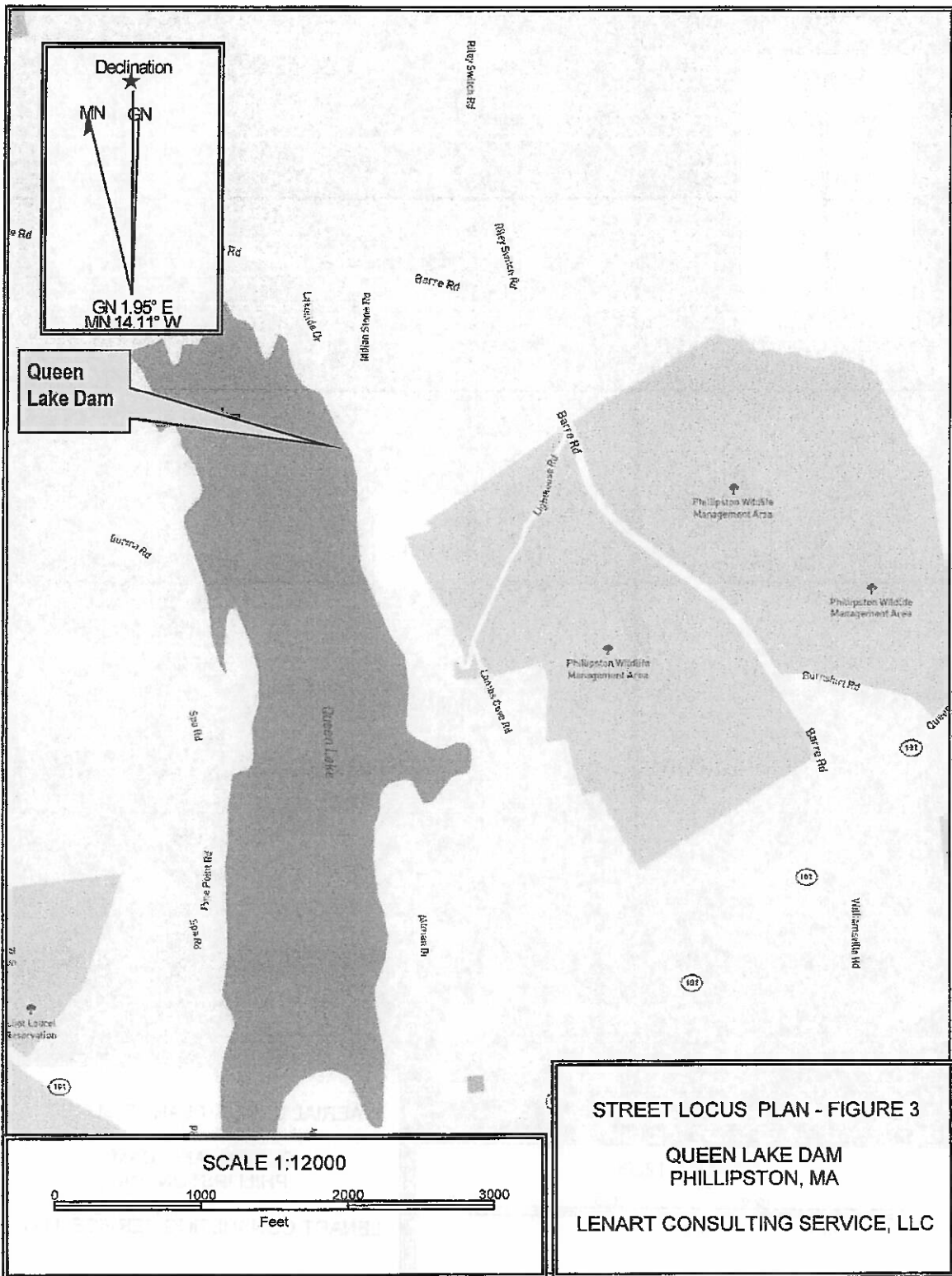


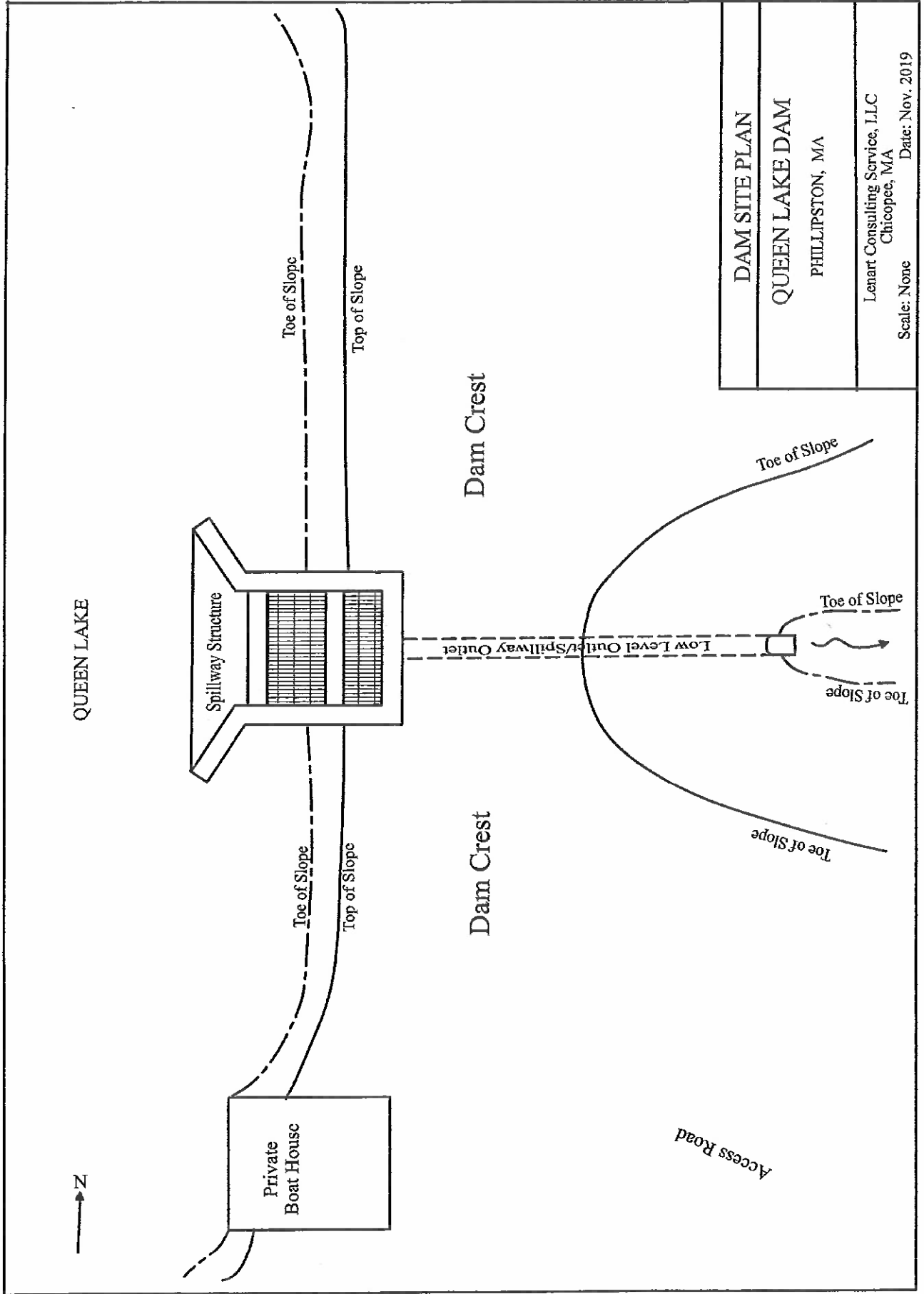
Boundary for area flooded

INUNDATION MAP FOR QUEEN LAKE DAM BREACH PHILLIPSTON, MA

Lenart Consulting Service, LLC







DAM SITE PLAN
QUEEN LAKE DAM
PHILLIPSTON, MA
Lenart Consulting Service, LLC Chicopee, MA
Scale: None
Date: Nov. 2019

Appendix A

The first part of the report is a summary of the findings of the study. This is followed by a detailed discussion of the results, which are presented in a series of tables and figures. The final part of the report is a conclusion, which summarizes the main findings and discusses their implications for future research.

Conclusion

The results of the study show that there is a significant relationship between the variables studied. This relationship is supported by the data presented in the tables and figures. The findings have important implications for the field of research, and they suggest that further work is needed to explore the underlying mechanisms.

The study was limited by several factors, including the sample size and the methods used. Despite these limitations, the findings are robust and provide a solid foundation for future research. It is hoped that this report will be useful to researchers and practitioners alike.

The authors would like to thank the following people for their assistance and support during the course of the study: [Names of individuals]. We also thank the funding agency for their generous contribution to the project.

Appendix A

Preparedness

The purpose of this appendix is to provide a detailed description of the methods used in the study. This includes information about the data collection, the statistical analysis, and the software used.

Data Collection

The data for this study were collected from a series of interviews and focus groups. The participants were selected through a purposive sampling method, and they were interviewed using a semi-structured interview schedule. The data were then analyzed using a content analysis approach.

Statistical Analysis

The statistical analysis was conducted using SPSS version 25.0. The data were first tested for normality and homogeneity of variance. If these assumptions were met, a parametric test (t-test or ANOVA) was used. If not, a non-parametric test (Mann-Whitney U-test or Kruskal-Wallis test) was used. The results of the statistical analysis are presented in the tables and figures. The findings indicate that there is a significant difference between the groups, and this difference is statistically significant at the 0.05 level.

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.

Surveillance

The most important step to activating an 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. The Phillipston Highway Department is currently responsible for implementing operational and maintenance activities for the dam.

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.

Access to Site

Access to the dam is by way of Millstone Road off of Barre Road. See Figures 1 and 2 appended to this report for the USGS site locus map and an aerial photography of the dam, respectively.

Operations and Maintenance Manual

The Phillipston Highway Department is currently responsible for implementing operational and maintenance activities for the dam. There is no known formal operations and maintenance manual for Queen Lake Dam.

Response during Periods of Darkness

There is no lighting equipment at Queen Lake Dam.

The embankment, spillway, low level outlet and any distressed areas of the dam should be illuminated if an emergency condition develops during period of darkness. This will allow the emergency condition to be monitored, assessed, and help facilitate a response. Lighting (e.g. portable light towers) is available for use by town and state agencies through MEMA. Emergency power and remote lighting contingencies may be available from local rental companies, such as United Rentals, 361 SW Cutoff, Worcester, MA 508-756-3306.

Response during Evenings, Weekends, and Holidays

The Notification Flowchart can be used for evenings, weekends, and holidays. When practical, redundancies of personnel and alternate telephone contact numbers have been provided.

Response during Periods of Adverse Weather

Personnel from the Town of Phillipston and the local and state emergency management will be in a heightened state of readiness in the event of predicted or actual adverse weather conditions. The dam is easily accessible by Town of Phillipston and other emergency personnel via on-site roads.

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/orientation 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 communication drills and table-top 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: DCR, Phillipston Highway Department, Town of Phillipston Emergency Management, MEMA, State Police.
- Topics:
 - Authorities responsible for executing the EAP should gather to discuss the EAP.
 - Review and updating of the Notification Flowchart, Emergency Contacts, 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 for alerting the public (i.e. Connect-CTY, CodeRED) should be discussed and updated.
 - Preparation and situational awareness techniques during an emergency situation should be discussed. (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 Phillipston Highway Department, 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.

Updating and Posting

All aspects of the EAP should be reviewed and updated once per year. The Phillipston Highway Department is responsible for coordinating the review and updates for this EAP.

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 Flowchart 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: Town of Phillipston, Town Administrator, Town Hall, 50 The Common, Phillipston, MA 01331
- Local Emergency Management Agency: Emergency Management Director, 90 State Road, Phillipston, MA 01331
- Massachusetts Emergency Management Agency (MEMA): Director, 400 Worcester Road, Framingham, MA 01702
- Massachusetts Department of Conservation and Recreation, Office of Dam Safety: William Salomaa, Director, 251 Causeway Street, Boston, MA 02114

Emergency Response Coordination

During an emergency situation, the **Incident Commander** will likely be the Phillipston Emergency Management Director. He/She 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.

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

A form for filling in contact information is provided at the end of this Appendix.

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. Notifying the public can be accomplished

with Reverse 911 systems (such as Connect-CTY or CodeRED), patrol cars, door to door, social media (Facebook, Twitter), and roadside message boards.

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. The 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.

Subcontractors

The Town of Phillipston, 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.

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.

TABLE A.1: Contact List for Residences and Businesses in Queen Lake Dam's Downstream Inundation Zone

(To be filled out by EAP plan holder)

Address	Phone Number	Notes
270 & 285 Barre Road		Notify and evacuate
5 Riley Switch Road		Notify and evacuate
Barre Road, Riley Switch Road, Route 101 and Burnshirt Road (Phillipston)		Set up Barriers and establish Detours
Stoney Bridge Road (Templeton)		Monitor and setup barriers if necessary and establish detours

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, Caretaker, Local EMD, Engineer, MA DCR ODS, MEMA, Massachusetts State Police

- Earthquake resulting in visible damage to the dam or appurtenances
- 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 Failure Warning Examples

Notify: ALL PARTIES LISTED ON THE NOTIFICATION FLOWCHART

- Water has overtopped or will overtop the dam
- Uncontrollable erosion, settlement, or upheaval occurring on the downstream slope or at the toe of the dam
- 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

A Dam Safety 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 Level

Additional guidance will be provided as needed.

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 seepage	Watch
	Cracked construction joint with seepage and actively progressing displacements	Warning
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 felt within 50 miles of the dam	--
Earthquake	Earthquake resulting in visible damage to the dam or appurtenances	Watch
	Earthquake resulting in uncontrollable release of water from the dam	Warning
Security Threat	Verified bomb threat that, if carried out, could result in damage to the dam	Watch
	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

- "--" signifies a non-emergency situation; an unusual event is slowly developing.
- * "Watch / Warning" signifies that site-specific visual inspection is warranted and engineering judgement is required to classify the emergency level.

B.4 Potential Deficiencies That Can Lead to Dam Failure

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 deficiency is listed along with typical causes. This is not intended to be an exhaustive list of all failure mechanisms as every 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; tree 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 could 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 subsequently reducing 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 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

The Town of Phillipston should maintain a current list of contractors under contract or prequalified to complete work for the Town along with contact names, address, telephone numbers, and capabilities (i.e. material and equipment). Copies of the contracts as well as a schedule for contract renewals should be maintained in this section of the EAP.

The Town of Phillipston should maintain an updated list of available equipment from the local state park (if applicable) within this section. This list should include the location at which this equipment is stored as well as the status of the equipment (working, damaged, etc.).

Lenart Consulting Service, LLC has prepared an abbreviated list of contractors who have completed dam projects within Massachusetts for informational purposes:

Contractor	Phone Number	Locations
Pete Lyman Excavating, Inc	978-249-6753	Phillipston, MA
T Ford Company, Inc.	978-352-5606	Georgetown, MA
J.H. Lynch & Sons, Inc.	401-333-4300	Millbury, MA; other locations in CT & RI
New England Infrastructure Inc.	978-293-3535	Hudson, MA
WES Construction Corp.	781-294-1080	Halifax, MA
NEL Corporation	978-777-2085	Middleton, MA
R. Zoppo Corp.	781-344-8822	Stoughton, MA
S&R Corporation	978-441-2000	Lowell, MA
James A. Gross Contractors	781-862-7307	Lexington, MA
Northern Construction LLC	413-289-1230	Weymouth, MA; Palmer, MA
Maxymillian Technologies	413-499-3050	Pittsfield, MA
E.T. & L. Corp.	978-897-4353	Stow, MA
Charter Contracting Company LLC	857-246-6800	Boston, MA
Mark Santora PE Inc.	508-839-5113	North Grafton, MA

APPENDIX E
Signoff Sheets

**APPENDIX E
SIGNOFF SHEETS****RECORD OF REVISIONS**

Date of Revision	Revision #	Sections Reviewed and Revisions Made	By Whom
November 2019	0	Original EAP Developed	Lenart Consulting Service, LLC
April 2022	1	Update contacts and telephone numbers	Lenart Consulting Service, LLC

RECORD OF TRAINING

Date of Training	Description	Attendees

APPENDIX F COMMON DAM SAFETY DEFINITIONS

The following definitions are intended to provide a common understanding of the terms used in the Dam Safety Act and the Dam Safety Regulations. The definitions are not intended to be exhaustive and are subject to change without notice.

Obstruction

Obstruction - Any object or structure that is located in the path of water flow.

Overflow - The water that flows over the crest of the dam or spillway.

Gate - A structure that is used to control the flow of water through a spillway or intake.

Leak - Any water that flows through the dam or spillway structure.

Dam Construction

APPENDIX F

Common Dam Safety Definitions

Impoundment - A body of water that is held back by a dam or spillway.

Gate - A structure that is used to control the flow of water through a spillway or intake.

Abutment - A structure that is used to support the dam or spillway.

Appurtenant - A structure that is used to support the dam or spillway.

Spillway - A structure that is used to discharge water from the dam or spillway.

Dam Construction

For the purpose of this Act, the definitions in this Appendix apply.

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 exists, 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.

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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.
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6. StreamStats, United States Geological Survey, <https://streamstats.usgs.gov/ss/>, accessed June 29, 2018. Peak flow regression equations were updated in 2017.
7. "Phase I Inspection/Evaluation Report for Queen Lake Dam", Root Engineering, June 26, 2014.