EMERGENCY ACTION PLAN

for

Cedar Meadow Lake Dam

Leicester, Worcester County, Massachusetts

National I.D. Number: MA00984 State ID Number: 3-14-151-8 Dam Location: <u>42.22572° N / 71.936361° W</u>







Dam Owner: Owner Name: Cedar Meadow Lake Watershed District Owner Address: 61 Fairview Drive, Leicester, MA 01542 Owner Daytime Phone: 774-239-1799 Owner Emergency: Phone: 911 Dam Caretaker: Caretaker Name: Cedar Meadow Lake Watershed District Caretaker Address: 61 Fairview Drive, Leicester, MA 01542 Caretaker Daytime Phone: 774-239-1799 Caretaker Emergency Phone: 911

Plan Developed 2020-01

Cedar Meadow Lake Dam

EMERGENCY ACTION PLAN TABLE OF CONTENTS

CHAP	<u>TER</u>		PAGE
PREAN	ABLE		
NOTIF	ICATIO	N FLOWCHART(s)	1-1
1.0	NOTIF	TCATION PROCEDURES	1-1
	1.1	Notification Flowchart	1-1
	1.2	Emergency Notification Template	1-1
	1.3	Impact Summary / Road Closures	1-2
	1.4	General Response Flowchart	1-2
2.0	PROJE	CT DESCRIPTION	2-1
3.0	GENE	RAL RESPONSIBILITIES	3-1
4.0	INUNI	DATION MAPS	4-1
	4.1	Inundation Map Development	4-1
	4.2	Impacted Area Summary	4-1
INUNE	DATION	MAPPING	4-3

FIGURES (From Most Recent Phase I Report)

Figure 1:	Locus Plan
Figure 2:	Aerial Photo
Figure 4:	Photo Sketch

APPENDICES

Appendix A	Preparedness
Appendix B	Emergency Detection, Evaluation, and Classification
Appendix C	Termination & Recovery
Appendix D	Materials & Equipment
Appendix E	Sign Off Sheets
Appendix F	Common Dam Safety Definitions

REFERENCES

PREAMBLE

This Emergency Action Plan was prepared for the Owner of the Cedar Meadow 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 publically 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 Cedar Meadow 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 Procedures

NOTIFICATION FLOWCHART(S)



CEDAR MEADOW LAKE DAM NOTIFICATION FLOWCHART

Phase I: NOTIFICATION PATH IF POTENTIAL FAILURE IS DEVELOPING (DAM SAFETY WATCH)

Phase II: NOTIFICATION PATH IF FAILURE IS IMMINENT OR HAS OCCURRED (DAM SAFETY WARNING)

* CALL THE NATIONAL WEATHER SERVICE IF IT IS NECESSARY TO BROADCAST THE EVACUATION ON TELEVISION AND RADIO. THE NATIONAL WEATHER SERVICE WILL CALL THE FIRE DEPARTMENT TO VERIFY THE EMERGENCY. ** LENARD EXIDERTING, INC. SHOULD BE CONTACTED IMMEDIATELY TO ASSESS THE SITUATION.



15 Midstate Drive, Suite 206, Auburn, Massachusetts 01501 Tel: 508.721.7600, Fax: 508.721.7610

1.0 NOTIFICATION PROCEDURES

1.1 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).

- <u>Dam Safety Watch:</u> "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.
- <u>Dam Failure Warning:</u> "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 Cedar Meadow Lake Dam.

Notification Procedures

Please be advised: A Dam (Dam Safety / Warning / Watch) condition has been identified at the Cedar Meadow Lake 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)"

1.3 Impact Summary / Road Closures

The downstream flooding from failure of Cedar Meadow Lake Dam was estimated by Lenard Engineering, Inc. using the DSS-WISE Lite software (see Section 4.0). Based on the analysis, the downstream flooding is expected to impact the Town of Leicester only. 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



Project Description

2.0 PROJECT DESCRIPTION

Dam Name: <u>Cedar Meadow Lake Dam</u> STATE-ID #: <u>3-14-151-8</u> City/Town: <u>Leicester</u> Size Classification: <u>Large</u> Hazard Classification: <u>Significant</u> Federal ID (NID): <u>MA00984</u> County: <u>Worcester</u>

Location: Cedar Meadow Lake Dam is located in the Town of Leicester, Worcester County, Massachusetts at approximately Latitude 42.22572 N, Longitude 71.936361 W (WGS 84 datum) as determined from Google Earth.

<u>Access</u>: From the intersection of State Route 56 and State Route 9, the dam can be reached by traveling west on Route 9 approximately 0.3 miles, taking a left on Pine Street and traveling approximately 2.2 miles, turning right onto Charles Street and traveling approximately 0.2 miles north where there is on-street parking.

Lot No: <u>12</u>	Block No: <u>A</u>
Latitude: 42.22572	Longitude: 71.936361
River/Stream/River Basin: Burncoat Brook	-
Quad Sheet: Leicester	Nearest City/Town: Spencer
Hydraulic/Structural Height (ft): <u>12.75/15.3</u>	Normal Surface Area (ac): <u>144</u>
Embankment Length (ft): <u>490</u>	Normal Storage (ac-ft): <u>1122</u>
Dam Type: Masonry/earthen fill	Maximum Storage (ac-ft): 1485
Spillway Type: Broad crested	Spillway Capacity (cfs): 512
Type Dike: <u>None</u>	Drainage Area (sq. mi.): 3.9
Outlet Type (other than spillway): Low level out	tlet
Year Built: <u>1920's</u>	Last Rehabilitation: 2013

Purpose/Operation of Dam (attach additional sheets if necessary): Cedar Meadow Lake Dam is primarily used for recreation. The dam was originally built in the 1920's to power a mill.

Instrumentation (if any): None

Upstream Dams: <u>Burncoat Pond Dam (MA00985, Significant)</u>

Downstream Dams: Bouchard's Pond Dam (MA02799, Non-Jurisdictional),

Description of Inundation Area and Downstream Hazards: <u>Inundation area extends from Dam to</u> <u>Oxord Town line and includes Pine Street</u>, <u>Green Street</u>, <u>River Street</u>, <u>Greenville Pond Dam</u>, <u>Hankey Street</u>, <u>Stafford Street</u>, <u>Charles Street and multiple residences and businesses</u>. Method of emergency drawdown: <u>Opening of the low level outlet gate</u>

3.0 GENERAL RESPONSIBILITIES

3.1 Summary of Responsibilities

Entity	Responsibilities		
Dam Owner: Cedar Meadow Lake Watershed District Phone Number: 508-892-3750 Emergency Phone: 911	 Notify local authorities. Upon receiving report of an incident, contact the Emergency Management Director (EMD) and identify the report. Evaluate the extent/nature/severity of the incident. Update the EMD as to the need to implement the EAP. 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: Name: Christopher Montiverdi Phone Number: 774-329-4305 Emergency Phone: 911	 Contact and warn population in area of potential impacts; Coordinate efforts with other parties involved in the EAP as necessary. The EMD/Incident Commander will serve as the contact point for disseminating all updates concerning the condition of the emergency. 		
Local Police Department: Name: Kenneth Antanavica Phone Number: 508-892-7009 Emergency Phone: 911	 Assist in securing the site and implementing evacuation if necessary (i.e. coordinating barricades, street closures, traffic flow). 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 Name: Robert Wilson Phone Number: 508-892-7022 Emergency Phone: 911	 Assist in the evacuation of special needs and/or elderly citizens. Provide additional evacuation support as needed. Assist EMD as needed. 		
Massachusetts Emergency Management Agency (MEMA) 24 hrs: 508.820.2000	 Coordinate broadcast notification as <u>requested</u> by the local Fire/Police/EMD. Mobilize necessary equipment as <u>requested</u> by the local Police/Fire/EMD. 		
Massachusetts State Police SP Brookfield Barracks 24hrs: 508-867-2912	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 Cedar Meadow Lake Dam, LEI performed a simulation of the hypothetical dam break utilizing the DSS-Wise Lite software. The DSS-WISE Lite software was developed by the National Center for Computational Hydroscience and Engineering, which is a research unit within the School of Engineering at the University of Mississippi. DSS-WISE Lite is a special version of DSS-WISE (Decision Support System for Water Infrastructural Security), which was funded by the Department of Homeland Security.

Inputs to the program include dam location, length, and height, reservoir storage, and dam breach parameters. The program uses a finite-volume discretization with a shock-capturing upwind scheme to solve the full dynamic shallow water equations over natural topography with wetting and drying. Outputs from the program include the flood zone, peak flow, maximum depth at downstream locations, and the arrival time of the flood waters.

For the simulation with Cedar Meadow Lake Dam, the inputs are listed below. Note that an actual breach may have different characteristics.

- DSS-WISE Failure Mode: Partial Dam Embankment Breach
- Pool Elevation at Failure (ft, NAVD88): 886.0 (at top of dam)
- Storage Volume at Failure (acre-ft): 1485.0
- Breach Width (ft): 74
- Time to Failure (hrs): 1.4
- Breach Invert Elevation (ft, NAVD88): 872.5
- Antecedent Flow Through Dam: None
- Antecedent Downstream Flooding: None

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. LEI's simulation does not include antecedent flooding in the downstream area. Downstream bridges and dams are represented in the DSS-WISE Lite model by the terrain. If the terrain data included the bridge opening, the simulation includes the bridge opening. 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 dam breach is 4,500 cfs. The impacted area is shown on the Inundation Maps.

Based on the analysis, the downstream flooding is expected to impact the Town of Leicester only. Flow from a potential breach would initially overtop Charles Street along the east side of the Burncoat Brook. Next, it passes Pine Street approximately 1,225 feet downstream, which is expected to be overtopped. Shortly after Pine Street, the flood wave splits with a section of the flood wave branching off from Burncoat Brook to the South through a wooded area until it reaches Green Street approximately 10,770 feet downstream of the dam, which is expected to be overtopped. This flood branch eventually meets back up with the Town Meadow Brook. The bulk of the flood wave extends to the east beginning at the split in the inundation area. The flood wave continues in an easterly direction along the Burncoat Brook until it reaches approximately 4,280 feet downstream of the dam where it is expected to overtop Pine Street for the second time. At this point along Pine Street, the dam breach analysis shows multiple residences/buildings that are either in the inundation area or access to the properties would be inaccessible. The flood wave then flows into the Town Meadow Brook and flows against the natural brook flow however there does not appear to be any impacted areas in this location.

Flows continue downstream along Town Meadow Brook until it reaches Green Street approximately 10,770 feet downstream. Green Street is expected to be overtopped and the dam breach analysis shows a residence that is located within the inundation area. After Green Street, flows enter Greenville Pond. The flood wave backs up and overtops River Street at Clarks Mill Pond. Next, the flood wave exits through Greenville Pond Dam with a peak flow of 1,807 cfs approximately 15,165 feet downstream. Flows exiting the Greenville Pond Dam discharge to the French River which meets Pleasant Street shortly after the dam. Pleasant Street is expected to be overtopped and the breach analysis showing multiple residences and businesses within the inundation area. Further downstream, the flood wave enters Roachdale Pond and then passes Stafford Street which is not expected to be overtopped. Multiple residences/buildings were determined to be within the inundation area on both sides of Roachdale Pond. Next, the flood wave continues along the French River and along Mill Street where the breach analysis shows a business within the inundation area.

The inundation mapping was terminated shortly after the Leicester Town line with Oxford MA since the inundation limits from a potential flood wave is contained within the FEMA 100-year flood zone.

Note that roadways that are in the inundation zone but are not expected to be 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 these roadways above the flood wave is not recommended or should be monitored.

INUNDATION MAPPING

See the following



FEMA SECTION B - GREENVILLE POND Distance Downstream 12,925 ft Peak Flow 1,813 cfs Arrival Time 4 hr. 24 min. Flood Depth 3 ft	Designed By: RPH	Drawn By: JS	Checked By. RPH
stream 10,770 ft 2,046 cfs 1 hr. 58 min. 6 ft Greenville		ion By	
Pond	Drawing date: January 27, 2020	Rev. Date Revis	
FLOODED Clarks Pond Nill Mill Mill Mill Networks Pond Nill Networks Null Pond Distance Downstream 12,700 ft Peak Flow Africe To The Africe Africe Africe Africe Africe Africe Africe Africe Africe Africe Africe Africe Africe Africe Africe Africe Africe Africe Peak Flow Peak Flow Africe Afri	FLOOD INUNDATION MAP	CEDAR MEADOW LAKE DAM	DAM No. 3-14-151-8 LEICESTER, MASSACHUSETTS
from year 2013 downloaded from MassGIS (Bureau of n) MassGIS Data Layers. All other background information was S (Bureau of Geographic Information) MassGIS Data Layers by/service-details/massgis-data-layers) will depend on actual failure conditions and may differ from e calculated by simulating a dam failure using the DSS-WISE re. Mated with water at the crest of Cedar Meadow Lake Dam. layed on this map represent events of extremely remote effect on the integrity of Cedar Meadow Lake Dam.		LENATG ENGINEETING, INC. Civi, Environmental and Hydrogeological Consultants 2210 wain Street 140 Willow Street 19 Midstate Drive	Glastonbury, CT Winsted, CT Auburn, MA (860) 659–3100 (860) 379–6669 (508) 721–7600
d on this plan indicate time after start of breach/piping. eadow Lake Dam may result in failure of downstream dams. as shown on this plan do not account for additional flow that failures.	Drawin 1 Job #	of <u>#</u> : Of	2





FIGURES (From Most Recent Phase I Inspection)







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.

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.

Access to Site

From the intersection of State Route 56 and State Route 9, the dam can be reached by traveling west on Route 9 approximately 0.3 miles, taking a left on Pine Street and traveling approximately 2.2 miles, turning right onto Charles Street and traveling approximately 0.2 miles north where there is on-street parking.

Operations and Maintenance Manual

The elected Management Committee of the Watershed District is responsible for operations and maintenance of the dam. Most day-to-day tasks are performed by members of the Cedar Meadow Lake Watershed District. The District maintains records of dam operations and repairs including: a date log of when the low level outlet gate is operated, a date log of weir board elevation change in the low flow sluiceway, and an invoice file documenting work performed by contractors for the District. The crest of the dam is mowed frequently to maintain the grass height. The dam is visually inspected on a regular basis. The impoundment is lowered by approximately five feet during in late September or early October for weed control purposes and maintained at approximately 24 inches to 36 inches below the spillway elevation for the remainder of the winter to minimize ice damage to shoreline structures.

Response during Periods of Darkness

Response times will vary depending upon the conditions surrounding the emergency. A delay in response time, beyond that which would be present during a fair-weather daytime emergency, may occur due to inclement weather or darkness. The standard notification processes shall be followed during periods of darkness with the following additional requirements:

- The Dam Caretaker shall illuminate the dam area during an emergency classification of "Dam Safety Watch" throughout periods of darkness until the conditions have passed or changed to an emergency classification of "Dam Safety Warning".
- Emergency power and remote lighting for evacuation routes and/or other locations are dependent upon local sources and MEMA.

Response during Evenings, Weekends, and Holidays

The Notification Flowchart can be used for evenings, weekends and holidays. In the event primary means of communication (telephone) to local response personnel is ineffective, the alternative system of communication shall be implemented immediately.

Response during Periods of Adverse Weather

Response times will vary depending upon the conditions surrounding the emergency. A delay in response time, beyond that which would be present during a fair weather daytime emergency, may occur due to inclement weather or darkness. The standard notification processes shall be followed during periods of adverse weather conditions with the understanding that local response resources may already be placed in a heightened state of readiness or occupied with other emergencies.

Access to the site may be difficult and delayed during periods of adverse weather. However, access should be made by the quickest and safest means (vehicle, ATV, horse, foot, snowmobile, boat). Response times may be twice to five times longer than that under good conditions.

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: DCR, Owner, Town of Leicester Emergency Management, MEMA, State Police Brookfield Troop.
- 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.

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 <u>immediately</u> 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: Cedar Meadow Lake Watershed District, 61 Fairview Drive, Leicester, MA 01542
- Local Emergency Management Agency: Christopher Montiverdi, 3 Paxton Street, Leicester, MA 01524
- Massachusetts Emergency Management Agency (MEMA); Ben Hiltunen, 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 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 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.

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. 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 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.

Massachusetts Water/Wastewater Agency Response Network (MA WARN)

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".
- <u>Dam Failure WARNING:</u> "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, MADCR ODS, MEMA and Massachusetts State Police

- 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

Fyont	Situation	Emergency	
Lvent	Situation	Level	
	New cracking along the concrete structure with radial, transverse, or		
Structural	vertical displacement		
Cracking	New cracks in the concrete with seepage	Watch	
	New cracks/old cracks with actively progressing displacements	Warning	
	New cracks at the abutment greater than ¹ / ₄ -inch wide without	Watch	
Foundation	seepage	vv atem	
Weakness	Cracks in the abutment with seepage	Watch	
	Visual movement/slippage of the embankment slope	Warning	
Construction	Cracking at the construction joint		
Joint Cracking	Cracked construction joint with displacement and seepage	Watch	
Sinkholes	Rapidly enlarging sinkhole	Warning	
	New cracks in the embankment greater than 1/4-inch wide without		
Embankment	seepage		
Cracking	Cracks in the embandment with seenage	Watch /	
	Cracks in the embankment with scepage	Warning	
Farthquake	Earthquake resulting in visible damage to the dam or appurtenances	Watch	
Larinquake	Earthquake resulting in uncontrolled release of water from the dam	Warning	
	Verified bomb threat that, if carried out, could result in damage to	Warning	
Security	the dam	w arning	
Threat	Detonated bomb that has resulted in damage to the dam or	Warning	
	appurtenances	warning	
	Damage to dam or appurtenances with no impacts to the functioning		
Sabotage/	of the dam		
Vandalism	Damage to dam or appurtenances that has resulted in seepage flow	Watch	
v undunibili	Damage to dam or appurtenances that has resulted in uncontrolled	Warning	
	water release	,, uning	

TABLE B.1: Possible Failure Modes

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

B.4 Potential Hazards 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 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. <u>Sliding</u>

- 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 expending/contracting ice structures).

6. <u>Blowing of Trees from Embankment</u>

- 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.

Appendix B

- 7. <u>Reduction of Crest Elevation</u>
 - Deterioration or washout of Dam crest
 - Causes: Poor concrete condition; heavy rain runoff.

8. <u>Dam Overtopping</u>

- 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. <u>Cracking</u>

- 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

APPENDIX D AVAILABLE MATERIALS & EQUIPMENT

TOWN OF LEICESTER, MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

CONTACT PERSON: <u>DENNIS GRIFFIN</u> CONTACT NUMBER: <u>508-892-7021</u> DAY <u>508-892-7021</u> NIGHT

	•		
Truck/Equipment			
No.	Description	Registration	Model #
1	2016 Ford 1 Ton Truck	M96281	F350
2	2008 Ford 1 Ton Truck	M68580	F350
3	2014 Int'l Dump Truck	M92013	700SER
4	2002 Int'l Dump Truck	M85178	2554
5	2008 Int'l Dump Truck	M84450	700SER
6	2005 Int'l Dump Truck	M82346	7400
7	1998 Int'l Sander Truck	M48993	2554
8	2006 Volvo F-Loader	M14131	L90E
9	2015 Ford 1 Ton Dump Truck	M89103	F450
10A	2020 Mack 1 Ton Dump Truck	M4283A	GR42F9
10B	2000 Int'l Dump Truck	M62961	200SER
11	2011 Frhtliner M2 Basin Cleaner	M85677	M2
12	2017 John Deere Backhoe	M98624	410L
13	2019 John Deere Tractor B/C	M5151A	5090M
14	1994 Tiger Tractor	M48713	BD76997
15	2017 Ford 1 Ton Dump	M99893	F550
16	2019 Trackless Sidewalk Mach	M60379	MT SERIES 7
17	2016 Elgin Pelican Sweeper	M95749	S9076S
18	2019 John Deere F-Loader	M5161A	544L
19	2006 Ford 1 Ton Truck	M48868	F450
20	2019 Ford 1 Ton Pickup	M5600A	F550
21	2005 Ford 1 Ton Flatbed	M48749	F350
22	1986 John Deere Grader	M14130	DW570AX
23	2018 Sullivan Air Compressor	M76253	D18PDZSB
24	2011 Ford Flatbed Dump	M90014	F450

Leicester Highway Department Vehicle Listing

APPENDIX E

Signoff Sheets

APPENDIX E SIGNOFF SHEETS

The following table shall serve as the formal distribution list for this Emergency Action Plan. All parties listed shall receive each update to this document.

Rev. #	Date of	Description of Revision	Recipient
	Revision		
0	1-29-20	Original EAP Developed and sent to	MA DCR
		all recipients via email.	Leicester EMD
			MEMA
			Owner

Project Review Form

<u>PROJECT</u> Emergency Action Plan Cedar Meadow Lake Dam – MA00984 Leicester, Massachusetts Cedar Meadow Lake Watershed District

The following verification of EAP review is required under MGL Chapter 253 and 302 CMR 10.0. This verification of review is to become 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 Plan, provided comments if necessary, and received a final copy of the Plan incorporating those comments, if necessary.

Signing of this document by the local Emergency Management Director acknowledges that the above described review process has taken place and provides approval of those responsibilities bestowed upon the local Emergency Management Director by the content of this Plan, dated January 29, 2020.

EMERGENCY MANAGEMENT DIRECTOR

Name:		

Title: _____

Signature: _____

Date: _____

End of Form

Appendix E

Project Review Form

<u>PROJECT</u> Emergency Action Plan Cedar Meadow Lake Dam – MA00984 Leicester, Massachusetts Cedar Meadow Lake Watershed District

The following verification of EAP review is required under MGL Chapter 253 and 302 CMR 10.0. This verification of review is to become 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 Massachusetts Emergency Management Agency has received and reviewed a draft copy of the Plan, received copy of local Emergency Management Director Project Review Forms, and provided comments if necessary.

Signing of this document by the Massachusetts Emergency Management Agency acknowledges that the above described review process has taken place and provides approval of those responsibilities bestowed upon the Massachusetts Emergency Management Agency by the content of this Plan, dated January 29, 2020.

MASSACHUSETTS EMERGENCY MANAGEMENT AGENCY

Name:	

Title: _____

Signature: _____

Date: _____

End of Form

Appendix E

RECORD OF TRAINING

Date of	Description of Training	Attendees
Training		

APPENDIX F

Common Dam Safety Definitions

Appendix F

APPENDIX F COMMON DAM SAFETY DEFINITIONS

For a comprehensive list of dam engineering terminology and definitions refer to 302 CMR10.00 Dam Safety, or other reference published by FERC, Dept. of the Interior Bureau of Reclamation, or FEMA. Please note should discrepancies between definitions exits, 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.

<u>Right</u> – Shall mean the area to the right when looking in the downstream direction.

<u>Left</u> – 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.

<u>Embankment</u> – Shall mean the fill material, usually earth or rock, placed with sloping sides, such that it forms a permanent barrier that impounds water.

<u>Crest</u> – Shall mean the top of the dam, usually provides a road or path across the dam.

<u>Abutment</u> – 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.

<u>Appurtenant Works</u> – 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.

<u>Spillway</u> – 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.

<u>Non-Jurisdictional</u> – structure less than 6 feet in height or having a storage capacity of less than 15 acrefeet.

Hazard Classification

(as listed in Commonwealth of Massachusetts, 302 CMR 10.00 Dam Safety)

<u>High Hazard (Class I)</u> – 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).

<u>Significant Hazard (Class II)</u> – 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

<u>EAP – Emergency Action Plan</u> - 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.

<u>O&M Manual</u> – 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.

<u>Acre-foot</u> – 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. On million U.S. gallons = 3.068 acre feet

<u>Height of Dam</u> – 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.

<u>Spillway Design Flood (SDF)</u> – 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

<u>Unsafe</u> - Major structural, operational, and maintenance deficiencies exist under normal operating conditions.

<u>Poor</u> - Significant structural, operation and maintenance deficiencies are clearly recognized for normal loading conditions.

<u>Fair</u> - 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.

<u>Satisfactory</u> - Minor operational and maintenance deficiencies. Infrequent hydrologic events would probably result in deficiencies.

<u>Good</u> - 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:

- "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.
- Commonwealth of Massachusetts General Laws, M.G.L. 253, Section 44, Chapter 302 CMR 10.00, Dam Safety, February 10, 2017.
- 5. "Phase 1 Inspection/Evaluation Report for Cedar Meadow Lake Dam", Lenard Engineering, Inc., June 10, 2015.
- 6. Decision Support System for Water Infrastructural Security (DSS-WISETM) Lite [Computer Software], https://dsswiseweb.ncche.olemiss.edu/index.php, University of Mississippi, National Center for Computational Hydroscience and Engineering, November 8, 2016.
- 7. StreamStats, United States Geological Survey, https://streamstats.usgs.gov/ss/, accessed January 10, 2020. Peak flow regression equations were updated in 2019.
- 8. <u>Existing Conditions Plan, Cedar Meadow Lake, Leicester, MA</u>, by Waterman Design Associates, Inc. for Cedar Meadow Watershed District, 3/7/2013.
- 9. Cedar Meadow Lake Watershed District, "Revision to Chapter 253 Permit Application Modifications to Cedar Meadow Pond Dam," 2/14/2013.
- 10. Soil Grouting Plan, Cedar Meadow Lake, Leicester, MA, by Lenard Engineering, Inc. for Cedar Meadow Watershed District, 2/13/2013.
- 11. Cedar Meadow Lake Watershed District, "Chapter 253 Permit Application Modifications to Cedar Meadow Pond Dam," 5/16/2012.