-- *CEDAR MEADOW POND DAM* --

PHASE I

INSPECTION / EVALUATION REPORT

Dam Name:	CEDAR MEADOW POND DAM
NID ID#:	MA00984
Owner:	CEDAR MEADOW LAKE WATERSHED DISTRICT
Town:	LEICESTER
Consultant:	LENARD ENGINEERING, INC.
Date of Inspection:	5/28/20

EXECUTIVE SUMMARY

Representatives of Lenard Engineering, Inc. visually inspected Cedar Meadow Pond Dam, Leicester, MA on May 28, 2020. The Cedar Meadow Pond Dam is currently classified as a LARGE size structure with a SIGNIFICANT (Class II) hazard classification. In general, we found the dam to be in FAIR condition.

Minor deficiencies include:

A. Several wet areas near left abutment on downstream side;

B. Upstream stone masonry wall tilted outward towards impoundment;

C. Small voids behind the downstream masonry wall and behind the spillway training walls;

D. Missing cap stones along the top of the downstream wall;

E. Multiple large trees growing at the immediate toe of the dam;

F. Multiple vertical through cracks in primary spillway training wall.

Repairs were made in 2012 and 2013 to implement corrective measures. The work included raising the earthen dam impervious core between the eastern spillway wall and low level out gate house; implementation of a pressure grouting program after concerns of potential voids adjacent to the east wall of the spillway and around the low level outlet gatehouse due to the inability to compact the impervious material in these locations. A copy of the construction plans is included in Appendix C.

As many of the deficiencies listed above are minor, they may be remedied through the course of regular maintenance. Some deficiencies and repairs require additional attention. The following activities are recommended to improve the overall condition of the dam but do not alter the current design of the dam:

A. Obtain legal maintenance agreements recorded on land deeds to allow access and maintenance activities such as tree and stump removal and repairs to the dam for the right abutment and downstream toe areas;

B. Cut crowns and trunks of trees (4 inches or greater) and leave stumps; treat stumps to control rot; monitor stumps; apply herbicide to prevent regrowth;

C. Clear brush, saplings and other unwanted vegetation within 20 feet of the dam and abutments and establish a maintainable stand of sturdy grass;

D. Seal through cracks in spillway training walls;

E. Fill voids behind downstream stone masonry wall and behind primary spillway training walls.

Dam Evaluation Summary Detail Sheet

1. NID ID:	**MA00984**	**4. Inspection Date:**	**May 28, 2020**
2. Dam Name:	**Cedar Meadow Pond Dam**	**5. Last Insp. Date:**	**June 10, 2015**
3. Dam Location:	**Leicester, MA**	**6. Next Inspection:**	**May 28, 2025**
7. Inspector:	**Douglas W. Bush, PE**		
8. Consultant:	**Lenard Engineering, Inc.**		
9. Hazard Code:	**Significant**	**9a. Is Hazard Code Change Requested?:**	**No**
10. Insp. Frequency:	**5 Years**	**11. Overall Physical Condition of Dam:**	**FAIR**
12. Spillway Capacity (% SDF)	**>100% SDF w/ no actions by Caretaker**		

E1. Design Methodology:	**3**	**E7. Low-Level Discharge Capacity:**	**4**
E2. Level of Maintenance:	**3**	**E8. Low-Level Outlet Physical Condition:**	**5**
E3. Emergency Action Plan:	**5**	**E9. Spillway Design Flood Capacity:**	**5**
E4. Embankment Seepage:	**3**	**E10. Overall Physical Condition of the Dam:**	**3**
E5. Embankment Condition:	**4**	**E11. Estimated Repair Cost:**	**$62,500**
E6. Concrete Condition:	**4**		

Evaluation Description

E1: DESIGN METHODOLOGY
1. Unknown Design – no design records available
2. No design or post-design analyses
3. No analyses, but dam features appear suitable
4. Design or post design analysis show dam meets most criteria
5. State of the art design – design records available & dam meets all criteria

E2: LEVEL OF MAINTENANCE
1. Dam in disrepair, no evidence of maintenance, no O&M manual
2. Dam in poor level of upkeep, very little maintenance, no O&M manual
3. Dam in fair level of upkeep, some maintenance and standard procedures
4. Adequate level of maintenance and standard procedures
5. Dam well maintained, detailed maintenance plan that is executed

E3: EMERGENCY ACTION PLAN
1. No plan or idea of what to do in the event of an emergency
2. Some idea but no written plan
3. No formal plan but well thought out
4. Available written plan that needs updating
5. Detailed, updated written plan available and filed with MADCR, annual training

E4: SEEPAGE (Embankments, Foundations, & Abutments)
1. Severe piping and/or seepage with no monitoring
2. Evidence of monitored piping and seepage
3. No piping but uncontrolled seepage
4. Minor seepage or high volumes of seepage with filtered collection
5. No seepage or minor seepage with filtered collection

E5: EMBANKMENT CONDITION (See Note 1)
1. Severe erosion and/or large trees
2. Significant erosion or significant woody vegetation
3. Brush and exposed embankment soils, or moderate erosion
4. Unmaintained grass, rodent activity and maintainable erosion
5. Well maintained healthy uniform grass cover

E6: CONCRETE CONDITION (See Note 2)
1. Major cracks, misalignment, discontinuities causing leaks, seepage or stability concerns
2. Cracks with misalignment inclusive of transverse cracks with no misalignment but with potential for significant structural degradation
3. Significant longitudinal cracking and minor transverse cracking
4. Spalling and minor surface cracking
5. No apparent deficiencies

E7: LOW-LEVEL OUTLET DISCHARGE CAPACITY
1. No low level outlet, no provisions (e.g. pumps, siphons) for emptying pond
2. No operable outlet, plans for emptying pond, but no equipment
3. Outlet with insufficient drawdown capacity, pumping equipment available
4. Operable gate with sufficient drawdown capacity
5. Operable gate with capacity greater than necessary

E8: LOW-LEVEL OUTLET PHYSICAL CONDITION
1. Outlet inoperative needs replacement, non-existent or inaccessible
2. Outlet inoperative needs repair
3. Outlet operable but needs repair
4. Outlet operable but needs maintenance
5. Outlet and operator operable and well maintained

E9: SPILLWAY DESIGN FLOOD CAPACITY
1. 0 - 50% of the SDF or unknown
2. 50-90% of the SDF
3. 90 - 100% of the SDF
4. >100% of the SDF with actions required by caretaker (e.g. open outlet)
5. >100% of the SDF with no actions required by caretaker

E10: OVERALL PHYSICAL CONDITION OF DAM
1. UNSAFE – Major structural, operational, and maintenance deficiencies exist under normal operating conditions
2. POOR - Significant structural, operation and maintenance deficiencies are clearly recognized under normal loading conditions
3. FAIR - Significant operational and maintenance deficiencies, no structural deficiencies. Potential deficiencies exist under unusual loading conditions that may realistically occur. Can be used when uncertainties exist as to critical parameters
4. SATISFACTORY - Minor operational and maintenance deficiencies. Infrequent hydrologic events would probably result In deficiencies.
5. GOOD - No existing or potential deficiencies recognized. Safe performance is expected under all loading including SDF

E11: ESTIMATED REPAIR COST
Estimation of the total cost to address all identified structural, operational, maintenance deficiencies. Cost shall be developed utilizing standard estimating guides and procedures

Changes/Deviations to Database Information since Last Inspection

E3: Upgraded from 4 to 5

PREFACE

The assessment of the general condition of the dam reported herein was based upon available data and visual inspections. Detailed investigations and analyses involving topographic mapping, subsurface investigations, testing and detailed computational evaluations were beyond the scope of this report unless reported otherwise.

In reviewing this report, it should be realized that the reported condition of the dam was based on observations of field conditions at the time of inspection, along with data available to the inspection team.

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

Douglas W. Bush, P.E.
Massachusetts License No.: 51824
License Type: Civil

Civil Engineer
Lenard Engineering, Inc.

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SECTION 1

1.0 DESCRIPTION OF PROJECT

1.1 General

1.1.1 Authority

The Cedar Meadow Lake Watershed District retained Lenard Engineering, Inc. to perform a visual inspection and develop a report of conditions for the dam at the Cedar Meadow Pond along the Burncoat Brook, a tributary to the French River in Leicester, Worcester County, Massachusetts. This inspection and report were performed in accordance with MGL Chapter 253, Sections 44-50 of the Massachusetts General Laws as amended by Chapter 330 of the Acts of 2002.

1.1.2 Purpose of Work

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

The investigation was divided into four parts: 1) obtain and review available reports, investigations, and data previously submitted to the owner pertaining to the dam and appurtenant structures; 2) perform a visual inspection of the site; 3) evaluate the status of an emergency action plan for the site and; 4) prepare and submit a final report presenting the evaluation of the structure, including recommendations and remedial actions, and opinion of probable costs.

1.1.3 Definitions

To provide the reader with a better understanding of the report, definitions of commonly used terms associated with dams are provided in Appendix D. Many of these terms may be included in this report. The terms are presented under common categories associated with dams which include: 1) orientation; 2) dam components; 3) size classification; 4) hazard classification; and 5) miscellaneous.

1.2 Description of Project

1.2.1 Location

Cedar Meadow Pond Dam is located in Worcester County in the Town of Leicester in south-central Massachusetts. The Cedar Meadow Pond lies below Burncoat Pond and above Bouchard's Pond on the Burncoat Brook, a tributary to the French River. The structure and the impoundment are shown on the Leicester, MA USGS quadrangle map at coordinates N42.22572°, W71.936361°. The nearest population center is the Town of Leicester; the dam is located approximately 2.16 miles directly southwest of the intersection of State Route 56 and State Route 9. From this intersection, the dam can be reached by traveling west on Route 9 approximately 0.3 miles, taking a left and traveling approximately 2.2 miles south on Pine Street; then turning right onto Charles Street and traveling 0.2 miles north to which there is on-street parking on the left. The location of Cedar Meadow Pond Dam is shown in Figure 1. An aerial photograph of the dam is provided as Figure 2.

1.2.2 Owner/Caretaker

The dam is currently owned by the Cedar Meadow Lake Watershed District. The Cedar Meadow Lake Watershed District is responsible for the operations and maintenance at the dam. See Table 1.1 for current owner and caretaker data (names and contact information).

The right abutment, left abutment and immediate downstream toe are currently owned privately as obtained from publicly available Assessors Records.

1.2.3 Purpose of the Dam

Cedar Meadow Pond Dam is primarily used for recreation. The dam was originally built in the 1920's to power a mill.

1.2.4 Description of the Dam and Appurtenances

The following description, provided in previous reports and supplemented with information from the current site visit and available plans, describes the dam and its appurtenant structures.

Cedar Meadow Pond Dam is a 490-foot long, 15.3-foot high gravity masonry dam with earth fill and impervious core. The width of the dam varies from approximately 29 feet to 31 feet. The outlet works consists of three major elements: a 42-foot wide concrete broad crested weir spillway, a 4-foot wide low flow sluiceway, and a low level outlet with gate.

The spillway is located approximately 135 feet left of the right abutment. The primary spillway is a concrete broad crested weir approximately 42-long along the dam by approximately 30.6 feet wide with training walls generally 2.25 feet high. A four foot wide by 2.8-foot deep low flow sluiceway with weir board control is located at the left end of the primary spillway. The upstream face of the spillway is formed by a concrete wall. A 1998 Municipally Owned Dam Inspection/Evaluation Report indicates that this upstream wall extends 6 inches into the pond bottom. The downstream face of the spillway is a vertical stone masonry wall. The spillway discharges to a rip-rap and concrete apron and then to a natural channel.

A low level outlet pipe is located approximately 70 feet left of the left spillway training wall. The low level outlet is a 16-inch diameter HDPE pipe with a gate operator on its upstream end. This pipe was installed as a slip liner and grouted in place inside the original stone conduit on the upstream side up to the gate house. The portion from the gate house to the downstream retaining wall was not grouted until 2013. The gate house no longer serves a function other than storage, as the new gate operator is accessed from a platform cantilevered off the upstream face of the dam.

1.2.5 Operations and Maintenance

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.

1.2.6 DCR Size Classification

Cedar Meadow Pond Dam has a height of dam of approximately 15.3 feet and a maximum storage capacity of 1485 acre-feet. Refer to Appendix D for definitions of height of dam and storage. Therefore, in accordance with Department of Conservation and Recreation Office of Dam Safety classification, under Commonwealth of Massachusetts dam safety rules and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, Cedar Meadow Pond Dam is a Large size structure.

1.2.7 DCR Hazard Potential Classification

Cedar Meadow Pond Dam is located upstream of Bouchard Pond and Greenville Pond. According to the 2020 EAP, it appears that a failure of the dam at maximum pool may cause flooding that extends from the dam to the Oxford Town line and includes Pine Street, Green Street, River Street, Greenville Pond Dam, Hankey Street, Stafford Street, Charles Street and multiple residences and businesses. Therefore, in accordance with Department of Conservation and Recreation classification procedures, under Commonwealth of Massachusetts dam safety rules and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, Cedar Meadow Pond should be classified as a Significant (Class II) hazard potential dam. The Hazard Potential Classification recommendation is consistent with the Hazard Potential Classification on record with the Office of Dam Safety for Cedar Meadow Pond.

1.3 Pertinent Engineering Data

1.3.1 Drainage Area

The drainage area for Cedar Meadow Pond is approximately 3.9 square miles and extends through the communities of Leicester and Spencer. The drainage area is generally heavily wooded with some residential and commercial development, most notably along Route 9 in Spencer and Leicester, along the southern shores of Burncoat Pond, and along most of the shoreline of Cedar Meadow Pond. The maximum elevation in the watershed is approximately 1060 feet. Burncoat Pond is the only significant impoundment located upstream of Cedar Meadow Pond. The combined surface area of Burncoat Pond and Cedar Meadow Pond is approximately 11 percent of the drainage area.

1.3.2 Reservoir

See Table 1.1 for data approximately normal, maximum, and spillway design flood (SDF) pools. These data were presented in previous reports and verified by Lenard Engineering with AutoCAD using available MassGIS topographic maps. The accuracy of the data has not been verified. A bathymetric survey dated 3/7/13 was conducted by Waterman Design Associates, Inc. A copy of their plan is included in Appendix C.

	Length (ft)	Width (ft)	Surface Area (acres)	Storage Volume (ac-ft)
Normal Pool	4,000	1650	144	1122
Maximum Pool	4,185	2400	147	1485
SDF Pool	4,185	2400	147	1485

1.3.3 Discharges at the Dam Site

No records are available from the Owner for flood flows into Cedar Meadow Pond or of spillway releases.

1.3.4 General Elevations (feet)

The benchmark used in the field was the left upstream corner of the concrete spillway training wall with an elevation of 885.91 feet as per the 2012 construction plans.

A.	Top of Dam	886.25
B.	Spillway Design Flood Pool	886.25
C.	Normal Pool	883.44
D.	Spillway Crest	883.44
E.	Upstream Water at Time of Inspection	884.01
F.	Downstream Water at Time of Inspection	877.44
G.	Streambed at Toe of the Dam	877.44
H.	Low Point along Toe of the Dam (at low level outlet)	877.44

1.3.5 Main Spillway Data

The benchmark used in the field was the left upstream corner of the concrete spillway training wall with an elevation of 885.91 feet as per the 2012 construction plans.

A.	Type	Broad Crested Weir
B.	Weir Length	38.00
C.	Weir Crest Elevation	883.44
D.	Upstream Channel	See Bathymetric Survey (App. C)
E.	Downstream Channel	877.44
F.	Downstream Outlet Invert	877.94

1.3.6 Low Flow Sluiceway

The benchmark used in the field was the left upstream corner of the concrete spillway training wall with an elevation of 885.91 feet as per the 2012 construction plans.

A.	Type	Sharp Crested Weir (Weir Boards)
B.	Weir Length	4.00
C.	Weir Crest Elevation	881.31
D.	Upstream Channel	See Bathymetric Survey (App. C)
E.	Downstream Channel	877.44
F.	Downstream Water Elevation	877.44

1.3.7 Low Level Outlet

The benchmark used in the field was the left upstream corner of the concrete spillway training wall with an elevation of 885.91 feet as per the 2012 construction plans.

A.	Type	16" Diameter HDPE Pipe
B.	Weir Length (through embankment)	36.00
C.	Invert Elevation	877.94
D.	Upstream Channel	See Bathymetric Survey (App. C)
E.	Downstream Channel	877.44
F.	Downstream Water Elevation	877.44

1.3.8 Design and Construction Records and History

Original design and construction records are not available.

On August 28, 2011, the Owner self-inspected the dam subsequent to Tropical Storm Irene in accordance with the Emergency Action Plan (EAP) developed for the dam. It was during this routine inspection that the Owner discovered an open void (8-9 ft diameter by 4 ft deep) within the embankment crest with substantial flow of approximately 50-100 gallons per minute. Subsequently, repairs were made in 2012 and 2013 to implement corrective measures. The work included raising the earthen dam impervious core between the eastern spillway wall and low level out gate house; implementation of a pressure grouting program after concerns of potential voids adjacent to the east wall of the spillway and around the low level outlet gatehouse due to the inability to compact the impervious material in these locations.

An additional 75 feet of core wall extension was undertaken in December 2013.

A copy of the construction plans is included in Appendix C.

1.3.9 Operating Records

The District maintains records of dam operations and repairs including: a date log of when the low level outlet gate is operated (previously reported), a date log of weir board elevation change in the low flow sluiceway (previously reported), and an invoice file documenting work performed by contractors for the District. The dam is mowed frequently to maintain the grass on the crest. The operating records were not reviewed in detail for this report.

1.4 Summary Data Table

See Next Page

1.1 Summary Data Table

Required Phase I Report Data	Data Provided by the Inspecting Engineer
National ID #	MA00984
Dam Name	Cedar Meadow Pond Dam
Dam Name (Alternate)	Cedar Meadow Lake Dam
River Name	Burncoat Brook
Impoundment Name	Cedar Meadow Pond/Lake
Hazard Class	Significant
Size Class	Large
Dam Type	Masonry/Earth Fill
Dam Purpose	Recreation
Structural Height of Dam (feet)	15.3
Hydraulic Height of Dam (feet)	12.75
Drainage Area (sq. mi.)	3.9
Reservoir Surface Area (acres)	144
Normal Impoundment Volume (acre-feet)	1122
Max Impoundment Volume ((top of dam) acre-feet)	1485
SDF Impoundment Volume* (acre-feet)	147
Spillway Type	Broad Crested Weir
Spillway Length (feet)	42
Freeboard at Normal Pool (feet)	3
Principal Spillway Capacity* (cfs)	386
Auxiliary Spillway Capacity* (cfs)	None
Low-Level Outlet Capacity* (cfs)	1) 126 2) 24.5
Spillway Design Flood* (flow rate - cfs)	500-YR/494 estimate
Winter Drawdown (feet below normal pool)	24 inches to 36 inches
Drawdown Impoundment Vol. (acre-feet)	Unknown
Latitude	42.22572
Longitude	-71.936361
City/Town	Leicester
County Name	Worcester
Public Road on Crest	None
Public Bridge over Spillway	None
EAP Date (if applicable)	1-Jan-20
Owner Name	Cedar Meadow Lake Watershed
Owner Address	61 Fairview Drive
Owner Town	Leicester, MA 01524
Owner Phone	774-239-1799
Owner Emergency Phone	774-239-1799 or 911
Owner Type	Private
Caretaker Name	c/o Tommy J. Lee
Caretaker Address	61 Fairview Drive
Caretaker Town	Leicester, MA 01524
Caretaker Phone	774-239-1799
Caretaker Emergency Phone	774-239-1799 or 911
Date of Field Inspection	5/28/2020
Consultant Firm Name	Lenard Engineering, Inc.
Inspecting Engineer	Douglas W. Bush, PE
Engineer Phone Number	508-721-7600

SECTION 2

2.0 INSPECTION

2.1 Visual Inspection

Cedar Meadow Pond Dam was inspected on May 28, 2020. At the time of the inspection, the weather was cloudy with temperatures in the 60s. Photographs to document the current conditions of the dam were taken during the inspection and are included in Appendix A. The level of the impoundment was approximately 884.01. Underwater areas were not inspected A copy of the inspection checklist is included in Appendix B. Right and left abutments are those on respective sides of an observer looking downstream.

2.1.1 General Findings

In general, Cedar Meadow Pond Dam was found to be in **Fair** condition with wet areas near the left abutment on downstream side, multiple large trees on the downstream side, and multiple small voids in the crest behind the stone masonry walls. The specific concerns are identified in more detail in the sections below:

2.1.2 Dam

- **Abutments (Photos 1 through 3)**

  Abutment contact was good at both ends. There was a wet area at the left end of the dam near the abutment contact on the downstream side. At the time of inspection, it was unclear if this area is from seepage through or under the dam. The wet area extends from the left abutment area with flow, although minimal, toward the spillway discharge channel. Vegetation was observed near the right abutment contact primarily on the upstream and downstream sides.

- **Upstream Face (Photos 4 and 5)**

  A section of masonry wall at the right abutment was tilted outward towards the impoundment. Animal burrows/small voids were observed behind the upstream masonry walls primarily to the right of the spillway. Very few voids were observed behind the wall along the left side of the dam.

- **Crest (Photos 6 through 8)**

  The crest was earth fill with a grass cover over most of the crest with some areas of thin vegetation. Small voids/animal burrows were observed behind the upstream and downstream masonry walls and along the right side of the right spillway training wall. Shallow tire ruts remain on left crest possibly from previous construction projects. A six inch diameter by 2 foot deep void was observed adjacent to the right spillway training wall toward the downstream side.

- **Downstream Face (Photos 9 and 10)**

  The downstream face of the dam is a near vertical dry stacked masonry wall. There are missing cap stones along top of downstream wall in multiple locations along the right side with only a few locations along the left side. Multiple large trees are growing at the immediate toe of the dam and within 20 feet. The previous report observed that there was flowing water that was audible on the downstream face of the spillway structure (no visible running water). This deficiency was not observed during this inspection.

- **Drains**

  No drains were observed

- **Instrumentation**

  No instrumentation was observed

- **Access Roads and Gates (Photo 11)**

  The dam is accessible at the left abutment through a swing gate adjacent to Charles Street. The right abutment, the immediate downstream area and a portion of the left downstream slope and left abutment are currently owned privately. An easement has been recorded formally providing access to the dam crest from Charles Street at the left abutment. Access to the right abutment is through an abutter's property downstream of the dam. A chain link fence and gate is located near the left abutment, limiting unauthorized access to the dam crest. A second chain link fence and gate is located to the right of the spillway approximately 100 feet from the right abutment. All gates are kept locked and the key is kept with the members of the Cedar Meadow Lake Watershed District members.

2.1.3 Appurtenant Structures

- Primary Spillway **(Photos 12 through 14)**

  The training wall that is shared between the low flow sluiceway and primary spillway has multiple vertical through cracks with minor seepage into the low flow sluiceway. The low flow sluiceway has the ability to hold approximately five 2x8 weir boards. At the time of the inspection, all weir boards were in place. The owner's representative stated that the weir boards have been replaced recently. No signs of unusual movement were evident. Multiple cracks had been repaired in the spillway crest from previous grout repairs. The previous report observed that there was flowing water that was audible on the downstream face of the spillway structure (no visible running water). This was not observed during this inspection. The water level was approximately 0.7 feet above the left edge of the spillway at the time of the inspection.

- Low-Level Outlets **(Photos 15 and 16)**

  The low-level outlet annulus was grouted shut in 2013. No evidence of seepage was observed at the time of inspection. A 16 inch HDPE pipe was used to slip line the 24

inch stone conduit that had served as the low level outlet. A gate valve was installed on the upstream end of the 16 inch pipe and grout was reportedly used to seal off the rest of the original stone conduit. The gate valve is accessed from a cantilevered operator's platform that hangs over the face of the dam. A small trash rack is installed around the upstream end of the conduit. The gate house structure was recently rebuilt however no longer serves a function other than storage**.**

- Auxiliary/Emergency Spillway

  There is no emergency spillway structure at Cedar Meadow Pond Dam.

- Dikes

  There are no dikes on Cedar Meadow.

2.1.4 Downstream Area (**Photo 17)**

The area below the dam is heavily wooded with many large diameter trees growing at the immediate toe of the dam and within 20 feet. The abutting property begins at the toe of the dam. The owner of the abutting property will reportedly not allow the cutting of trees on the property.

Several wet areas below the dam were observed. At the left end of the dam an area of ponding was observed beginning at the left abutment. Water was flowing minimally in this area toward the spillway discharge channel. The source of the water is not known at this time.

The outflow of Cedar Meadow Lake enters Burncoat Brook and flows through Bouchard Pond and under Pine Street. Burncoat Brook east of Pine Street enters lowland swamps that extend to the north and south sides of Pine Street and to the east of Pine Street where Burncoat Brook intersects with Town Meadow Brook.

Access to the area below the dam is poor due to heavy vegetation. The abutting property owner reportedly refuses to allow the owner access to the toe of the dam for maintenance purposes.

2.1.5 Reservoir Area (**Photo 18)**

Cedar Meadow Pond is oriented from northwest to southeast. The impoundment is nearly as wide as it is long. The southern end of the pond narrows significantly and the dam is located at the end of this narrowed section. The terrain around the pond is generally low rolling hills with significant wetland areas upstream. There are neighborhoods growing up along both sides of Cedar Meadow Pond, alongside parts of Burncoat Pond and along Route 9 in Leicester and Spencer. Otherwise the watershed is heavily wooded. There were no steep slopes observed that would be subject to sliding and affecting water level and discharges from the pond.

2.2 Caretaker Interview

The Caretaker was informally interviewed during the inspection. The caretaker's comments are reported in the relevant sections of this report.

2.3 Operation and Maintenance Procedures

The elected Management Committee of the Watershed District are responsible for operations and maintenance of the dam. No formal operations and maintenance plan was available for review during preparation of this report.

2.3.1 Operational Procedures

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.

2.3.2 Maintenance of Dam and Operating Facilities

The dam crest is mowed regularly to keep grass less than 6 inches long. No other routine maintenance is performed and no records of maintenance and training were available for review.

2.4 Emergency Warning System

An Emergency Action Plan was completed in 2020 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..

2.5 Hydrologic/Hydraulic Data

A brief H&H review was performed for the preparation of the 1998 Inspection report. No calculations were available for review.

The 1998 Report indicated that the modifications being made to the dam were based on a 100-year design storm. The peak test inflow into Cedar Meadow Lake was determined to be 283 cfs. This number was checked using the regression equations for central Massachusetts defined in the USGS publication titled Estimating Peak Discharges of Small Rural Streams in Massachusetts and found to be reasonable. The report indicated that the spillway capacity with weir boards removed from the low flow sluiceway is about 512 cfs. We have estimated that the capacity of the spillway with weir boards in place is approximately 386 cfs. Inflow routed through the impoundment could potentially reduce the outflow of the spillway, but a detailed analysis would be required.

Current regulations indicate that a Large, Significant hazard dam should be evaluated using the 500-year design storm. No 500-year storm flows were listed within the 1998 Report. The 500-

year storm flow is estimated to be 494 cfs using US Water Resources Council Bulletin 17B guidelines. Cedar Meadow Pond Dam may be capable of safely passing the SDF with the weir boards removed. It is not known if a plan exists to remove the weir boards during flooding conditions to provide the full capacity.

A.	Spillway Design Flood (SDF) Return Period	500-year storm
B.	100-year storm inflow(CFS)	283
C.	Estimated 500-year storm inflow (CFS)	494
D.	Spillway Capacity (CFS) (with weir boards removed)	512
E.	Spillway Capacity (CFS) (without weir boards removed)	386

2.6 Structural and Seepage Stability

2.6.1 Embankment Structural Stability

The masonry wall on the upstream face of the dam at the right abutment was observed to be tilted slightly toward the impoundment. This deficiency is minor and likely has little effect on the structural integrity of the dam. Many small voids/animal burrows were observed on the upstream side. No unusual movement was observed due to these voids however these areas should be monitored for any movement of the wall and/or movement within the crest area.

Previous reports observed multiple sinkholes and depressions along the crest of the dam indicating loss of soils that possibly affected that dam's structural integrity. After a routine inspection in 2011 revealed a large sinkhole on the crest, repairs were made in 2012 and 2013 to implement corrective measures. At this time, the embankment appears to be structurally stable.

2.6.2 Structural Stability of Non-Embankment Structures

The owners recently rebuilt the old low level outlet gate house. At this time, the non-embankment structures appear to be structurally stable.

2.6.3 Seepage Stability

The soil grouting program and raising the impervious core appears to have addressed the seepage points between the primary spillway and low level outlet. Previous reports indicate audible seeps along the west primary spillway limit. This was not observed during this inspection however this should be continued to be monitored at this time. Work is planned to extend the work on the dam's impervious core that may alleviate the seepage points west of the low level outlet. Other seeps to the east of the low level outlet and near Charles Street show pooling of water with minimal flow. At this time, the dam appears to be stable against seepage.

SECTION 3

3.0 ASSESSMENTS AND RECOMMENDATIONS

3.1 Assessments

In general, the overall condition of Cedar Meadow Pond Dam is Fair. The dam was found to have the following deficiencies:

1. Several wet areas near left abutment on downstream side;
2. Upstream stone masonry wall tilted outward towards impoundment;
3. Small voids behind the upstream and downstream masonry walls and behind the spillway training walls;
4. Missing cap stones along the top of the downstream wall;
5. Multiple large trees growing at the immediate toe of the dam;
6. Multiple vertical through cracks in primary spillway training wall.

A comparison to the previously reported condition of the dam is included in this section. Many conditions have been improved as well as those that have remained persistent since the last inspection are indicated. Major recommendations from previous inspections are described, as well as the level of compliance with those recommendations.

Previously Identified Deficiency	***Resolution or Current Condition***
Several wet areas near left abutment on downstream side	Still persists
Upstream stone masonry wall tilted outward towards impoundment	Still persists
Small voids behind the downstream masonry wall and behind the spillway training walls	Still persists
Missing cap stones along the top of the downstream wall	Still persists
Multiple large trees growing at the immediate toe of the dam	Still persists. Tree growing through downstream wall have been removed.
Flowing water is audible at the downstream face of the spillway	None observed but assumed to still persist
Multiple vertical through cracks in primary spillway training wall	Still persists

The following recommendations and remedial measures generally describe the recommended approach to address current deficiencies at the dam. Prior to undertaking recommended maintenance, repairs, or remedial measures, the applicability of environmental permits needs to be determined for activities that may occur within resource areas under the jurisdiction of local conservation commissions, MADEP, or other regulatory agencies.

3.2 Studies and Analyses

The following studies or analyses are recommended to evaluate concerns and comply with current regulations.

A. A formalized Operations and Maintenance (O&M) Manual should be developed for this structure. This manual should include procedures for maintaining the level of the impoundment, including adjusting the level of the impoundment seasonally to provide additional freeboard during the wetter months. Additionally, the manual should include periodic inspection schedules and operational and maintenance procedures required to ensure satisfactory operation, and minimize deterioration of the facility. Currently an O&M manual is not required by regulations.

3.3 Recurrent Maintenance Recommendations

This section discusses those activities that should be undertaken on a regular or yearly basis. Typically these activities are recurrent maintenance level activities that can be undertaken by the dam owner/caretaker and do not require engineering design or permitting, unless otherwise indicated:

A. Remove saplings (less than 4 inches in diameter) and roots within 20 feet of the dam area; backfill with suitable material. Remove brush and vegetation within 20 feet of the dam and abutments; remove woody brush on top of channel walls;

B. Fill low spots and eroded areas; seed filled areas and bare patches of earth within 20 feet of the dam and abutments; mow regularly;

C. Remove debris, brush, vegetation, and sediment from upstream and downstream channels; clear trash racks;

D. Exercise low level outlet gate regularly;

E. Complete routine review and updates of the Emergency Action Plan. Complete periodic training of involved personnel;

F. Perform regular monitoring and inspection of the dam and appurtenant structures, including areas of observed seepage, to check for other signs of deteriorating conditions. Complete formal inspections in accordance with current state regulations, which for this structure are required every 5 years;

G. Replace missing cap stones.

3.4 Minor Repair Recommendations

This section discusses recommended studies or activities to improve the overall condition of the dam that do not alter the current design of the dam. These recommendations may require design by a professional engineer and construction by a contractor experienced in dam repair. A Chapter 253 permit may be required.

A. Obtain legal maintenance agreements recorded on land deeds to allow access and maintenance activities such as tree and stump removal and repairs to the dam for the right abutment and downstream toe areas;

B. Cut crowns and trunks of trees (4 inches or greater) and leave stumps; treat stumps to control rot; monitor stumps; apply herbicide to prevent regrowth;

C. Clear brush, saplings and other unwanted vegetation within 20 feet of the dam and abutments and establish a maintainable stand of sturdy grass;

D. Seal through cracks in spillway training walls;

E. Fill voids behind downstream stone masonry wall and behind primary spillway training walls.

3.5 Remedial Modifications Recommendations

This section includes recommended modifications to the dam that alter the current configuration or design of the dam that are necessary to meet stability, seepage or safety concerns as well as comply with current state requirements. These recommendations will require design by a professional engineer and construction by a contractor experienced in dam repair. A Chapter 253 permit will likely be required.

A. Continue to correct seepage that is occurring along the toe of the dam;

B. Continue to investigate and provide appropriate corrective measures to flowing water within the dam;

C. Monitor and stabilize the tilting upstream face of the dam near the right abutment if it is found to be moving.

3.6 Alternatives

This section includes a discussion of practical alternatives to the recommendations presented above. Examples include, but are not limited to, alternative armoring approaches, alternative spillway configurations, or alternative stabilizations.

None at this time.

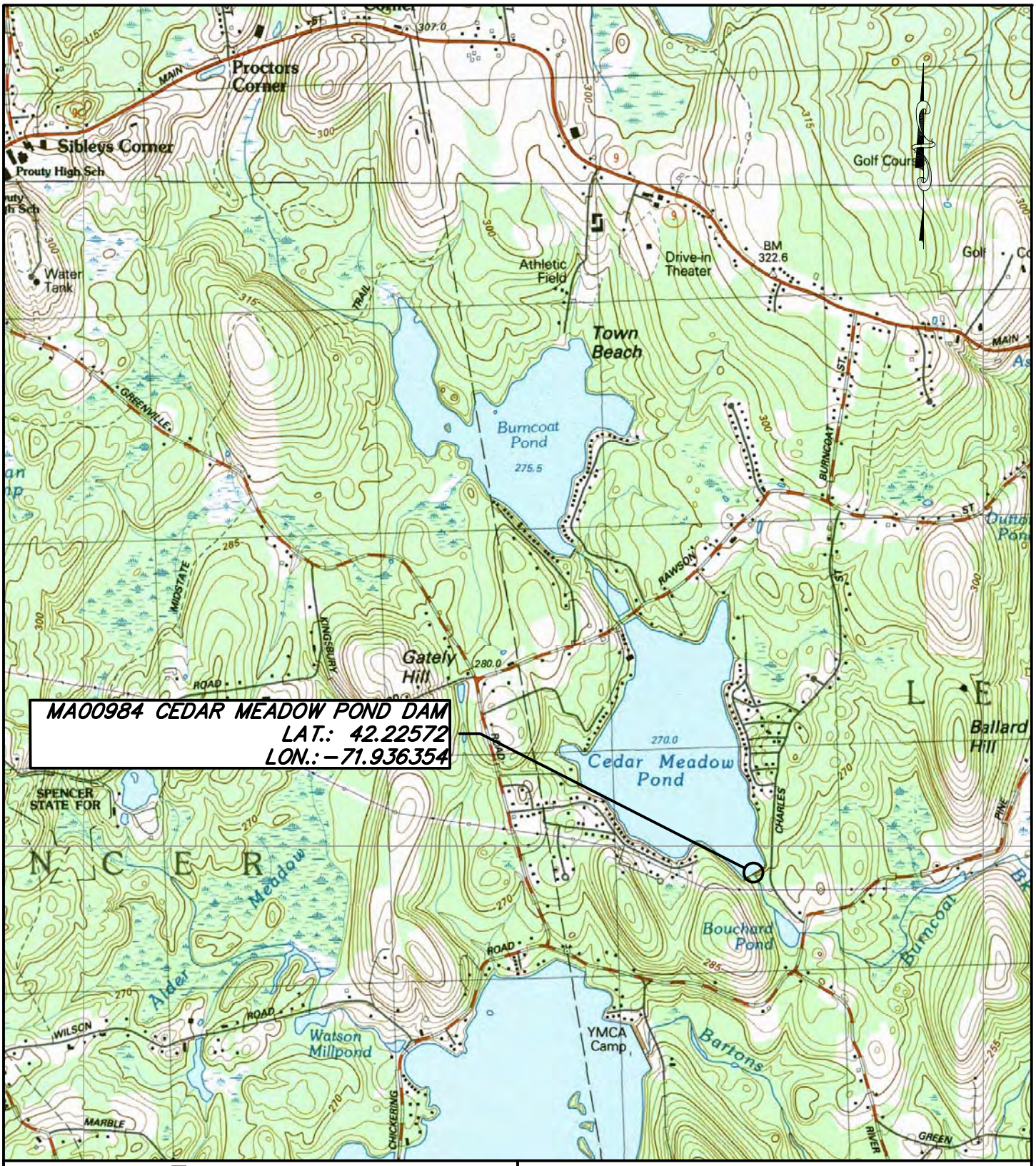
3.7 Opinion of Probable Construction Costs

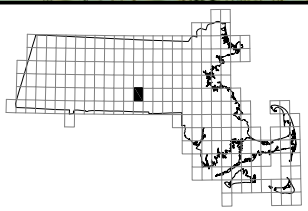
This section gives an opinion of the probable construction costs for the previously discussed dam analysis, repair, and remediation activities. It should be noted that this is just an opinion; actual costs may vary widely depending on current economic factors, material availability, and regulations.

The actual costs may also vary depending on the outcome of subsequent specialized or invasive testing and inspections. It is highly recommended to re-observe deficiencies under no or low flow conditions prior to undertaking repairs to determine the extent of the deficiencies.

Item	Opinion of Probable Cost
Studies and Analyses	
O&M	$2,500
Recurrent Maintenance	$3,000 per year
Repairs	
Clear trees and brush	$10,000
Fill voids	$500
Replace missing cap stones	$2,000
Repair audible water flow issues	$20,000
Repair seepage issues	$20,000
Repair/stabilize tilting wall section	$10,000
TOTAL	$62,500 (not including recurrent maintenance, studies and analysis, or alternatives)

FIGURES





Source:
USGS TOPOGRAPHIC MAP
LEICESTER, MA QUADRANGLE

Lenard Engineering, Inc.
Auburn, MA

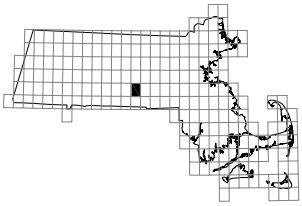
FIGURE 1 - LOCUS PLAN

State ID# 3-14-151-8 NID# MA00984

CEDAR MEADOW POND DAM

LEICESTER, MA

Scale 1"=2000'



Source:
USGS TOPOGRAPHIC MAP
LEICESTER, MA QUADRANGLE

Lenard Engineering, Inc.
Auburn, MA

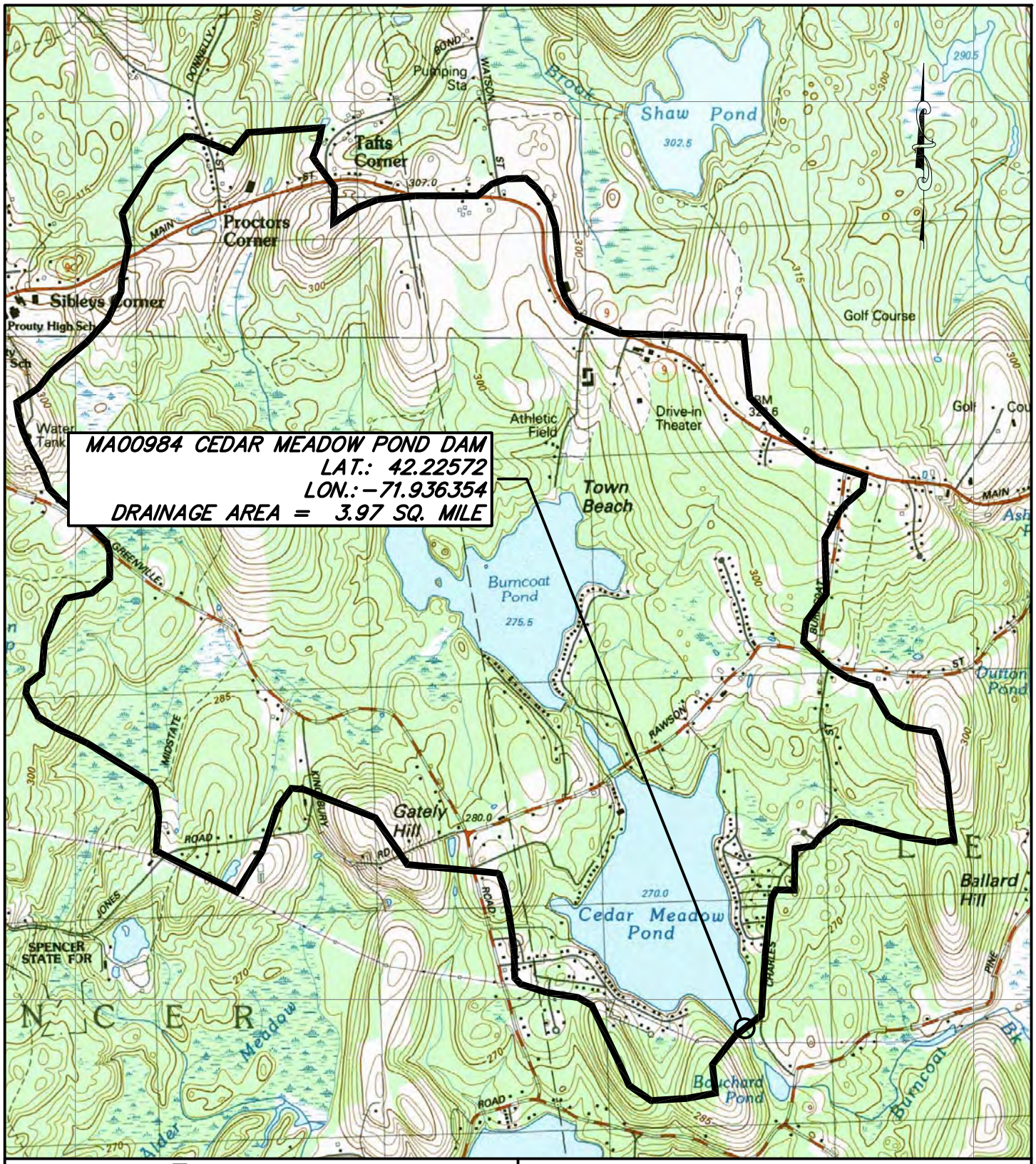
FIGURE 2 - AERIAL PHOTO

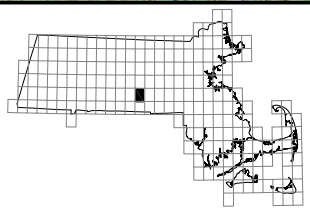
State ID# 3-14-151-8 NID# MA00984

CEDAR MEADOW POND DAM

LEICESTER, MA

Scale 1"=2000'





Source:
USGS TOPOGRAPHIC MAP
LEICESTER, MA QUADRANGLE

Lenard Engineering, Inc.
Auburn, MA

FIGURE 3 - DRAINAGE & DOWNSTREAM AREA

State ID# 3-14-151-8 NID# MA00984

CEDAR MEADOW POND DAM

LEICESTER, MA

Scale 1"=2000'

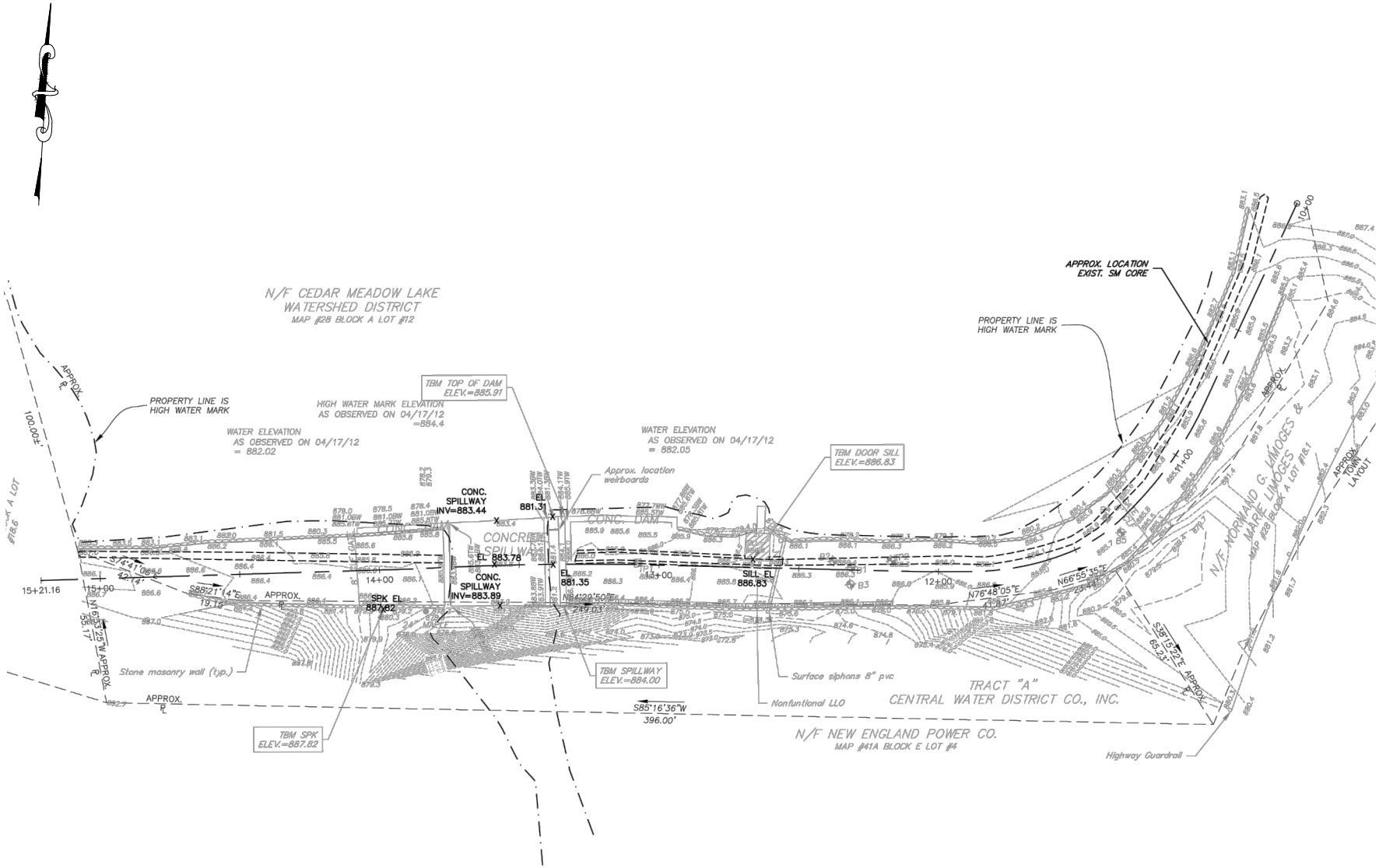


FIGURE 4 - PHOTO SKETCH

State ID# 3-14-151-8 NID# MA00984

CEDAR MEADOW POND DAM

LEICESTER, MA

Scale: NONE

Lenard Engineering, Inc.
Auburn, MA

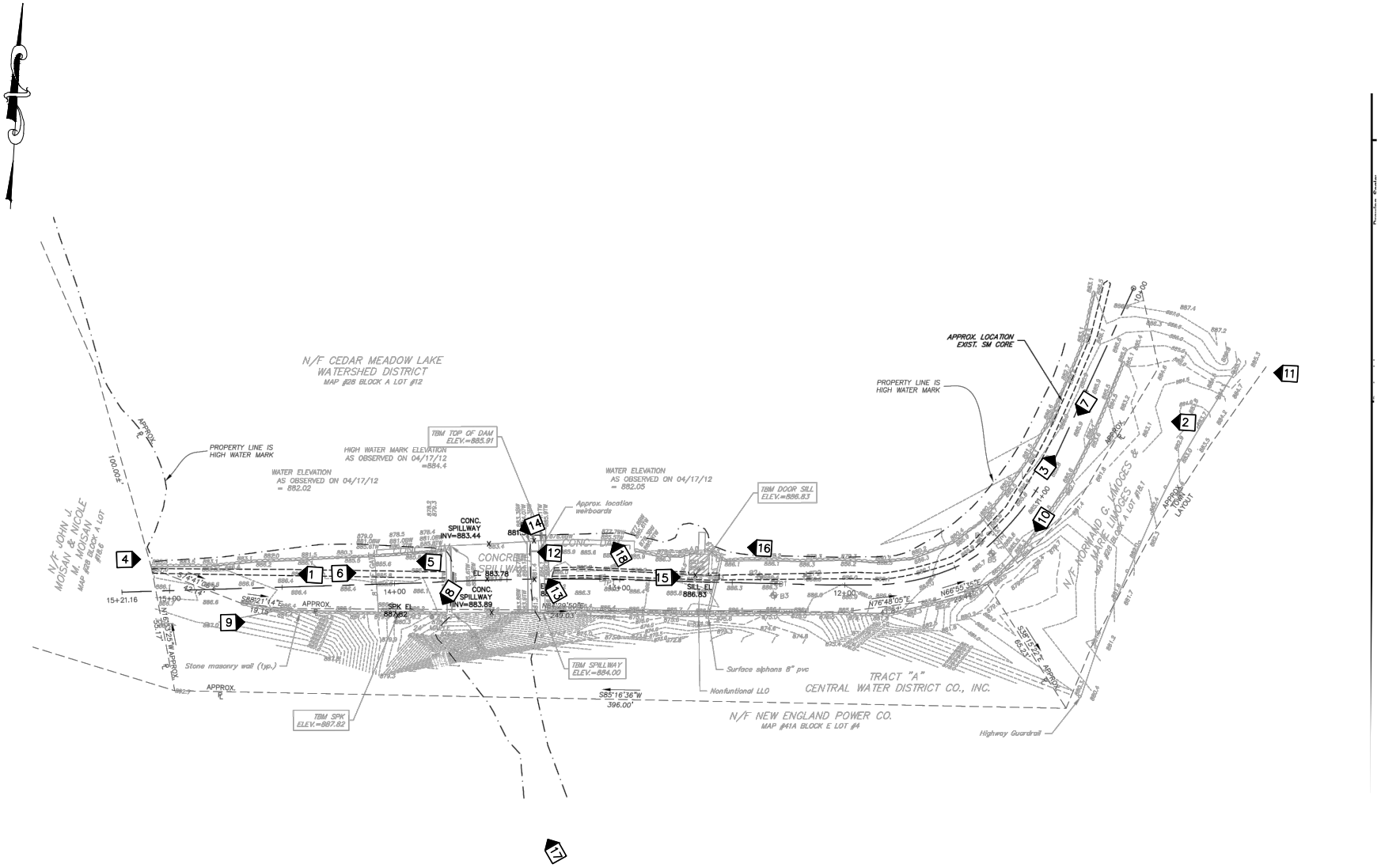


FIGURE 5 - PHOTO LOCATION

State ID# 3-14-151-8 NID# MA00984

CEDAR MEADOW POND DAM

LEICESTER, MA

Scale: NONE

Lenard Engineering, Inc.
Auburn, MA

APPENDIX A
Photographs

(MA00984) CEDAR MEADOW POND DAM

Photo 1: Right abutment from dam crest – Vegetation within 20 feet of the contact mainly on the upstream and downstream sides.

Photo 2: Downstream area at the left abutment – The area is wet with some pooled areas and minimal flow toward the spillway. Photo was taken from Charles Street.

Photo 3: Left abutment from the crest – Minor thin areas of vegetation and shallow tire rutting.

Photo 4: Right upstream face of the dam looking toward the spillway – The upstream wall was leaning outward.

Photo 5: Upstream face between the spillway and the fence on the right crest – Multiple small voids/animal burrows were observed in this area.

Photo 6: Right crest from the right abutment – There was some thin vegetation along the crest. Note the gate located across the crest.

Photo 7: Left crest from the left abutment – There was some thin vegetation along the crest as well as some shallow tire rutting. Note the gate located across the crest.

Photo 8: Void in right crest adjacent to the right spillway training wall.

Photo 9: Right downstream face from the right abutment – Missing cap stones along the top of the wall in multiple locations. Heavy vegetation was observed within 20 feet of the toe.

Photo 10: Left downstream face from the left abutment – Missing cap stones along the top of the wall in multiple locations. Heavy vegetation was observed within 20 feet of the toe.

Photo 11: Access to the dam from Charles Street – Entrance is protected from vehicular traffic via a locked swing gate.

Photo 12: Shared wall between primary spillway and low flow sluiceway. Multiple cracks were observes with seepage through the cracks.

Photo 13: Inlet to the low flow sluiceway – Weir boards were in place at the time of inspection. Weir boards were recently replaced.

Photo 14: Primary spillway from the left crest – Cracks shown in spillway had been repaired from previous grout repairs. No deficiencies to note during this inspection.

Photo 15: Gate house – The gate house was recently rebuilt but no longer serves a function other than storage. Access to the controls is through this building out onto a cantilever platform.

Photo 16: Access to the gate valve for the low level outlet is gained from this cantilevered platform that hangs over the upstream face of the dam.

Photo 17: Downstream area along the channel looking back at the dam. The area is heavily vegetated with many trees within 20 feet of the dam toe.

Photo 18: Reservoir Area.

APPENDIX B
Inspection Checklist

DAM SAFETY INSPECTION CHECKLIST

NAME OF DAM: Cedar Meadow Pond Dam

STATE ID #: 3-14-151-8

REGISTERED: ☑ YES ☐ NO

NID ID #: MA00984

STATE SIZE CLASSIFICATION: Large

STATE HAZARD CLASSIFICATION: Significant

CHANGE IN HAZARD CLASSIFICATION REQUESTED?: No

DAM LOCATION INFORMATION

CITY/TOWN: Leicester

COUNTY: Worcester

DAM LOCATION: Charles Street
(street address if known)

ALTERNATE DAM NAME: Cedar Meadow Lake Dam

USGS QUAD.: Paxton, Leicester

LAT.: 42.22572

LONG.: -71.936361

DRAINAGE BASIN: French

RIVER: Burncoat Brook

IMPOUNDMENT NAME(S): Cedar Meadow Pond/Lake

GENERAL DAM INFORMATION

TYPE OF DAM: Masonry/Earth Fill

OVERALL LENGTH (FT): 490

PURPOSE OF DAM: Recreation

NORMAL POOL STORAGE (ACRE-FT): 1122

YEAR BUILT: Mid 1920's

MAXIMUM POOL STORAGE (ACRE-FT): 1485

STRUCTURAL HEIGHT (FT): 15

EL. NORMAL POOL (FT): 883.4

HYDRAULIC HEIGHT (FT): 12.75

EL. MAXIMUM POOL (FT): 886.3

FOR INTERNAL MADCR USE ONLY

FOLLOW-UP INSPECTION REQUIRED: ☐ YES ☐ NO

CONDITIONAL LETTER: ☐ YES ☐ NO

NAME OF DAM: Cedar Meadow Pond Dam STATE ID #: 3-14-151-8

INSPECTION DATE: May 28, 2020 NID ID #: MA00984

INSPECTION SUMMARY

DATE OF INSPECTION: May 28, 2020 DATE OF PREVIOUS INSPECTION: June 10, 2015

TEMPERATURE/WEATHER: Cloudy, 60s ARMY CORPS PHASE I: ☐ YE ☑ N If YES, date

CONSULTANT: Lenard Engineering, Inc. PREVIOUS DCR PHASE I: ☑ YE ☐ N If YES, date 6/10/2015

BENCHMARK/DATUM: 885.91, Top of spillway upstream left training wall (Construction Plans 2012)

OVERALL PHYSICAL CONDITION OF DAM: FAIR DATE OF LAST REHABILITATION: 2012/2013

SPILLWAY CAPACITY: >100% SDF w/ no actions by Caretaker

EL. POOL DURING INSP.: 884.01 EL. TAILWATER DURING INSP.: 877.44

PERSONS PRESENT AT INSPECTION

NAME	TITLE/POSITION	REPRESENTING
Douglas W. Bush, PE	Project Engineer	Lenard Engineering, Inc.
		Lenard Engineering, Inc.

EVALUATION INFORMATION

		Click on box to select E-code
E1)	TYPE OF DESIGN	3
E2)	LEVEL OF MAINTENANCE	3
E3)	EMERGENCY ACTION PLAN	5
E4)	EMBANKMENT SEEPAGE	3
E5)	EMBANKMENT CONDITION	4
E6)	CONCRETE CONDITION	4
E7)	LOW-LEVEL OUTLET CAPACITY	4

		Click on box to select E-code
E8)	LOW-LEVEL OUTLET CONDITION	5
E9)	SPILLWAY DESIGN FLOOD CAPACITY	5
E10)	OVERALL PHYSICAL CONDITION	3
E11)	ESTIMATED REPAIR COST	$62,500
	ROADWAY OVER CREST	NO
	BRIDGE NEAR DAM	NO

NAME OF INSPECTING ENGINEER: Douglas W. Bush, PE SIGNATURE:

NAME OF DAM: Cedar Meadow Pond Dam

STATE ID #: 3-14-151-8

INSPECTION DATE: May 28, 2020

NID ID #: MA00984

OWNER:		CARETAKER:	
ORGANIZATION	Cedar Meadow Lake Watershed	ORGANIZATION	Ceadar Meadow Lake Watershed District
NAME/TITLE	District c/o Tommy Lee	NAME/TITLE	c/o Tommy J. Lee
STREET	61 Fairview Drive	STREET	61 Fairview Drive
TOWN, STATE, ZIP	Leicester, MA 01524	TOWN, STATE, ZIP	Leicester, MA 01524
PHONE	774-239-1799	PHONE	774-239-1799
EMERGENCY PH. #	774-239-1799 or 911	EMERGENCY PH. #	774-239-1799 or 911
FAX	NA	FAX	NA
EMAIL	tommyjoelee@gmail.com	EMAIL	tommyjoelee@gmail.com
OWNER TYPE	Private		

PRIMARY SPILLWAY TYPE: Broad Crested Weir

SPILLWAY LENGTH (FT): 42

SPILLWAY CAPACITY (CFS): 386

AUXILIARY SPILLWAY TYPE:

AUX. SPILLWAY CAPACITY (CFS): None

NUMBER OF OUTLETS: 2

OUTLET(S) CAPACITY (CFS): 1) 126 2) 24.5

TYPE OF OUTLETS: 1) Low flow sluiceway
2) Low level outlet 16" diam. Pipe

TOTAL DISCHARGE CAPACITY (CFS): 537

DRAINAGE AREA (SQ MI): 3.9

SPILLWAY DESIGN FLOOD (PERIOD/CFS): 500-YR/494 estimate

HAS DAM BEEN BREACHED OR OVERTOPPED: ☐ YE ☑ N

IF YES, PROVIDE DATE(S):

FISH LADDER (LIST TYPE IF PRESENT):

DOES CREST SUPPORT PUBLIC ROAD? ☐ YE ☑ N

IF YES, ROAD NAME:

PUBLIC BRIDGE WITHIN 50' OF DAM? ☐ YE ☑ N

IF YES, ROAD/BRIDGE NAME:

MHD BRIDGE NO. (IF APPLICABLE)

NAME OF DAM: Cedar Meadow Pond Dam STATE ID #: 3-14-151-8

INSPECTION DATE: May 28, 2020 NID ID #: MA00984

EMBANKMENT (CREST)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
CREST	1. SURFACE TYPE	Earth	X		
	2. SURFACE CRACKING	None observed	X		
	3. SINKHOLES, ANIMAL BURROWS	Majority of burrows/voids behind upstream walls and right spillway training wall			X
	4. VERTICAL ALIGNMENT (DEPRESSIONS	None observed	X		
	5. HORIZONTAL ALIGNMENT	Good	X		
	6. RUTS AND/OR PUDDLES	Minor tire ruts on crest near left abutment			X
	7. VEGETATION (PRESENCE/CONDITION)	Good/ well developed grass cover. Some thin vegetation			X
	8. ABUTMENT CONTACT	Good	X		

ADDITIONAL COMMENTS: A six inch, 2' deep hole was observed behind the right spillway training wall near the downstream side. The majority of the other burrows/voids were not as large.

NAME OF DAM: Cedar Meadow Pond Dam STATE ID #: 3-14-151-8

INSPECTION DATE: May 28, 2020 NID ID #: MA00984

EMBANKMENT (D/S SLOPE)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S SLOPE	1. WET AREAS (NO FLOW)	No downstream slope. See Downstream masonry walls.			
	2. SEEPAGE				
	3. SLIDE, SLOUGH, SCARP				
	4. EMB.-ABUTMENT CONTACT				
	5. SINKHOLE/ANIMAL BURROWS				
	6. EROSION				
	7. UNUSUAL MOVEMENT				
	8. VEGETATION (PRESENCE/CONDITION)				

N/A

ADDITIONAL COMMENTS:

NAME OF DAM: Cedar Meadow Pond Dam STATE ID #: 3-14-151-8

INSPECTION DATE: May 28, 2020 NID ID #: MA00984

EMBANKMENT (U/S SLOPE)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S SLOPE	1. SLIDE, SLOUGH, SCARP	No upstream slope. See upstream masonry walls.			
	2. SLOPE PROTECTION TYPE AND COND.				
	3. SINKHOLE/ANIMAL BURROWS				
	4. EMB.-ABUTMENT CONTACT				
	5. EROSION				
	6. UNUSUAL MOVEMENT				
	7. VEGETATION (PRESENCE/CONDITION)				

N/A

ADDITIONAL COMMENTS:

NAME OF DAM: Cedar Meadow Pond Dam STATE ID #: 3-14-151-8

INSPECTION DATE: May 28, 2020 NID ID #: MA00984

INSTRUMENTATION

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
INSTR.	1. PIEZOMETERS	No instrumentation observed on this dam.			
	2. OBSERVATION WELLS				
	3. STAFF GAGE AND RECORDER				
	4. WEIRS				
	5. INCLINOMETERS				
	6. SURVEY MONUMENTS				
	7. DRAINS				
	8. FREQUENCY OF READINGS				
	9. LOCATION OF READINGS				

N/A

ADDITIONAL COMMENTS:

NAME OF DAM: Cedar Meadow Pond Dam STATE ID #: 3-14-151-8

INSPECTION DATE: May 28, 2020 NID ID #: MA00984

DOWNSTREAM MASONRY WALLS

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
	1. WALL TYPE	Dry stacked masonry	X		
	2. WALL ALIGNMENT	Good	X		
	3. WALL CONDITION	Multiple trees growing at downstream toe. Multiple missing cap stones on right side			X
D/S WALLS	4. HEIGHT: TOP OF WALL TO MUDLINE	min: 3' max: 15.3' avg: 8'			
	5. SEEPAGE OR LEAKAGE	Seepage at multiple locations along left downstream toe. Unknown origin		X	
	6. ABUTMENT CONTACT	Good	X		
	7. EROSION/SINKHOLES BEHIND WALL	Several small sinkholes behind wall on crest			X
	8. ANIMAL BURROWS	Several small sinkholes behind wall on crest. Unknown if animal related			X
	9. UNUSUAL MOVEMENT	None observed	X		
	10. WET AREAS AT TOE OF WALL	Wet areas along downstream toe. Flow from left abutment area towards spillway		X	
		discharge area			

ADDITIONAL COMMENTS:

NAME OF DAM: Cedar Meadow Pond Dam STATE ID #: 3-14-151-8

INSPECTION DATE: May 28, 2020 NID ID #: MA00984

UPSTREAM MASONRY WALLS

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S WALLS	1. WALL TYPE	Dry stacked masonry/gunnite face		X	
	2. WALL ALIGNMENT	Good	X		
	3. WALL CONDITION	Good	X		
	4. HEIGHT: TOP OF WALL TO MUDLINE	min: max: avg:			
	5. ABUTMENT CONTACT	Good	X		
	6. EROSION/SINKHOLES BEHIND WALL	Several small sinkholes behind wall on crest		X	X
	7. ANIMAL BURROWS	Several small sinkholes behind wall on crest. Unknown if animal burrows		X	X
	8. UNUSUAL MOVEMENT	Upstream wall tilts outward slightly at right abutment		X	

ADDITIONAL COMMENTS: Spillway wingwalls span 50 feet right of the spillway and 30 feet left of the spillway. Concrete is in good condition.

NAME OF DAM: Cedar Meadow Pond Dam STATE ID #: 3-14-151-8

INSPECTION DATE: May 28, 2020 NID ID #: MA00984

DOWNSTREAM AREA

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S AREA	1. ABUTMENT LEAKAGE	Seepage toward the left abutment may be abutment seepage. Need further analysis		X	
	2. FOUNDATION SEEPAGE	Multiple wet areas & seepage at toe			X
	3. SLIDE, SLOUGH, SCARP	None observed	X		
	4. WEIRS	None observed	X		
	5. DRAINAGE SYSTEM	None observed	X		
	6. INSTRUMENTATION	None observed	X		
	7. VEGETATION	Heavy tree and vegetation growth within 20 feet of the dam			X
	8. ACCESSIBILITY	Downstream area near left abutment owned by private owner. No access allowed	X		
		Downstream area elsewhere accessible by foot from Charles Street			
	9. DOWNSTREAM HAZARD DESCRIPTION	Pine Street 1/4 mile downstream. Private residence 1/2 mile downstream may be flooded. Flows eventually enter Greenville Pond Dam (High Hazard)			
	10. DATE OF LAST EAP UPDATE	1-Jan			

ADDITIONAL COMMENTS:

NAME OF DAM: Cedar Meadow Pond Dam STATE ID #: 3-14-151-8

INSPECTION DATE: May 28, 2020 NID ID #: MA00984

MISCELLANEOUS

AREA INSPECTED	CONDITION	OBSERVATIONS
	1. RESERVOIR DEPTH (AVG)	See bathymetric survey (Appendix C)
	2. RESERVOIR SHORELINE	Wooded with residential development
	3. RESERVOIR SLOPES	Low to moderate
MISC.	4. ACCESS ROADS	Charles Street privides access to left abutment
	5. SECURITY DEVICES	Locked gate at Charles Street. Locked fencing & gate on left and right crest
	6. VANDALISM OR TRESPASS	☐ YE ☑ N WHAT:
	7. AVAILABILITY OF PLANS	☑ YE ☐ N DATE: Construction Plans 2012
	8. AVAILABILITY OF DESIGN CALCS	☐ YE ☑ N DATE:
	9. AVAILABILITY OF EAP/LAST UPDATE	☑ YE ☐ N DATE: 1-Jan-20
	10. AVAILABILITY OF O&M MANUAL	☐ YE ☐ N DATE:
	11. CARETAKER/OWNER AVAILABLE	☑ YE ☐ N DATE: May 28, 2020
	12. CONFINED SPACE ENTRY REQUIRED	☐ YE ☐ N PURPOSE:

ADDITIONAL COMMENTS:

NAME OF DAM: Cedar Meadow Pond Dam STATE ID #: 3-14-151-8

INSPECTION DATE: May 28, 2020 NID ID #: MA00984

PRIMARY SPILLWAY

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
SPILLWAY	SPILLWAY TYPE	Concrete overflow weir	X		
	WEIR TYPE	Broad crested	X		
	SPILLWAY CONDITION	Satisfactory. Spillway crest shows remnants of grout holes and crack repair	X		
	TRAINING WALLS	Few vertical through cracks in left spillway wall. Minor seepage into low flow outlet		X	
	SPILLWAY CONTROLS AND CONDITION	No controls	X		
	UNUSUAL MOVEMENT	None observed	X		
	APPROACH AREA	Clear of debris	X		
	DISCHARGE AREA	Rip rap, rubble, excell concrete mass	X		
	DEBRIS	No debris at inlet or discharge	X		
	WATER LEVEL AT TIME OF INSPECTION	844.01	X		

ADDITIONAL COMMENTS:

NAME OF DAM: Cedar Meadow Pond Dam STATE ID #: 3-14-151-8

INSPECTION DATE: May 28, 2020 NID ID #: MA00984

LOW FLOW SLUICEWAY

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
SPILLWAY	SPILLWAY TYPE	Sluiceway at left end of main spillway	X		
	WEIR TYPE	Sharp crested (stop logs)	X		
	SPILLWAY CONDITION	Satisfactory (Controls not tested).	X		
	TRAINING WALLS	Fair. Few vertical through cracks in concrete w/ minimal flow from spilway		X	
	SPILLWAY CONTROLS AND CONDITION	Appeared to be in good condition. Weir boards reently replaced	X		
	UNUSUAL MOVEMENT	None observed	X		
	APPROACH AREA	Clear	X		
	DISCHARGE AREA	Clear	X		
	DEBRIS	None observed	X		
	WATER LEVEL AT TIME OF INSPECTION	At spillway invert; 883.44	X		

ADDITIONAL COMMENTS:

NAME OF DAM: Cedar Meadow Pond Dam STATE ID #: 3-14-151-8

INSPECTION DATE: May 28, 2020 NID ID #: MA00984

OUTLET WORKS

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
OUTLET WORKS	TYPE	Low level outlet; 16" HDPE pipe			
	INTAKE STRUCTURE	Gate valve with trash rack/screen		X	
	TRASHRACK	Submerged. Unable to observed	X		
	PRIMARY CLOSURE	Gate valve	X		
	SECONDARY CLOSURE	None	X		
	CONDUIT	16" HDPE - used as a slipliner in 2'x2' original stoned lined conduit	X		
	OUTLET STRUCTURE/HEADWALL	Downstream dam face. Dry stacked masonry	X		
	EROSION ALONG TOE OF DAM	None observed	X		
	SEEPAGE/LEAKAGE	None observed	X		
	DEBRIS/BLOCKAGE	None observed	X		
	UNUSUAL MOVEMENT	None observed	X		
	DOWNSTREAM AREA	Small channel to confluence with Burncoat Brook	X		
	MISCELLANEOUS				

ADDITIONAL COMMENTS: A small stilling pool was observed at the discharge area with minimal flow. The caretaker stated that the low level outlet was recently opened.

NAME OF DAM: Cedar Meadow Pond Dam STATE ID #: 3-14-151-8

INSPECTION DATE: May 28, 2020 NID ID #: MA00984

CONCRETE/MASONRY DAMS

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
GENERAL	TYPE				
	AVAILABILITY OF PLANS				
	AVAILABILITY OF DESIGN CALCS				
	PIEZOMETERS				
	OBSERVATION WELLS				
	INCLINOMETERS				
	SEEPAGE GALLERY				
	UNUSUAL MOVEMENT				

N/A

ADDITIONAL COMMENTS:

NAME OF DAM: Cedar Meadow Pond Dam STATE ID #: 3-14-151-8

INSPECTION DATE: May 28, 2020 NID ID #: MA00984

CONCRETE/MASONRY DAMS (CREST)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
CREST	TYPE				
	SURFACE CONDITIONS				
	CONDITIONS OF JOINTS				
	UNUSUAL MOVEMENT				
	HORIZONTAL ALIGNMENT				
	VERTICAL ALIGNMENT				

N/A

ADDITIONAL COMMENTS:

NAME OF DAM: Cedar Meadow Pond Dam STATE ID #: 3-14-151-8

INSPECTION DATE: May 28, 2020 NID ID #: MA00984

CONCRETE/MASONRY DAMS (DOWNSTREAM FACE)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S FACE	TYPE				
	SURFACE CONDITIONS				
	CONDITIONS OF JOINTS				
	UNUSUAL MOVEMENT				
	ABUTMENT CONTACT				
	LEAKAGE				

N/A

ADDITIONAL COMMENTS:

NAME OF DAM: Cedar Meadow Pond Dam STATE ID #: 3-14-151-8

INSPECTION DATE: May 28, 2020 NID ID #: MA00984

CONCRETE/MASONRY DAMS (UPSTREAM FACE)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S FACE	TYPE				
	SURFACE CONDITIONS				
	CONDITIONS OF JOINTS				
	UNUSUAL MOVEMENT				
	ABUTMENT CONTACTS				

N/A

ADDITIONAL COMMENTS:

DAM SAFETY INSPECTION CHECKLIST INSTRUCTION PAGE

The checklist (Excel file) includes sections applicable to a variety of dam structure types. Carefully follow the instructions on the first tab of the checklist. Complete those pages pertaining to each structure and omit pages that are not relevant or mark them "Not Applicable." The Checklist must be signed by the inspecting engineer and a clean, neat copy included in the final inspection report. Use the checklist to generate the Dam Evaluation Summary Detail Sheet (should immediately follow the Executive Summary) and Table 1.1 (should immediately follow Section 1.0).

E1: DESIGN METHODOLOGY
1. Unknown Design – no design records available
2. No design or post-design analyses
3. No analyses, but dam features appear suitable
4. Design or post-design analyses show dam meets most criteria
5. State of the art design – design records available & dam meets all criteria

E2: LEVEL OF MAINTENANCE
1. Dam in disrepair, no evidence of maintenance, no O&M manual
2. Dam in poor level of upkeep, very little maintenance, no O&M manual
3. Dam in fair level of upkeep, some maintenance and standard procedures
4. Adequate level of maintenance and standard procedures
5. Dam well maintained, detailed maintenance plan that is executed

E3: EMERGENCY ACTION PLAN
1. No plan or idea of what to do in the event of an emergency
2. Some idea but no written plan
3. No formal plan but well thought out
4. Available written plan that needs updating
5. Detailed, updated written plan available, filed with MADCR, annual training

E4: EMBANKMENT SEEPAGE (Embankment, Foundation & Abutments)
1. Severe piping and/or seepage with no monitoring
2. Evidence of monitored piping and seepage
3. No piping but monitored seepage
4. Minor seepage or high volumes of seepage with filtered collection
5. No seepage or minor seepage with filtered collection

E5: EMBANKMENT CONDITION (see Note 1)
1. Severe erosion and/or large trees
2. Significant erosion or significant woody vegetation
3. Brush and exposed embankment soils, or moderate erosion
4. Unmaintained grass, rodent activity and maintainable erosion
5. Well maintained, healthy uniform grass cover

E6: CONCRETE CONDITION (see Note 2)
1. Major cracks, misalignment, discontinuities causing leaks, seepage or stability concerns
2. Cracks with misalignment inclusive of transverse cracks with no mis-alignment but with potential for significant structural degradation
3. Significant longitudinal cracking and minor transverse cracking
4. Spalling and minor surface cracking
5. No apparent deficiencies

E7: LOW-LEVEL OUTLET DISCHARGE CAPACITY
1. No low-level outlet, no provisions (e.g., pumps, siphons) for emptying pond
2. No operable outlet, plans for emptying pond, but no equipment
3. Outlet with insufficient drawdown capacity, pumping equipment available
4. Operable gate with sufficient drawdown capacity
5. Operable gate with capacity greater than necessary

E8: LOW-LEVEL OUTLET PHYSICAL CONDITION
1. Outlet inoperative needs replacement, non-existent or inaccessible
2. Outlet inoperative needs repair
3. Outlet operable but needs repair
4. Outlet operable but needs maintenance
5. Outlet and operator operable and well maintained

E9: SPILLWAY DESIGN FLOOD CAPACITY
1. 0 - 50% of the SDF or unknown
2. 51- 90% of the SDF
3. 91- 100% of the SDF
4. >100% of the SDF with actions required by caretaker (e.g., open outlet)
5. >100% of the SDF with no actions required by caretaker

E10: OVERALL PHYSICAL CONDITION OF THE DAM
1. *UNSAFE* – Major structural, operational, and maintenance deficiencies exist under normal operating conditions
2. *POOR* - Significant structural, operation and maintenance deficiencies are clearly recognized for normal loading conditions
3. *FAIR* - Significant operational and maintenance deficiencies, no structural deficiencies. Potential deficiencies exist under unusual loading conditions that may realistically occur. Can be used when uncertainties exist as to critical parameters
4. *SATISFACTORY* - Minor operational and maintenance deficiencies. Infrequent hydrologic events would probably result in deficiencies.
5. *GOOD* - No existing or potential deficiencies recognized. Safe performance is expected under all loading including SDF

E11: ESTIMATED REPAIR COST
Estimation of the total cost to address all identified structural, operational, maintenance deficiencies. Cost shall be developed utilizing standard estimating guides and procedures

Guidelines and Notes for Evaluations

Each of the evaluation categories has 5 rating levels. In general, the rating levels in each category are intended to reflect the following conditions:

1. Unsafe
2. Poor
3. Fair
4. Satisfactory
5. Good

<u>E10-Overall Safety Rating Guideline</u>
Unless the inspecting engineer presents compelling data, analyses, and observations that justify a higher rating, E10-Overall Safety Rating of the Dam shall not be higher than the lowest ranking in these high importance categories:
-E4-Seepage,
-E5-Embankment Condition (for embankment dams), and
-E6-Concrete Condition (for dams where concrete structures retain water).

Note 1 - Embankment Condition Factor of Safety Criteria
In addition to the inspection conditions listed, the embankment condition rating should consider the slope stability Factor of Safety (FS) according to the following guidelines for downstream (D/S) and upstream slopes (U/S).

	Normal Pool	**SDF**	**Seismic**	**Rapid Drawdown**
Rating	**D/S & U/S FS**	**D/S FS**	**D/S & U/S FS**	**U/S FS**
1	<1.3	<1.1	<1.0	<1.0
2	<1.5	<1.4	<1.0	<1.1
3	>1.5	<1.5	<1.1	<1.2
4	>1.5	>1.5	>1.1	>1.2
5	>1.5	>1.5	>1.1	>1.2

In the absence of stability analyses, use the following factors to evaluate the stability component of the embankment rating. The inspecting engineer will need to consider all factors in combination as the exact combination of conditions listed will rarely occur. For slopes, > indicates "steeper than."

Rating	**Slopes**	**Seepage**	**Material**	**Compaction**
1	>2H:1V	>5' above toe	SP, ML*, SM*	Loose or unknown
2	>2.5H:1V	>2' above toe	ML**, MH	Loose or unknown
3	>3H:1V	at toe	SM**, SW, CH	Likely compacted
4	<3H:1V	DS of toe	SC, CL	Compacted
5	<3H:1V	None	Suitably Zoned	Compacted

ML* - Non-plastic silt or any silt or clay susceptible to dispersion
ML** - Silt with some plasticity (non-dispersive)
SM* - Uniform silty fine sand
SM** - Widely graded silty sand

Note 2 - Concrete Condition Factor of Safety Criteria
In addition to the inspection conditions listed, ratings should consider the sliding stability Factors of Safety (FS) for any concrete structures that retain water according to the following guidelines.

FS Criteria for Dams with Limited Structure and Foundation Information and Testing

Rating	**Normal Pool FS**	**SDF FS**	**Ice Loading FS**	**Seismic FS**
1	<2.0	<1.3	<1.3	<1.0
2	<3.0	<2.0	<2.0	<1.3
3	>3.0	>2.0	>2.0	<1.5
4	>3.0	>2.0	>2.0	>1.5
5	>3.0	>2.0	>2.0	>1.5

FS Criteria for Dams with Well Defined Structure and Foundation Information and Testing

Rating	**Normal Pool FS**	**SDF FS**	**Ice Loading FS**	**Seismic FS**
1	<1.5	<1.3	<1.3	<1.0
2	<2.0	<1.7	<1.7	<1.0
3	<3.0	<2.0	<2.0	<1.1
4	>3.0	>2.0	>2.0	<1.3
5	>3.0	>2.0	>2.0	>1.3

See Appendix D for a complete listing of dam orientation and terminology definitions.

Upstream – Shall mean the side of the dam that borders the impoundment.

Downstream – Shall mean the high side of the dam, the side opposite the upstream side.

Right – Shall mean the area to the right when looking in the downstream direction.

Left – Shall mean the area to the left when looking in the downstream direction.

Height of Dam – Shall mean the vertical distance from the lowest portion of the natural ground, including any stream channel, along the downstream toe of the dam to the crest of the dam.

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

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

Abutment – Shall mean that part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment.

Appurtenant Works – Shall mean structures, either in dams or separate therefrom, including but not be limited to, spillways; reservoirs and their rims; low-level outlet works; and water conduits including tunnels, pipelines, or penstocks, either through the dams or their abutments.

Spillway – Shall mean a structure over or through which water flows are discharged. If the flow is controlled by gates or boards, it is a controlled spillway; if the fixed elevation of the spillway crest controls the level of the impoundment, it is an uncontrolled spillway.

APPENDIX C

Previous Reports and References

PREVIOUS REPORTS AND REFERENCES

The following is a list of reports that were located during the file review, or were referenced in previous reports.

1. Cedar Meadow Pond Dam Phase I Inspection/Evaluation Report, by Lenard Engineering, Inc., 6/10/15.

2. Existing Conditions Plan, Cedar Meadow Lake, Leicester, MA, by Waterman Design Associates, Inc. for Cedar Meadow Watershed District, 3/7/2013.

3. Cedar Meadow Lake Watershed District, "Revision to Chapter 253 Permit Application Modifications to Cedar Meadow Pond Dam," 2/14/2013.

4. Soil Grouting Plan, Cedar Meadow Lake, Leicester, MA, by Lenard Engineering, Inc. for Cedar Meadow Watershed District, 2/13/2013.

5. Cedar Meadow Lake Watershed District, "Chapter 253 Permit Application Modifications to Cedar Meadow Pond Dam," 5/16/2012.

6. Cedar Meadow Pond Dam, Leicester, MA, by Lenard Engineering, Inc. for Cedar Meadow Watershed District, 5/7/2012.

7. Emergency Action Plan for Cedar Meadow Lake Dam, http://www.cedarmeadow.org/, prepared by Cedar Meadow Lake Watershed District, December 2008.
8.
9. Cedar Meadow Pond Dam Phase I Inspection/Evaluation Report, by Lenard Engineering, Inc., 10/17/07.

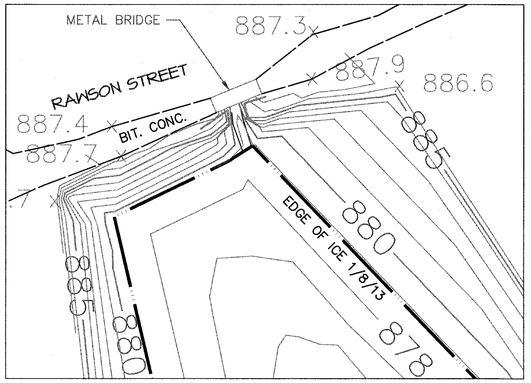
10. Cedar Meadow Pond Dam Phase I Inspection/Evaluation Report, prepared by Haley & Aldrich, for the Town of Leicester, May 14, 1998.

11. Cedar Meadow Lake Watershed District, "Chapter 253 Permit Application Modifications to Cedar Meadow Pond Dam," 1997.

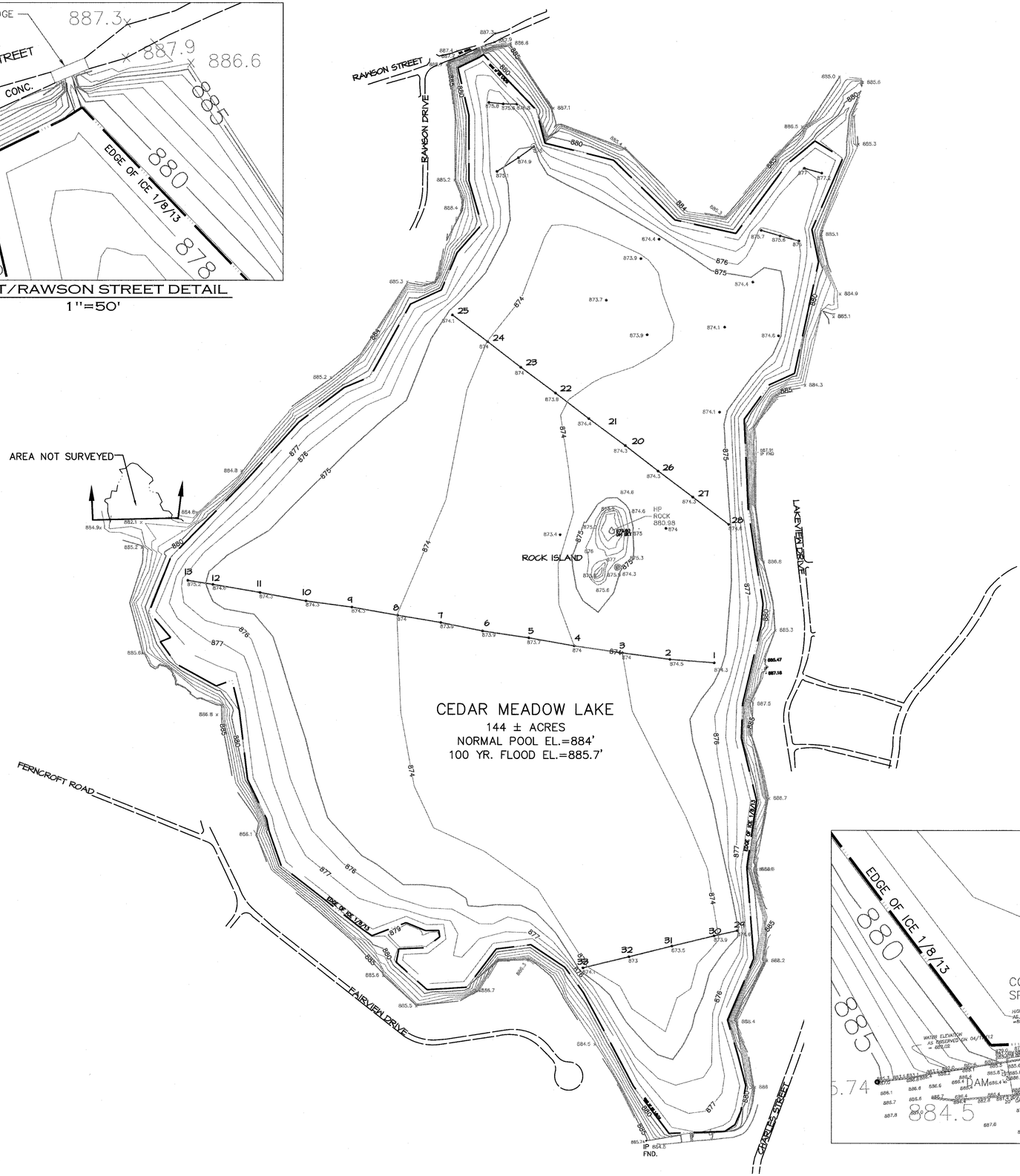
The following references were utilized during the preparation of this report and the development of the recommendations presented herein.

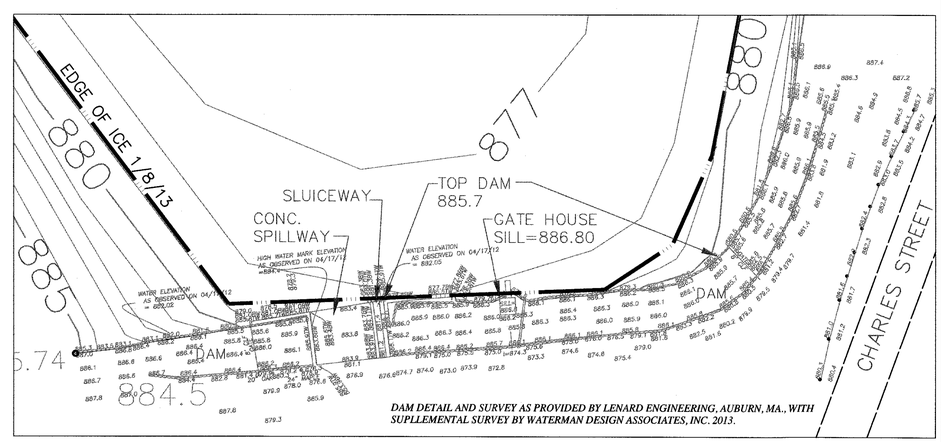
1. USGS "Streamstats", http://water.usgs.gov/osw/streamstats/massachusetts.html

2. USGS, "Estimating Peak Discharges of Small Rural Streams in Massachusetts", Wandle, 1983.



INLET/RAWSON STREET DETAIL
1"=50'





DAM DETAIL AND SURVEY AS PROVIDED BY LENARD ENGINEERING, AUBURN, MA., WITH SUPLLEMENTAL SURVEY BY WATERMAN DESIGN ASSOCIATES, INC. 2013.

DAM/SPILLWAY DETAIL
1"=40'

REV.	DATE	DESCRIPTION	APP'D.
A		INITIAL ISSUE	

PROGRESS PLAN

PREPARED BY:
WATERMAN DESIGN ASSOCIATES, INC.
31 East Main Street
Westborough, MA 01581
508.366.6552
508.366.6506 (fax)
watermandesign.com wda@wdassoc.com

OWNER:
CEDAR MEADOW LAKE WATERSHED DISTRICT
1 MAPLE GLEN LANE
LEICESTER, MA
01524

PREPARED FOR:
CEDAR MEADOW LAKE WATERSHED DISTRICT
1 MAPLE GLEN LANE
LEICESTER, MA
01524

TITLE:
EXISTING CONDITIONS PLAN
CEDAR MEADOW LAKE
Leicester, MA
(Worcester County)

FOR REVIEW

0 200 400 600

DATE: 3/7/13	SCALE: 1" = 200'
JOB NO.: 0863.00	RSCH. BY:
	FIELD BY: SPC/JRZ/BPW
	CALC. BY: SPC/BPW
FILE NO.: 0863001	DWN. BY: SPC/BPW
	CHK'D. BY: SPC
DRAWING NO.: 0863002A	SHEET: 1

CEDAR MEADOW POND DAM (MA00984)

DAM REPAIRS

LEICESTER, MASSACHUSETTS

CONSTRUCTION PLANS

5/16/12

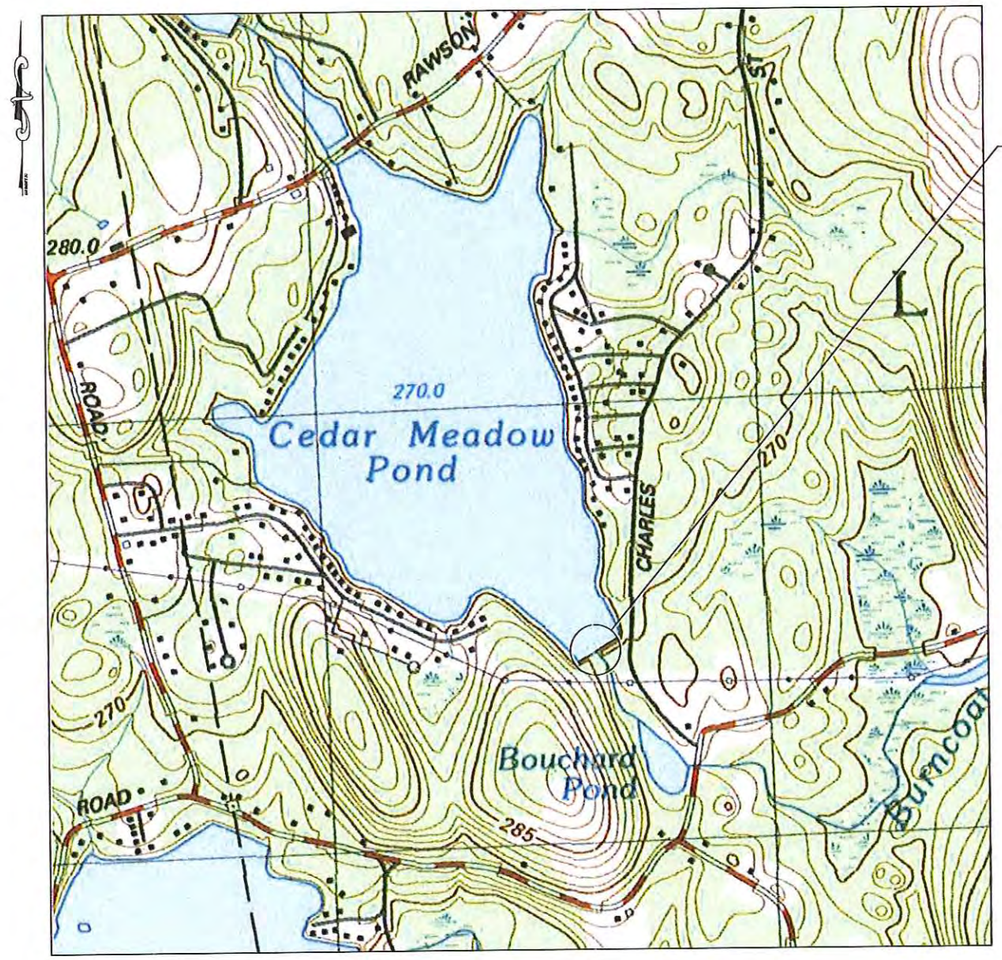
COMMONWEALTH OF MASSACHUSETTS
KAREN S. FUNG
CIVIL
No. 47605
REGISTERED PROFESSIONAL ENGINEER

DRAWING INDEX

SHEET NO.	TITLE
1	COVER SHEET
2	EXISTING CONDITIONS
3	PROPOSED CONDITIONS

LEGEND

EXISTING		PROPOSED
	SOIL BORING	
910	MAJOR CONTOUR	920
912	MINOR CONTOUR	917
	EDGE OF WETLANDS	
	EDGE OF POND	
	EDGE OF BROOK	
100'VB	LIMIT OF 100' BUFFER ZONE	
	EDGE OF GRAVEL ACCESS ROAD	
12+00	CENTERLINE OF GRAVEL ACCESS ROAD	
PL	PROPERTY LINE	
	SILT FENCE/ HAYBALE BARRIER	
	COFFER DAM	
	SPOT GRADE	EL. X663.44
	MASONRY WALL	



OWNER:
CEDAR MEADOW LAKE WATERSHED DISTRICT
C/O
ONE MAPLE GLEN LANE
LEICESTER, MA 01524

ENGINEER:
LENARD ENGINEERING, INC.
19 MIDSTATE DRIVE, SUITE 200
AUBURN, MA 01501

SURVEYOR:
FIELD RESOURCES
249 MILLBURY ST.
AUBURN, MA 01501

LOCATION MAP

SCALE 1" = 500'

GRAPHIC SCALE

(IN FEET)
1 inch = 500 ft.

Designed By: KSF
Drawn By: KSF
Checked By: SDC
CAD File:

Drawing Scale: AS SHOWN

Rev.	Date	Revision	By

Drawing date: 5/7/12

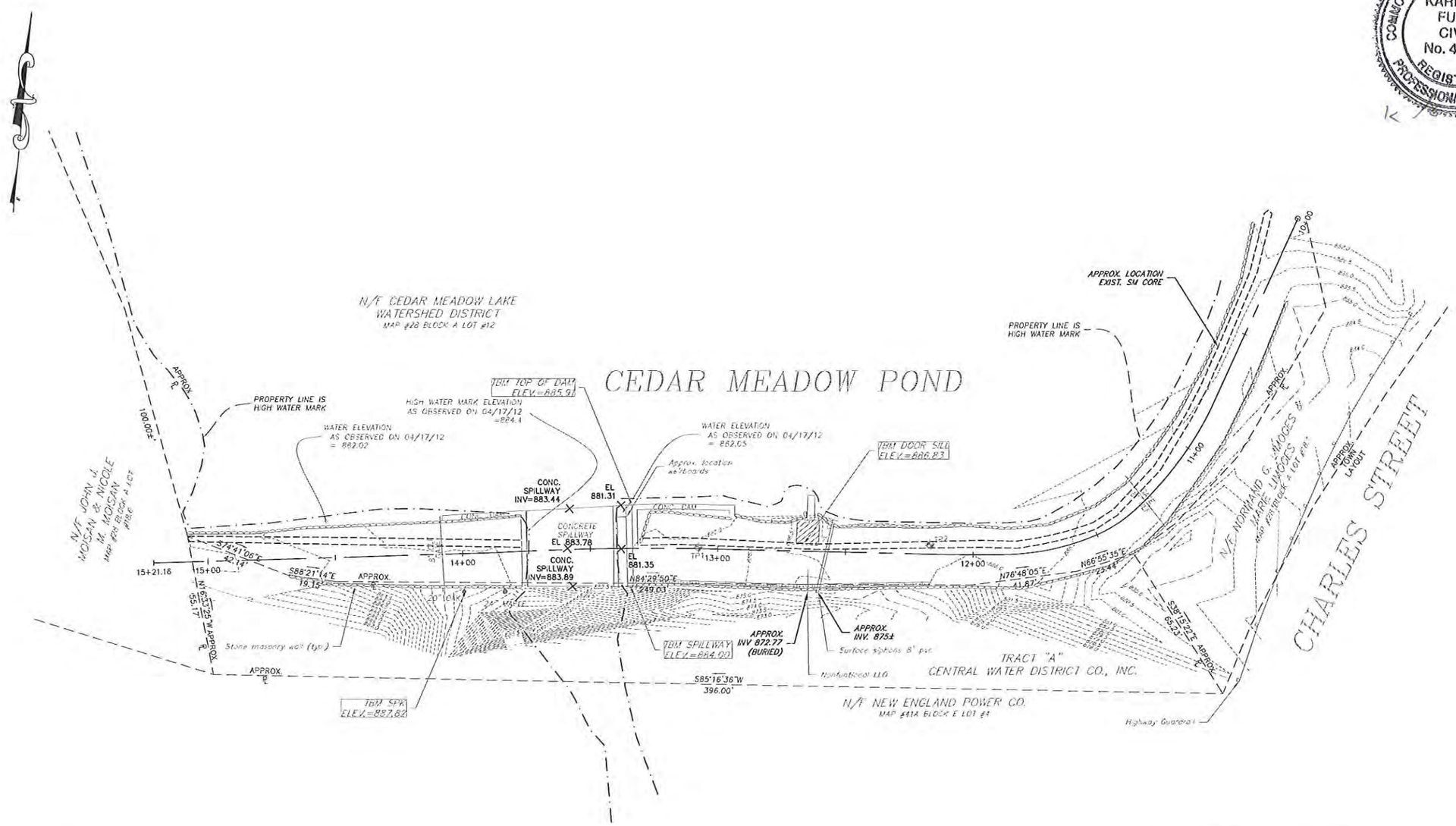
COVER

PREPARED FOR
CEDAR MEADOW LAKE WATERSHED DISTRICT
LEICESTER, MASSACHUSETTS

Lenard Engineering, Inc.
Civil, Environmental and Hydrogeological Consultants
2210 Main Street, GLASTONBURY, CT, (860) 659-3100
140 Willow Street, WINSTED, CT, (860) 379-6869
19 Midstate Drive, AUBURN, MA, (508) 721-7900

Drawing #: 1 OF 3

Job #: 12-706



GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

GENERAL NOTES:

1. SM REFERS TO USCS SOIL CLASSIFICATION FOR SAND/SILT MATERIAL.
2. ELEVATION AND EXTENT OF EXISTING SM CORE VARIES. USE TEST PITS TO DETERMINE EXTENT. TOP OF SM CORE FOUND IN TEST PIT #1 AT -42" BELOW CREST AND IN TEST PIT #2 AT -49" BELOW CREST ON 4/11/12.

5/10/12

COMMONWEALTH OF MASSACHUSETTS
KAREN S. FUNG
CIVIL
No. 47605
REGISTERED PROFESSIONAL ENGINEER

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Drawn By: KSF
Checked By: SDC
CAD File:

Drawing Scale: AS SHOWN
Drawing date: 5/7/12

Rev.	Date	Revision	By

EXISTING CONDITIONS

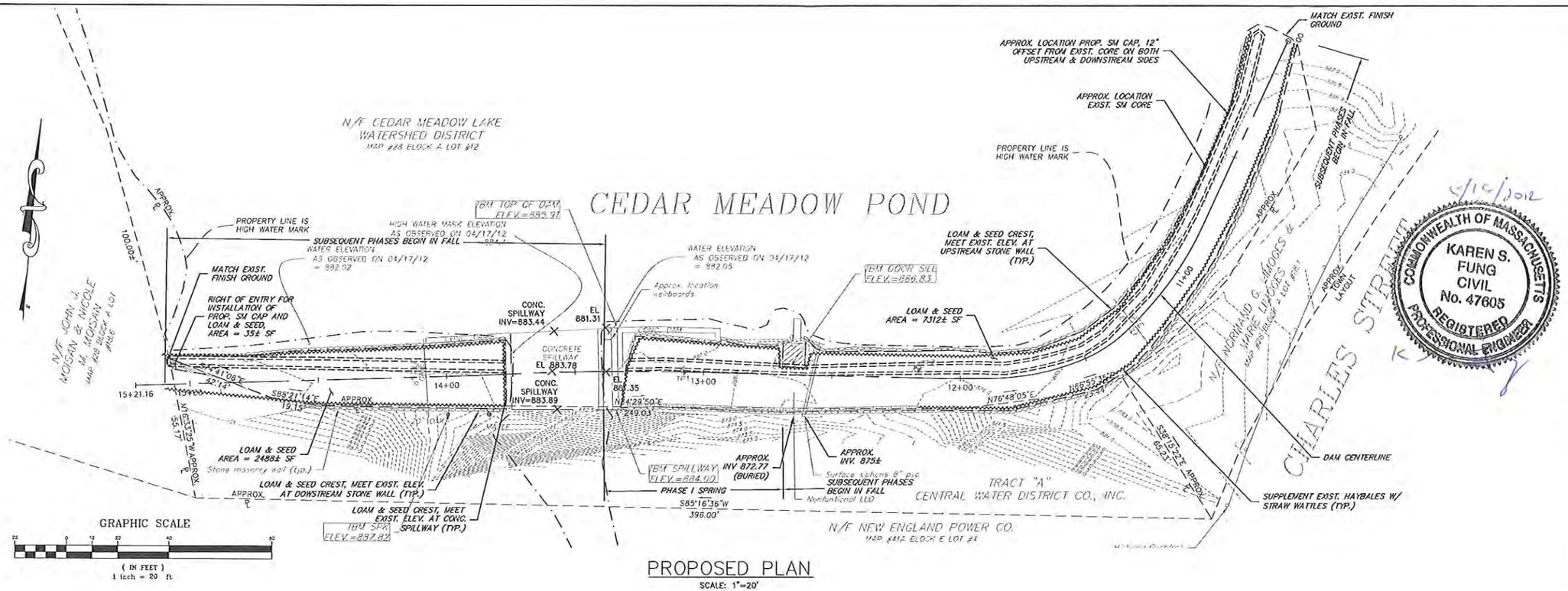
PREPARED FOR

CEDAR MEADOW LAKE WATERSHED DISTRICT
LEICESTER, MASSACHUSETTS

Lenard Engineering, Inc.
Civil, Environmental and Hydrogeological Consultants
2210 Main Street GLASTONBURY, CT (860) 659-3100
140 Willow Street WINSTED, CT (860) 379-8569
19 Midstate Drive AUBURN, MA (508) 721-7500

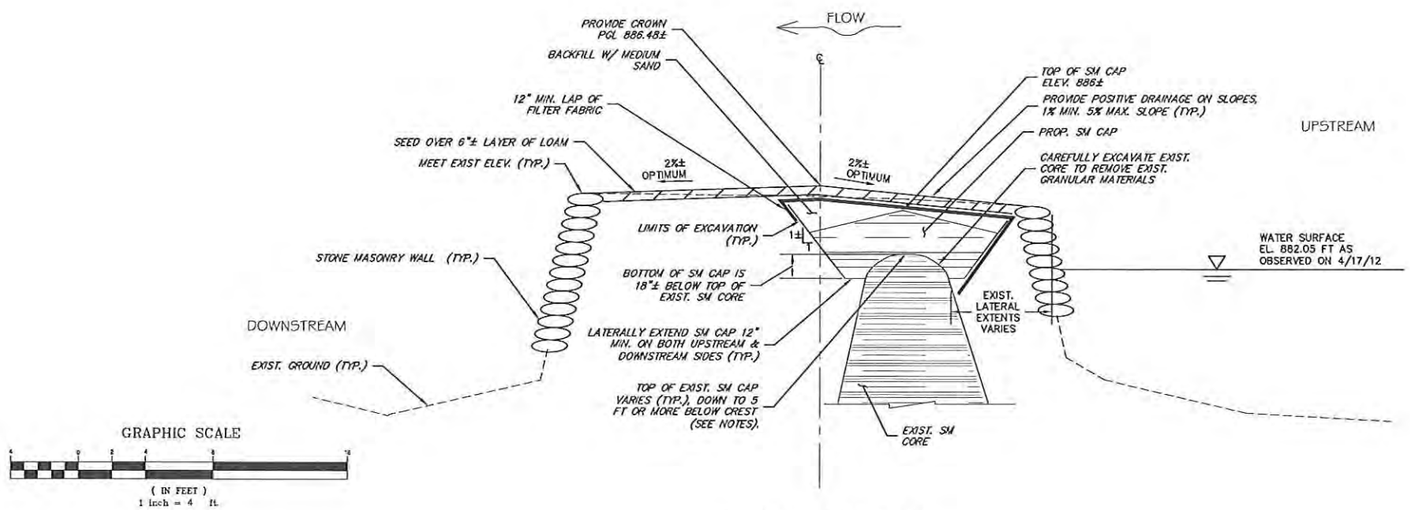
Drawing #:
2 OF 3

Job #: 12-706



PROPOSED PLAN

SCALE: 1"=20'



TYPICAL SECTION

SCALE: 1"=4'

GENERAL NOTES:

1. SM REFERS TO USCS SOIL CLASSIFICATION FOR SAND/SILT MATERIAL.
2. WORK SHALL BE CONDUCTED IN PHASES: PHASE I (BETWEEN GATE HOUSE AND SPILLWAY) SHALL BE CONDUCTED DURING THE SPRING; SUBSEQUENT PHASES (RIGHT OF THE GATE HOUSE AND LEFT OF SPILLWAY) SHALL COMMENCE IN THE FALL AND BE CONDUCTED DURING PERIODS OF ANNUAL FALL DRAWDOWNS.
3. THE ELEVATION AND EXTENT OF EXISTING SM CORE VARIES. FOR THE LOCATION OF THE EXISTING SM CORE IN PHASE I, THE RESULTS OF TEST PITS ARE AVAILABLE FROM THE ENGINEER. PRIOR TO BEGINNING PHASE II, THE CONTRACTOR SHALL EXCAVATE TEST PITS TO DETERMINE THE EXTENT OF THE EXISTING SM CORE IN THE REMAINDER OF THE DAM.
4. EXCAVATE ONLY 25% OF THE DAM LENGTH AT A TIME. BACKFILL AND COMPACT EACH QUARTER-LENGTH PRIOR TO OPENING A NEW EXCAVATION.
5. PROVIDE A TOP COVER OF 6" MIN. OF LOAM OVER THE TOP OF SM CAP.
6. PROVIDE SIDE COVER OF 12" MIN. OF MEDIUM SAND.
7. ENSURE PROPER MOISTURE CONTENT OF PROPOSED BORROW MATERIALS FOR COMPACTION.
8. COMPACT SM CAP, MEDIUM SAND, AND LOAM BORROW WITH 4 FT WIDE DRUM ROLLER, NO VIBRATION.
9. SCRATCH TOP OF COMPACTED LOAM BY HAND WITH A RAKE PRIOR TO PLACEMENT OF SEED.

6/14/2012

COMMONWEALTH OF MASSACHUSETTS
KAREN S. FUNG
CIVIL
No. 47605
REGISTERED PROFESSIONAL ENGINEER

Designed By: KSF
Drawn By: KSF
Checked By: SDC
CAD File:

Drawing Scale: AS SHOWN

Drawing date: 5/7/12

Rev.	Date	Revision	By

PROPOSED CONDITIONS

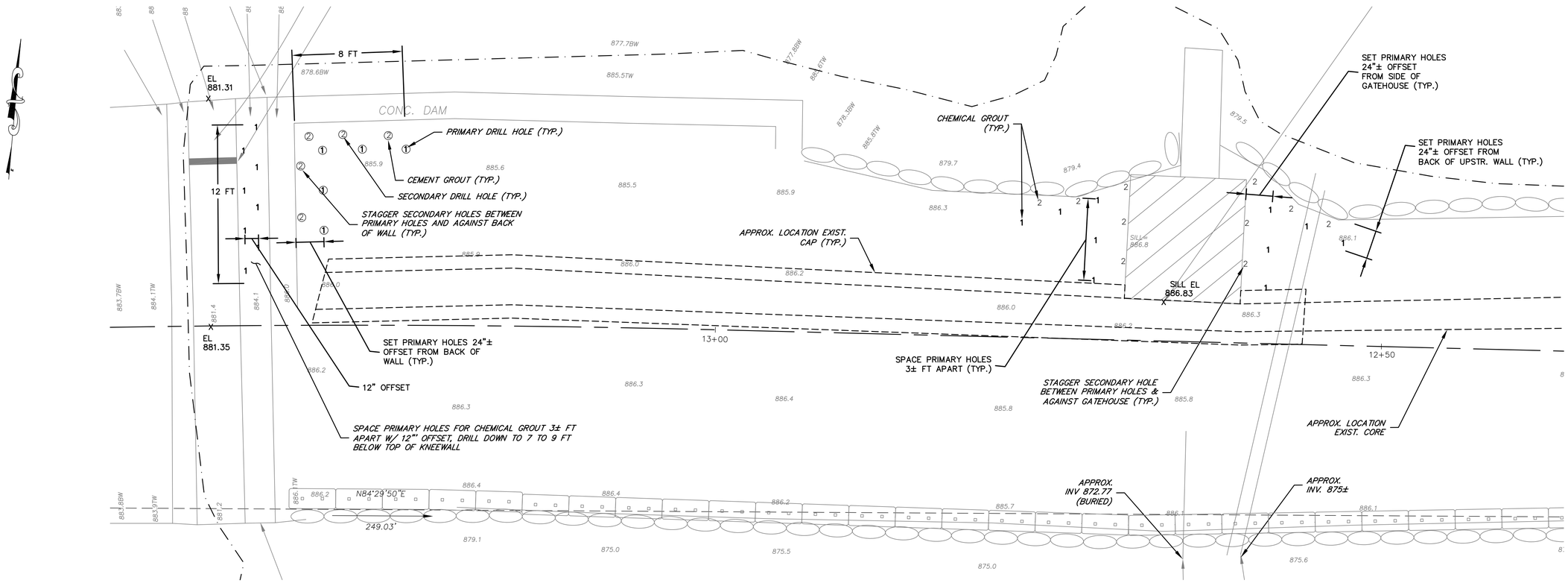
PREPARED FOR

CEDAR MEADOW LAKE WATERSHED DISTRICT LEICESTER, MASSACHUSETTS

Lenard Engineering, Inc.
Civil, Environmental and Hydrogeological Consultants
2210 Main Street CLASTONBURY, CT (860) 659-3100
140 Willow Street WINSTED, CT (860) 379-6669
19 Midstate Drive AUBURN, MA (508) 721-7600

Drawing #: 3 OF 3

Job #: 12-706



PROPOSED PLAN
STA. 12+55 TO 13+35

SCALE: 1"=4'

GRAPHIC SCALE

4 0 2 4 8 16

(IN FEET)
1 inch = 4 ft.

GENERAL NOTES:

1. ELEVATION AND EXTENT OF EXISTING CAP AND CORE VARIES.
2. LOCATIONS OF DRILL HOLES FOR GROUT ARE APPROXIMATE. ACTUAL LOCATIONS AND DEPTHS SHALL BE DETERMINED IN THE FIELD BY THE ENGINEER.
3. ALL DRILL HOLES SHALL BE LOCATED ON THE UPSTREAM SIDE OF THE CORE AND CAP UNLESS OTHERWISE SPECIFIED OR OTHERWISE DIRECTED BY THE ENGINEER.
4. EFFICACY OF GROUT IN PRIMARY DRILL HOLES SHALL BE DETERMINED PRIOR TO EXECUTION OF SECONDARY DRILL HOLES. AFTER EVALUATION OF GROUT IN PRIMARY DRILL HOLES, SECONDARY DRILL HOLES WITH GROUT WILL BE INSTALLED IF NEEDED AND AT THE DIRECTION OF THE ENGINEER.
5. EXCEPT FOR DRILL HOLES IN THE EASTERN KNEEWALL OF THE SLUICEWAY, DRILL ALL HOLES 10 TO 14 FT DEEP IF NOT OTHERWISE SPECIFIED OR IF OTHERWISE DIRECTED BY THE ENGINEER. DRILL HOLES IN THE KNEEWALL OF THE SLUICEWAY SHALL BE DRILLED DOWN TO 7 FT MINIMUM BELOW TOP OF THE KNEEWALL, UNLESS OTHERWISE SPECIFIED OR IF OTHERWISE DIRECTED BY THE ENGINEER.

Designed By: KSF
Drawn By: KSF
Checked By: SDC
CAD File: CEDAR MEADOW SITE PLAN

Drawing Scale: AS SHOWN
Drawing date: 2/13/13

Rev.	Date	Revision	By

SOIL GROUTING

PREPARED FOR

CEDAR MEADOW LAKE
WATERSHED DISTRICT
LEICESTER, MASSACHUSETTS

Lenard Engineering, Inc.
Civil, Environmental and Hydrogeological Consultants
2210 Main Street, GLASTONBURY, CT (860) 659-3100
140 Willow Street, WINSTED, CT (860) 379-6669
19 Midstate Drive, AUBURN, MA (508) 721-7600

Drawing #: 1 OF 1

Job #: 12-706

APPENDIX D
Definitions

COMMON DAM SAFETY DEFINITIONS

For a comprehensive list of dam engineering terminology and definitions refer to 302 CMR10.00 Dam Safety, or other reference published by FERC, Dept. of the Interior Bureau of Reclamation, or FEMA. Please note should discrepancies between definitions exist, those definitions included within 302 CMR 10.00 govern for dams located within the Commonwealth of Massachusetts.

Orientation

Upstream – Shall mean the side of the dam that borders the impoundment.

Downstream – Shall mean the high side of the dam, the side opposite the upstream side.

Right – Shall mean the area to the right when looking in the downstream direction.

Left – Shall mean the area to the left when looking in the downstream direction.

Dam Components

Dam – Shall mean any artificial barrier, including appurtenant works, which impounds or diverts water.

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

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

Abutment – Shall mean that part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment.

Appurtenant Works – Shall mean structures, either in dams or separate therefrom, including but not be limited to, spillways; reservoirs and their rims; low-level outlet works; and water conduits including tunnels, pipelines, or penstocks, either through the dams or their abutments.

Spillway – Shall mean a structure over or through which water flows are discharged. If the flow is controlled by gates or boards, it is a controlled spillway; if the fixed elevation of the spillway crest controls the level of the impoundment, it is an uncontrolled spillway.

Size Classification

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

Large – structure with a height greater than 40 feet or a storage capacity greater than 1,000 acre-feet.

Intermediate – structure with a height between 15 and 40 feet or a storage capacity of 50 to 1,000 acre-feet.

Small – structure with a height between 6 and 15 feet and a storage capacity of 15 to 50 acre-feet.

Non-Jurisdictional – structure less than 6 feet in height or having a storage capacity of less than 15 acre-feet.

Hazard Classification

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

High Hazard (Class I) – Shall mean dams located where failure will likely cause loss of life and serious damage to home(s), industrial or commercial facilities, important public utilities, main highway(s) or railroad(s).

Significant Hazard (Class II) – Shall mean dams located where failure may cause loss of life and damage to home(s), industrial or commercial facilities, secondary highway(s) or railroad(s), or cause the interruption of the use or service of relatively important facilities.

Low Hazard (Class III) – Dams located where failure may cause minimal property damage to others. Loss of life is not expected.

General

EAP – Emergency Action Plan – Shall mean a predetermined (and properly documented) plan of action to be taken to reduce the potential for property damage and/or loss of life in an area affected by an impending dam failure.

O&M Manual – Operations and Maintenance Manual; Document identifying routine maintenance and operational procedures under normal and storm conditions.

Normal Pool – Shall mean the elevation of the impoundment during normal operating conditions.

Acre-foot – Shall mean a unit of volumetric measure that would cover one acre to a depth of one foot. It is equal to 43,560 cubic feet. One million U.S. gallons = 3.068 acre feet.

Height of Dam (Structural Height) – Shall mean the vertical distance from the lowest portion of the natural ground, including any stream channel, along the downstream toe of the dam to the lowest point on the crest of the dam.

Hydraulic Height – means the height to which water rises behind a dam and the difference between the lowest point in the original streambed at the axis of the dam and the maximum controllable water surface.

Maximum Water Storage Elevation – means the maximum elevation of water surface which can be contained by the dam without overtopping the embankment section.

Spillway Design Flood (SDF) – Shall mean the flood used in the design of a dam and its appurtenant works particularly for sizing the spillway and outlet works, and for determining maximum temporary storage and height of dam requirements.

Maximum Storage Capacity – The volume of water contained in the impoundment at maximum water storage elevation.

Normal Storage Capacity – The volume of water contained in the impoundment at normal water storage elevation.

Condition Rating

Unsafe – Major structural*, operational, and maintenance deficiencies exist under normal operating conditions.

Poor – Significant structural*, operation and maintenance deficiencies are clearly recognized for normal loading conditions.

Fair – Significant operational and maintenance deficiencies, no structural deficiencies. Potential deficiencies exist under unusual loading conditions that may realistically occur. Can be used when uncertainties exist as to critical parameters.

Satisfactory – Minor operational and maintenance deficiencies. Infrequent hydrologic events would probably result in deficiencies.

Good – No existing or potential deficiencies recognized. Safe performance is expected under all loading including SDF.

* Structural deficiencies include but are not limited to the following:

- Excessive uncontrolled seepage (e.g., upwelling of water, evidence of fines movement, flowing water, erosion, etc.)
- Missing riprap with resulting erosion of slope
- Sinkholes, particularly behind retaining walls and above outlet pipes, possibly indicating loss of soil due to piping, rather than animal burrows
- Excessive vegetation and tree growth, particularly if it obscures features of the dam and the dam cannot be fully inspected
- Deterioration of concrete structures (e.g., exposed rebar, tilted walls, large cracks with or without seepage, excessive spalling, etc.)
- Inoperable outlets (gates and valves that have not been operated for many years or are broken)