DANIELSON MILL DAM

PHASE I
INSPECTION / EVALUATION REPORT

Dam Name:	Danielson Mill Dam
NID ID#:	MA03351
Owner:	Town of Medfield
Town:	Medfield
Consultant:	Pare Corporation
Date of Inspection:	June 30, 2020

PARE CORPORATION

Dam Evaluation Summary Detail Sheet

1. NID ID:	**MA03351**	**4. Inspection Date:**	**June 30, 2020**
2. Dam Name:	**Danielson Mill Dam**	**5. Last Insp. Date:**	**November 11, 2014**
3. Dam Location:	**Medfield, MA**	**6. Next Inspection:**	**April 23, 2020**
7. Inspector:	**Clarence C. Hutto, III, P.E.**		
8. Consultant:	**Pare Corporation**		
9. Hazard Code:	**Significant**	**9a. Is Hazard Code Change Requested?:**	**No**
10. Insp. Frequency:	**5 Years**	**11. Overall Physical Condition of Dam:**	**POOR**
12. Spillway Capacity (% SDF)	**0-50% of the SDF or Unknown**		

E1. Design Methodology:	**1**	**E7. Low-Level Discharge Capacity:**	**1**
E2. Level of Maintenance:	**3**	**E8. Low-Level Outlet Physical Condition:**	**1**
E3. Emergency Action Plan:	**4**	**E9. Spillway Design Flood Capacity:**	**1**
E4. Embankment Seepage:	**4**	**E10. Overall Physical Condition of the Dam:**	**2**
E5. Embankment Condition:	**2**	**E11. Estimated Repair Cost ($1,000):**	**$644k-$1.4m**
E6. Concrete Condition:	**2**		

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

Maximum pool storage changed from 1360 acre-feet to 2900 acre-feet.
Structural height changed from 52 feet to 54 feet.
Length of dam increased from 400 feet to 560 feet and now includes the right upstream wall.
Request a change in Hazard Classification from Significant to High Hazard.

EXECUTIVE SUMMARY

This Phase I Inspection/Evaluation Report details the inspection and evaluation of Danielson Mill Dam located in Medfield, Massachusetts. The inspection was completed by Pare Corporation of Foxboro, Massachusetts on June 30, 2020. Danielson Mill Dam is an approximately 225-foot long, 7-foot high earthen embankment structure. The dam is currently classified as a **Small** sized, **Class II (Significant)** hazard potential dam.

No formal operations and maintenance plan (O&M) is known to exist for this structure. An EAP is currently under development by Pare in accordance with the MADCR requirement that significant hazard dams have an EAP on file.

In general, Danielson Mill Dam was found to be in **Poor** condition with the following deficiencies noted:

1. Overgrown vegetation, including large leaning trees, along the upstream and downstream slopes, and along abutment slopes;
2. Cracked mortar, slight stone separation, settling, and voids along the upstream masonry walls;
3. Bare areas along the crest;
4. Unprotected section of the upstream slope with scarping up to 12-inches deep;
5. Areas of previously reported seepage along the downstream toe and downstream area;
6. Failed sections of the right downstream masonry wall;
7. Voids, up to 48-inches deep, within the downstream left stone wall;
8. Significant deterioration of the stone training walls including voids, potential bulge, previously reported leakage, and subsidence of soils behind walls;
9. Significant deterioration of the concrete training walls including potential movement, significant deterioration of the timber, and subsidence of soils behind walls;
10. No EAP (currently being prepared by Pare);
11. Insufficient capacity to pass the SDF;
12. No O&M Manual;
13. Additional maintenance deficiencies and potential dam safety concerns, as identified herein.

More detailed descriptions, additional deficiencies, recommended repairs, and opinions of probable repair costs are provided within this report.

Based upon the size and hazard potential of this structure, the spillway design flood (SDF) for the dam is the 100-year storm event. A hydrologic and hydraulic (H&H) analysis was completed by Pare Corporation as part of the Hazard Potential Classification review in February of 2020. That analysis suggested that the Danielson Mill Dam is not capable of accommodating the SDF and overtops by approximately 0.4 feet during the SDF.

Pare Corporation recommends the following actions be taken to address the deficiencies found at the dam during this inspection and evaluation:

1. Develop a formalized Operations and Maintenance Manual .
2. Develop a formalized Emergency Action Plan. *(currently under contract)*
3. Evaluate seepage and saturation along the downstream side of the dam.
4. Complete a slope stability analysis.
5. Perform regular monitoring of the dam.
6. Perform regular maintenance activities.
7. Routinely review, update, and exercise the EAP once developed.

8. Rehabilitate/reconstruct the spillway system.
9. Remove the downstream boulder wall and replace with a protected, earthen slope or rebuilt, fully grouted, boulder masonry gravity wall.
10. Remove unwanted vegetation from the crest to 20 feet beyond the downstream toe for the full width of the dam, including dead and dying conifers along the downstream crest, right side. Root ball removal and replacement with select backfill will be required.
11. Remove vegetation from the upstream embankment from the crest to approximately 10 feet beyond the upper edge of the crest
12. Remove vegetation from upstream embankments along the impoundment banks on both sides, 20 feet beyond the limits of the dam
13. Remove fallen trees crossing the downstream channel
14. Develop and install a seepage mitigation system
15. Provide riprap slope protection along the upstream slope.
16. Modify the spillway accommodate the SDF.
17. Conduct additional studies, evaluations, maintenance, and repairs as noted herein.

These repairs should be made in accordance to standard design practices, specifications, and construction methods. Design of the repairs, analyses to confirm the extent or the work, and observation to verify materials/methods used should be completed by a qualified engineer experienced in the design and rehabilitation of earthen dams throughout the evaluation, design, and construction process. All work should be undertaken in accordance with the dam safety regulations stated in 302 CMR 10.00.

Prior to undertaking recommended maintenance, repairs and 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.

PREFACE

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

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection, observations during recent construction activity, and other data available to the inspection team.

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

Allen R. Orsi, P.E.
Massachusetts License No.: 46904
License Type: Civil
Vice President
Pare Corporation

TABLE OF CONTENTS

	Page No.
EXECUTIVE SUMMARY	i
PREFACE	iii
1.0 DESCRIPTION OF PROJECT	1
1.1 General	1
1.1.1 Authority	1
1.1.1 Purpose of Work	1
1.1.2 Common Dam Safety Definitions	1
1.2 Description of Project	1
1.2.1 General	1
1.2.2 Location	2
1.2.3 Owner/Operator	2
1.2.4 Purpose of the Dam	2
1.2.5 Description of the Dam and Appurtenances	2
1.2.6 Operations and Maintenance	2
1.2.7 DCR Size Classification	3
1.2.8 DCR Hazard Classification	3
1.3 Engineering Data	3
1.3.1 Drainage Area	3
1.3.2 Reservoir	3
1.3.3 Discharges at the Dam Site	4
1.3.4 General Elevations (feet)	4
1.3.5 Primary Spillway	4
1.3.6 Design and Construction Records	4
1.3.7 Operating Records	4
1.4 Summary Data Table	5
2.0 INSPECTION	6
2.1 Visual Inspection	6
2.1.1 General Findings	6
2.1.2 Dam	6
2.1.3 Spillway	7
2.1.4 Downstream Area	8
2.1.5 Reservoir Area	8
2.2 Caretaker Interview	8
2.3 Operation and Maintenance Procedures	8
2.3.1 Operational Procedures	8
2.3.2 Maintenance of Dam and Operating Facilities	8
2.4 Emergency Warning System	8
2.5 Hydraulic/Hydrologic Data	9
2.6 Structural and Seepage Stability	9
2.6.1 Embankment Structural Stability	9
2.6.2 Structural Stability of Non-Embankment Structures	9
2.6.3 Seepage Stability	9

3.0 ASSESSMENTS AND RECOMMENDATIONS 10
3.1 Assessments 10
3.2 Engineering Studies and Evaluations 11
3.3 Yearly & Recurrent Maintenance Recommendations 11
3.4 Minor Repair Recommendations 12
3.5 Remedial Modification Recommendations 12
3.6 Alternatives 12
3.7 Opinion of Probable Costs 13

FIGURES

Figure 1: Locus Plan
Figure 2: Aerial Plan
Figure 3: Site Sketch

APPENDICES

Appendix A: Photographs
Appendix B: Inspection Checklist
Appendix C: Previous Reports and References
Appendix D: Common Dam Safety Definitions
Appendix E: Visual Dam Inspection Limitations

SECTION 1

1.0 DESCRIPTION OF PROJECT

1.1 General

1.1.1 Authority

The Town of Medfield (Town) has retained Pare Corporation (Pare) to perform a visual inspection and develop a report of conditions for the Danielson Mill Dam in Medfield, Norfolk County, Massachusetts. This inspection and report were performed in accordance with MGL Chapter 253, Sections 44-50 of the Massachusetts General Laws.

1.1.1 Purpose of Work

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

The investigation is 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 and need for an emergency action plan for the site and; 4) prepare and submit a final report presenting the evaluation of the structure, including recommendations for remedial actions, and opinions of probable costs.

1.1.2 Common Dam Safety 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; 5) general; and, 6) condition rating.

1.2 Description of Project

1.2.1 General

Sections of this report are based upon available documentation, including previous inspection reports and other available information as identified in Appendix C. Other historical information obtained during the inspection, including information provided by the caretaker has also been incorporated into this report. This material is intended to provide general information. The accuracy of this referenced information was not verified as it was outside the scope of work for this inspection.

The completion of detailed hydrologic/hydraulic studies, stability analyses, subsurface investigations, and underwater investigations is beyond the scope of this evaluation.

1.2.2 Location

Danielson Mill Dam is located within Norfolk County in the Town of Medfield, Massachusetts. The dam impounds water along the Great Brook. The dam and impoundment are shown on the Medfield, MA USGS quadrangle map near coordinates 42.17054°N / 71.29507°W.

To access the dam from I-95 N, take exit 9 onto US-1 N toward Walpole/MA-27. Marge onto US-1 N and use the left lane to turn slightly left to stay of US-1 N. In 0.2 miles, take a sharp left onto US-1 S, then in 0.9 miles take a right onto Old Post Road. In 0.1 miles, continue onto Common Street then in 1.8 miles continue onto Elm Street. In 1.3 miles, continue onto MA-27 N/High Street. Follow High Street for approximately 1.5 miles. The left abutment of the dam can be accessed from High Street. The dam is located at the northwest end of the impoundment, as indicated on Figure 1: Locus Plan.

1.2.3 Owner/Operator

The dam is currently owned by the Town of Medfield Conservation Commission. The Medfield Department of Public Works (DPW) primarily completes operations and maintenance at the dam.

1.2.4 Purpose of the Dam

Danielson Mill Dam currently impounds water for recreational purposes. The dam reportedly impounded water to operate a mill during the 18th and 19th centuries.

1.2.5 Description of the Dam and Appurtenances

Danielson Mill Dam (National ID MA03351), as shown in Figure 3: Site Sketch, consists of a roughly 225-foot long earthen embankment dam with a stop log controlled stone masonry spillway channel. The dam has a hydraulic height of approximately 6 feet and a maximum structural height of approximately 7 feet.

The upstream slope of the dam is boulder lined. Within 15 feet on either side of the spillway, the upstream slope consists of a granite block upstream wing walls. The crest of the embankment is approximately 7 to 20-feet wide and is grass covered. The downstream side of the dam consist of grass slopes from the left abutment to left of the spillway with field stone retaining wall for the remainder of its length.

The primary spillway is 4-feet wide and consists stop log controlled bay atop a stepped weir. Flows from the primary spillway pass under a concrete deck over the spillway channel to the downstream channel. The training walls consist of stone masonry under the concrete slab and then transitions to a concrete training wall. Remnants of a former turbine are located 25 feet downstream of the the stop logs near the end of the spillway channel.

1.2.6 Operations and Maintenance

The Medfield DPW completes operations and maintenance of the structure. At the time of this inspection, no formal operations and maintenance manual exists for this dam structure.

1.2.7 DCR Size Classification

Danielson Mill Dam has a maximum structural height of approximately 7 feet and a maximum storage capacity of 44 acre-feet. Therefore, in accordance with Department of Conservation and Recreation Office of Dam Safety classification, under Commonwealth of Massachusetts dam safety rules and regulations stated in 302 CMR 10.00, Danielson Mill Dam is a **Small** size structure.

1.2.8 DCR Hazard Classification

Danielson Mill Dam is located upstream of residences and businesses along Homestead Drive and Spring Street / MA-27. It appears that a failure of the dam at maximum pool may result in loss of life and damage to residential, industrial, and commercial facilities, as well as overtopping at MA-27. 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, Danielson Mill Dam is classified as a **Class II (Significant)** hazard potential structure.

A hazard potential reclassification review was performed in February 2020 by Pare to determine the potential impacts to infrastructure in the downstream area associated with a failure of the Danielson Mill Dam. Based on the model results, Danielson Mill Dam appears to be appropriately classified as a Significant Hazard potential dam. This finding is primarily supported by the model results indicating that a failure of the dam during the 25- and 50-year storms is likely to result in overtopping of heavily traveled roads including Spring Street (Route 27) and South Street. In both of these cases, the non-failure scenario does not overtop the roads, as such, the incremental damage associated with overtopping of the roadways during a failure event justifies the current hazard potential classification of Significant.

1.3 Engineering Data

1.3.1 Drainage Area

The drainage area for Danielson Mill Dam is approximately 0.54 square miles and extends through residential and wooded areas within the Town of Medfield to the east and south of the dam, as shown on Figure 1: Locus Plan. The drainage area includes 51.5% forests, 2.0% lakes and ponds, 8.4% wetlands, 31.8% developed (urban) areas, 7.4% impervious areas and has an average land slope of 2.5% (250K DEM). Based upon a review of information available within the MADCR Office of Dam Safety database, no other control structures exist within the drainage area.

1.3.2 Reservoir[1]

Table 1.1 Reservoir Properties

	Elevation (feet)	Surface Area (acres)	Storage Volume (acre-feet)
Normal Pool	145.6	7.8 ±	31 ±
Maximum Pool	147.2 ±	10.3 ±	44 ±
SDF Pool	147.6 ±	11.3 ±	50 ±

[1] Information obtained from Hazard Potential Classification Review by Pare, February 2020 and available LiDAR data.

1.3.3 Discharges at the Dam Site

No records of discharges from the dam site were made available during preparation of this report.

1.3.4 General Elevations (feet)

Elevations reference the concrete weir at the invert of the spillway stoplogs with an elevation of El. 143.0 (local datum). The weir elevation was reported within the 2014 Phase I prepared by Polaris Consultants, LLC. An elevation reference has not been identified within previous reports.

A.	Top of Dam	Avg: 147.6 ft ±
		High: 147.8 ft ±
		Low: 147.4 ft ±
B.	Spillway Design Flood Pool (100-yr)	147.6 ft ±
C.	Normal Pool	145.6 ft ±
D.	Upstream Water at Time of Inspection	145.0 ft ±
E.	Downstream Water at Time of Inspection	141.2 ft ±
F.	Downstream channel	141 ft ±
G.	Toe of Dam	140 ft ± (previously reported)

1.3.5 Primary Spillway

A.	Type	Concrete Broad Crested Weir
B.	Width	4 ft
C.	Crest Elevation	
	i. Top of Stoplogs (During Inspection)	144.9 ±
	ii. Stoplog Invert (Concrete Sill)	143.0 ±

1.3.6 Design and Construction Records

The original design and/or construction records were not available for review during the preparation of this report.

1.3.7 Operating Records

No operating records were made available or indicated to exist during the inspection and preparation of this report.

1.4 Summary Data Table

1.1 Summary Data Table

National ID #	MA03351
Dam Name	Danielson Mill Dam
Dam Name (Alternate)	N/A
River Name	Great Brook, trib to West Branch Nantasket River
Impoundment Name	Danielson Pond
Hazard Class	Significant
Size Class	Small
Dam Type	Earthen Embankment
Dam Purpose	Recreation (formerly mill operation)
Structural Height of Dam (feet)	7
Hydraulic Height of Dam (feet)	6
Drainage Area (sq. mi.)	0.54
Reservoir Surface Area (acres)	108 ±
Normal Impoundment Volume (acre-feet)	31 ±
Max Impoundment Volume ((top of dam) acre-feet)	50 ±
SDF Impoundment Volume (acre-feet)	2100 ±
Spillway Type	Stop log Controlled Concrete Broad Crested Weir
Spillway Length (feet)	4
Freeboard at Normal Pool (feet)	Dam Design 7.5 ±; Dam Low Area 6 ±; Dike 4 ±
Principal Spillway Capacity (cfs)	32 ±
Auxiliary Spillway Capacity (cfs)	N/A
Low-Level Outlet Capacity (cfs)	N/A
Spillway Design Flood (flow rate - cfs)	100-yr / 210
Winter Drawdown (feet below normal pool)	N/A
Drawdown Impoundment Vol. (acre-feet)	N/A
Latitude	47.17054ºN
Longitude	71.29507ºW
City/Town	Medfield
County Name	Norfolk
Public Road on Crest	No
Public Bridge over Spillway	No
EAP Date (if applicable)	EAP development is currently under contract
Owner Name	Town of Medfield
Owner Address	55 North Meadows Road
Owner Town	Medfield, MA 02052
Owner Phone	508-906-3003
Owner Emergency Phone	911
Owner Type	Municipality or Political subdivision
Caretaker Name	Robert Kennedy, DPW Supervisor
Caretaker Address	55 North Meadows Road
Caretaker Town	Medfield, MA 02052
Caretaker Phone	508-906-3003
Caretaker Emergency Phone	0
Date of Field Inspection	6/30/2020
Consultant Firm Name	Pare Corporation
Inspecting Engineer	Clarence C. Hutto, III, P.E.
Engineer Phone Number	508.543.1755

SECTION 2

2.0 INSPECTION

2.1 Visual Inspection

The Danielson Mill Dam was inspected on June 30, 2020. At the time of the inspection, temperatures were near 66ºF with cloudy skies. Photographs to document conditions were taken during the inspection and are included in Appendix A. Underwater areas were not evaluated during this inspection. A copy of the inspection checklist is included in Appendix B.

For reference purposes, a baseline was established during the inspection along the crest of the dam that references the left abutment set at Sta. 0+00 and the right abutment at Sta 2+25. Observations were made in relation to their location along the baseline as appropriate and as noted herein.

2.1.1 General Findings

In general, the overall condition of the Danielson Mill Dam was found to be **Poor**. The specific observations are identified in more detail in the sections below.

2.1.2 Dam

The following was noted along the embankment portion of the dam during the inspection.

Upstream Slope

- Vegetation consisting of weeds, brush, and wetland vegetation blocked a full inspection of the upstream slope.
- Erosion was noted near STA 0+35, approximately 3 inches deep.
- Between STA 0+70 to the spillway and from the spillway to STA 1+00, the upstream slope consisted of a granite block wing wall.
    - The mortar within the joints was cracked and deteriorated with slight separation between stones.
    - The left most corner near STA 0+70 was bulging approximately 2 inches toward the impoundment. The ground behind the wall within this area was settled/eroded.
    - Voids were present between stones. Animals, specifically snakes, were noted burrowing within the voids in the wall.
    - Depressions/sinkholes were noted at the following areas:
        - STA 0+70: 1-inch deep
        - STA 0+90: 2-inches deep
        - STA 0+95: 2-inches deep
        - STA 1+00: 2-inches deep
- Between STA 1+00 and 1+75, the upstream slope consisted of riprap. Vegetation blocked full viewing of the slope in this area. No indications of gross movement was noted.
- Between 1+75 and the right abutment, the slope was unprotected. Scarping up to 12 inches deep was noted within this area.
- Abutment contact appeared good.

Crest

- Between the left abutment and STA 1+75, the crest was covered with grass. Between STA 1+75 and the right abutment, the crest was bare with deadfall.
- The vertical alignment was irregular and varied up to 5 inches.
- The crest consisted of a concrete slab over the spillway channel near STA 0+85. The upstream and downstream edges of the concrete were deteriorated with section loss and exposed aggregate.
- An area of erosion was noted at the downstream left end adjacent to the downstream left concrete training wall. An approximate 8-inch wide and 4-inch tall hole was noted from the crest through the training wall.
- Abutment contact appeared good.

Downstream Slope

- Dense vegetation blocked a full inspection of the downstream slope. Vegetation consisted of large trees, brush, saplings, and wetland plants. The dense brush blocked the view of any potential seepage or saturation of the downstream slope and area. However, wetland plants indicate saturation within the downstream area.
- Between the left abutment and STA 0+60, the downstream slope is vegetated with tall grass and weeds. A pile of stone was noted near STA 0+75.
- Several large trees (24 to 36-inch diameter) were noted along the slope at the following locations: STA 0+00, 0+50, 0+80, 0+95, 1+20, 1+45, 1+50, 1+75, 2+00, and 2+25.
    - The trees were leaning toward the downstream area at STA 1+45 1+50, and 1+75.
    - The tree located at STA 0+80 was noted to be leaning towards the downstream channel with a large root system observed going towards the crest center.
- The dry stacked stone wall from the spillway to the right abutment was in poor condition with large voids, failed areas, and an irregular alignment. The wall appeared to have failed near STA 2+10.
- The stone wall located from the spillway to STA 0+75 was in poor condition with voids that were probed to 48-inches.
- Abutment contact appeared good.

2.1.3 Spillway

The following was noted along the spillway during the inspection:

- Vegetation was developing within the approach.
- The spillway training walls were in poor condition with the following deficiencies noted:
    - Multiple voids were present within the stone training walls. Voids were present at the bottom of the concrete training walls.
    - The concrete training walls appeared to be leaning towards the channel.
    - Significant deterioration of the timber within the concrete training walls was observed.
    - A potential bulge/movement was noted toward on the downstream portion of the stone training wall.

- No leakage was observed during the inspection; However, leakage has been previously reported through the stone masonry channel training walls.
- Erosion/sloughing of the soils behind the concrete section of the training walls was noted.

- Debris, including branches, logs, and vegetation, was present within the downstream channel. The capacity of the spillway does not appear to be affected by the debris.

2.1.4 Downstream Area

The downstream area of the dam is a wooded bordering vegetated wetland to the right of the spillway and consists of a residential home to the left of the spillway. Discharges from the dam flow under Homestead Drive approximately 150 feet downstream then flow under Route 27 approximately 0.2 miles downstream. Flows then meet with Nantasket Brook, from Kingsbury Pond Dam before entering a large swamp in the floodplain of the Charles and Stop Rivers.

Downstream hazards include several residences along Homestead Drive, South Street, and Route 27.

2.1.5 Reservoir Area

The impoundment is generally located within a wooded area with a few surrounding residential homes. The banks surrounding the impoundment are slightly sloped with dense vegetation. The geometry of the impoundment is generally rectangular extending to the south east of the dam.

2.2 Caretaker Interview

The Town of Medfield Department of Public Works completes operations and maintenance at the dam. Information provided by the Town has been incorporated into this report.

2.3 Operation and Maintenance Procedures

2.3.1 Operational Procedures

A formal operations and maintenance manual has not been prepared for this structure nor is one known to exist.

2.3.2 Maintenance of Dam and Operating Facilities

A formal operations and maintenance manual has not been prepared for this structure nor is one known to exist.

2.4 Emergency Warning System

An Emergency Action Plan (EAP) is currently being prepared by Pare for this structure.

2.5 Hydraulic/Hydrologic Data

Danielson Mill Dam is currently classified as a **Small** size, **Class II** (Significant) hazard structure. Therefore, in accordance with current state regulations, the spillway design flood (SDF) for the site is the 100-year storm event.

A hydrologic and hydraulic (H&H) analysis was completed by Pare in February 2020 as part of the Hazard Potential Classification Review. The analysis suggested that Danielson Mill Dam is not capable of passing flows associated with the SDF. The dam overtops by approximately 0.4 feet assuming a starting water elevation of Normal Pool (145.6 ft). The following table shows the results of that analysis.

Table 2.1 H&H Results (2020)

	25-year Storm	50-year Storm	100-year Storm
Peak Inflow (cfs)	125	165	210
Peak Spillway Outflow (cfs)	32	34	36
Peak Elevation (ft)	147.4	147.5	147.6
Peak Overtopping Flow (cfs)	70	117	167
Peak Overtopping Depth (ft)	0.2	0.3	0.4

Assumes starting water elevation at Normal Pool El. 145.6 and no operations completed.

2.6 Structural and Seepage Stability

Based upon visual inspection of the dam, the downstream walls appear to be failing with bulged areas, voids, and sinkholes. These may represent immediate signs of potential stability concerns.

2.6.1 Embankment Structural Stability

Formal stability analyses of the dam embankment were outside the scope of this report and therefore were not performed. No stability analysis is available for review or known to exist. The downstream stone walls have failed in areas. there were multiple large leaning trees, and voids were probed up to 48-inches deep. These areas should be evaluated and monitored for further movement.

2.6.2 Structural Stability of Non-Embankment Structures

Formal structural stability analyses of the non-embankment structures were outside the scope of this report and therefore were not performed. No calculations pertaining to the existing non-embankment structures were available during the preparation of this report. The spillway training walls appear to be leaning towards the channel and possibly bulging. These deficiencies should be evaluated and monitored for further movement.

2.6.3 Seepage Stability

No seepage stability calculations were available for review or are known to exist. No seepage was noted during the inspections. However, previous inspections noted seepage to the right of the spillway. Wetland vegetation was noted within the downstream area.

SECTION 3

3.0 ASSESSMENTS AND RECOMMENDATIONS

3.1 Assessments

In general, the overall condition of Danielson Mill Dam is **Poor** with the following deficiencies identified:

TABLE 3.1: Deficiency Summary

Deficiency Number	*Description*
1	Overgrown vegetation, including large leaning trees, along the upstream and downstream slopes, and along abutment slopes;
2	Cracked mortar, slight stone separation, settling, and voids along the upstream masonry walls;
3	Bare areas along the crest;
3	Unprotected section of the upstream slope with scarping up to 12-inches deep;
4	Areas of previously reported seepage along the downstream toe and downstream area;
5	Failed sections of the right downstream masonry wall;
6	Voids, up to 48-inches deep, within the downstream left stone wall;
7	Significant deterioration of the stone training walls including voids, potential bulge, previously reported leakage, and subsidence of soils behind walls;
8	Significant deterioration of the concrete training walls including potential movement, significant deterioration of the timber, and subsidence of soils behind walls;
9	No EAP (currently being prepared by Pare);
10	Insufficient capacity to pass the SDF;
11	No O&M Manual;
12	Additional maintenance deficiencies and potential dam safety concerns, as identified herein.

Based upon comparison to reported conditions and photographs included within the 2014 Phase I Inspection/Evaluation Report, the general conditions noted at the dam were similar, which rated the condition of the structure as **Poor.**

The following table provides a summary of previous recommendations and their status at the time of the inspection:

Table 3.2: Summary of Previous Recommendations

Previously Identified Deficiency/Recommendation	*Resolution or Current Condition*
Further evaluate seepage and saturation along the downstream side of the dam.	No apparent change / Similar recommendation
Develop a formalized O&M manual.	No apparent change / Similar recommendation
Perform routine monitoring at the dam.	No apparent change / Similar recommendation
Rehabilitate/reconstruct spillway system.	No apparent change / Similar recommendation
Remove irregular downstream boulder wall.	No apparent change / Similar recommendation
Clear and grub vegetation.	No apparent change / Similar recommendation
Develop and install seepage mitigation system.	No apparent change / Similar recommendation
Provide riprap slope protection along upstream slope.	No apparent change / Similar recommendation
Modify dam to accommodate the SDF.	No apparent change / Similar recommendation
Develop a formalized EAP.	Currently under contract

Complete a Hazard Classification assessment.	Completed in 2020; dam appropriately classified as significant
Complete H&H analysis.	Completed by Pare in 2019/2020

The following recommendations and remedial measures generally describe the recommended approach to address current deficiencies at the dam. Prior to undertaking recommended maintenance, repairs and remedial measures, the applicability of the dam safety regulations through 302 CMR 10.00 and the 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. In general, repairs to impacting the structure of the dam or the appurtenant structures will require a permit from the Office of Dam Safety.

3.2 Engineering Studies and Evaluations

It is recommended that the owner of the dam arrange for the following investigations to be performed by a qualified registered professional engineer experienced with embankment dams and hydrology, maintenance, and monitoring activities.

1. 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.

2. Develop and implement a program to monitor displacement of masonry and concrete wall sections and the development of sinkholes in the area of the spillway.

3. Develop a formalized EAP for the dam. *(Currently under contact)*

4. Evaluate the seepage and saturation along the downstream side of the dam.

5. Complete a stability analysis to evaluate the slope stability of earthen sections as well as the stability of other retaining structures (walls).

3.3 Yearly & Recurrent Maintenance Recommendations

The following recommendations should be performed on a regular schedule and allotted for within yearly operational budgets for the structure:

1. Perform regular monitoring and inspection of the dam and appurtenant structures, including areas of observed scarping, possible depressions, rodent holes, vegetative growth, or other areas of suspected movement, to check for increases in flow rate or other signs of deteriorating conditions. Complete routine inspection after all significant rainfall events and formal inspections in accordance with current state regulations. As the dam is currently classified as a significant hazard potential dam, formal inspection is required every five years.

The inspection program should also include completion of poor condition dam follow up inspections in accordance with the current dam safety order.

2. Regular maintenance activities should be continued to control and prevent further growth of unwanted vegetation, and remove accumulated debris from the spillway and discharge channel, as was noted in areas during the inspection. Mowing grass should be performed at least twice per year (i.e., late spring and fall). Mowing and fertilizing should be continued and performed at least twice per year. Mowing at longer intervals will likely require that the clippings be bagged and disposed of offsite or fully mulched to limit the build-up of thatch and the potential for choking of the grass. All cuttings from brush or other vegetation should be removed from the site and properly disposed.

3. Routinely review, update, and exercise the Emergency Action Plan.

3.4 Minor Repair Recommendations

The minor repairs presented below should be implemented to maintain the integrity of the structure. If deferred these maintenance items could develop into larger deficiencies that are more costly to address.

1. Pending the results of the stability evaluations, remove the irregular downstream boulder wall and replace with an earthen slope or rebuilt, fully grouted, boulder masonry gravity wall.

2. Remove unwanted vegetation from the dam. Grub all root systems. Fill resulting holes with suitable, structural material compacted in lifts. Regrade areas and reestablish adequate surface cover including grass in non-riprapped areas and replacing / augmenting riprap in riprapped areas.

3. Supplement/improve riprap slope protection along the upstream slope.

3.5 Remedial Modification Recommendations

Based on the results of the studies and analysis, the following remedial measure is recommended to be completed. However, upon completion of recommended and ongoing studies and analyses, the need to implement additional remedial measures may become apparent.

1. Modify the dam to accommodate the 100-year SDF.

2. Pending results of the seepage evaluation, develop and install a seepage mitigation program at the dam to address the seepage concerns along the downstream side of the dam.

3. Rehabilitate / reconstruct the spillway system to address the noted concerns.

3.6 Alternatives

The following alternative is presented based upon a conceptual review of the concerns. Additional studies and or considerations may indicate that some or all of the options presented below are not suitable for the conditions specific to this dam and dam site.

All Recommendations: Breaching of the dam is always an alternative for addressing safety and stability concerns at the dam.

3.7 Opinion of Probable Costs

The following conceptual opinions of probable costs have been developed for the recommendations noted above. The cost ranges shown herein are based on a limited investigation and are provided for general information only. This should not be considered an engineer's estimate, as actual construction costs may be somewhat less or considerably more than indicated.

Engineering Studies and Evaluations

1. Develop O&M Manual	$ 3,000 -	$ 5,000
2. Monitoring Program	$ 2,000 -	$ 4,000
3. Develop EAP	*Currently Under Contract*	
4. Evaluate Seepage	$ 7,000 -	$ 10,000
5. Slope Stability Analysis	$ 7,000 -	$ 10,000
Subtotal	**$ 19,000 -**	**$ 29,000**

Yearly Activities

1. Regular Monitoring and Inspection	$ 2,000 -	$ 4,000 /yr.
2. Regular Maintenance Activities	$ 2,000 -	$ 4,000 /yr.
3. Review, Update, Exercise EAP	$ 1,000 -	$ 3,000 /yr.
Subtotal	**$ 5,000 -**	**$ 11,000 /yr.**

Recommendations, Maintenance, and Minor Repairs

1. Remove Downstream Wall/Replace	$100,000 -	$ 200,000
2. Vegetation Removal		
a) Clear	$ 15,000 -	$ 30,000
a) Grub and Fill Root Systems	$ 35,000 -	$ 70,000
a) Regrade and Establish Surface Coverage	$ 10,000 -	$ 50,000
3. Install Upstream Slope Protection	$ 5,000 -	$ 25,000
Subtotal	$165,000 -	$ 375,000
Engineering & Design	$ 20,000 -	$ 50,000
Permitting	$ 20,000 -	$ 50,000
Contingency	$ 35,000 -	$ 100,000
Subtotal	**$240,000 -**	**$ 575,000**

Remedial Modification Recommendations

1. Modify to Accommodate SDF[1]	$100,000 -	$ 200,000
2. Install Seepage Mitigation	$ 20,000 -	$ 50,000
3. Rehabilitate/Reconstruct Spillway System	$100,000 -	$ 200,000
Subtotal	$220,000 -	$ 450,000
Engineering & Design	$ 30,000 -	$ 60,000

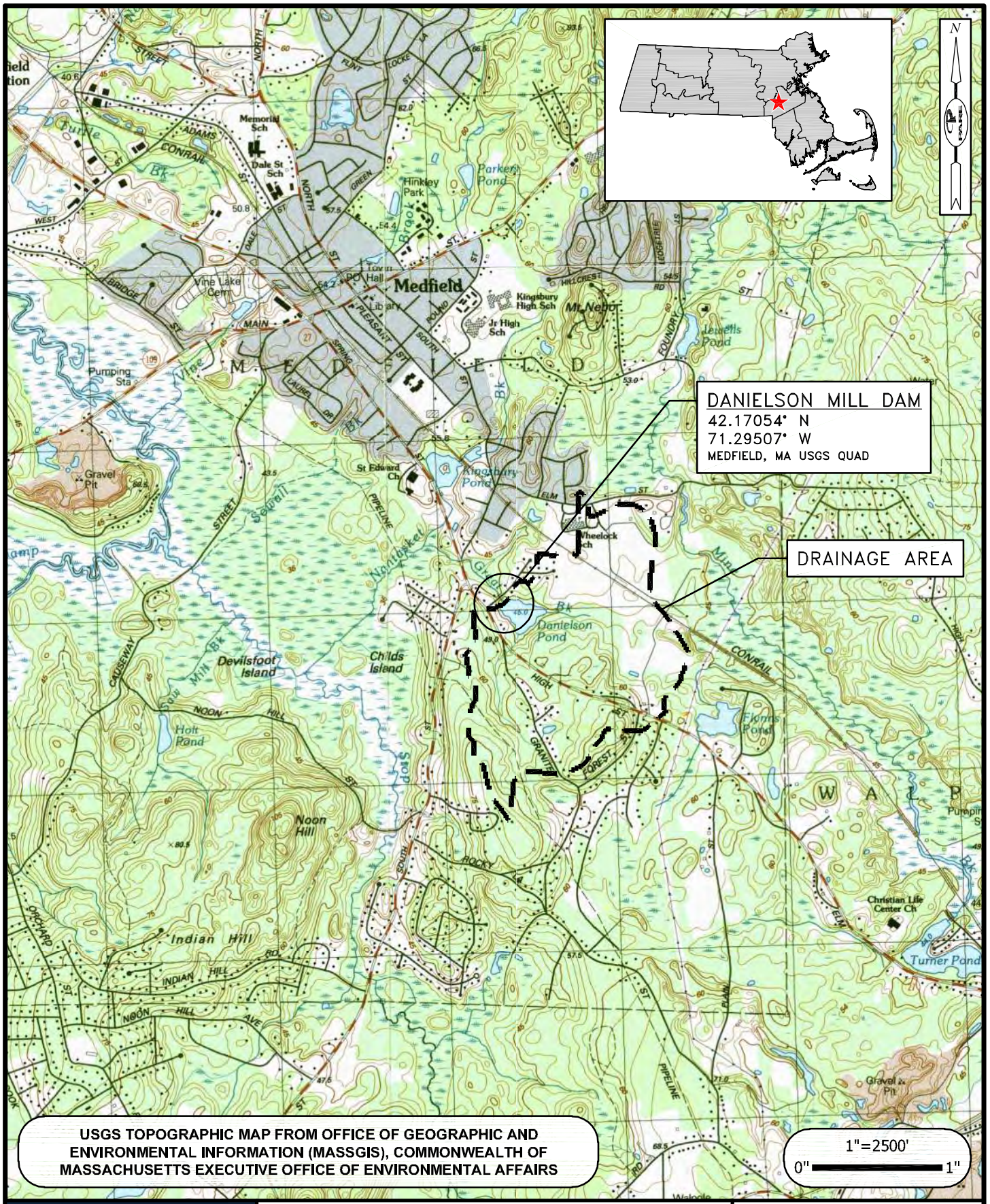
[1] The cost to modify the dam to accommodate the SDF will be lower if combined with the rehabilitation/reconstruction of the spillway system.

Permitting	$ 30,000 -	$ 60,000
Contingency	$100,000 -	$ 200,000
Subtotal	**$380,000 -**	**$ 770,000**
RECOMMENDATIONS TOTAL	**$644,000 -**	**$1,385,000**

When comparing costs, the total cost including design, engineering, permitting, construction, and long-term maintenance should be considered.

While some of these activities can be undertaken as maintenance activities under 302 CMR 10 Dam Safety and will only require that the Office of Dam Safety be notified of the activities, the applicability of other environmental permits (i.e., NOI, PGP, Water Quality Certificate, etc.) needs to be determined prior to undertaking maintenance activities that may occur within resource areas under the jurisdiction of MADEP, the local conservation commission or other regulatory agency.

FIGURES
Danielson Mill Dam
Medfield



USGS TOPOGRAPHIC MAP FROM OFFICE OF GEOGRAPHIC AND ENVIRONMENTAL INFORMATION (MASSGIS), COMMONWEALTH OF MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS

PARE CORPORATION

DANIELSON MILL DAM

MA03351

MEDFIELD, MASSACHUSETTS

OWNER : TOWN OF MEDFIELD

LOCUS PLAN

JUNE 2020 FIGURE 1

PARE CORPORATION

DANIELSON MILL DAM

MA03351

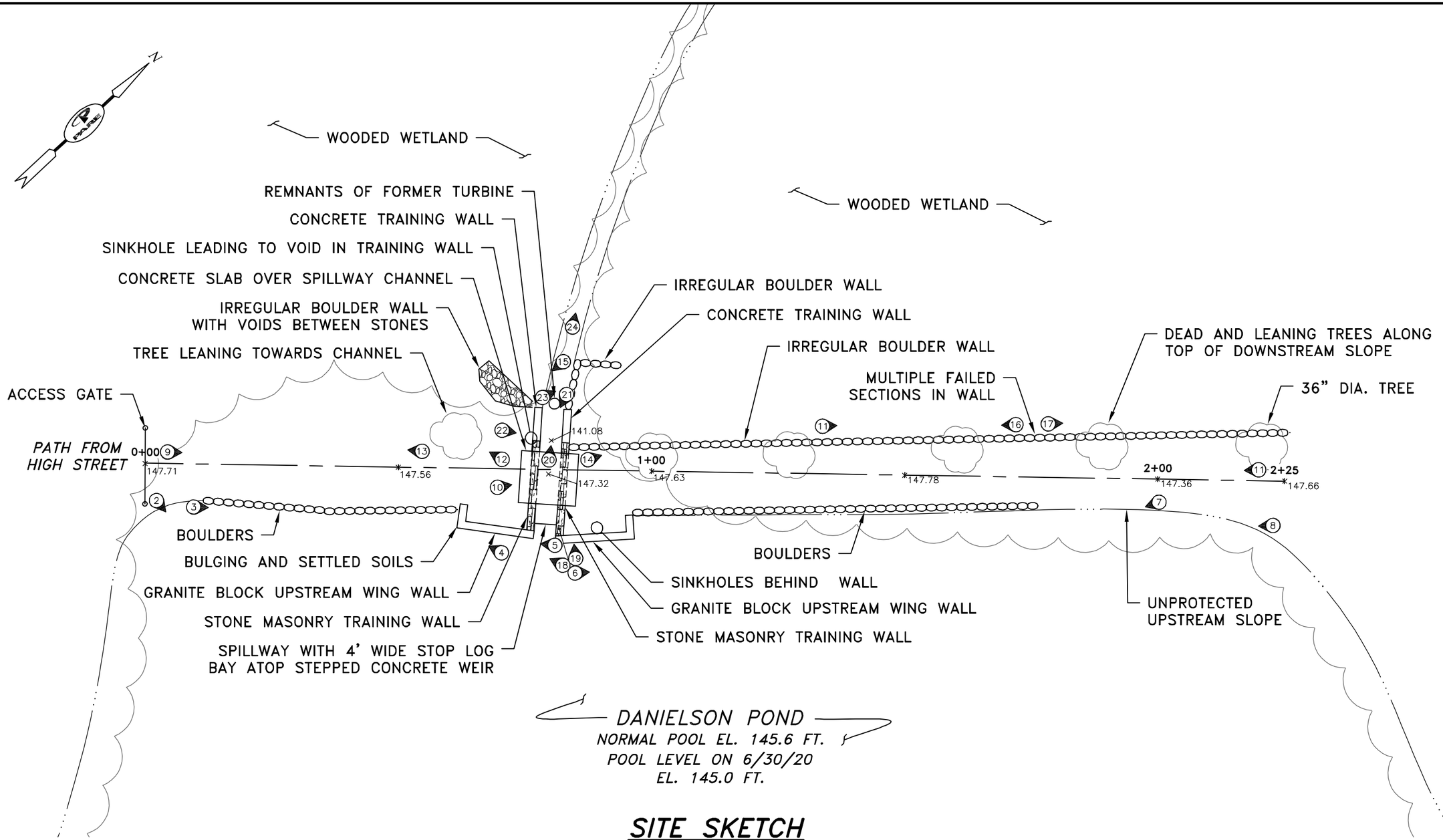
MEDFIELD, MASSACHUSETTS

OWNER : TOWN OF MEDFIELD

AERIAL PLAN

JUNE 2020

FIGURE 2



SITE SKETCH

SCALE: 1"=20'±

NOTES AND LEGEND

1. PLAN DEVELOPED FROM NOTES TAKEN DURING THE INSPECTION, PREVIOUS SITE SKETCHES FROM PREVIOUS INSPECTION REPORTS, AND AVAILABLE AERIAL IMAGERY FROM MASSGIS. INFORMATION IS PROVIDED FOR REFERENCE PURPOSES ONLY.

×125.00 SPOT ELEVATION AS DETERMINED BY RELATIVE ELEVATION SURVEY COMPLETED BY PARE DURING THE INSPECTION.

◀# DENOTES APPROXIMATE LOCATION AND DIRECTION OF PHOTOGRAPH.

1+00 BASELINE AND STATIONING

PARE
PARE CORPORATION
ENGINEERS • SCIENTISTS • PLANNERS
10 LINCOLN ROAD, SUITE 210
FOXBORO, MA 02035
508-543-1755

SCALE ADJUSTMENT GUIDE
0" 1"
BAR IS ONE INCH ON ORIGINAL DRAWING.

DANIELSON MILL DAM
MA03351
MEDFIELD, MASSACHUSETTS
OWNER : TOWN OF MEDFIELD

REVISIONS:

PROJECT NO.:	19126.02
DATE:	JUNE 2020
SCALE:	AS NOTED
DESIGNED BY:	HMS
CHECKED BY:	CCH
DRAWN BY:	LMC
APPROVED BY:	ARO

SITE SKETCH

FIGURE NO.: 3

APPENDIX A
Photographs
Danielson Mill Dam
Medfield

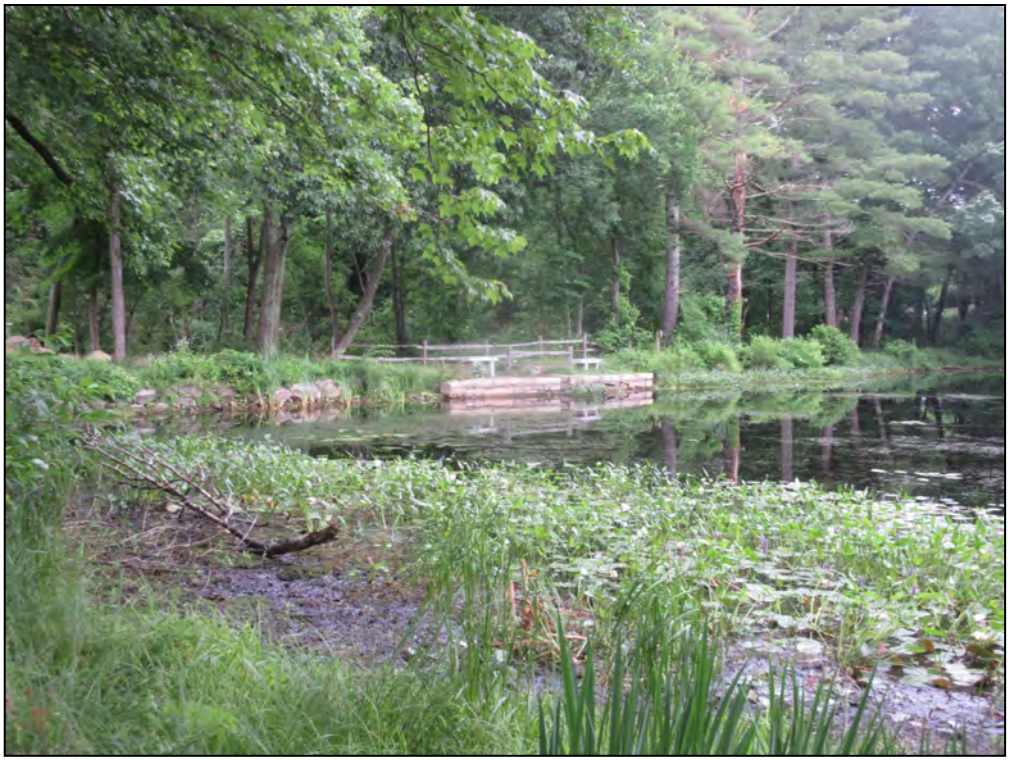


Photo No. 1: Overview of the dam from the left shoreline.

Photo No. 2: Impoundment from the left abutment.

Photo No. 3: Upstream slope from the left abutment looking right.

Photo No. 4: Left end of the upstream wall. Note movement of the wall towards the impoundment.

Photo No. 5: Upstream wall from the spillway looking left. Note voids within the wall.

Photo No. 6: Upstream wall from the spillway looking right. Note arrows pointing to sinkholes behind wall.

Photo No. 7: Scarping on the unprotected section of the upstream slope, near STA 2+00.

Photo No. 8: Upstream slope from the right abutment looking left.

Photo No. 9: Crest from the left abutment looking right.

Photo No. 10: Concrete slab over the spillway near STA 0+85.

Photo No. 11: Crest from the right abutment looking left.

Photo No. 12: Large leaning tree to the left of the spillway near STA 0+80.

Photo No. 13: Downstream slope from the spillway looking left.

Photo No. 14: Downstream slope from the spillway looking right.

Photo No. 15: Stone wall to the left of the spillway. Note large voids that were probed to 48-inches.

Photo No. 16: Downstream slope from near STA 1+75 looking left. Note irregular wall that appears to be failed.

Photo No. 17: Downstream slope from near STA 1+75 looking right. Note large tree at top of slope.

Photo No. 18: Approach and overview of the spillway. Note vegetation and debris.

Photo No. 19: Spillway channel from the upstream end looking downstream.

Photo No. 20: Downstream side of the spillway channel from the crest.

Photo No. 21: Spillway channel looking upstream.

Photo No. 22: Surface behind the left downstream training wall. Note apparent subsidence and sinkhole.

Photo No. 23: Right downstream stone training wall. Note voids between the stones.

Photo No. 24: Downstream channel.

APPENDIX B
Inspection Checklist
Danielson Mill Dam
Medfield

DAM SAFETY INSPECTION CHECKLIST

NAME OF DAM: Danielson Mill Dam

STATE ID #: N/A

REGISTERED: ☑ YES ☐ NO

NID ID #: MA03351

STATE SIZE CLASSIFICATION: Small

STATE HAZARD CLASSIFICATION: Significant

CHANGE IN HAZARD CLASSIFICATION REQUESTED?: No

DAM LOCATION INFORMATION

CITY/TOWN: Medfield

COUNTY: Norfolk

DAM LOCATION: Off of High Street/MA-27
(street address if known)

ALTERNATE DAM NAME: N/A

USGS QUAD.: Medfield

LAT.: 47.17054ºN

LONG.: 71.29507ºW

DRAINAGE BASIN: Charles

RIVER: Great Brook, trib to West Branch Nantasket River

IMPOUNDMENT NAME(S): Danielson Pond

GENERAL DAM INFORMATION

TYPE OF DAM: Earthen Embankment

OVERALL LENGTH (FT): 225 ±

PURPOSE OF DAM: Recreation (formerly mill operation)

NORMAL POOL STORAGE (ACRE-FT): 31 ±

YEAR BUILT: Unknown

MAXIMUM POOL STORAGE (ACRE-FT): 50 ±

STRUCTURAL HEIGHT (FT): 7

EL. NORMAL POOL (FT): 145.6

HYDRAULIC HEIGHT (FT): 6

EL. MAXIMUM POOL (FT): 147.6 ±

FOR INTERNAL MADCR USE ONLY

FOLLOW-UP INSPECTION REQUIRED: ☐ YES ☐ NO

CONDITIONAL LETTER: ☐ YES ☐ NO

NAME OF DAM: Danielson Mill Dam | STATE ID #: N/A

INSPECTION DATE: June 30, 2020 | NID ID #: MA03351

INSPECTION SUMMARY

DATE OF INSPECTION: June 30, 2020 | DATE OF PREVIOUS INSPECTION: November 11, 2014

TEMPERATURE/WEATHER: Cloudy, 66º F | ARMY CORPS PHASE I: ☐ YES ☑ NO | If YES, date

CONSULTANT: Pare Corporation | PREVIOUS DCR PHASE I: ☑ YES ☐ NO | If YES, date 11-Nov-14

BENCHMARK/DATUM: Local Datum, top of weir crest (Elev. 143.0)

OVERALL PHYSICAL CONDITION OF DAM: POOR | DATE OF LAST REHABILITATION: N/A

SPILLWAY CAPACITY: 0-50% of the SDF or Unknown

EL. POOL DURING INSP.: 145.0 ± | EL. TAILWATER DURING INSP.: 141.2 ±

PERSONS PRESENT AT INSPECTION

NAME	TITLE/POSITION	REPRESENTING
Clarence C. Hutto, III, P.E.	Senior Project Engineer	Pare Corporation
Heather M. Shanks, E.I.T.	Engineer II	Pare Corporation

EVALUATION INFORMATION

		Click on box to select E-code
E1)	TYPE OF DESIGN	1
E2)	LEVEL OF MAINTENANCE	3
E3)	EMERGENCY ACTION PLAN	4
E4)	EMBANKMENT SEEPAGE	4
E5)	EMBANKMENT CONDITION	2
E6)	CONCRETE CONDITION	2
E7)	LOW-LEVEL OUTLET CAPACITY	1

		Click on box to select E-code
E8)	LOW-LEVEL OUTLET CONDITION	1
E9)	SPILLWAY DESIGN FLOOD CAPACITY	1
E10)	OVERALL PHYSICAL CONDITION	2
E11)	ESTIMATED REPAIR COST	$644k-$1.4m
	ROADWAY OVER CREST	NO
	BRIDGE NEAR DAM	NO

NAME OF INSPECTING ENGINEER: Clarence C. Hutto, III, P.E. | SIGNATURE: 

NAME OF DAM: Danielson Mill Dam

STATE ID #: N/A

INSPECTION DATE: June 30, 2020

NID ID #: MA03351

OWNER:		CARETAKER:	
ORGANIZATION	Town of Medfield	ORGANIZATION	Town of Medfield Dept. of Public Works
NAME/TITLE	Maurice Goulet, Director of Public Works	NAME/TITLE	Robert Kennedy, DPW Supervisor
STREET	55 North Meadows Road	STREET	55 North Meadows Road
TOWN, STATE, ZIP	Medfield, MA 02052	TOWN, STATE, ZIP	Medfield, MA 02052
PHONE	508-906-3003	PHONE	508-906-3003
EMERGENCY PH. #		EMERGENCY PH. #	
FAX		FAX	
EMAIL	mgoulet@medfield.net	EMAIL	rkennedy@medfield.net
OWNER TYPE	Municipality or Political subdivision		

PRIMARY SPILLWAY TYPE: Stop log Controlled Concrete Broad Crested Weir

SPILLWAY LENGTH (FT): 4

SPILLWAY CAPACITY (CFS): 32 ±

AUXILIARY SPILLWAY TYPE: N/A

AUX. SPILLWAY CAPACITY (CFS): N/A

NUMBER OF OUTLETS: 0

OUTLET(S) CAPACITY (CFS): N/A

TYPE OF OUTLETS: N/A

TOTAL DISCHARGE CAPACITY (CFS): 32 ± (no overtopping)

DRAINAGE AREA (SQ MI): 0.54

SPILLWAY DESIGN FLOOD (PERIOD/CFS): 100-yr / 210

HAS DAM BEEN BREACHED OR OVERTOPPED: ☐ YES ☑ NO

IF YES, PROVIDE DATE(S):

FISH LADDER (LIST TYPE IF PRESENT): None present

DOES CREST SUPPORT PUBLIC ROAD? ☐ YES ☑ NO

IF YES, ROAD NAME:

PUBLIC BRIDGE WITHIN 50' OF DAM? ☐ YES ☑ NO

IF YES, ROAD/BRIDGE NAME:

MHD BRIDGE NO. (IF APPLICABLE

NAME OF DAM: Danielson Mill Dam STATE ID #: N/A

INSPECTION DATE: June 30, 2020 NID ID #: MA03351

EMBANKMENT (CREST)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
CREST	1. SURFACE TYPE	Maintained grass		X	
	2. SURFACE CRACKING	None observed		X	
	3. SINKHOLES, ANIMAL BURROWS	Sinkholes up to 2-inches deep behind upstream stone wall. Area of erosion at the downstream left end of concrete over spillway adjacent to left training wall, measuring approximately 8 inches wide and 4-inch tall.		X	X
	4. VERTICAL ALIGNMENT (DEPRESSIONS	Vertical alignment irregular.		X	X
	5. HORIZONTAL ALIGNMENT	Appeared okay		X	
	6. RUTS AND/OR PUDDLES	None observed		X	
	7. VEGETATION (PRESENCE/CONDITION)	Between left abutment at STA 1+75, covered with grass. Between 1+75 and right abutment, bare with deadfall.		X	X
	8. ABUTMENT CONTACT	Appears okay		X	

ADDITIONAL COMMENTS: 1. The split rail fence on downstream side was broken in areas.

NAME OF DAM: Danielson Mill Dam STATE ID #: N/A

INSPECTION DATE: June 30, 2020 NID ID #: MA03351

EMBANKMENT (D/S SLOPE)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S SLOPE	1. WET AREAS (NO FLOW)	Dense vegetation blocked the view of any saturation. However, wetland plants indicate saturation and was previously reported.		X	X
	2. SEEPAGE	None observed due to dense vegetation. Seepage has been previously reported.		X	X
	3. SLIDE, SLOUGH, SCARP	Dry stacked stone wall from right abutment to spillway in poor condition with large voids, failed areas, and an irregular alignment. The wall appeared to have failed near STA 2+10.		X	X
	4. EMB.-ABUTMENT CONTACT	Appeared okay		X	
	5. SINKHOLE/ANIMAL BURROWS	None observed		X	
	6. EROSION	None observed		X	
	7. UNUSUAL MOVEMENT	See slide, slough, scarp.		X	X
	8. VEGETATION (PRESENCE/CONDITION)	Dense vegetation blocked a full inspection. Large trees, brush, saplings, and wetland plants throughout. Between STA 0+00 and STA 0+60, consisted of tall grass and weeds. Several large trees (24 to 36-inch diameter) were noted at the following locations: STA 0+00, 0+50, 0+80, 0+95, 1+20, 1+45, 1+50, 1+75, 2+00, and 2+25. Trees were leaning toward the downstream area at STA 1+45 1+50, and 1+75. Tree located at STA 0+80 was noted to be leaning towards channel with a large root system observed going towards the crest center.		X	X

ADDITIONAL COMMENTS: 1. A pile of stone was noted near STA 0+75.

NAME OF DAM: Danielson Mill Dam STATE ID #: N/A

INSPECTION DATE: June 30, 2020 NID ID #: MA03351

EMBANKMENT (U/S SLOPE)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S SLOPE	1. SLIDE, SLOUGH, SCARP	Scarping up to 12 inches deep in area of no slope protection.		X	X
	2. SLOPE PROTECTION TYPE AND COND.	Between STA 1+00 and 1+75, consisted of riprap. Vegetation blocked full viewing of the slope in this area. Between 1+75 and the right abutment, the slope was unprotected.		X	X
	3. SINKHOLE/ANIMAL BURROWS	None observed.		X	
	4. EMB.-ABUTMENT CONTACT	Appeared okay		X	
	5. EROSION	Near STA 0+35, approximately 3 inches deep.		X	X
	6. UNUSUAL MOVEMENT	None observed.		X	
	7. VEGETATION (PRESENCE/CONDITION)	Weeds, brush, and wetland vegetation blocked a full inspection of the upstream slope.		X	X

ADDITIONAL COMMENTS:

NAME OF DAM: Danielson Mill Dam STATE ID #: N/A

INSPECTION DATE: June 30, 2020 NID ID #: MA03351

INSTRUMENTATION

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
INSTR.	1. PIEZOMETERS	Not applicable	X		
	2. OBSERVATION WELLS	Not applicable	X		
	3. STAFF GAGE AND RECORDER	Not applicable	X		
	4. WEIRS	Not applicable	X		
	5. INCLINOMETERS	Not applicable	X		
	6. SURVEY MONUMENTS	Not applicable	X		
	7. DRAINS	Not applicable	X		
	8. FREQUENCY OF READINGS	Not applicable	X		
	9. LOCATION OF READINGS	Not applicable	X		

ADDITIONAL COMMENTS:

NAME OF DAM: Danielson Mill Dam STATE ID #: N/A

INSPECTION DATE: June 30, 2020 NID ID #: MA03351

DOWNSTREAM MASONRY WALLS

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S WALLS	1. WALL TYPE	Dry stacked stone wall	X		
	2. WALL ALIGNMENT	Irregular with failed sections.		X	X
	3. WALL CONDITION	Poor. Wall has failed in multiple places throughout.		X	X
	4. HEIGHT: TOP OF WALL TO MUDLINE	min 2 max 5 avg: 4			
	5. SEEPAGE OR LEAKAGE	See downstream slope			X
	6. ABUTMENT CONTACT	Appeared okay		X	
	7. EROSION/SINKHOLES BEHIND WALL	See downstream slope		X	
	8. ANIMAL BURROWS	None observed		X	
	9. UNUSUAL MOVEMENT	See wall condition.		X	X
	10. WET AREAS AT TOE OF WALL	See downstream slope		X	X

ADDITIONAL COMMENTS:

NAME OF DAM: Danielson Mill Dam STATE ID #: N/A

INSPECTION DATE: June 30, 2020 NID ID #: MA03351

UPSTREAM MASONRY WALLS

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S WALLS	1. WALL TYPE	Stone masonry wall	X		
	2. WALL ALIGNMENT	Appeared okay.		X	
	3. WALL CONDITION	Voids were present between stones. Mortar within the joints was cracked and deteriorated with slight separation between stones.		X	X
	4. HEIGHT: TOP OF WALL TO MUDLINE	min: 1 Max: 1 Avg: 1			
	5. ABUTMENT CONTACT	Not applicable.		X	
	6. EROSION/SINKHOLES BEHIND WALL	Depressions/sinkholes were noted at the following areas: STA 0+70: 1-inch deep, STA 0+90: 2-inches deep, STA 0+95: 2-inches deep, and STA 1+00: 2-inches deep.		X	X
	7. ANIMAL BURROWS	Animals, specifically snakes, were noted burrowing within the voids in the wall.		X	
	8. UNUSUAL MOVEMENT	The left most corner near STA 0+70 bulging approximately 2 inches toward the impoundment. The ground behind the wall within this area was depressed/eroded.		X	X

ADDITIONAL COMMENTS:

NAME OF DAM: Danielson Mill Dam STATE ID #: N/A

INSPECTION DATE: June 30, 2020 NID ID #: MA03351

DOWNSTREAM AREA

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S AREA	1. ABUTMENT LEAKAGE	None observed		X	
	2. FOUNDATION SEEPAGE	None observed		X	
	3. SLIDE, SLOUGH, SCARP	None observed		X	
	4. WEIRS	None observed	X		
	5. DRAINAGE SYSTEM	Not applicable	X		
	6. INSTRUMENTATION	None observed	X		
	7. VEGETATION	Dense woods		X	
	8. ACCESSIBILITY	Good; Gate at the entrance blocks vehicles from accessing the dam.		X	
	9. DOWNSTREAM HAZARD DESCRIPTION	Homestead Ave, High street/MA-27.		X	
	10. DATE OF LAST EAP UPDATE	EAP development is currently under contract		X	

ADDITIONAL COMMENTS:

NAME OF DAM: Danielson Mill Dam STATE ID #: N/A

INSPECTION DATE: June 30, 2020 NID ID #: MA03351

MISCELLANEOUS

AREA INSPECTED	CONDITION	OBSERVATIONS
MISC.	1. RESERVOIR DEPTH (AVG)	Not available
	2. RESERVOIR SHORELINE	Wooded with few homes
	3. RESERVOIR SLOPES	Mild
	4. ACCESS ROADS	Gravel roadway from High Street to the left abutment.
	5. SECURITY DEVICES	One gate at the left abutment.
	6. VANDALISM OR TRESPASS	☐ YES ☑ NO WHAT:
	7. AVAILABILITY OF PLANS	☐ YES ☑ NO DATE:
	8. AVAILABILITY OF DESIGN CALCS	☐ YES ☑ NO DATE:
	9. AVAILABILITY OF EAP/LAST UPDATE	☐ YES ☑ NO DATE: Currently under contract
	10. AVAILABILITY OF O&M MANUAL	☐ YES ☑ NO DATE:
	11. CARETAKER/OWNER AVAILABLE	☑ YES ☐ NO DATE: Prior to/during inspection
	12. CONFINED SPACE ENTRY REQUIRED	☐ YES ☑ NO PURPOSE:

ADDITIONAL COMMENTS:

NAME OF DAM: Danielson Mill Dam STATE ID #: N/A

INSPECTION DATE: June 30, 2020 NID ID #: MA03351

PRIMARY SPILLWAY

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
PRIMARY SPILLWAY	SPILLWAY TYPE	Concrete weir with stoplog controls	X		
	WEIR TYPE	Broad Crested Weir	X		
	SPILLWAY CONDITION	Weir appeared to be in okay condition.		X	
	TRAINING WALLS	Multiple voids were present within the stone training walls and bottom of the concrete training walls. Concrete training walls appeared to be leaning towards the channel. Significant deterioration of the timber within the concrete training walls. A potential bulge/movement noted toward the downstream portion of the stone training wall. Leakage was previously noted through the stone masonry channel training walls. Erosion/sloughing of the soils behind the concrete section of the training walls noted.		X	X
	SPILLWAY CONTROLS AND CONDITION	Timber stop logs. Appeared okay.		X	
	UNUSUAL MOVEMENT	See training walls.		X	X
	APPROACH AREA	Vegetation was developing within the approach		X	X
	DISCHARGE AREA	Appeared okay and clear.		X	
	DEBRIS	Debris was noted on the stop logs.		X	X
	WATER LEVEL AT TIME OF INSPECTION	145.0 ±		X	

ADDITIONAL COMMENTS:

NAME OF DAM: Danielson Mill Dam STATE ID #: N/A

INSPECTION DATE: June 30, 2020 NID ID #: MA03351

AUXILIARY SPILLWAY (DIKE)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
AUXILIARY SPILLWAY	SPILLWAY TYPE	NOT APPLICABLE TO THIS STRUCTURE			
	WEIR TYPE				
	SPILLWAY CONDITION				
	TRAINING WALLS				
	SPILLWAY CONTROLS AND CONDITION				
	UNUSUAL MOVEMENT				
	APPROACH AREA				
	DISCHARGE AREA				
	DEBRIS				
	WATER LEVEL AT TIME OF INSPECTION				

ADDITIONAL COMMENTS:

NAME OF DAM: Danielson Mill Dam STATE ID #: N/A

INSPECTION DATE: June 30, 2020 NID ID #: MA03351

OUTLET WORKS

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
OUTLET WORKS	TYPE	NOT APPLICABLE TO THIS STRUCTURE			
	INTAKE STRUCTURE				
	TRASHRACK				
	PRIMARY CLOSURE				
	SECONDARY CLOSURE				
	CONDUIT				
	OUTLET STRUCTURE/HEADWALL				
	EROSION ALONG TOE OF DAM				
	SEEPAGE/LEAKAGE				
	DEBRIS/BLOCKAGE				
	UNUSUAL MOVEMENT				
	DOWNSTREAM AREA				
	MISCELLANEOUS				

ADDITIONAL COMMENTS:

NAME OF DAM: Danielson Mill Dam STATE ID #: N/A

INSPECTION DATE: June 30, 2020 NID ID #: MA03351

CONCRETE/MASONRY DAMS

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
GENERAL	TYPE	NOT APPLICABLE TO THIS STRUCTURE			
	AVAILABILITY OF PLANS				
	AVAILABILITY OF DESIGN CALCS				
	PIEZOMETERS				
	OBSERVATION WELLS				
	INCLINOMETERS				
	SEEPAGE GALLERY				
	UNUSUAL MOVEMENT				

ADDITIONAL COMMENTS:

NAME OF DAM: Danielson Mill Dam STATE ID #: N/A

INSPECTION DATE: June 30, 2020 NID ID #: MA03351

CONCRETE/MASONRY DAMS (CREST)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
CREST	TYPE	NOT APPLICABLE TO THIS STRUCTURE			
	SURFACE CONDITIONS				
	CONDITIONS OF JOINTS				
	UNUSUAL MOVEMENT				
	HORIZONTAL ALIGNMENT				
	VERTICAL ALIGNMENT				

ADDITIONAL COMMENTS:

NAME OF DAM: Danielson Mill Dam STATE ID #: N/A

INSPECTION DATE: June 30, 2020 NID ID #: MA03351

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				

NOT APPLICABLE TO THIS STRUCTURE

ADDITIONAL COMMENTS:

NAME OF DAM: Danielson Mill Dam STATE ID #: N/A

INSPECTION DATE: June 30, 2020 NID ID #: MA03351

CONCRETE/MASONRY DAMS (UPSTREAM FACE)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S FACE	TYPE	NOT APPLICABLE			
	SURFACE CONDITIONS				
	CONDITIONS OF JOINTS				
	UNUSUAL MOVEMENT				
	ABUTMENT CONTACTS				
		TO THIS			
		STRUCTURE			

ADDITIONAL COMMENTS:

APPENDIX C
Previous Reports and References
Danielson Mill Dam
Medfield

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. "Hazard Potential Classification Review" for Danielson Mill Dam, Prepared by Pare Corporation, dated February 2020.

2. "Poor Condition Follow-Up Inspection", Prepared by Pare Corporation, dated February 28, 2020.

3. "Poor Condition Follow-Up Inspection", Prepared by Pare Corporation, dated August 23, 2019.

4. "Poor Condition Follow-Up Inspection", Prepared by Tighe & Bond, Inc., dated October 18, 2017.

5. "Phase I Inspection/Evaluation Report" for Danielson Mill Dam, Prepared by Polaris Consultants, LLC, dated November 24, 2014.

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

1. "Design of Small Dams", United States Department of the Interior Bureau of Reclamation, 1987.

2. "ER 110-2-106 - Recommended Guidelines for Safety Inspection of Dams", Department of the Army, September 26, 1979.

3. "Guidelines for Reporting the Performance of Dams" National Performance of Dams Program, August 1994.

4. 302 CMR: Department of Conservation and Recreation Section 10.00 Dam Safety.

APPENDIX D
Common Dam Safety Definitions
Danielson Mill Dam
Medfield

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.

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

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

Dam Components

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

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

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

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

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

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

Size Classification

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

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

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

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

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

Hazard Classification

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

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

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

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

General

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

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

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

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

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

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

Condition Rating

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

Poor - Significant structural, operational and maintenance deficiencies are clearly recognized for normal loading conditions.

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

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

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

APPENDIX E
Visual Dam Inspection Limitations
Danielson Mill Dam
Medfield

VISUAL DAM INSPECTION
LIMITATIONS

Visual Inspection

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

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

3. In cases where an impoundment is lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions, which might otherwise be detectable if inspected under the normal operating environment of the structure.

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

Use of Report

1. The applicability of other environmental permits (ie., NOI, PGP, Water Quality Certificate, etc.) needs to be determined prior to undertaking maintenance activities that may occur within resource areas under the jurisdiction of MADEP, the local conservation commission or other regulatory agency.

2. This report has been prepared for the exclusive use of the Town of Medfield for specific application to the Danielson Mill Dam in accordance with generally accepted engineering practices. No other warranty, expressed or implied, is made.

3. This report has been prepared for this project by Pare. This report is for preliminary evaluation purposes only and is not necessarily sufficient to support design or repairs or recommendations or to prepare an accurate bid.