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PARE CORPORATION

March 28, 2022

Department of Conservation and Recreation
Office of Dam Safety
251 Causeway Street, Suite 800
Boston, MA 02114

Re: **Follow-Up Inspection – March 2022**
**Snake Brook Dam (MA01119)**
**Wayland, Massachusetts**
(PARE Project No.: 19167.02/800)

Dear Office of Dam Safety:

On behalf of Town of Wayland (Owner), Pare Corporation (Pare) completed a follow-up inspection of the Snake Brook Dam located in Wayland, Massachusetts on March 9th, 2022. ***Based upon the observed conditions, the dam appears to remain in* POOR *condition with deficiencies similar in nature and extent as those observed during previous inspections.***

Since the date of the previous Phase I Inspection, the Town has continued the design phase of the dam rehabilitation project and has applied for funding assistance through FEMA BRIC and EOEEA Dams and Seawalls in attempts to secure the necessary funding for the permitting and construction phases of the rehabilitation project.

Additional background information, details of the inspection, and specific findings are included in the attached *Poor Condition Dam Follow-up Inspection Form.* 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.

We trust that the Follow-up Inspection Form meets the requirements of the follow up inspection for the Snake Brook Dam. Should you have any questions please feel free to contact me at 508.543.1755 or via email at mdunn@parecorp.com.

Sincerely,

PARE CORPORATION


Matthew Dunn, PE, PLS, CFM
Senior Project Engineer

Attachment: Poor Condition Dam Follow-Up Inspection Form (with attachments)

**Commonwealth of Massachusetts**
**Department of Conservation and Recreation**
**Office of Dam Safety Poor Condition Dam Follow-up Inspection Form**

**Dam Name:** Snake Brook Dam
**Dam Owner:** Town of Wayland
**Nat. ID Number:** MA01119
**Hazard Potential:** Significant (Class II)
**Location of Dam (town):** Wayland
**Coordinate location (lat,long):** 42.33425ºN/71.34166ºW
**Date of Inspection:** March 9, 2022
**Weather:** 42ºF, Cloudy

**Consultant Inspector(s):** Pare Corporation, Matthew Dunn, PE, PLS, CFM

**Others in Attendance at Field Inspection:** None

**Attachments:** Figure 1: Locus Plan
Figure 2: Aerial Plan
Figure 3: Hydrology Map
Figure 4: Site Sketch
Photographs
Inspection Limitations

**I. Previous Inspection date/Overall Condition:**

- August 18, 2021 Phase I Inspection (Pare Corporation) / Poor
- August 16, 2017 Phase I Inspection (Haley & Aldrich) / Fair
- August 14, 2012 Phase I Inspection (GZA GeoEnvironmental) / Fair
- April 30, 1999 Phase I Inspection (Haley & Aldrich) / Fair

**II. Previous Inspection Deficiencies:**

1. Routine and persistent beaver activity / accumulated debris issues at the spillway often causing elevated pool levels, limited freeboard during normal operations, and restricted discharge capacity
2. Inadequate discharge capacity to accommodate the SDF, even with a cleared spillway
3. Inoperable low level outlet system and therefore no means of implementing a drawdown of the impoundment nor means of providing supplemental outlet capacity beyond the beaver/debris plagued spillway
4. Steep and irregular downstream slope that does not meet the required factors of safety for slope stability
5. Areas of overgrown tree and brush vegetation along the dam embankment
6. Areas of apparent sinkholes/vertical irregularities within the downstream area in the vicinity of the alignment of both the water supply distribution line and the stone culvert. Unknown if related to soil loss/settlement issues along conduit alignment
7. Gatehouse deficiencies including collapsed roof, inoperable door, and no safe access to mechanical equipment
8. Sediment/leaf accumulation up to 1-foot above the level of the 18-inch conduit within the impoundment as well several downed trees and limbs
9. Additional maintenance and dam safety concerns.

**III. Overall Condition of Dam at the Time of the Current Follow-up Inspection:**

**a. State the current condition:** Poor

**b. Have conditions changed since the previous inspection?** Debris from the spillway that had been present consistently has been removed by the Town during the emergency response to the September 2nd overtopping event.

**IV. Comparison of Current Conditions to Condition Listed in Previous Phase I Inspection Report:**

**a. Have any of the deficiencies listed in the previous Phase I Inspection Report worsened?** No

**b. If yes, list the changes.**

**i.** Not Applicable

**c. Are there any additional deficiencies that have been identified in the current inspection?** No

**d. If yes, list the deficiencies and describe.**

**i.** Not Applicable

**V. Dam Safety Orders:**

- Certificate of Non-Compliance and Dam Safety Order to be issued shortly.

**VI. Maintenance:**

1. **Indicate if there exists an operation and maintenance plan for the dam.** No formal operations and maintenance plan is known to exist.
2. **Indicate if it appears the dam is being maintained.** The Owner is actively involved in inspection and maintenance, particularly routine inspection for and removal of debris at the spillway.

**VII. Recommendations:**

Based on the visual observations during this and previous Follow-Up Inspections and previous Phase I Inspections, Pare recommends the following be completed at the dam:

*i. Studies and Analyses*

1. ***Design, Permitting, and Bidding of the Dam Rehabilitation Project:*** Complete the final design, permitting, and bid phases of the dam rehabilitation project to ready the project for the construction phase. *Design phase is close to completion; permitting, bid, and construction phases will commence once funding is secured.*

2. ***Operations and Maintenance Manual:*** Develop an O&M for this structure. O&M 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.

3. ***Site Safety Assessment:*** Coordinate the completion of a site-specific risk and safety assessment to further evaluate, categorize, and determine need for implementing a site safety improvement program.

*ii. Recurring Monitoring and Maintenance*

1. Perform ***regular monitoring and inspection*** of the dam and appurtenant structures, inclusive of checking for the following:

a. Accumulated debris within the spillway control section and approach and discharge areas.
b. Areas of suspected soil movement (e.g.: erosion, holes, depression, bulge, slides, slough)
c. Areas of seepage within the embankment.
d. Complete formal Phase I Inspections of the dam; as the dam is currently considered a significant hazard potential structure, formal inspection is required every 5 years.
e. As the dam has been found to be in Poor condition, Poor Condition Follow Up inspections are anticipated to be required once every 6 months.

2. Complete ***regular maintenance*** activities at the site; inclusive of the following:
   a. Routine removal of accumulated debris (beaver activities, fallen branches, logs, leaves, etc.) from the spillway control section, approach and discharge areas, and the dam in general.
   b. Control vegetation at the dam and downstream area including the regular mowing of grass vegetation.
   c. Address issue identified during the regular monitoring and inspection activities.

3. Complete ***routine review, updates, and exercise of the EAP*** as needed. At a minimum, the EAP should be reviewed annually to verify that contact information for response personnel remains up to date.

### *iii. Repairs*

Deficiencies that have been identified as part of the inspection that require minor repairs are anticipated to be addressed as part of the planned dam rehabilitation project. However, if the project is deferred or not implemented, Pare recommends that the findings of this report be reviewed and interim repairs be completed to address the noted concerns.

### *iv. Remedial Measures*

1. Implement design, permitting and construction phases of the dam rehabilitation project at the dam that includes:
   a. Modify the spillway system to address debris and capacity issues
   b. Embankment repairs including clearing and grubbing of the embankment, establishing a consistent dam crest elevation of El. 267.0, and regrading the downstream slope to a milder slope that meets the required factors of safety
   c. Convert the current 18-inch line into a LLO system for the dam (through sliplining, valve installation, and conduit extension to the downstream channel)
   d. Formally abandon the components of the gatehouse that are no longer in use (10-inch WSL, stone culvert, etc.) and complete miscellaneous gatehouse improvements
   e. Remove accumulated trees and limbs from the impoundment bottom that may impact outlet functionality

## VIII. Other Comments or Observations:

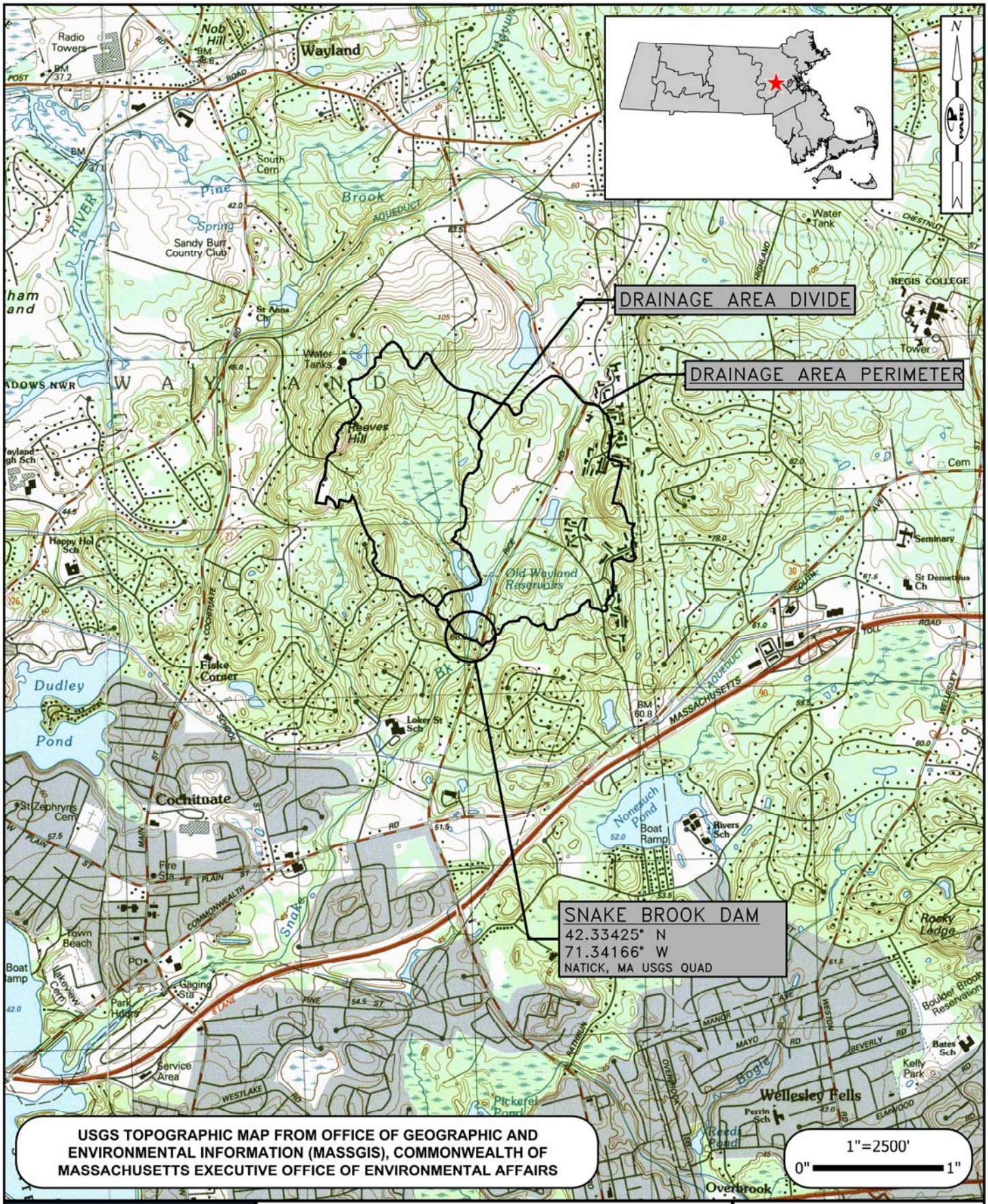
- As indicated within the After Action Report dated September 7, 2021, overtopping of the dam embankment occurred on September 2nd, 2021 in response to a high intensity rain event from Hurricane Ida. In response to the event, Town personnel removed much of the debris from the spillway and lined the low point of the crest with small sandbags. Refer to the After Action Report for additional information.
- During the current inspection the spillway was clear of debris and pool levels were near normal operating levels.

**IX. Updated Site Sketch with Photo Locations:** Attached

**X. Updated Photos:** Attached

**XI. Copy of Locus Map from Phase I Report:** Figure 1: Locus Plan attached

**XII. Other applicable attachment:** Figure 2: Aerial Plan, Figure 3: Hydrology Map, Inspection Limitations




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

PARE CORPORATION

# SNAKE BROOK DAM

MA01119

WAYLAND, MASSACHUSETTS

TOWN OF WAYLAND CONSERVATION COMMISSION

## LOCUS PLAN

AUGUST 2021

FIGURE 1


PARE CORPORATION

# SNAKE BROOK DAM

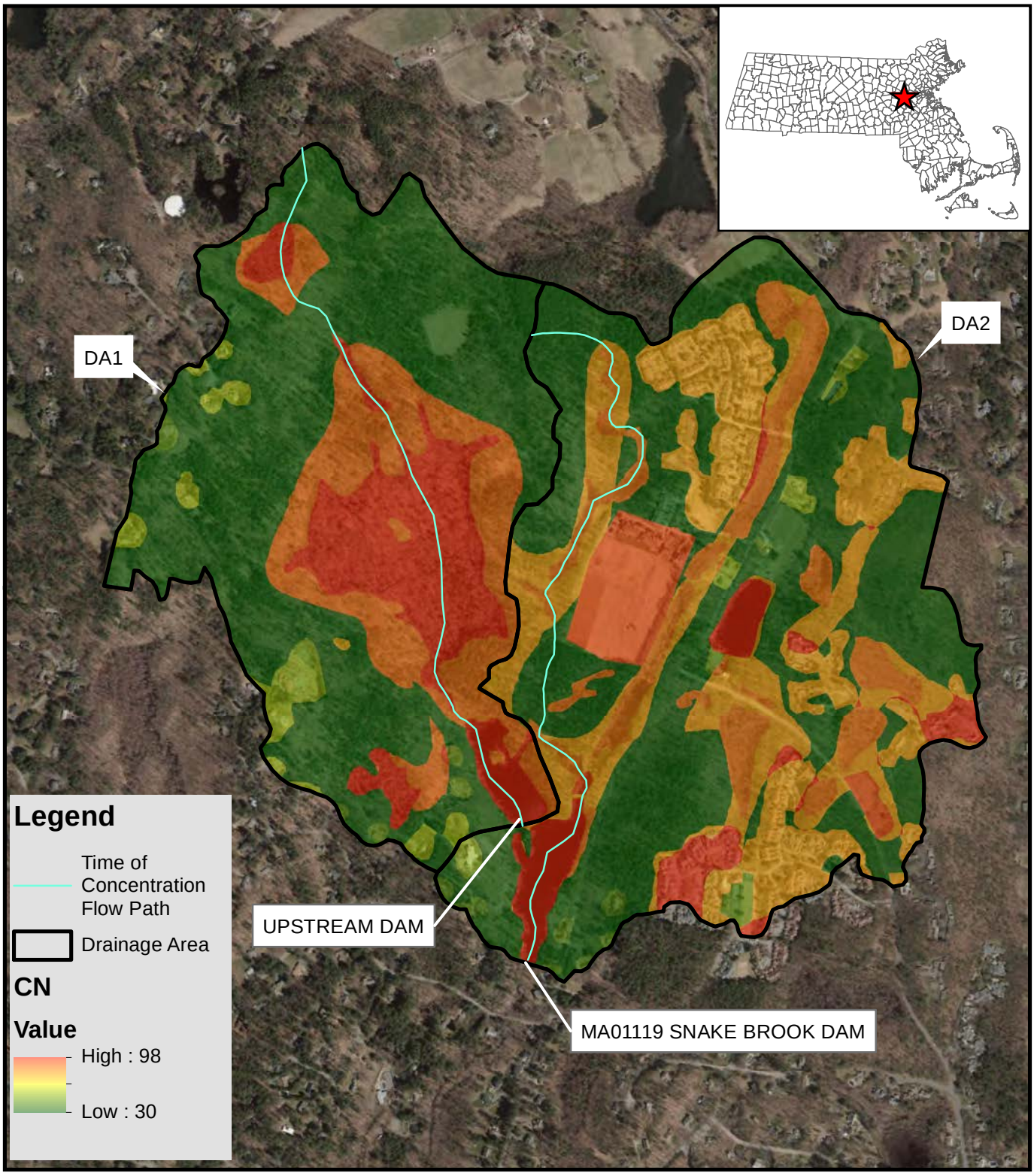
MA01119

WAYLAND, MASSACHUSETTS

TOWN OF WAYLAND CONSERVATION COMMISSION

AERIAL PLAN

AUGUST 2021 FIGURE 2




# HYDROLOGY MAP

SCALE:1"=1,000'

8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
(401) 334-4100

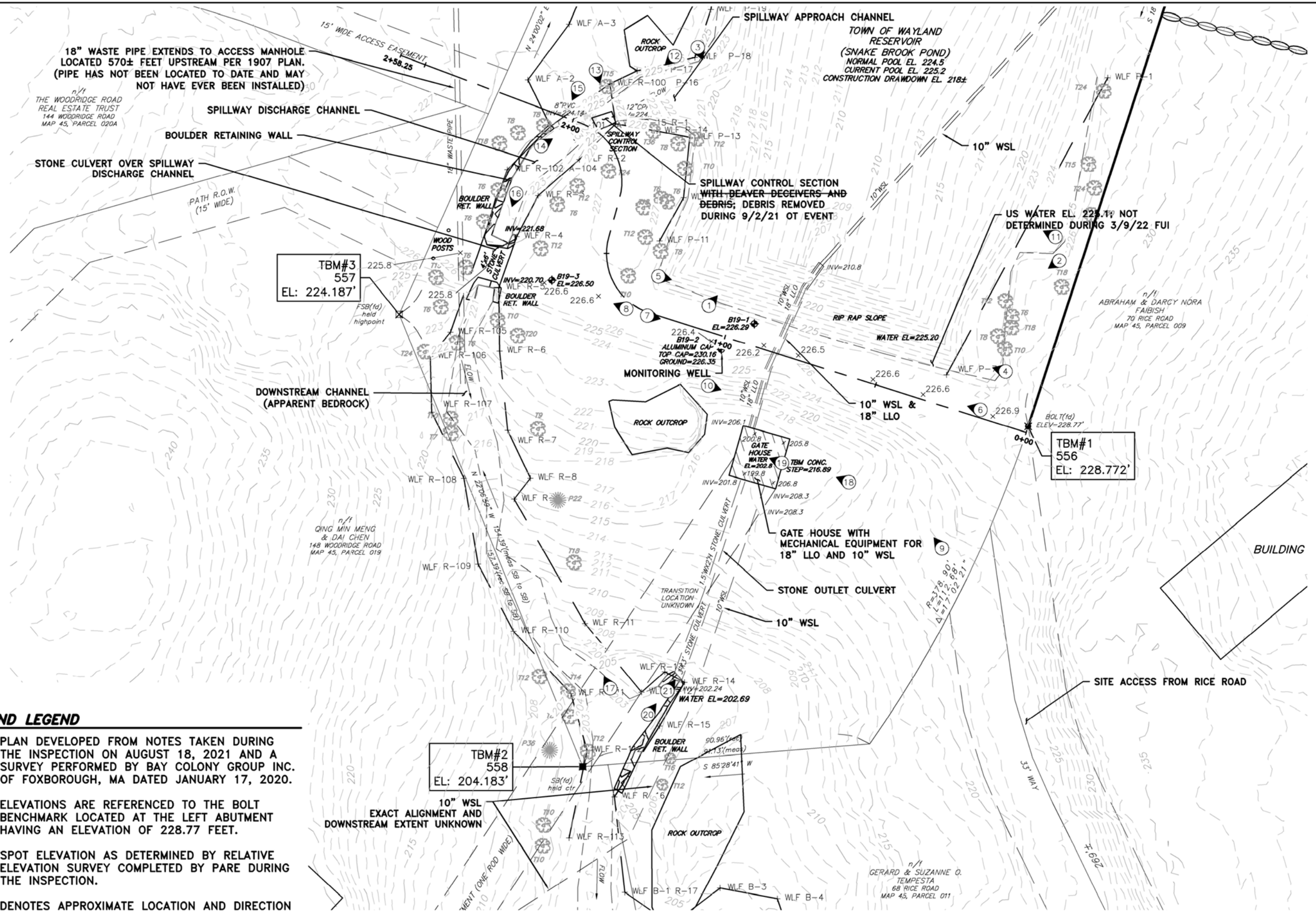
10 LINCOLN ROAD, SUITE 210
FOXBORO, MA 02035
(508) 543-1755

PARE PROJECT No. 19167.00 MARCH 2020

# FIGURE 3

SNAKE BROOK DAM
WAYLAND, MA

CLIENT: TOWN OF WAYLAND




## NOTES AND LEGEND

1. PLAN DEVELOPED FROM NOTES TAKEN DURING THE INSPECTION ON AUGUST 18, 2021 AND A SURVEY PERFORMED BY BAY COLONY GROUP INC. OF FOXBOROUGH, MA DATED JANUARY 17, 2020.
2. ELEVATIONS ARE REFERENCED TO THE BOLT BENCHMARK LOCATED AT THE LEFT ABUTMENT HAVING AN ELEVATION OF 228.77 FEET.

× 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

# SITE SKETCH

SCALE: 1"=30'±

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.

SNAKE BROOK DAM
MA01119
WAYLAND, MASSACHUSETTS
TOWN OF WAYLAND CONSERVATION COMMISSION

| REVISIONS: | | |
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| 1 | MED | MARCH 2022 FUI |
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|---|---|
| PROJECT NO.: | 19167.02 |
| DATE: | AUGUST 2021 |
| SCALE: | AS NOTED |
| DESIGNED BY: | MLP |
| CHECKED BY: | MED |
| DRAWN BY: | LMC |
| APPROVED BY: | ARO |

SITE SKETCH

FIGURE NO.: 4

Photo No. 1.: Overview of the impoundment from the dam crest.

Photo No. 2.: Overview of the upstream face of the dam from the upstream left abutment looking downstream and right.

Photo No. 3.: Overview of the upstream face of the dam from the spillway approach looking downstream and left.

Photo No. 4.: Upstream slope from the left abutment looking right.

Photo No. 5.: Upstream slope from near 1+30 looking left.

Photo No. 6.: Crest of the dam from the left abutment looking right.

Photo No. 7.: Crest of the dam from near 1+40 looking left.

Photo No. 8.: Crest of the dam from near 1+40 looking right.

Photo No. 9.: Downstream side of the dam from the downstream left abutment looking upstream and right.

Photo No. 10.: Downstream side of the dam from near 1+00 looking left.

Photo No. 11.: Spillway approach (red arrow) from the upstream left abutment looking right

Photo No. 12.: Spillway control section from the approach looking downstream.

Photo No. 13.: Spillway control section. Note beaver deceiver pipe.

Photo No. 14.: Spillway control section from the discharge channel looking upstream.

Photo No. 15.: Discharge channel of the spillway and the stone culvert from near the control section looking downstream.

Photo No. 16.: The stone culvert that carries the spillway channel beneath the crest looking downstream.

Photo No. 17.: Discharge channel of the spillway from the downstream channel looking upstream. Note the apparent bedrock outcrops throughout.

Photo No. 18.: Left side of the gatehouse.

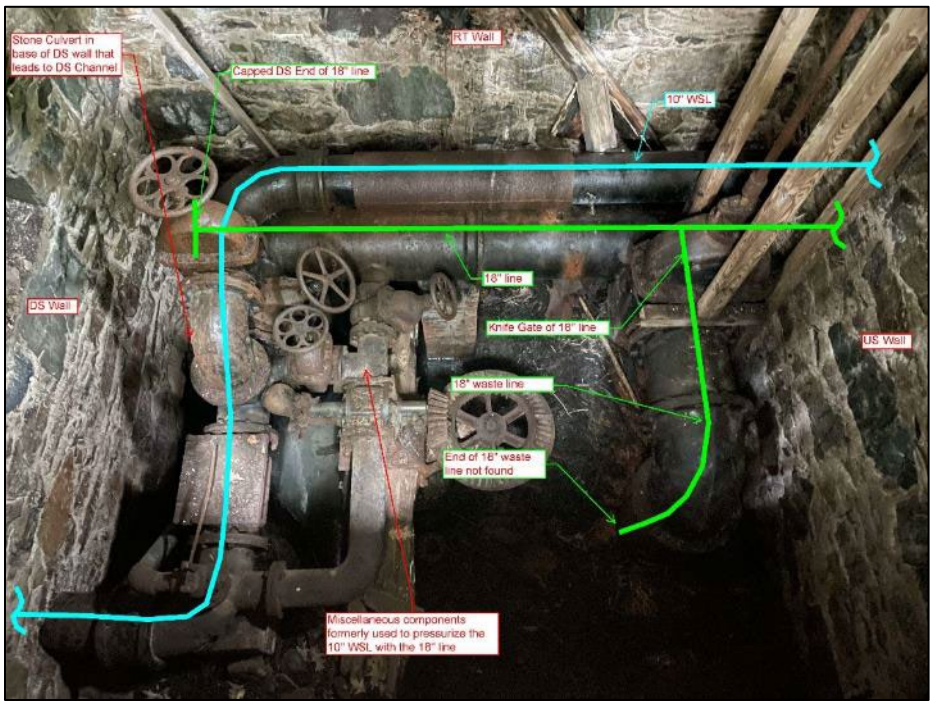


Photo No. 19.: View of the base of the chamber of the gatehouse with the various piping and controls of the 18-inch LLO and the 10-inch WSL.

Photo No. 20.: Downstream end of the stone culvert looking upstream.

Photo No. 21.: View within the culvert from the downstream end looking upstream.

Photo No. 22.: Downstream channel from Woodbridge Road looking upstream.

Photo No. 23.: Downstream channel from Woodbridge Road looking downstream.

**VISUAL DAM INSPECTION**
**LIMITATIONS**

## Visual Inspection

1. The assessment of the general condition of the dam is based upon available data and abbreviated visual inspections completed as part of the follow up inspection. 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 Wayland for specific application to the Snake Brook 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.