

-- WYOMING UPPER DAM --
VISUAL INSPECTION / EVALUATION REPORT



Dam Name: Wyoming Upper Dam

NID ID#: RI01401

State ID#: 216

Owner: Rhode Island Dept. of Fish and Wildlife

Town: Hopkinton

Hazard Classification: High

Consultant: GZA GeoEnvironmental, Inc.

Date of Inspection: March 19, 2025



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By RIDEM at 8:53 am, Jun 20, 2025



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June 20, 2025
GZA File No. 01.0177966.00

Stacey Pinto, Environmental Engineer III
Rhode Island Department of Environmental Management
Office of Compliance and Inspection, Dam Safety Program
235 Promenade Street, Providence, Rhode Island 02908

Re: Visual Inspection/Evaluation Report
Wyoming Upper Dam
NID #RI01401
State ID #216
Hopkinton, Rhode Island

Dear Ms. Pinto,

In accordance with our Purchase Order #3931646 with Rhode Island Department of Environmental Management (RIDEM), GZA GeoEnvironmental, Inc. (GZA) has completed our visual inspection of the Wyoming Upper Dam (Dam), located in Hopkinton, Rhode Island. The inspection was conducted on March 19, 2025. The purpose of our efforts was to perform a formal visual inspection of the dam in accordance with Dam Safety Regulations 250-RICR-130-05-1, Subchapter 05. Our services and report are subject to the Limitations in **Appendix A**.

Wyoming Upper Dam is currently classified by the RIDEM as a High Hazard Dam. A discussion of our evaluations and recommended action items is presented in the Visual Inspection/Evaluation Report.

We are happy to have been able to assist you with this inspection and appreciate the opportunity to continue to provide the RIDEM with dam engineering consulting services. Please contact the undersigned (860-462-3016, james.davis@gza.com) if you have any questions or comments regarding the content of this Inspection/Evaluation Report.

Sincerely,
GZA GeoEnvironmental, Inc.

Billy Carias E.I.T.
Assistant Project Manager

David M. Barstow, P.E.^(CT)
Consultant / Reviewer

James F. Davis, P.E.
Principal-In-Charge

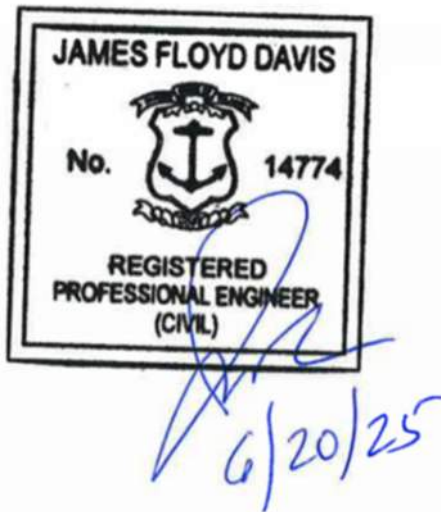


PREFACE

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.



JAMES F. DAVIS, P.E.

Rhode Island License No.: 14774

Principal-in-Charge
GZA GeoEnvironmental, Inc.



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- Appendix B: Photographs
- Appendix C: List of Previous Reports and References
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1.0 DESCRIPTION OF PROJECT

1.1 GENERAL

1.1.1 Authority

The Rhode Island Department of Environmental Management (RIDEM) Office of Compliance and Inspection retained GZA GeoEnvironmental, Inc. (GZA) to perform a visual inspection and prepare a report summarizing the observed conditions of Wyoming Upper Dam in Hopkinton, Rhode Island. GZA performed the visual inspection of the dam on March 19th, 2025, in accordance with Rhode Island Rules and Regulations for Dam Safety (250-RICR-130-05-1). This report is subject to the Limitations in **Appendix A**.

1.1.2 Purpose of Work

The purpose of the project was to visually inspect the condition of the dam and appurtenant structures in accordance with Rhode Island Rules and Regulations for Dam Safety and to prepare a report summarizing the conditions observed and provide recommendations for maintenance and or repair. GZA completed the following for this Project: 1) obtained and reviewed existing information from the RIDEM files; 2) performed a visual dam inspection; and 3) prepared this report summarizing our findings.

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. The terms “left” and “right” when used in this report are oriented as facing downstream.

1.2 DESCRIPTION OF PROJECT

1.2.1 Location

Wyoming Upper Dam is located in the Town of Hopkinton, Washington County, Rhode Island. The dam impounds Wyoming Pond, and discharges into Wood River to the south. Locustville Pond Dam is located about a half mile south of Wyoming Dam.

Wyoming Upper Dam is located on the southern shoreline of Wyoming Pond with approximate coordinates 41.51592°N Latitude and 71.70341°W Longitude. A Site Locus showing the area of the dam is provided as **Figure 1**.

The dam can be accessed via a parking lot off of Bridge Street. The directions to the dam from Providence are:

1. Take I-95 South for 27 miles and merge onto exit 7 for RI-138W towards Hope Valley.
2. Follow RI-138W/Main Street for approximately 0.5 miles and take a left on Nooseneck Hill Road.
3. Stay on Nooseneck Hill Road/Route 3 for approximately 0.5 miles and take a right onto Bridge Street.
4. The dam is to the right and parking is available at a dirt lot near the left abutment of the dam.



1.2.2 Owner/Operator

The dam is owned and operated by RIDEM Division of Fish and Wildlife. The Owner's representative, Mr. Phillip Edwards, assisted by Michael Cabral and Alan Libby can be reached at phillip.edwards@dem.ri.gov, michael.cabral@dem.ri.gov, and alan.libby@dem.ri.gov. Mr. Cabral and Mr. Libby serve as the caretakers of the dam.

1.2.3 Purpose of the Dam

The dam impounds water for recreational purposes. The dam was reportedly originally built as a water supply for local mills formerly located at each abutment. Online articles indicate a dam has been at this location since the 1750s with the current configuration since at least 1890.

1.2.4 Description of the Dam and Appurtenances

The dam is approximately 310 feet long and 11 feet tall. Significant repairs were made to the dam circa 2021. The brief description of the dam after the repairs is based on the March 4, 2020 Rule 10 Submission prepared by Pare Corporation. As-built and design plans were not provided at the time of this report. The dam consists of the following primary structures:

Embankment: The embankment is broken into three sections, separated by the sluiceway and spillway. The left side of the embankment consists of an approximate 60-foot-long, 100-foot wide earthen embankment supported by an upstream stone masonry wall. The right side of the embankment consists of an approximate 70-foot-long earthen embankment. The upstream side consists of an approximately 3 horizontal to 1 vertical (3H:1V) riprap slope. The riprap ranged from about 4 to 12 inches in diameter. The downstream side consists of an approximate 40-foot-long cast in place concrete retaining wall and an approximate 30-foot long, earthen slope with an approximate 3H:1V downstream slope. The area between the sluiceway and primary spillway is approximately 15 feet wide and identified as the center embankment. The center embankment has stone masonry walls around four sides, covered in grass and has an upstream concrete slab.

Primary Spillway: The primary spillway is approximately 180 feet long and consists of a stone masonry gravity structure with a concrete cap. The spillway consists of three approximately 60-foot-long sections at 30-degree bends to form a broad U-shape. The downstream face of the spillway is vertical. Bedrock outcrops and boulders exist at the toe of the spillway.

Low Level Outlet: The 24-inch diameter low-level outlet is located at the base of the concrete wall on the right side of the dam. The outlet controls are located in a locked hatch at the top of the embankment. A former low-level outlet was located through the right third of the spillway and is assumed to have been abandoned as part of the 2021 repairs.

Sluiceway: A stone masonry sluiceway is located between the left and center embankments. The sluiceway is an approximate 13-foot-wide stone masonry wall-lined channel. Approximately in line with the spillway are two, approximately 6-foot-wide aluminum gates positioned side-by-side. The gates are reportedly leaf gates that can be operated together as a single unit, or individually. The gates are accessed via a wooden pedestrian bridge between the embankments. Flow from the sluiceway travels about 35 feet downstream where the culvert turns 90-degrees to the right and becomes a stone masonry tunnel for about 30 feet. After the tunnel, the channel extends another 45 feet where it meets with the spillway downstream channel.



Downstream Channel: Immediately downstream of the dam, the downstream channel consists of an approximate 2H:1V riprap slope along the right side that transitions to a stone masonry wall, and stone masonry walls along the left side. The primary spillway, sluiceway and low-level outlet discharge into Wood River which flows about 4,700 feet downstream to Wood River Pond. Beyond the masonry walls, the downstream channel consists of bedrock and boulders within a forested area.

1.2.5 Operations and Maintenance

The RIDEM Division of Fish and Wildlife are responsible for the operations and maintenance of the dam. Mr. Michael Cabral and Mr. Alan Libby are the current caretakers of the dam and were present during the inspection. Information from Mr. Cabral and Mr. Libby has been incorporated into this report. The embankment is reportedly mowed monthly during the growing season and representatives from RIDEM routinely visit the dam (on a weekly basis) to observe if there is active seepage, animal activity, debris caught on the primary spillway or sluiceway, or other unusual observations. As part of the visits, debris (if any) on the primary spillway and sluiceway is removed. RIDEM personnel also visit the dam after significant storm events.

1.2.6 Hazard Potential Classification

Wyoming Upper Dam is currently classified by RIDEM as a HIGH hazard potential dam, which is defined as “*failure or mis operation will result in a probable loss of human life*”. The dam is located upstream of Wood River and Locustville Pond Dam, Route 3/Nooseneck Hill Road and surrounded by residential and commercial businesses. The dam is also located 1 mile north from I-95.

In 2017, GZA completed a screening-level spillway adequacy analysis of the dam. GZA’s analysis concluded that the dam’s spillway does not have the capacity to pass the estimated 100-year and 500-year peak flow. The analysis showed that the 100-year and 500-year flood flows overtop the dam by 0.2 feet and 0.9 feet. Our understanding is that the hydrologic and hydraulic properties of the dam did not change during the 2021 repairs.

1.2.7 Design and Construction Records

No records are known to exist for the original design or construction of the dam. Records of the circa 2021 reconstruction were not available to GZA. Based on a report by Pare Corporation titled, “Wyoming Upper Reservoir Dam Repairs & Rule 10 Submission”, dated March 4, 2020, repairs at the dam performed in circa 2021 consisted of:

- Removing inoperable sluiceway controls and replacing with operable gates;
- Abandoning the existing low-level outlet within the primary spillway;
- Excavation and replacement of the embankment right of the primary spillway with a new low-level outlet structure and cast-in-place concrete wall;
- Removing loose and deteriorated concrete from the spillway crest and replacing with a new concrete cap;
- Installing engineered fill as a cutoff upstream of the spillway;
- Reconstructing damaged sections of stone masonry on the downstream face of the spillway;
- Repointing stone masonry wall within 10 feet of the dam/spillway structure;
- Completing a permeation grouting program at the center of the embankment to address leakage and sinkholes; and
- Removing vegetation from the downstream channel.



2.0 INSPECTION

2.1 VISUAL INSPECTION

Wyoming Upper Dam was inspected on March 19, 2025, by James Davis, P.E. and Billy Carias of GZA. At the time of the visit, the weather was sunny, and the temperature was mid-40°F. Mr. Michael Cabral and Mr. Alan Libby, the caretakers of the dam, were present during the inspection. Photographs to document the current conditions of the dam were taken during the inspection and are included in **Appendix B**, with photo locations shown on **Figure 2**. The impoundment level at the time of inspection was approximately 1 to 2 inches above the primary spillway. Underwater areas of the structure were not observed.

2.1.1 General Findings

Wyoming Upper Dam was repaired and upgraded sometime around 2021. In general, the observed deficiencies included:

- Irregular and displaced stone masonry along the left portion of the sluiceway downstream channel.
- Bulge in the sluiceway downstream stone masonry wall towards Wood River.
- Depressions above the tunnel-portion of the sluiceway downstream channel.
- Sparse grass with areas of exposed soil on top of the right embankment.
- Areas of exposed soil on the upstream riprap slope to the right of the primary spillway.

Specific observations are identified in more detail in the sections below:

2.1.2 Dam Embankment

No indications of slope instability, misalignment, or settlement were observed on the embankment. The abutment-to-embankment contacts appeared good.

Left Embankment

- The left embankment was supported by an upstream stone masonry wall. The upstream wall appeared in good condition during the current inspection with no indications of movement, rotation, or misaligned stones.
 - In Pare's 2014 visual inspection report, it was stated that the upstream wall was in poor condition with missing mortar, missing chinking stones, displaced stone and vegetation growth through the wall joints. GZA assumes the wall was repaired during the 2020-2021 repairs.
- The top of the embankment consisted of grass. The grass appeared mature and well maintained. The embankment appeared uniform with no signs of depressions or other abnormalities.
 - In Pare's 2014 visual inspection report, sinkholes behind the retaining wall were observed. GZA assumes the depressions were repaired during the 2020-2021 repairs.

Center Embankment

- The center embankment consists of an approximately 10 to 15 feet wide stone masonry lined earthen embankment. The top of the embankment consisted of grass with an upstream concrete platform. The



grass appeared mature and well maintained. The embankment appeared uniform with no signs of depressions or other abnormalities.

- In Pare's 2014 visual inspection report, several depressions were noted along the embankment. GZA assumes the embankment was repaired during the 2021-2021 repairs.
- The stone masonry walls to the left and right of the embankment are also the training walls for the sluiceway and primary spillway. The walls appeared in good condition during the inspection with no indications of movement, rotation or misaligned stones.
 - Portions of the walls appeared to have been repointed and the embankment was reportedly permeation grouted as part of the 2021-2022 repairs.
 - Two areas of leakage were observed on the left side of the embankment, adjacent to the sluiceway. The leakage points were approximately 6 inches apart and one area was through a grouted joint and the second was through a circular opening (unsure if a weephole). The leakage was estimated to be less than 1 gallon per minute.

Right Embankment

- The top of the embankment consisted of sparse grass and large areas of exposed soil. The exposed soil was hard packed.
- The upstream slope consisted of 4- to 12-inch riprap. Some patches of soil were observed between the smaller riprap stones.
- The embankment appeared uniform with no signs of depressions or other abnormalities, except for an approximate 18-inch wide and 4-inch deep depression adjacent to the low-level outlet locked hatch.
- Hairline cracks were observed at the top of the downstream concrete wall, but they did not appear to be structural cracks.
- No deficiencies in the downstream concrete wall were observed.

2.1.3 Low-Level Outlet

- The low-level outlet is located through the right embankment.
- The dam caretakers indicated that the low-level outlet is operational and exercised at least two times a year. The last known operation of the outlet was in the fall of 2024 and the gate was reportedly able to open with no issues. The caretakers did not have the equipment to operate the gate or the key to the hatch.
- Some iron staining and less than 1 gpm of leakage was observed downstream of the gate.
- The intake was below water and not observed during the current inspection.

2.1.4 Primary Spillway

- During the time of inspection, approximately 1 to 2 inches of water was flowing over the spillway limiting observations.



- The recently repaired concrete apron along the upstream approach appeared in like new-condition. No scour was observed when viewing from the left and right training walls.
- No signs of misaligned stones, overturning or bulging of the downstream stone masonry spillway wall was observed based on the limited observations that could be made.
- There was no debris or vegetation in the spillway approach or discharge area.
- Flow and tailwater obscured the condition of the toe of the spillway and prevented assessment of potential toe scour.
- The cast-in place concrete retaining wall right of the primary spillway and a stone masonry wall left of the spillway serve as the spillway's training walls. The sections of the walls serving as training walls appeared in good condition. Cracking concrete or misplaced stone masonry was not observed.

2.1.5 Sluiceway

- During the time of inspection, approximately 6 inches of water was flowing over the sluiceway limiting observations.
- The sluiceway is operated at least twice a year and can be positioned such that it is lower than the spillway. The last known operation of the sluiceway gates was in the fall of 2024 and the gates were reportedly able to open with no issues
- In general, the stone masonry walls at the sluiceway gates appeared in good condition with evidence of recent repointing.
- No indications of movement, rotation or misaligned stones was observed.
- The upstream wooden footbridge appeared to be in good condition with no deficiencies.

2.1.6 Downstream Channel

Primary Spillway and Low-Level Outlet

- Flow from the spillway and low-level outlet enters Wood River, below Bridge Street and flows approximately 4,700 feet downstream to Wood River Pond.
- Immediately downstream of the dam, the right side of the channel consists of an approximate 2H:1V riprap slope and a stone masonry wall. The riprap appeared to range from about 6- to 24-inch diameter. The stone masonry wall appeared to be in good condition with no signs of rotation, bulging or missing stone. Brush was growing near the water line of the riprap.
- The left side of the channel consists of stone masonry walls, likely from former mill structures. The masonry walls had an irregular top elevation, but appeared stable with no signs of rotation or bulging.
- Near the center of the spillway is the center support for the Bridge Street bridge. The center support is located on an island that is overgrown with brush, saplings and small trees.



Sluiceway

- Flow from the sluiceway travels about 35 feet downstream where the culvert turns 90-degrees to the right and becomes a stone masonry tunnel for about 30 feet. After the tunnel, the channel extends another 45 feet where it meets with the spillway downstream channel
- Prior to the tunnel-portion of the channel, the left side of the channel consists of a stone masonry wall with random-stacked riprap. The wall appeared to be overturning with exposed soil in areas. The wall supports the left embankment and the parking at the dam.
- Above the tunnel-portion of the channel, three depressions were observed that were up to 36-inches wide and 12-inches deep. The soil appears to be migrating through openings on the upstream headwall of the tunnel, in what appears to be windows of the former mill building.
- Beyond the tunnel, the sluiceway channel is separated from the spillway channel by an irregular stone masonry wall or riprap embankment. The separating structure was difficult to observe due to brush growth.
- The left stone masonry wall downstream of the tunnel was bulging. At the top of the bulge was evidence of a former tree, consisting of root remnants and an approximate 3-foot diameter low area.

2.1.7 Downstream Area

The spillway and sluiceway channel discharge into separate channels that converge about 50 feet downstream of the dam. Wood River then flows approximately 4,700 feet downstream to Wood Pond. Downstream of Bridge Street appears to be generally flat and wooded.

2.1.8 Reservoir Area

The perimeter of the pond is surrounded by woodlands and residences. Wyoming Pond is approximately 4,000-foot long and about 400-foot wide. Flow enters the impoundment near its northeast side from Wood River. The perimeter of the pond is developed with mostly residences or wooded areas.

2.2 CARETAKER INTERVIEW

Mr. Michael Cabral and Mr. Alan Libby, the dam Caretakers, were present throughout the inspection. The information provided was incorporated into this report.

2.3 OPERATION AND MAINTENANCE PROCEDURES

No formal operations or maintenance manual was available at the time of the inspection.

2.3.1 Operational Procedures

Operable components include the low-level outlet gate and sluiceway. The dam caretakers indicated the low-level outlet gate and sluiceway are exercised at least two times a year.



2.3.2 Maintenance of Dam and Operating Facilities

Mr. Michael Cabral and Mr. Alan Libby were both knowledgeable regarding the dam maintenance. Although there is no maintenance plan for the dam, typical maintenance performed at the dam includes regularly cutting vegetation, clearing debris from the primary spillway, sluiceway, filling eroded areas, and revegetating erosion. In addition, RIDEM staff visit the dam after significant storm events.

3.0 ASSESSMENTS AND RECOMMENDATIONS

3.1 ASSESSMENTS

The following deficiencies were observed at Wyoming Upper Dam:

Structure	Noted deficiencies
Right Embankment	<ul style="list-style-type: none"> • Top of the right embankment had sparse grass and areas of exposed soil. • The upstream slope of the right embankment had exposed soil. • Small depressed area near the low-level outlet hatch.
Sluiceway	<ul style="list-style-type: none"> • Two minor leaks were observed on the right side of the channel. • Irregular and displaced stone masonry wall along the left side of the sluiceway downstream channel. • Apparent bulge in the stone masonry downstream wall along Bridge Street. • Depressions above the tunnel-portion of the sluiceway channel.

Pare completed an inspection of Wyoming Upper Dam in 2014, which was the most recent inspection to which GZA had access to records. Repairs were made to the dam in 2020-2021 which appeared to address recommendations from Pare’s inspection report. A comparison of recommendations from Pare’s 2014 report and conditions observed during the current inspection are summarized below:

Previous Recommendation	Resolution or Current Conditions
Fill sinkholes right of the spillway and at the left and right embankments with compacted engineered fill.	Sinkholes and depressions were reportedly repaired during the 2020-2021 repairs and not observed during the current inspection at the embankments.
Clear vegetation, re-chink and repoint stone masonry at walls that support the three embankments (center, left, right), right channel wall at the sluiceway’s discharge and downstream face of spillway.	This work was reportedly completed in 2020-2021.
Perform Underwater inspections, dye tests, subsurface investigations and flow monitoring if clearing vegetation, re-chinking and re-pointing stone masonry did not address leaks through wall.	A grouting program was reportedly performed as part of the 2020-2021 repairs.



Previous Recommendation	Resolution or Current Conditions
Clear discharge channel of all vegetation from flow areas between spillway and Bridge Street.	Spillway channel was clear of vegetation and debris as part of the 2020-2021 repairs, although vegetation is starting to return.
Complete a stability evaluation of the dam sections.	GZA is unaware if Pare Corporation performed a stability evaluation of the spillway and other dam sections. A stability analyses was reportedly completed for the new concrete retaining wall at the right embankment.
Complete an underwater inspection to assess the condition of walls, gates, stop logs, and other structures that are normally below water.	These structures were replaced as part of the 2020-2021 repairs.
Complete an inspection of the downstream face of the spillway under low flow conditions to assess the spillway for indications of problematic leakage or stone loss.	Based on the dam repairs and rule 10 submission report submitted by Pare Corporation dated March 4, 2020, failed stone masonry sections were proposed to be repaired during the 2020-2021 repairs.
Monitor the seepage through the base of the wall right of the spillway and beneath the concrete wall at the apparent former flume location.	The right embankment was reconstructed during the 2020-2021 repairs.
Evaluate the abandonment procedures utilized at the flume.	Former flume was demolished during the 2021-2022 repairs.
Seal leakage around the stop log slots at the sluiceway.	The sluiceway gate was replaced during the 2021-2022 repairs.
Modify the existing controls at the sluiceway to provide an operable outlet structure.	The sluiceway gate was replaced during the 2020-2021 repairs.
Trap and remove burrowing animals and promptly fill the resulting holes with compacted structure fill.	No animal burrows were observed during the current inspection.
Rehabilitate the right embankment's upstream side.	The right embankment was replaced in 2020-2021.
Development of a formalized Operations and Maintenance Manual.	Not complete but RIDEM performs regular maintenance of the dam.
Implement a program of regular inspection and monitoring of the dam.	A formal maintenance program has not been completed but dam caretakers regularly inspect the dam and after significant storm events.



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 should be determined.

3.2 RECURRENT MAINTENANCE RECOMMENDATIONS

GZA recommends that the Owner arrange for the following maintenance activities to be performed on a regular basis:

- M1. Clear vegetation within the downstream channel to limit debris collection during storm events.
- M2. Consider the development of a formal Operations and Maintenance Plan that includes schedule and procedures for maintaining vegetation, operation of the low-level outlet, inspection schedule and observation checklists.
- M3. Fill the former window openings above the tunnel-portion of the sluiceway downstream channel with concrete which is allowing migration of soils. Although not necessarily a dam safety concern, the public walk along this portion of the dam and the sinkholes create a tripping hazard.
- M4. Continue trying to grow grass along the top of the right embankment. Fill low spots with topsoil.
- M5. Add supplemental riprap along the right embankment upstream slope where displacement or missing riprap is observed.
- M6. Monitor the bulge along the sluiceway downstream stone masonry wall, parallel to Bridge Street. The monitoring could consist of measuring the edge of the bulge with a plumb bob at consistent locations to evaluate whether the bulging is ongoing. If ongoing, develop a repair plan before the sidewalk collapses, which could create safety issues with Bridge Street.
- M7. Monitor the leaks on the left side of the center embankment (right side of sluiceway downstream channel). If the migration of soil is observed, contact an engineer to further evaluate. The leakage could be through the embankment, which a grouting program or installation of less permeable soil may control. The leakage could also be flowing through the masonry wall itself and could be controlled with repointing the wall.

3.3 STUDY RECOMMENDATIONS

- S1. GZA performed a cursory spillway capacity analysis in 2017. The 2017 GZA study indicated the dam's spillway does not have the capacity to pass the estimated 100-year and 500-year peak flow and the dam would be overtopped by 0.2 feet and 0.9 feet, respectively. We understand the 2021 improvements to the dam did not change the hydraulic properties of the dam. Perform a hydrologic & hydraulic analysis (H&H) using the latest rainfall estimates to evaluate the current spillway capacity, along with recommendations for spillway design flood (SDF). If the spillway capacities are insufficient, design and construct improvements to supplement capacity or storage.

3.4 REPAIR RECOMMENDATIONS

- R1. Repair the displaced and overturning stone masonry wall on the left side of the sluiceway downstream channel. The repair would likely consist of removing the stone, resetting the wall, and placing the upper riprap in a more controlled fashion.



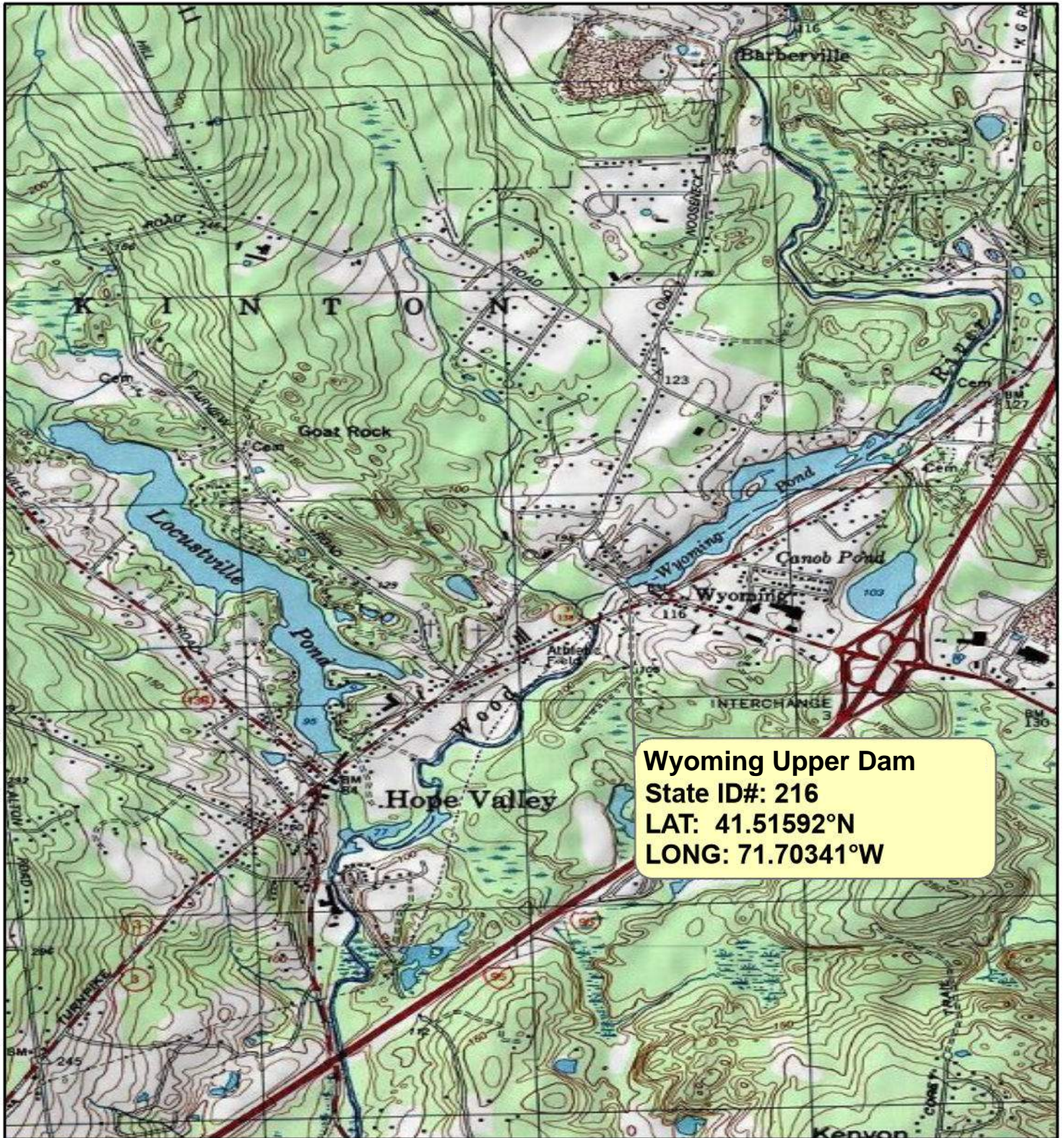
3.5 ALTERNATIVES

The following alternatives were evaluated for their feasibility at Wyoming Upper Dam: no action and permanent breaching of dam.

- **No action:** The dam appears to be well maintained. The maintenance, study and repair recommendations will reduce future maintenance and unexpected issues at the dam. No action is not recommended by GZA.
- **Lower Impoundment:** Lowering the impoundment would consist of lowering a piece of the spillway. This alternative would decrease the head on the dam which would reduce the risk of overtopping and potential dam failure. However, all of the recommendations referenced herein are also applicable and recommended to be performed. Lowering the impoundment would have to be evaluated with surrounding residences. Documents from RIDEM files indicate that when the dam was lowered prior to the 2021 repairs due to leakage, several residences had well issues. If wells are tied to the water level at the pond, this alternative may not be feasible.
- **Permanent breaching** of the dam would remove the impoundment and decrease the Owner's risk associated with owning a dam and lower maintenance costs. Although breaching would decrease risks associated with owning a dam, the construction and permitting costs would likely be greater than repairs and yearly maintenance. The breaching would also remove environmental and recreational resources. The initial steps to further evaluate breaching, if breaching is considered an alternative, should include:
 - Hydrologic and hydraulic analyses to determine the extent of breach required and assess downstream impacts during routine storm events if the dam were to be breached. If changes to downstream flooding is estimated from the dam breach, consultation with RIDEM and possibly a lawyer should be considered to evaluate the Owner's potential liability, if any, from changing conditions of the impoundment.
 - Pre-characterization analytical testing and estimating the volume of the impounded sediments for potential contamination. Management and disposal of sediments have the potential to be a significant cost of breaching projects, depending on volume and potential contamination.
 - Pre-application meeting with RIDEM to determine potential for rare or endangered species in the area, if breaching the dam may have impacts to the species environment, and what mitigation measures may be required.



FIGURES



Wyoming Upper Dam
State ID#: 216
LAT: 41.51592°N
LONG: 71.70341°W



SOURCE : THIS MAP CONTAINS THE ESRI ARCGIS ONLINE USA TOPOGRAPHIC MAP SERVICE, PUBLISHED DECEMBER 12, 2009 BY ESRI ARCGIS SERVICES AND UPDATED AS NEEDED. THIS SERVICE USES UNIFORM NATIONALLY RECOGNIZED DATUM AND CARTOGRAPHY STANDARDS AND A VARIETY OF AVAILABLE SOURCES FROM SEVERAL DATA PROVIDERS.

Data Supplied by :



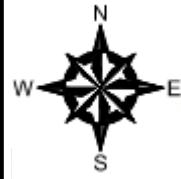
PROJ. MGR.: PTP
 DESIGNED BY: SC
 REVIEWED BY: PTP
 OPERATOR: SC
 DATE: 04-08-2025

LOCUS PLAN

WYOMING UPPER DAM
HOPKINTON, RHODE ISLAND

JOB NO.
 01.0177966.00

FIGURE NO.
1



GENERAL NOTES:

1. BASE MAP DEVELOPED FROM AERIAL IMAGERY AVAILABLE ON RHODE ISLAND GIS (RIGIS).

LEGEND

APPROX. PHOTOGRAPH LOCATION & ORIENTATION

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL INC. (GZA). THE INFORMATION SHOWN ON THIS DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR MODIFIED IN WHOLE OR IN PART FOR ANY OTHER PURPOSE OR PROJECT. REUSE, OR MODIFICATION TO THE DRAWING, SHALL BE AT THE USER'S OR SUCH OTHER PARTIES' SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

**WYOMING UPPER DAM
HOPKINTON, RHODE ISLAND**

**VISUAL INSPECTION REPORT
PHOTO LOCATION PLAN**

PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com	PROJ MGR: PTP DESIGNED BY: BC	REVIEWED BY: JFD CHECKED BY: DMB
PREPARED FOR: RIDEM PROVIDENCE, RI	PROJECT NO: 01.0177966.00 DATE OF INSPECTION: 3-19-2025	FIGURE NO. 2



APPENDIX A – LIMITATIONS



DAM ENGINEERING REPORT LIMITATIONS

Use of Report

1. GZA GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of the Rhode Island Department of Environmental Management (Client) for the stated purpose(s) and location(s) identified in the Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

Standard of Care

2. Our findings and conclusions are based on the work conducted as part of the Scope of Services set forth in the Report and/or proposal, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. Conditions other than described in this report may be found at the subject location(s).
3. Our services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

Subsurface Conditions

4. If presented, the generalized soil profile(s) and description, along with the conclusions and recommendations provided in our Report, are based in part on widely-spaced subsurface explorations by GZA and/or others, with a limited number of soil and/or rock samples and groundwater /piezometers data and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs. The nature and extent of variations between these explorations may not become evident until further exploration or construction. If variations or other latent conditions then appear evident, it will be necessary to reevaluate the conclusions and recommendations of this report.
5. Water level readings have been made in test holes (as described in the Report), monitoring wells and piezometers, at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this Report. Fluctuations in the groundwater and piezometer levels, however, occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, reservoir and tailwater levels, the presence of subsurface utilities, and/or natural or artificially induced perturbations.

General

6. The observations described in this report were made under the conditions stated therein. The conclusions presented were based solely upon the services described therein, and not on scientific tasks or procedures beyond the scope of described services or the time and budgetary constraints imposed by the Client.
7. In preparing this report, GZA relied on certain information provided by the Client, state and local officials, and other parties referenced therein available to GZA at the time of the evaluation. GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.
8. Any GZA hydrologic analysis presented herein is for the rainfall volumes and distributions stated herein. For storm conditions other than those analyzed, the response of the site's spillway, impoundment, and drainage network has not been evaluated.



9. Observations were made of the site and of structures on the site as indicated within the report. Where access to portions of the structure or site, or to structures on the site was unavailable or limited, GZA renders no opinion as to the condition of that portion of the site or structure. In particular, it is noted that water levels in the impoundment and elsewhere and/or flow over the spillway may have limited GZA's ability to make observations of underwater portions of the structure. Excessive vegetation, when present, also inhibits observations.
10. In reviewing this Report, it should be realized that the reported condition of the dam is based on observations of field conditions during the course of this study along with data made available to GZA. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. 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 inspection and care can there be any chance that unsafe conditions be detected.

Compliance with Codes and Regulations

11. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.
12. This scope of work does not include an assessment of the need for fences, gates, no-trespassing signs, boat/swimmer barriers, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

Cost Estimates

13. Unless otherwise stated, our cost estimates are for comparative, or general planning purposes. These estimates may involve approximate quantity evaluations and may not be sufficiently accurate to develop construction bids, or to predict the actual cost of work addressed in this Report. Further, since we have no control over the labor and material costs required to plan and execute the anticipated work, our estimates were made using our experience and readily available information. Actual costs may vary over time and could be significantly more, or less, than stated in the Report.

Additional Services

14. It is recommended that GZA be retained to provide services during any future: site observations, explorations, evaluations, design, implementation activities, construction and/or implementation of remedial measures recommended in this Report. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.



APPENDIX B – PHOTOGRAPHS



Photographic Log


Client Name: Rhode Island Department of Environmental Management		Site Location: Wyoming Upper Dam	Project No. 01.0177966.00
Photo No. 1	Date: 3/19/25		
Direction Photo Taken: North			
Description: Overview of left embankment and Wyoming Pond (impoundment).			

Photo No. 2	Date: 3/19/25		
Direction Photo Taken: Northeast			
Description: Overview of left embankment and upstream wall.			



Photographic Log

Client Name: Rhode Island Department of Environmental Management		Site Location: Wyoming Upper Dam	Project No. 01.0177966.00
Photo No. 3	Date: 3/19/25		
Direction Photo Taken: East			
Description: Overview of upstream wall along the left embankment.			

Photo No. 4	Date: 3/19/25		
Direction Photo Taken: Southeast			
Description: Overview of left embankment and parking lot adjacent to Bridge Street.			



Photographic Log



Client Name: Rhode Island Department of Environmental Management		Site Location: Wyoming Upper Dam	Project No. 01.0177966.00
Photo No. 5	Date: 3/19/25		
Direction Photo Taken: Southwest			
Description: Riprap slope along right groin of dam.			

Photo No. 6	Date: 3/19/25		
Direction Photo Taken: Down			
Description: Overview of upstream riprap slope right of the spillway. Note limited vegetation growth on top of embankment.			



Photographic Log

Client Name: Rhode Island Department of Environmental Management		Site Location: Wyoming Upper Dam	Project No. 01.0177966.00
Photo No. 7	Date: 3/19/25		
Direction Photo Taken: Down			
Description: Low-level outlet control chamber. Low area observed to the left of concrete. Refer to photo 8.			

Photo No. 8	Date: 3/19/25	
Direction Photo Taken: Down		
Description: Low area approximately 18 inches wide and 4 inches deep.		



Photographic Log


Client Name: Rhode Island Department of Environmental Management		Site Location: Wyoming Upper Dam	Project No. 01.0177966.00
Photo No. 9	Date: 3/19/25		
Direction Photo Taken: East			
Description: Overview of right embankment. Sparse grass cover observed and large areas of exposed soil.			

Photo No. 10	Date: 3/19/25		
Direction Photo Taken: North			
Description: Overview of riprap slope downstream of low-level outlet and cast-in place concrete wall.			



Photographic Log


Client Name: Rhode Island Department of Environmental Management		Site Location: Wyoming Upper Dam	Project No. 01.0177966.00
Photo No. 11	Date: 3/19/25		
Direction Photo Taken: Down			
Description: Iron flocculent, limited leakage (estimated less than 1 gallon per minute) and pooling of water at the toe of the low-level outlet.			

Photo No. 12	Date: 3/19/25	
Direction Photo Taken: Down		
Description: Overview of outlet gate.		



Photographic Log



Client Name: Rhode Island Department of Environmental Management		Site Location: Wyoming Upper Dam	Project No. 01.0177966.00
Photo No. 13	Date: 3/19/25		
Direction Photo Taken: Northwest			
Description: Sluiceway gate controls.			

Photo No. 14	Date: 3/19/25		
Direction Photo Taken: Down			
Description: Seepage along the downstream right stone masonry wall of the sluiceway.			



Photographic Log


Client Name: Rhode Island Department of Environmental Management		Site Location: Wyoming Upper Dam	Project No. 01.0177966.00
Photo No. 15	Date: 3/19/25		
Direction Photo Taken: North			
Description: Overview of downstream sluiceway channel. Note the displaced stone masonry along the left side of the downstream channel. Refer to photo 16. Possible opening that soil is migrating through (see Photos 17 and 18)			

Photo No. 16	Date: 3/19/25	
Direction Photo Taken: Northeast		
Description: Displaced stone masonry wall and piled masonry along the left side of the downstream sluiceway channel. Some exposed soil observed along wall (identified with arrow).		



Photographic Log


Client Name: Rhode Island Department of Environmental Management		Site Location: Wyoming Upper Dam	Project No. 01.0177966.00
Photo No. 17	Date: 3/19/25		
Direction Photo Taken: Down			
Description: An approximate 36-inch wide and 12-inch deep depression behind stone masonry wall above the sluiceway channel. See Photo 15 for opening the soil appears to be migrating through.			

Photo No. 18	Date: 3/19/25		
Direction Photo Taken: Down			
Description: Two depressions behind the stone masonry wall above the sluiceway channel. See Photo 15 for opening the soil appears to be migrating through.			



Photographic Log

Client Name: Rhode Island Department of Environmental Management		Site Location: Wyoming Upper Dam	Project No. 01.0177966.00
Photo No. 19	Date: 3/19/25		
Direction Photo Taken: Down			
Description: Low spot and tree root upstream of the sluiceway downstream channel. See Photo 20.			

Photo No. 20	Date: 3/19/25		
Direction Photo Taken: Southwest			
Description: Bulge in downstream stone masonry wall, parallel to Bridge Street. Refer to Photo 21. Area of tree root and low spot upstream of channel wall.			



Photographic Log


Client Name: Rhode Island Department of Environmental Management		Site Location: Wyoming Upper Dam	Project No. 01.0177966.00
Photo No. 21	Date: 3/19/25		
Direction Photo Taken: East			
Description: Overview of sluiceway downstream channel and culvert. Bulge along the downstream wall as noted in Photo 20.			

Photo No. 22	Date: 3/19/25	
Direction Photo Taken: North		
Description: Overview of primary spillway.		



Photographic Log

Client Name: Rhode Island Department of Environmental Management		Site Location: Wyoming Upper Dam	Project No. 01.0177966.00
Photo No. 23	Date: 3/19/25		
Direction Photo Taken: East			
Description: Typical condition of recently installed concrete cap at the spillway, right of the sluiceway.			

Photo No. 24	Date: 3/19/25		
Direction Photo Taken: Northwest			
Description: Overview of low-level outlet downstream channel, riprap slope and stone masonry wall.			



Photographic Log



Client Name: Rhode Island Department of Environmental Management		Site Location: Wyoming Upper Dam	Project No. 01.0177966.00
Photo No. 25	Date: 3/19/25		
Direction Photo Taken: Down			
Description: Overview of recently installed concrete cap at the spillway from the right abutment.			

Photo No. 26	Date: 3/19/25		
Direction Photo Taken: Up			
Description: Overview of downstream spillway stone masonry, looking from the right side. Limited observations could be made with flowing water.			



Photographic Log

Client Name: Rhode Island Department of Environmental Management		Site Location: Wyoming Upper Dam	Project No. 01.0177966.00
Photo No. 27	Date: 3/19/25		
Direction Photo Taken: Southeast			
Description: Overview of downstream channel and Bridge Street.			



APPENDIX C – PREVIOUS REPORTS & 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. Pare Corporation, Visual Inspection/Evaluation Report, June 5, 2014
2. Pare Corporation, Visual Inspection/Evaluation Report, November 29, 2011.
3. Pare Corporation, Wyoming Upper Reservoir Dam Repairs & Rule 10 Submission, dated March 4, 2020.
4. RIDEM OCI Memorandum, Repairs to Wyoming Upper Reservoir Dam, dated April 3, 2020.
5. RIDEM OCI Case Summary Report, Case ID: OCI-DAMS-14-50.
6. GZA GeoEnvironmental Inc, Spillway Capacity Report, 2017.
7. Pare Corporation, Wyoming Upper Reservoir Dam Repairs & Rule 10 Submission, dated December 21, 2018.

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

1. Rules and Regulations for Dam Safety, 250-RICR-130-05-1.



APPENDIX D – DEFINITIONS



COMMON DAM SAFETY DEFINITIONS

For a comprehensive list of dam engineering terminology and definitions refer to 250-RICR-130-05-1.5 Rules and Regulations for Dam Safety / Definitions, 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 250-RICR-130-05-1.5 govern for dams located within the State of Rhode Island.

Orientation & General Terms

<u>Upstream</u>	Shall mean the side of the dam that borders the impoundment.
<u>Downstream</u>	Shall mean the high side of the dam, the side opposite the upstream side.
<u>Right</u>	Shall mean the area to the right when looking in the downstream direction.
<u>Left</u>	Shall mean the area to the left when looking in the downstream direction.
<u>Abutment</u>	Shall mean that part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment.
<u>Crest</u>	Shall mean the top of the dam, usually provides a road or path across the dam.

Dam Components

per 250-RICR-130-05-1.5

<u>Dam</u>	Shall mean any barrier made by humans, including appurtenant works that impounds or diverts water.
<u>Embankment</u>	Shall mean the fill material, including but not limited to rock or earth, placed to provide a permanent barrier that impounds water.
<u>Appurtenant Works</u>	Shall mean any ancillary feature of a dam including such structures as dikes, training walls, spillways, either in the dam or separate there from, low level outlet works, and water conduits such as tunnels, channels, pipelines or penstocks, either through the dam or its abutments.
<u>Spillway</u>	Shall mean a structure, a low area in natural grade or any part of the dam which has been designed or relied upon to allow normal flow or major flood flow to pass over or through while being discharged from a reservoir.



Hazard Classification

per 250-RICR-130-05-1.5

<u>High Hazard</u>	Shall mean a dam where failure or misoperation will result in a probable loss of human life.
<u>Significant Hazard</u>	Shall mean a dam where failure or misoperation results in no probable loss of human life but can cause major economic loss, disruption of lifeline facilities or impact other concerns detrimental to the public's health, safety or welfare. Examples of major economic loss include but are not limited to washout of a state or federal highway, washout of two or more municipal roads, loss of vehicular access to residences, (e.g., a dead end road whereby emergency personnel could no longer access residences beyond the washout area) or damage to a few structures.
<u>Low Hazard Dam</u>	Shall mean a dam where failure or misoperation results in no probable loss of human life and low economic losses.
<u>Probable Loss of Human Life</u>	Shall mean loss of human life that is likely to occur, or reasonably or realistically expected. This definition does not include persons who are only incidentally in the potential inundation area downstream of a dam. Examples include walking on the dam, driving on lightly traveled roads on or downstream of the dam and recreating downstream of the dam provided the area is not an established recreational area.

General

<u>EAP</u>	Emergency Action Plan (EAP) 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.
<u>O&M Manual</u>	Operations and Maintenance (O&M) Manual; Document identifying routine maintenance and operational procedures under normal and storm conditions.
<u>Normal Pool</u>	Shall mean the elevation of the impoundment during normal operating conditions.
<u>Acre-foot</u>	Shall mean a unit of volumetric measure that would cover one acre to a depth of one foot. It is equal to 43,560 cubic feet. One million U.S. gallons = 3.068 acre feet.
<u>Height of Dam</u>	Shall mean means the vertical distance from the elevation of the uppermost surface of a dam to the lowest point of natural ground, including any stream channel, along the downstream toe of the dam.
<u>Hydraulic Height</u>	Shall mean 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.
<u>Maximum Water Storage Elevation</u>	means the maximum elevation of water surface which can be contained by the dam without overtopping the embankment section.
<u>Spillway Design Flood (SDF)</u>	means 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 means the volume of water contained in the impoundment at maximum water storage elevation.

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

Condition Rating *per 250-RICR-130-05-1.05 and 1.11*

Good Meeting minimum guidelines, where no irregularities are observed and the component appears to be maintained properly.

Fair Component requires maintenance.

Poor Component that has deteriorated beyond a maintenance issue and requires repair; the component no longer functions as it was originally intended.

Unsafe Condition of a regulated dam, as determined by the Director, is such that an unreasonable risk of failure exists that will result in a probable loss of human life or major economic loss. Among the conditions that would result in this determination are: excessive vegetation that does not allow the Director to perform a complete visual inspection of a dam, excessive seepage or piping, significant erosion problems, inadequate spillway capacity, inadequate capacity and/or condition of control structure(s) or serious structural deficiencies, including movement of the structure or major cracking.

Maintenance (As included in definition for POOR, and as generally applicable). Means minor work on a dam necessary to maintain the dam in proper working order, including activities such as filling minor erosion areas, mowing or clearing vegetation provided that it does not affect the integrity of the dam, lubricating and exercising equipment and re-pointing masonry areas. Maintenance does not include repair of a dam or substantial alteration of a dam.

Repair (As included in definition for POOR, and as generally applicable). Means any work performed at a dam that may affect the integrity of the dam, including certain cutting or removal of trees where the resulting decomposition of the tree root system could jeopardize the integrity of the dam, work requiring excavation into the embankment fill or foundation of a dam, work requiring reinforcement of the embankment or work requiring removal or replacement of major structural components of a dam; or any related, new, temporary or permanent access way(s) that may be required within freshwater wetlands.

Substantial alteration (As included in definition for MAINTENANCE, and as generally applicable). Means any physical modification to a dam that results in a permanent change in the water elevation of the reservoir or in water flow downstream of the dam.