

# Dam Safety Inspection Report

Name: **Indian Brook Reservoir Dam**  
State ID: **69.01** NID ID: **VT00055**  
Hazard Class: **High Hazard Potential**

Town: **Essex**  
Watershed: **Malletts Bay**  
Stream: **Indian Brook**

## Inspection Details

**Inspection date:** 08/01/2024 12:28

**Inspection type:** Periodic

**Weather:** Sunny, 70F

**Inspected by:** Andrew Sampsell, Hannah Kuleba

**Others present:** Adriane Martin, Aaron Martin

## Dam Safety Recommendations

*The following recommendations and remedial measures describe the recommended approach to address current deficiencies at the dam. Maintenance level activities can be performed by the Owner, while Studies and Analyses and Remedial Repair Recommendations will require the services of a qualified professional engineer registered in the State of Vermont who is experienced in dam safety engineering design, permitting, and construction. Remedial repairs will likely require obtaining a Dam Order from the Dam Safety Program.*

### Overall dam condition:

Satisfactory  Fair  Poor  Unsatisfactory  Not Rated

*\*See General Information section at the end of report for further details*

## Maintenance level recommendations

<i>General</i>	<ul style="list-style-type: none"> <li>On a regular basis and following unusual or extreme loading conditions, perform monitoring of the dam and its appurtenances. Report any unsafe conditions to the Dam Safety Program.</li> <li>Establish and maintain vegetation clearing limits a minimum of 15 feet from all portions of the dam.</li> <li>Annually cut and remove grass, weeds, brush, and woody vegetation (but leave stumps) from the dam and surrounding area.</li> </ul>
<i>Concrete Surfaces</i>	<ul style="list-style-type: none"> <li>Monitor the concrete surface conditions. Perform minor surficial repairs as needed.</li> <li>Monitor the condition of the concrete joints. Remove debris and re-install sealant.</li> </ul>
<i>Downstream area</i>	<ul style="list-style-type: none"> <li>Regularly monitor seepage, leakage, and wet areas at the abutments and downstream area of the dam for changes in flow, turbidity, or size.</li> </ul>
<i>Spillways</i>	<ul style="list-style-type: none"> <li>Maintain the spillways and downstream areas free of debris to promote free flow conditions.</li> </ul>
<i>Low-level outlets</i>	<ul style="list-style-type: none"> <li>Once operable, test operate the low-level outlet twice yearly to maintain operability and check leakage.</li> </ul>

<b>Maintenance level recommendations</b>	
<i>Emergency Action Plan</i>	<ul style="list-style-type: none"> <li>Perform an update to the Emergency Action Plan at least every other year and provide the updates to all key contacts.</li> </ul>

<b>Studies and analysis</b>	
<b>Screening Level Risk Assessment 2023</b>	<p>GZA (a national consulting firm) completed a screening level risk assessment of the Indian Brook Reservoir Dam in 2023 using FEMA HHPD grant funding secured by the State of Vermont. The risk assessment contains relevant and valuable information which pertains to some of the following study and analyses. Due to the nature of the risk assessment (<b>used readily available existing information only, no field data collection</b>) further data collection, investigation, and study may be required to refine the results of the GZA assessment work.</p>
<i>Survey &amp; Bathymetry</i>	<ul style="list-style-type: none"> <li>Perform topographic survey to verify geometry and key elevations as it relates to subsequent analyses which rely on this information.</li> <li>Perform bathymetric survey upstream of the dam to establish depth of water, sediment, and rock as it relates to subsequent analyses.</li> </ul>
<i>Geotechnical/Geologic</i>	<ul style="list-style-type: none"> <li>Perform additional investigation and analysis to determine the source and potential risks of the uncontrolled seepage and leakage.</li> <li>Perform subsurface investigation and testing to determine foundation conditions at the dam as it relates to the stability of the dam, and the ability of the dam to safely withstand overtopping.</li> </ul>
<i>Hydrology and hydraulics/hazard classification</i>	<ul style="list-style-type: none"> <li>Refine the GZA 2023 H&amp;H analysis using updated survey information referenced in above Survey &amp; Bathymetry section. Verify the dam has adequate freeboard during the inflow design flood.</li> <li>Evaluate the erodibility of the rock at the downstream toe as it relates to the stability of the dam (utilize information collected in the above Geotechnical and Geologic section).</li> <li>Identify alternatives as required to make the dam hydraulically adequate or capable of safely being overtopped during the Inflow Design Flood.</li> <li>Evaluate the hydraulic capacity of the low-level-outlet and its suitability to drawdown the pond in an emergency.</li> </ul>
<i>Structural</i>	<ul style="list-style-type: none"> <li>Perform a structural inspection of the concrete elements of the dam and identify repair or replacement alternatives. Inspection of the submerged upstream face will likely require a dive inspection unless the water level can be lowered sufficiently.</li> <li>Collect concrete cores and perform testing to establish compressive strength and density of concrete in support of structural analyses.</li> <li>Evaluate the stability of the dam in reference to design loading events (normal, flood, normal + ice, normal + earthquake). Identify alternatives to address any inadequate factors of safety.</li> <li>Evaluate the strength of the swim/boat barrier in reference to design loads. Consider implementing a more robust system as appropriate.</li> </ul>

Studies and analysis	
<i>Low-Level-Outlet &amp; Gate Chamber</i>	<ul style="list-style-type: none"> <li>Perform a confined space entry inspection of the gate chamber, evaluate the condition of the low-level-outlet and other components.</li> <li>Perform video/camera inspection of pipes.</li> <li>Identify repair, replacement, or decommissioning alternatives to restore functionality or reduce potential risks as required.</li> </ul>
<i>Emergency Action Planning</i>	<ul style="list-style-type: none"> <li>Utilize the results of the GZA 2023 dam failure analysis to update the emergency action plan (EAP), consider using DSP EAP template.</li> </ul>
<i>Operation and maintenance</i>	<ul style="list-style-type: none"> <li>Develop an Operations and Maintenance Manual for the dam (including gates) and provide a copy to the Dam Safety Program for record keeping purposes.</li> </ul>

Remedial repair recommendations
<ul style="list-style-type: none"> <li>Based on the studies and analysis recommended above, repair, rehabilitate, or replace the dam to bring it into compliance with current dam safety rules and guidance. Alternatively, consider pursuing dam removal.</li> </ul>

Dam Information		
<b>Type:</b> Gravity, Concrete	<b>Status:</b> In Service	<b>Construction date:</b>
<b>Purpose:</b> Recreation	<b>Height:</b> 26 ft	1957
	<b>Length:</b> 238 ft	
<b>Owner/Contact/Operator:</b> Town of Essex <i>email:</i> <a href="mailto:aemartin@essex.org">aemartin@essex.org</a> <i>phone:</i> 802-878-1342		
<b>Normal storage:</b> 1,084 ac-ft	<b>Max storage:</b> 1,157 ac-ft	Dam has capability to impound <b>more than</b> 500k cubic feet (11.48 ac-ft)
<b>Normal surface area:</b> 48 ac	<b>Drainage area:</b> 1.23 sq mi	<b>Max surface area:</b> Not Calculated
<b>Pool elevation during inspection:</b> less than 1-inch above principal spillway crest	<b>Tailwater elevation during inspection:</b> Normal, no backwater	<b>Normal pool elevation:</b> El. 529.6 (NAVD88, feet)
It's unknown if the dam has been breached or overtopped. The crest is designed to overtop.		
Dam <b>does not</b> have public road on crest.	Dam <b>does not</b> have public bridge.	Dam <b>does not</b> have associated dike.
<b>Inspection history:</b> The dam was last inspected by the Department on September 8, 2022. The dam was rated in POOR condition. A rapid inspection of this dam was performed after the July 10, 2023, flooding event. The rapid inspection was not performed with the intent of providing a condition rating.		

<b>Access road to dam</b>
<b>Type:</b> Maintained gravel road
<b>Seasonal access:</b> <input checked="" type="checkbox"/> Plowed winter <input type="checkbox"/> Sanded winter <input type="checkbox"/> Maintained in mud season <input type="checkbox"/> Passable in all weather conditions <input type="checkbox"/> Need high clearance vehicle
<b>Access of emergency/construction equipment:</b> FAIR, there is a parking lot in close proximity to both the crest of the dam and the downstream of the dam.
Action required: <input checked="" type="checkbox"/> None <input type="checkbox"/> Monitor <input type="checkbox"/> Maintenance <input type="checkbox"/> Engineer

<b>Security</b>
<b>Device type(s):</b> Gate chamber is locked, and bridge is gated, signage posted restricting access. Dam has <b>no</b> sign of vandalism, trespass or unauthorized operation.
Action required: <input checked="" type="checkbox"/> None <input type="checkbox"/> Monitor <input type="checkbox"/> Maintenance <input type="checkbox"/> Engineer

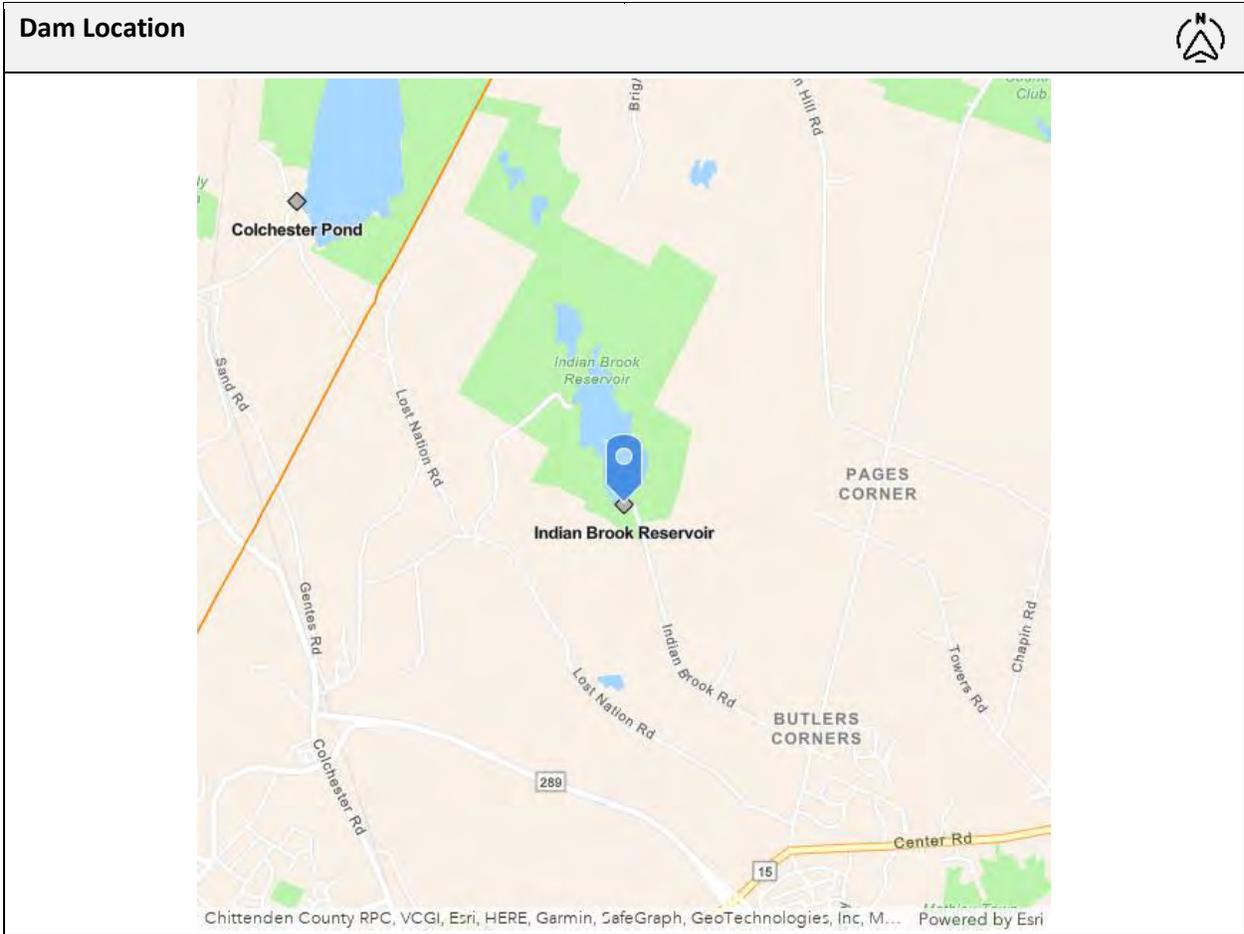
<b>Public/Inspection team safety at dam</b>
Confined space entry required: Gate chamber. Fall protection required for close inspection of concrete elements of the dam, and preforming repairs.
Other safety required: None Noted Public safety consideration: Swim/boat barrier installed during recreation season.
Action required: <input checked="" type="checkbox"/> None <input type="checkbox"/> Monitor <input type="checkbox"/> Maintenance <input type="checkbox"/> Engineer

**Dam Description/Background**

The Indian Brook Reservoir Dam was constructed in 1957 based on a design by Whitman and Howard Engineering. The dam impounds the Indian Brook Reservoir, which was originally filled for water supply purposes; currently, the Reservoir is used strictly for recreation. The Town of Essex owns and maintains the dam. The dam is accessible off Indian Brook Road in Essex, Vermont. The Dam is a 238-foot-long concrete gravity dam with a structural height of 31 feet. From left (looking downstream) to right, the Indian Brook Dam consists of the following primary water retaining structures:

- A 43-foot-long concrete ogee-style principal spillway, with a crest elevation of 530 feet. The spillway has a vertical upstream face, approximate 4-foot-wide crest, and a 3H:4V sloping downstream face. A steel pedestrian bridge spans over this section, from the left abutment to the gate chamber, with a reported low-chord elevation of 533.0 feet.
- A 10-foot-long by 9-foot-wide gate chamber, cast integrally with the spillway. The gate chamber houses three 12-inch diameter inlet ports (elevations 505, 510 and 520) regulated by slide gates and protected by bar screens. The original design included two outlet ports; however, it is reported that the gates have not been operated for many years, and the outlet pipe is not visible at the toe of the spillway. The gate chamber is accessible by a steel pedestrian bridge from the left abutment of the dam.
- 70-foot-long concrete ogee-style principal spillway, with a crest elevation of 530 feet. Similar to the first spillway section, this section has a vertical upstream face, approximate 4-foot-wide crest, and a 3H:4V sloping downstream face.
- A 125-foot-long auxiliary spillway. The auxiliary spillway is similar in design to the two sections of the principal spillway, with a crest elevation 0.5 foot higher (approximate elevation 530.5 feet).

The Indian Brook Reservoir Dam remains true to its original structure; however, it has had some surficial concrete repairs along horizontal joints in the downstream spillway face in 2003 to address on-going spalling and concrete deterioration problems. These 2003 repairs also included grouting the leaking joints and bedrock foundation and the installation of reinforcing bars in the drill holes used to inject the grout. These historical issues at the site have continued to redevelop since the 2003 repairs with extensive spalling along the lift joints of the downstream principal and auxiliary spillway faces. Vegetation present within these larger spalls indicates that seepage through both spillway faces may have redeveloped. The contributing drainage area to the dam is about 787 acres (1.23 sq. mi.). The reservoir area at the normal pool is about 48 acres. The normal and maximum storage capacities of the dam are approximately 1,084 acre-feet and 1,157 acre-feet, respectively.



### Downstream Hazard Classification

**Current classification:** High Hazard Potential

Current classification appears appropriate, and an inundation map was used to determine the classification.

### Emergency Action Plan

EAP on file.

As the dam is a HIGH Hazard potential dam, an up-to-date EAP with dam failure flood hazard inundation map is required.

**Has the EAP been exercised?**  Yes  No

What issues are present with the EAP?	Action
<input type="checkbox"/> None <input checked="" type="checkbox"/> Revisions required <input type="checkbox"/> Not approved <input type="checkbox"/> No plan available <input type="checkbox"/> Inundation study required <input type="checkbox"/> Format out of date <input type="checkbox"/> Under review	<input type="checkbox"/> None <input type="checkbox"/> Monitor <input checked="" type="checkbox"/> Maintenance <input type="checkbox"/> Engineer

Operation & Maintenance Manual	
O&M Manual <b>not on file</b>	
<b>Accessibility to outlets or low-level outlet (LLO):</b> Fair, from spillway bridge.	<b>Frequency of outlet or LLO discharge:</b> Not test operated.
<b>Frequency of mowing:</b> As needed.	<b>Seasonal drawdown?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<b>Frequency of dam owner surveillance:</b> Periodic	<b>Owner surveillance during storm events:</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<b>Operating problems since last inspection:</b> None reported.	<b>History of repairs since last inspection:</b> None reported.

What issues are present with the O&M Manual?	Action
<input type="checkbox"/> None <input type="checkbox"/> Revisions required <input type="checkbox"/> Not approved <input checked="" type="checkbox"/> No plan available <input type="checkbox"/> Format out of date <input type="checkbox"/> Under review	<input type="checkbox"/> None <input type="checkbox"/> Monitor <input type="checkbox"/> Maintenance <input checked="" type="checkbox"/> Engineer

### Hydrologic/Hydraulic Data

Since Indian Brook Reservoir Dam is a HIGH hazard potential dam, the Inflow Design Flood (IDF) is the Probable Maximum Flood (PMF) event based on Federal Guidance currently used in Vermont.

The most recent H&H analysis for the dam was performed by GZA as part of a 2023 screening level risk assessment. The hydrologic and hydraulic analyses by GZA provided the following results:

- Crest of Principal Spillway:** El. 529.6 (NAVD88 feet)
- Crest of Auxiliary Spillway:** El. 530.1 (NAVD88 feet)
- Reported Gate Chamber Pedestrian Bridge Low-Cord:** El. 532.6 (NAVD88 feet)
- Dam Crest/Lowest Non-Overflow Section (Top of Concrete at Left Dam Abutment):** El. Unknown

Flood Event	Inflow (cfs)	Outflow (cfs)	Peak Water Surface Elevation (NAVD88, feet)	Depth of flow over principal spillway (feet)	Depth of flow over auxiliary spillway (feet)	Freeboard to Pedestrian Bridge Low-Cord (feet)	Freeboard to Dam Crest (feet)
100-yr (24-hr)	Not Reported	Not Reported	530.3	0.7	0.2	2.3	Unknown
1000-yr (24-hr)	Not Reported	Not Reported	530.5	0.9	0.4	2.1	Unknown
PMF (72-hr)	3,100	3,040	532.1	2.5	2.0	0.5	Unknown

According to State requirements the dam needs to provide a minimum of 3.0 feet of freeboard between the normal water level and the dam crest/lowest non-overflow section. Visually it appears the requirement is likely being met.

According to State requirements the dam needs to provide a prescriptive minimum of 1.5 feet of freeboard between the peak water surface elevation of the IDF and the dam crest/lowest non-overflow section. Visually based on the PMF freeboard to the pedestrian bridge low-cord elevation, it appears this requirement is likely being met.

The dam appears to have been designed with the intent that it would be overtopped by flood waters for its entire length between abutments. However, the DSP does not have design or construction records which indicate that the dam can safely withstand the IDF flood loading. The erodibility of the bedrock below the dam is currently unknown. Accordingly, the hydraulic adequacy of the dam is considered unknown.

Upstream Wall		
<b>Wall type:</b> Concrete Length: 236 feet		
<b>Wall height (exposed):</b> Submerged	<b>Horizontal wall alignment:</b> Straight	<b>Vertical wall alignment:</b> Not Observable
<b>Unusual wall movement:</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> None observed		
<b>Additional comments:</b> Water level prevented thorough inspection of upstream wall.		<b>Surface condition:</b> Unknown
<b>Joint condition:</b> Not observable, submerged. Dam has historic leakage issues, there are periods during the summer where the water level sits below the principal spillway crest.		<b>Abutment contact condition:</b> Good, contacts rock at both abutments.

Upstream wall issues	Action
Water level prevents a thorough visual inspection.	Consider having the upstream wall inspected by a dive team.

Crest
<b>Length:</b> 238 feet <span style="float: right;"><b>Width:</b> Approximately 3 feet</span>
<b>Freeboard:</b> <ul style="list-style-type: none"> <li>• 0.5 feet from principal spillway crest (normal pool) to auxiliary spillway crest.</li> <li>• Reportedly 3 feet from principal spillway crest (normal pool) to gate chamber pedestrian bridge low-cord.</li> <li>• Freeboard from principal spillway crest (normal pool) to top of dam at left dam abutment is unknown.</li> </ul>
<p>Additional comments: The dam crest includes the entire length of the structure, both crest of principal and auxiliary spillways.</p> <p>The bridge across the dam crest which provides access to the gate chamber appeared to be in FAIR condition, the protective paint coating has deteriorated in places and exposes the bridge structure to rust. The bridge is not open to the public. Warning signs are posted informing the public to stay off and keep away.</p>

Crest issues	Action
<b>Concrete deterioration</b>	<input type="checkbox"/> None <input checked="" type="checkbox"/> Monitor <input checked="" type="checkbox"/> Maintenance <input type="checkbox"/> Engineer

**Crest images**



Looking at the crest from the left abutment. Upstream wall is submerged.



Looking at the crest from the right abutment.

**Crest images**



Example concrete crest deterioration below gate chamber bridge.

**Instrumentation**

No instrumentation found.

**Seepage Collection Systems**

**Number**

No seepage collection systems observed.

0

**Principal Spillway**

**Spillway type:** Weir

**Primary material:** Concrete

**Weir:** Ogee

**Spillway location:** Center of dam

**Water level measured against principal spillway crest:** less than 1-inch above crest

**Erosion control structures:** None, bedrock downstream of dam.

**Spillway components:**

Anti-vortex plate

Filter Diaphragm

Training Walls

Flashboard

Trashrack

Other:

Additional comments: none

Principal spillway issues	Action
<b>Deteriorating Concrete</b>	
<ul style="list-style-type: none"> <li>• Deterioration of concrete at contact with rock at left abutment (downstream face).</li> <li>• Concrete deterioration along the downstream face of the horizontal lift joint and the principal spillway crest.</li> <li>• Spalling at the horizontal construction lift joints of the downstream principal spillway face.</li> <li>• Spalling present with iron-stained seepage at the rock contact with the toe of the principal spillway.</li> <li>• Prominent horizontal construction joint with spalled joint faces, approximately 15 feet below the crest; the deteriorated joint extends the majority of the length of the principal spillway.</li> <li>• Minor missing grout between the downstream spillway face joint to the low-level outlet structure.</li> <li>• Efflorescence observed below gate chamber (downstream face).</li> <li>• Vegetation growth is present throughout the downstream face and crest.</li> </ul> <p>Comments: Minor issues can be addressed through maintenance while significant spalling and joint deterioration will require repair developed in coordination with a licensed professional engineer.</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> None</li> <li><input checked="" type="checkbox"/> Monitor</li> <li><input checked="" type="checkbox"/> Maintenance</li> <li><input checked="" type="checkbox"/> Engineer</li> </ul>

Principal spillway drains	Number
No drains were observed during inspection.	0

**Principal spillway images**



Concrete deterioration on left side of principal spillway at left abutment contact (downstream face).



Left side of principal spillway at left abutment contact.

**Principal spillway images**



Right side of principal spillway, note efflorescence below gate chamber.



Outlet channel below dam.

Auxiliary Spillway	
<b>Spillway type:</b> Weir	<b>Primary material:</b> Concrete <b>Weir:</b> Ogee
<b>Spillway location:</b> Right abutment	
<b>Water level measured against auxiliary crest:</b> Approximately 5 inches below	<b>Erosion control structures:</b> None, water spillway onto reported bedrock.
<b>Spillway components:</b> <input type="checkbox"/> Anti-vortex plate <input type="checkbox"/> Filter Diaphragm <input type="checkbox"/> Training Walls <input type="checkbox"/> Flashboard <input type="checkbox"/> Trashrack <input type="checkbox"/> Other:	
<b>Number of auxiliary spillways:</b> 1 Additional comments: Seepage through concrete downstream face in various locations, significant seepage along downstream toe of spillway right abutment to outlet channel. Upward welling leak observed 10 ft to left of break between auxiliary and principal spillway crests at toe of dam.  Seepage and leakage flowing along toe of auxiliary spillway measured to be approximately 12 gallons per minute using bucket and stopwatch.	

Auxiliary spillway issues	Action
<b>Deteriorating concrete</b>  Seepage/leakage along toe, minor boil historically noted in this area. Iron staining present.  Deterioration of previous 2003 repair/patch work.  Leakage emanating from construction joints and below 2003 repair/patch work.  Vegetation growth is present throughout the spillway downstream face and joints.  Comments: Minor issues can be addressed through maintenance while significant spalling and joint deterioration will require repair developed in coordination with a licensed professional engineer.	<input type="checkbox"/> None <input checked="" type="checkbox"/> Monitor <input checked="" type="checkbox"/> Maintenance <input checked="" type="checkbox"/> Engineer

Auxiliary Spillway Drains	Number
No drains were observed during inspection.	0

**Auxiliary spillway images**



The red line illustrates the breakpoint between principal and auxiliary spillway. Note there is significant seepage and leakage flowing along interface of bedrock with concrete and spilling down into discharge channel below dam.



The red vertical line illustrates the breakpoint between principal and auxiliary spillway. Orange horizontal line illustrates 2003 repair surface breakpoint.

**Auxiliary spillway images**



Looking towards the right abutment, note leakage from beneath 2003 repair surface (wetted concrete surface despite no overflow).



The auxiliary spillway crest contacts right dam abutment (rock).

**Gate Chamber (Low-Level-Outlet)**

The dam includes a low-level outlet (LLO). The LLO is an important risk reduction feature of the dam which can be used to lower the water level in the event an unsafe condition is detected at the dam.

The Indian Brook Reservoir’s LLO includes three 12-inch diameter slide gate-controlled inlets that allow water to enter a gate chamber. These gates are reportedly inoperable. The high-level gate is approximately 14 feet down from the concrete platform, the mid-level gate is approximately 24 feet down, and the lowest gate is approximately 27 feet down.

Within the gate chamber are two gated outlets with 4-inch mesh screens.

The former water supply pipe is 12-inch cast iron pipe. The valve stem is reportedly cut flush with the floor of the outlet structure and the gate stand has been removed.

The low-level-outlet consists of a 12-inch diameter cast iron pipe that enlarges into a 15-inch diameter pipe and discharges into the downstream channel. The valve is reportedly not operable, and the discharge point below the dam within the channel is not visible from the surface.

Gate Chamber (Low-Level-Outlet) issues	Action
<p><b>Deteriorating protective paint coating.</b> Location: Bridge, railings, manholes/valve access points.</p>	<p><input type="checkbox"/> None  <input type="checkbox"/> Monitor  <input checked="" type="checkbox"/> Maintenance  <input type="checkbox"/> Engineer</p>
<p><b>Bulging intake screens within gate chamber.</b></p>	<p><input type="checkbox"/> None  <input checked="" type="checkbox"/> Monitor  <input checked="" type="checkbox"/> Maintenance  <input type="checkbox"/> Engineer</p>
<p><b>Standing water within gate chamber.</b></p>	<p><input type="checkbox"/> None  <input checked="" type="checkbox"/> Monitor  <input type="checkbox"/> Maintenance  <input checked="" type="checkbox"/> Engineer</p>
<p><b>Inoperable/Unknown Operability</b></p>	<p><input type="checkbox"/> None  <input type="checkbox"/> Monitor  <input checked="" type="checkbox"/> Maintenance  <input checked="" type="checkbox"/> Engineer</p>

**Gate Chamber (Low-Level Outlet) Images**



## GENERAL INFORMATION

Website: <https://dec.vermont.gov/water-investment/dam-safety>

The Dam Safety Program conducts periodic safety inspections of non-federal, non-power dams to determine their condition and the extent to which they pose a potential or actual threat to life, property, and the environment. The condition rating reported herein was based on available data and visual inspection. Detailed investigations/analyses were beyond the scope of this report. It should be realized that the reported condition was based on observations of field conditions at the time of inspection, along with data available to the inspection team. 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 in the future. Only through continued care and inspection can there be any chance that unsafe conditions are detected.

### Hazard Potential Classifications:

**HIGH:** Dams where failure or mis-operation will probably cause loss of human life.

**SIGNIFICANT:** Dams where failure or mis-operation results in no probable loss of human life but can cause economic loss, environment damage, disruption of lifeline facilities, or impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

**LOW:** Dams where failure or mis-operation results in no probable loss of human life and low economic and environmental losses.

**MINIMAL:** A dam that meets the LOW hazard definition, above, but is only capable of impounding less than 500,000 cubic feet.

### Condition Ratings:

**SATISFACTORY:** No existing or potential dam safety deficiencies are recognized. Acceptable performance is expected under all loading conditions (static, hydrologic, seismic) in accordance with the applicable regulatory criteria or tolerable risk guidelines.

**FAIR:** No existing dam safety deficiencies are recognized for normal loading conditions. Rare or extreme hydrologic and/or seismic events may result in a dam safety deficiency. Risk may be in the range to take further action.

**POOR:** A dam safety deficiency is recognized for loading conditions which may realistically occur. Remedial action is necessary. POOR may also be used when uncertainties exist as to critical analysis parameters which identify a potential dam safety deficiency. Further investigations and studies are necessary.

**UNSATISFACTORY:** A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution.

**NOT RATED:** The dam has not been inspected, is not under state jurisdiction, or has been inspected but, for whatever reason, has not been rated.

### Definitions:

**Upstream:** The side of the dam that borders the impoundment located up gradient of the dam.

**Downstream:** The side of the dam opposite the upstream side, located down gradient of the dam.

**Right:** The area to the right when looking in the downstream direction (also known as "river right").

**Left:** The area to the left when looking in the downstream direction (also known as "river left").

**Structural Height-of-Dam:** The vertical distance from the lowest point in the stream bed or native ground surface at the downstream toe of the dam to the elevation of the lowest non-overflow section of the dam crest.

**Embankment:** An artificially constructed feature usually consisting of earth and rock with sloping sides and a flat crest, intended to provide a permanent barrier that impounds or is capable of impounding water.

**Dam Crest:** The top of the non-overflow portion of the dam.

**Abutment:** The part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed at the interface with a concrete gravity section.

**Normal Pool:** The water elevation, reservoir surface area, and reservoir storage capacity that is prevalent at the site or typical under normal, non-storm conditions. Typically, this level is controlled by the principal spillway.

**Maximum Pool:** The highest water elevation, reservoir surface area, and reservoir storage capacity that could be impounded by the dam, including accumulated sediments, with the water or liquid level at the top of the lowest non-overflow part of the structure or dam crest.

**Principal spillway:** A structure that maintains normal pool conditions and over which daily non-storm related and flood flows are discharged. Also called a primary or service spillway.

**Auxiliary Spillway:** The secondary spillway not in use under normal conditions but used when needed to pass flood flows that exceed the capacity of the principal spillway.

**Low-level outlet or "LLO":** An installed pipe and operable gate or valve typically located in or near the foundation of a dam that can be used to alter water levels, drain the reservoir, or otherwise meet operational or safety needs. Also called a pond drain.

**Inflow Design Flood or "IDF":** The flood event in which the hydraulic capacity of the spillway structure and dam is designed and required to safely pass. Dam safety rules under development are considering the following prescriptive IDF's, Low and Minimal = 100-year flood, Significant = 1,000-year flood, High = PMF. The use of incremental consequence analysis or risk-informed decision making to evaluate the potential of selecting a smaller/site specific IDF is permitted.

**Emergency Action Plan (EAP):** A written plan that identifies the area that would likely be inundated by the failure of a dam and identifies the actions that should be taken by the Owner to protect life, property, lifelines, and the environment in the event of a dam failure or threatening condition at the dam. The plan is usually implemented in cooperation with the local, regional, and state emergency personnel.

**Operation and Maintenance Plan or "O&M":** A plan that provides guidelines for the necessary, regular operation and maintenance activities at a dam.

**Complete list of definitions from the Vermont Dam Safety Rule:**

<https://anrweb.vt.gov/DEC/IronPIG/DownloadFile.aspx?DID=185352&DVID=0>