

Introduction

Dam failure hazard planning as it relates to Hinckley Reservation, Cleveland Metroparks, Medina County, Ohio

Cleveland Metroparks Hinckley Reservation experiences a variety of natural hazards that may cause public and private property damage and threaten life safety. As required by federal law, under 44 CFR part 201, local jurisdictions must develop and maintain a mitigation plan to obtain federal emergency management grants, such as the Hazard Mitigation Grant Program and the Flood Mitigation Assistance Grant Program. Cleveland Metroparks has prepared this plan appendix, which provides information about dam failure hazards that affect Hinckley Reservation and, by extension, Medina County and establishes strategies to decrease vulnerability.

Overview of Hinckley Reservation, Cleveland Metroparks

Cleveland Metroparks mission is to conserve significant natural resources and enhance people's lives by integrating high-quality outdoor education, recreation, and zoological opportunities into people's lives. Cleveland Metroparks was established in 1917 to provide open greenspace for the people of Greater Cleveland and to preserve the natural resources of the region. Today, the Park District consists of nearly 24,000 acres in 18 reservations and 48 communities throughout Northeast Ohio. Cleveland Metroparks is a separate political subdivision of the state of Ohio. The Park District is governed by Cleveland Metroparks Board of Park Commissioners, composed of three citizens who serve three-year terms without compensation. Board members are appointed by the presiding Judge of the Probate Court of Cuyahoga County.

Hinckley Reservation was created in 1923 and is located in Hinckley Township, Medina County, Ohio. The Reservation is managed and maintained as part of Cleveland Metroparks system and is open to the public 365 days per year with no admission fees. Hinckley Reservation consists of 2,953 acres, including a 110-acre lake (Hinckley Lake).

Hinckley Lake Dam is a combination of an earth embankment 750 feet long with a maximum height of 39.6 feet and a concrete, broad crested weir spillway section 150 feet long and 32 feet high. A concrete core wall in the embankment extend from the spillway to the abutment. There is not emergency spillway.

Hinckley Lake is a destination for anglers and paddle sport enthusiasts. The reservation is also home to Whipps Ledges, 250-year rock outcroppings that are enjoyed by hikers and rock climbers throughout the year. Hinckley Reservation is nationally known for the annual return of

the buzzard each year on March 15th. In 2018, Hinckley Reservation recorded 782,510 recreational visits.

Planning Process

The planning process began with a Preliminary Design Report for Hinckley Dam that was completed in March 2018 by Michael Baker International, Inc. This report included a thorough description of general site conditions, topographic surveys, hydrologic and hydraulic analyses, and geotechnical analyses. A Final Design Proposal, including a cost estimate, was subsequently completed in August 2018. Following the reviews of these plans, Cleveland Metroparks developed a Planning Team consisting of Cleveland Metroparks staff members with the overall responsibility of project management, information gathering, and drafting of the plan appendix. The Planning Team is as follows:

Planning Team	
Sean McDermott, P.E.	Chief of Planning and Design
David Frey	Civil Engineer
Greg Headley	Director of Risk Management
Joe Lambert	Safety Manager
Kristen Trolie	Grants Manager

The Planning Team reviewed the dam failure hazard of Hinckley Lake Dam identified in the Medina County All Hazard and Flood Mitigation Plan 2019. The Team gathered current information on dam failure hazard descriptions, locations, extent, historical occurrences, vulnerability, and probability. The hazard profiles and risk assessment information of the 2019 Plan was reviewed between September – December 2019.

Simultaneously, Cleveland Metroparks began communication with the State Hazard Mitigation Planner with the Ohio Emergency Management Agency and the Emergency Management Specialist with Medina County Office of Emergency Management and Homeland Security regarding the Park District's inclusion in and adoption of the above-referenced Mitigation Plan. This communication continued through June 2020 until approval of the Park District's addendum to the plan. Cleveland Metroparks formally adopted the Medina County All Hazard and Flood Mitigation Plan 2019 in June 2020 via a memorandum signed by Cleveland Metroparks Chief Executive Officer and approved as to legal form by Cleveland Metroparks Legal Counsel. Please see attached memorandum.

Dam Failure

Description

A dam is defined as a barrier constructed across a watercourse for storage, control, or diversion of water. They are typically constructed of earth, rock, concrete, or mine tailings. A dam failure is a collapse or breach of this material causing downstream flooding. Two factors that influence the severity of full or partial dam failure are the amount of water impounded; and the density, type, and value of development and infrastructure located downstream. Dam failures can result from many things including:

- Prolonged periods of rainfall and flooding, which cause most failures;
- Inadequate spillway capacity, resulting in excess overtopping flows;
- Internal erosion caused by embankment or foundation leakage or piping; or
- Improper maintenance, including failure to remove trees, repair internal seepage problems, replace lost material from the cross-section of the dam and abutments, or maintain gates, valves, and other operational components.

Extent – How it's Measured

In Ohio, dams have been divided into four classes (I, II, III, and IV) defined by the Ohio Administrative Code, Section 1501:21-13-01. The classification system was modeled after the Federal Guidelines for Dam Safety established in 1979. The following parameters are the governing criteria for the classification:

1. Dam height - defined as the vertical dimension as measured from the natural streambed at the downstream toe of a dam to the low point along the top of the dam.
2. Storage volume - defined as the total volume impounded when the pool level is at the top of the dam immediately before it is overtopped.
3. Potential downstream hazard - defined as the resultant downstream damage should the dam fail, including probable future development.

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Height of Dam

Class I - greater than 60 feet

Class II - greater than 40 feet

Class III - greater than 25 feet

Class IV - less than or equal to 25 feet

Storage Volume

Class I - greater than 5000 acre-feet

Class II - greater than 500 acre-feet

Class III - greater than 50 acre-feet

Class IV - less than or equal to 50 acre-feet

(1 acre-foot = about 326,000 gallons)

Hazard Classes based on Potential Downstream Hazard

Class I - Probable loss of life, a serious hazard to health, structural damage to high-value property (i.e., homes, industries, major

public utilities).

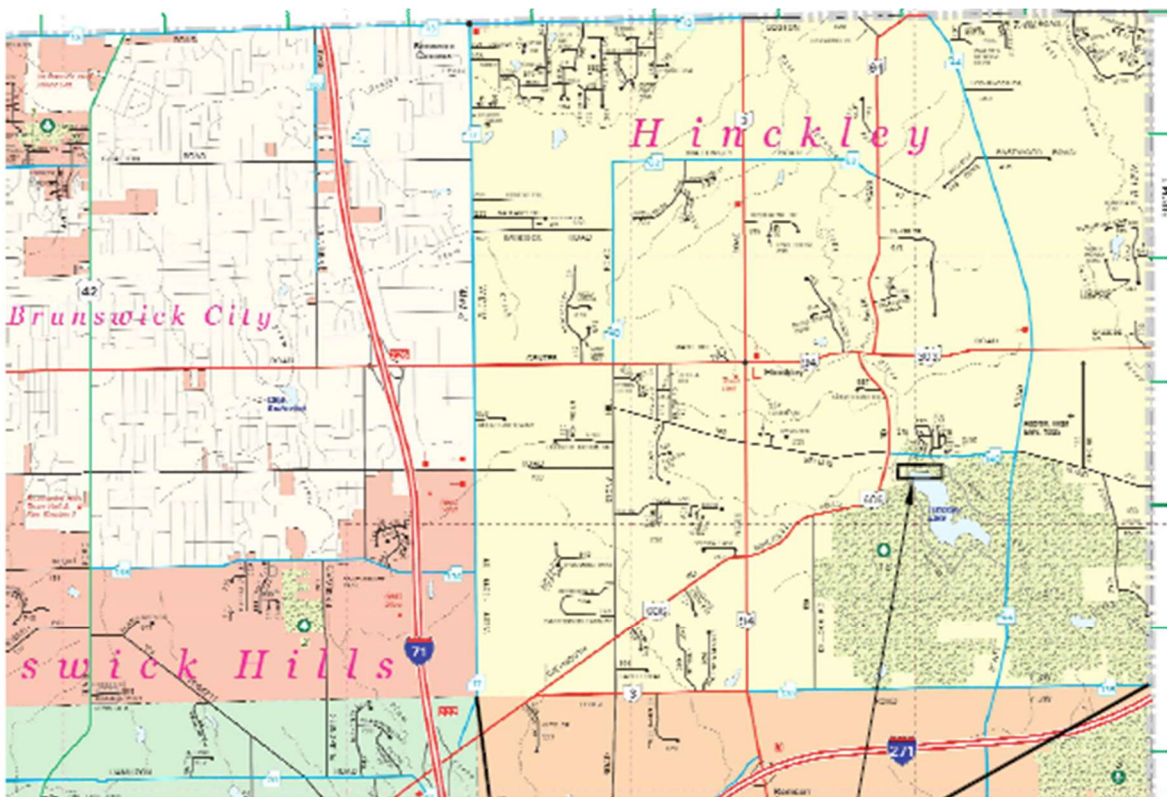
Class II - Flood water damage to homes, businesses, industrial structures (no loss of life envisioned), damage to state and interstate highways, railroads, only access to residential areas.

Class III - Damage to low-value non-residential structures, local roads, agricultural crops, and livestock.

Class IV - Losses restricted mainly to the dam.

Location

Cleveland Metroparks owns and maintains Hinckley Lake Dam in Hinckley Reservation. Hinckley Lake Dam is a Class I, 39.6 foot-high earthen dam that impounds the 110acre Hinckley Lake. Hinckley Lake Dam is located in Hinckley Township, Medina County, Ohio.



HINCKLEY LAKE DAM



HINCKLEY TOWNSHIP,
MEDINA COUNTY, OHIO

Historical Narratives

Cleveland Metroparks records show no indication of dam failure for Hinckley Lake Dam. The dam was designed and built in 1928 by the Cleveland Metropolitan Park District. A Phase I inspection was performed in 1979 by Dodson-Lindblom Associates, Inc. under contract with the U.S. Army Corps of Engineers as part of a national dam inspection program authorized by Public Law 92-367, "The National Dam Inspection Act." Since then, five safety inspections have been carried out by the Division of Soil & Water Resources. Miscellaneous repairs including vegetation removal, animal and erosion control, and valve and sluice gate repair have been completed as part of these inspections. Reports including a concrete condition report, earthen embankment analysis, probable maximum flood study and dam break analysis have been produced to enhance the inspection reports.

Vulnerability

The areas that would be most effected are those downstream for approximately 1 mile from Hinckley Lake dam.

From south to north, communities downstream of Hinckley Lake Dam include:

1. Hinckley Township, Medina County
2. City of North Royalton, Cuyahoga County
3. City of Strongsville, Cuyahoga County

There are over 100 structures, facilities and residences downstream of Hinckley Lake Dam that could potentially be affected by flooding due to a dam failure. All are located within the East Branch of the Rocky River valley, including lower tributaries, between the dam and the eastside of Interstate 71 in the city of Strongsville. There are no significant dams upstream or downstream of Hinckley Lake Dam. Specific roads, homes, businesses, waste water treatment plants and agricultural facilities within the flood zone can be observed in the inundation maps:

Hinckley Lake Dam has an approved Emergency Action Plan (EAP) and Operation, Maintenance and Inspection Manual that meets current planning requirements and Interagency Committee on Dam Safety guidelines.

The purpose of the Hinckley Lake Dam EAP is to provide a framework for use by Cleveland Metroparks and emergency responders to safeguard the lives of residents who live and work along East Branch of the Rocky River downstream of Hinckley Lake Dam in the event of a failure or conditions potentially leading to a failure. The plan details the responsibilities of Cleveland Metroparks' personnel and local responders in Medina and Cuyahoga counties in the event that an emergency condition is identified. The plan also details monitoring of the dam and identification of various conditions and responses pertaining to emergency events.

Probability

There are no recorded dam failures for Hinckley Lake Dam, according to records held by Cleveland Metroparks. Medina County EMA has estimated that the probability of dam failure for all dams (n=129) in the county is 0.15, or 15% in any given year. Hinckley Lake Dam is regulated and inspected. Probability is lessened with continued maintenance and inspection programs

Mitigation Goals and Actions

The table titled “Local Mitigation Strategies” is a list of hazard mitigation strategies shown as goals and actions designed to accomplish those goals. These strategies have been documented by representatives of Cleveland Metroparks with consultation from Medina County EMA. Goal and actions may progress continuously during the planning cycle. For prioritization, Cleveland Metroparks has applied the STAPLEE method of evaluation, which is as follows:

	+1	+0	-1	Score
Is the action socially acceptable?	1			1
Is the action technically feasible?	1			1
Are the required personnel & administrative capabilities available?	1			1
Is there political support for the action?	1			1
Is there legal authority to execute the action?	1			1
Is the action economically feasible?	1			1
Is the action environmentally friendly?	1			1
Total				7

STAPLEE priority scores in this appendix only pertain to the priorities of Cleveland Metroparks.

For further prioritization, Cleveland Metroparks may consider information from the Hazard Vulnerability Analysis in the Medina County Plan. Cleveland Metroparks may consider other available information such as cost/benefit analysis and economic opportunity.

Cleveland Metroparks Dam Failure Mitigation Strategy						
Lead Agency	Goal	Actions	Status	Cost Est.	Time Frame	STAPLEE Priority
CM	To reduce potential loss of life and property due to dam failure	Create EAP.	Complete	0	NA	S – yes T – yes A – yes P – yes L – yes E – yes E – yes Score= 7
CM	To reduce potential loss of life and property due to dam failure	Create Operation, Maintenance and Inspection Manual	Complete	0	NA	S – yes T – yes A – yes P – yes L – yes E – yes E – yes Score= 7
CM	To reduce potential loss of life and property due to dam failure	Prepare preliminary design report in preparation for dam rehab/modification	Complete	\$226,000	NA	S – yes T – yes A – yes P – yes L – yes E – yes E – yes Score= 7
CM	To reduce potential loss of life and property due to dam failure	Finalize design for dam rehab/modification	Scheduled completion November 2020	\$358,600		S – yes T – yes A – yes P – yes L – yes E – yes E – yes Score= 7
CM	To reduce potential loss of life and property due to dam failure	Dam rehab/modification	2021-2022	\$7MM-9MM		S – yes T – yes A – yes P – yes L – yes E – yes E – yes

						Score= 7
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