

Novel Approaches to Protect Public and Dam Owner Interests

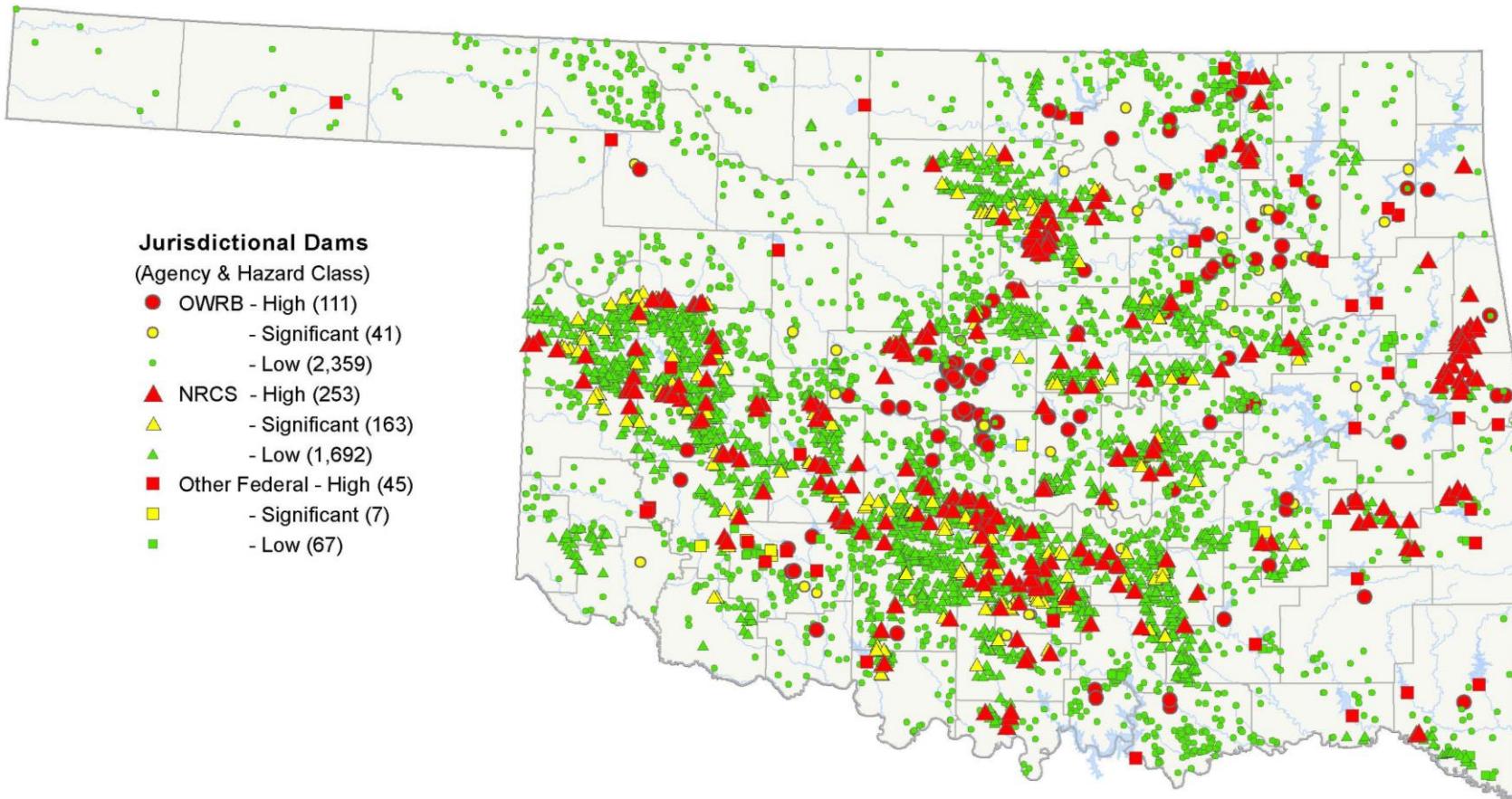
Dam Safety Facts

- **69% dams are privately owned and dam owners are responsible for maintenance and upgrades**
- **Oklahoma has the second highest number of jurisdictional dams in the nation**
- **Average age of dams in the U.S. is more than 53 years old**
- **Many people are unaware of living in dam failure inundation zones**

Oklahoma has 55,646 miles of shoreline
along lakes and ponds

Oklahoma Dam Inventory

(Jurisdictional Dams by Agency and Hazard Classification)



The OWRB coordinates the Oklahoma Dam Safety Program to ensure the safety of over 4,700 dams in the state. The Oklahoma Dam Inventory is a collection of state jurisdiction dams as well as federally owned and operated dams. For more information please visit the OWRB's web site at: (<http://www.owrb.ok.gov>) 2/2/2018



Oklahoma Dam Safety Program

Strengths

- Staff and executive leadership
- Work environment
- Commitment to training
- Outreach
- Information technology
- Legal support
- Dialogue with finance

Areas to Improve

- Fees are not consistent
- Funding availability
- Limited technical references
- Number of dams
- Construction

PEER REVIEW
OF THE
DAM SAFETY PROGRAM
OF THE
OKLAHOMA WATER RESOURCES BOARD

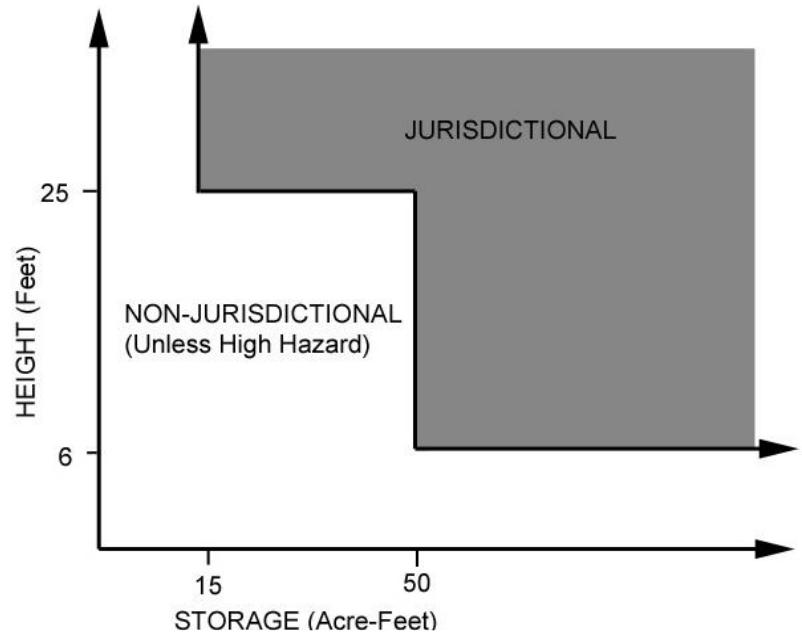


Prepared by:
DEAN B. DURKEE, PH.D., P.E.
MANOSHREE SUNDARAM, P.E.
RICHARD SANCHEZ, P.E.

Hazard-Potential Classification	Description
Low	No probable loss of human life and low economic losses
Significant	No probable loss of human life but can cause economic loss or disruption of lifeline facilities
High	Probable loss of human life

What is jurisdictional size?

Any sized dam determined to be of high hazard-potential.



Dam Safety Program Priorities/Updates

- Public awareness
- Emergency Action Planning
- Hazard-potential reclassification of dams
- Rehabilitation of structurally deficient dams

Public Awareness in 2016 -2018

- Dam Safety for Real Estate Agents
- Dam Safety Workshop (April 25, 2018)
- Free low hazard dam inspections
- Dam safety quarterly newsletter
- Website

Past workshops

- Earthquakes and Infrastructure (Winter 2016)
- HEC-RAS 2D workshop (Spring 2017)

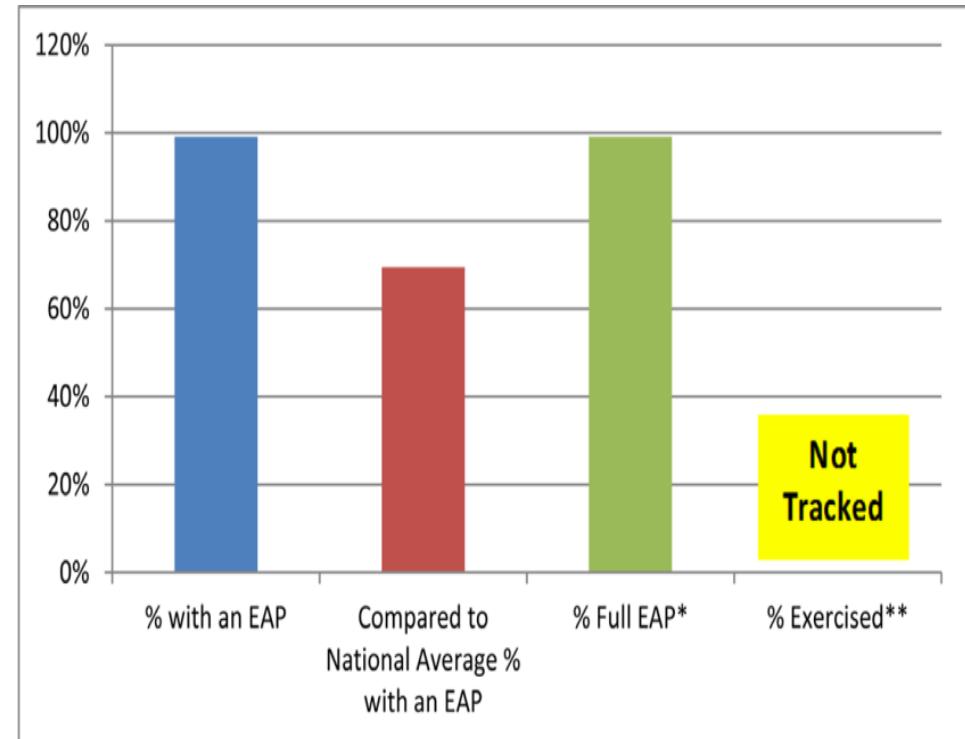
LOCATION OF SUBJECT PROPERTY

Environmental (Continued from Page 2)
37. Are you aware of any wells located on the property?
38. Are you aware of any dams located on the property?
If yes, are you responsible for the maintenance of that dam? _____ YES _____ NO

New language on dams in the Oklahoma Real Estate Commission's Appendix A. Residential Property Condition Disclosure Statement.

Oklahoma Dam Safety Program EAP Performance

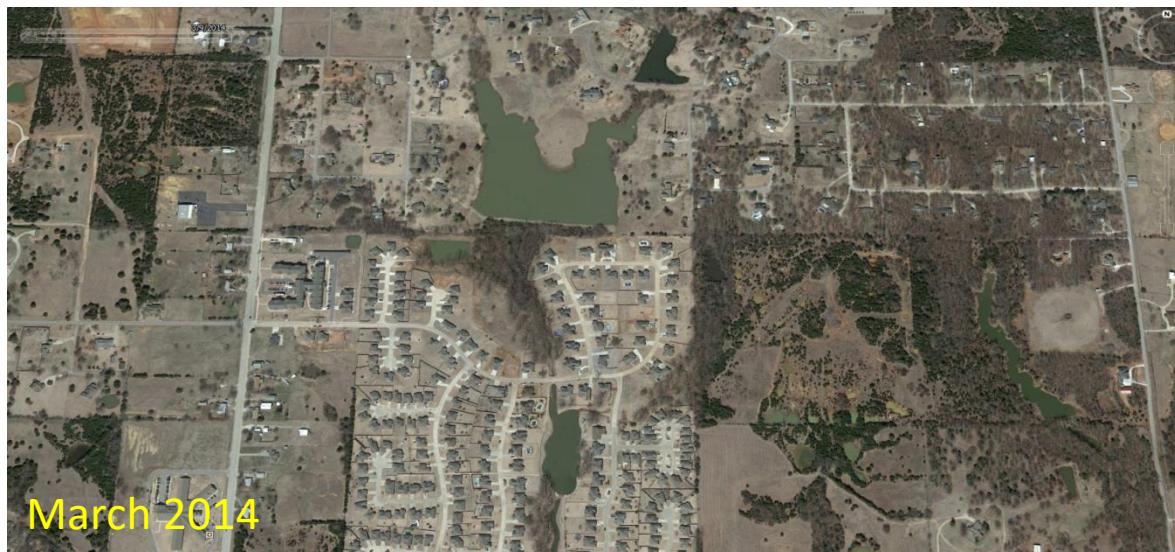
- Based solely on the downstream risk in the event of failure
- **NOT** based on the physical condition of the structure
- Emergency Action Plans
 - 345 High Hazard Dams out of 359 (96%)
 - Dam Breach Inundation Maps (99%)
 - Breach map 2010 and newer (90%)



Hazard Creep



Hazard Creep

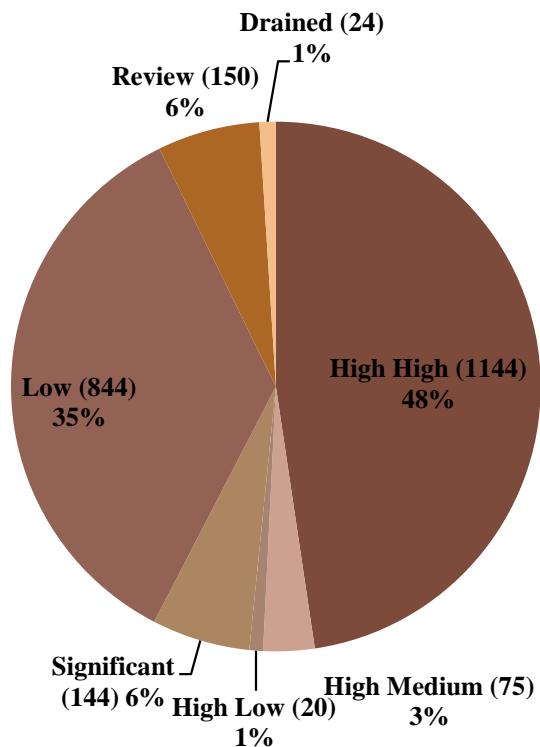


Hazard Reclassification

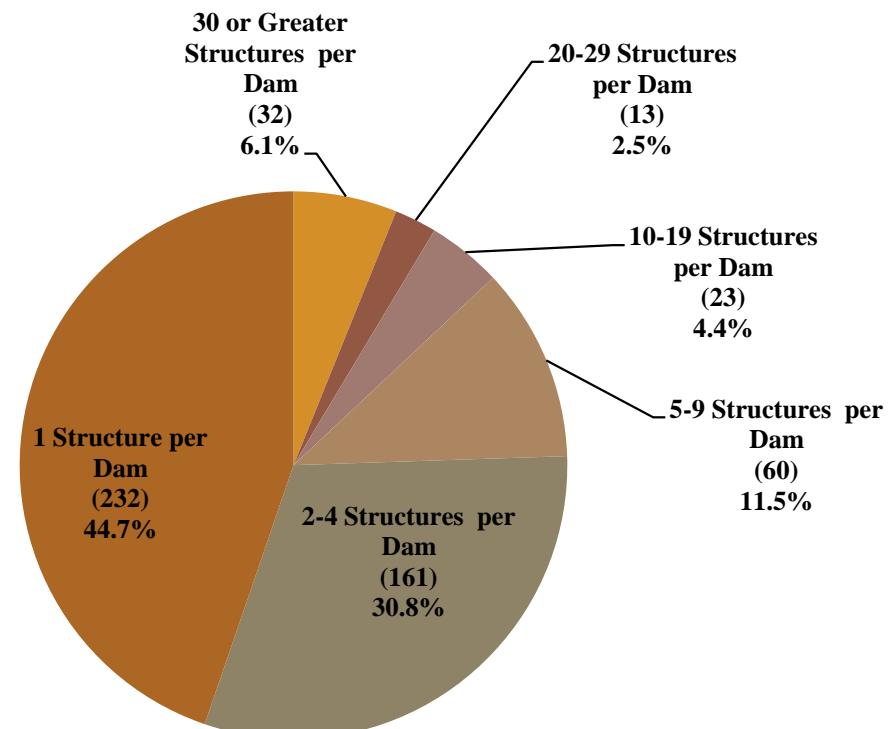
1. Breach inundation rule of thumb by FTN (2015)
2. Field visit
3. Simplified steady state analysis
4. Detailed study
5. Refer to OWRB hazard reclassification guidelines and ACER Technical Memorandum No. 11 by Bureau of Reclamation

Hazard Reclassification Rule of Thumb Model

Dam Classification Summary



**High (H1) Dams with Residential and Commercial Structures
(not in backwater and not in fringe)**



Hazard Reclassification Rule of Thumb Model And Simplified Steady State Analysis



Detailed Study

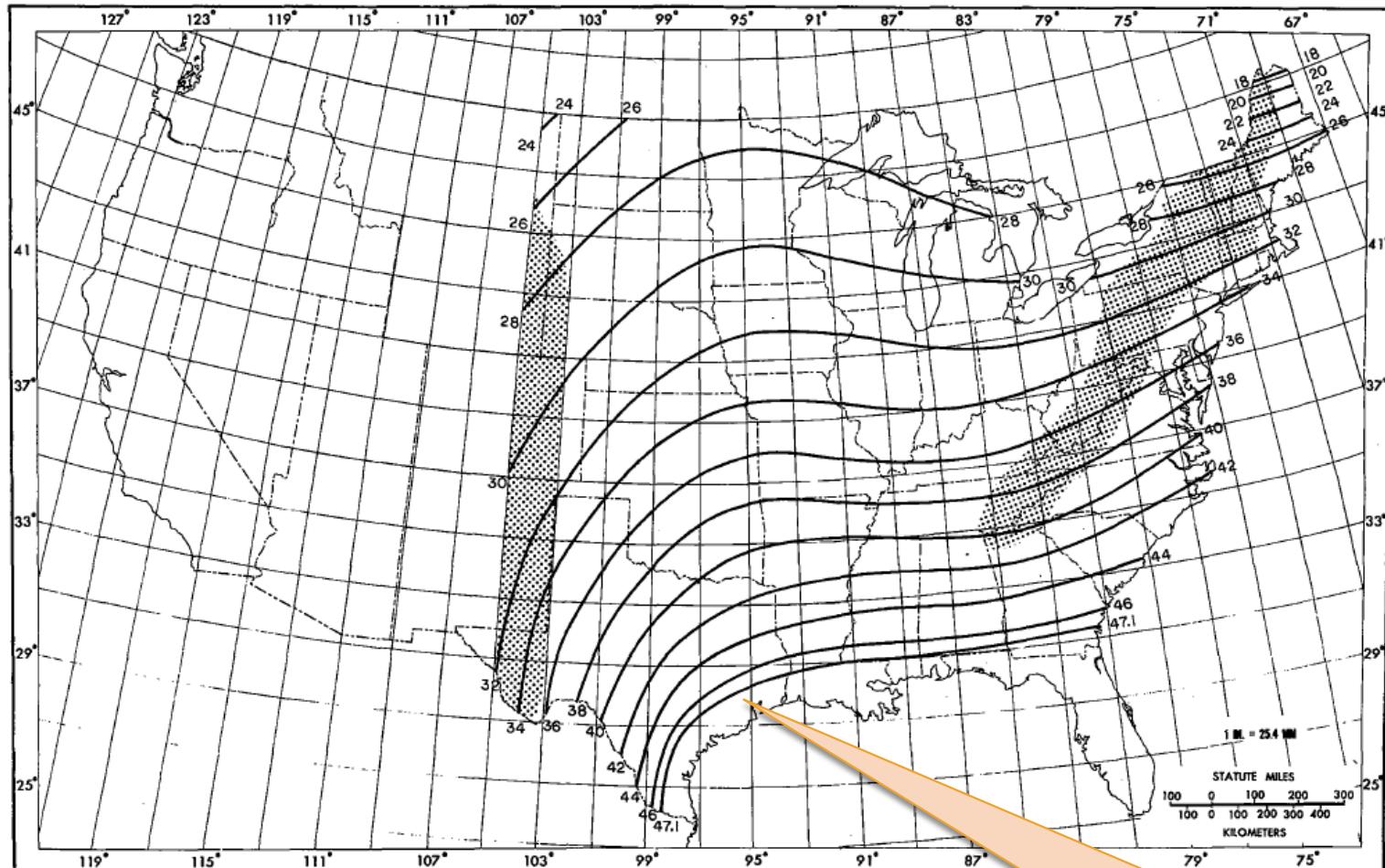
Breach Analysis Scenarios

- **Sunny Day**
 - Piping Failure at Normal Pool Elevation, No Inflow
- **Overtopping** – Depends on Timing with Precipitation
 - Barely Overtopping
 - Maximum Water Surface Elevation Overtopping
- **Non-breach Design Flood**

Design Flood

Size	Hazard-Potential	Design Flood (% PMF)	Minimum Freeboard (ft)
Small	Low	25%	0
	Significant	40%	0
	High	50%	1
Intermediate	Low	25%	1
	Significant	50%	1
	High	75%	3
Large	Low	50%	1
	Significant	75%	1
	High	100%	3

Probable Maximum Precipitation (PMP)



Harvey
31.25" for 24 hour 10 mi²

Source: NOAA – Hydrometeorological Report No. 51
24 hours 10 mi²

Why do we need to update the PMP?

- HMR 51 was published in 1978
- Many major storms happened in the last 40 years
- The importance of extending the duration of the storm
- Partnership with Arkansas, Louisiana, Mississippi, and Oklahoma Conservation Commission/NRCS

	Average Tropical PMP (post-Harvey)	Average Tropical PMP (pre-Harvey)	Average % Increase	Average General PMP (pre-Harvey)	Average % Increase over General PMP	Average HMR 51 PMP	Average % Increase from HMR 51
5,000-sqmi 48-hour	-	-	-	-	No Increase	-	No Increase
5,000-sqmi 72-hour	29.2"	27.4"	6.6%	36.0"	No Increase	31.1"	No Increase
5,000-sqmi 96-hour	30.7"	N/A	-	N/A	-	N/A	No Increase
5,000-sqmi 120-hour	32.3"	N/A	-	N/A	-	N/A	No Increase
10,000-sqmi 48-hour	21.6"	21.1"	2.5%	25.0"	No Increase	22.9"	No Increase
10,000-sqmi 72-hour	25.0"	23.4"	7.1%	29.6"	No Increase	26.8"	No Increase
10,000-sqmi 96-hour	26.6"	23.6"	12.5%	28.2"	No Increase	N/A	No Increase
10,000-sqmi 120-hour	28.3"	23.8"	18.9%	28.4"	No Increase	N/A	No Increase
20,000-sqmi 48-hour	17.1"	16.2"	5.4%	20.5"	No Increase	22.8"	No Increase
20,000-sqmi 72-hour	20.4"	18.4"	10.9%	22.3"	No Increase	26.8"	No Increase
20,000-sqmi 96-hour	23.2"	20.6"	12.8%	23.1"	0.6%	N/A	No Increase
20,000-sqmi 120-hour	23.8"	20.8"	14.8%	22.8"	4.4%	N/A	No Increase

ACER 11

HIGH DANGER ZONE – Occupants of most houses are in danger from floodwater.

JUDGEMENT ZONE – Danger level is based upon engineering judgement.

LOW DANGER ZONE – Occupants of most houses are not seriously in danger from flood water.

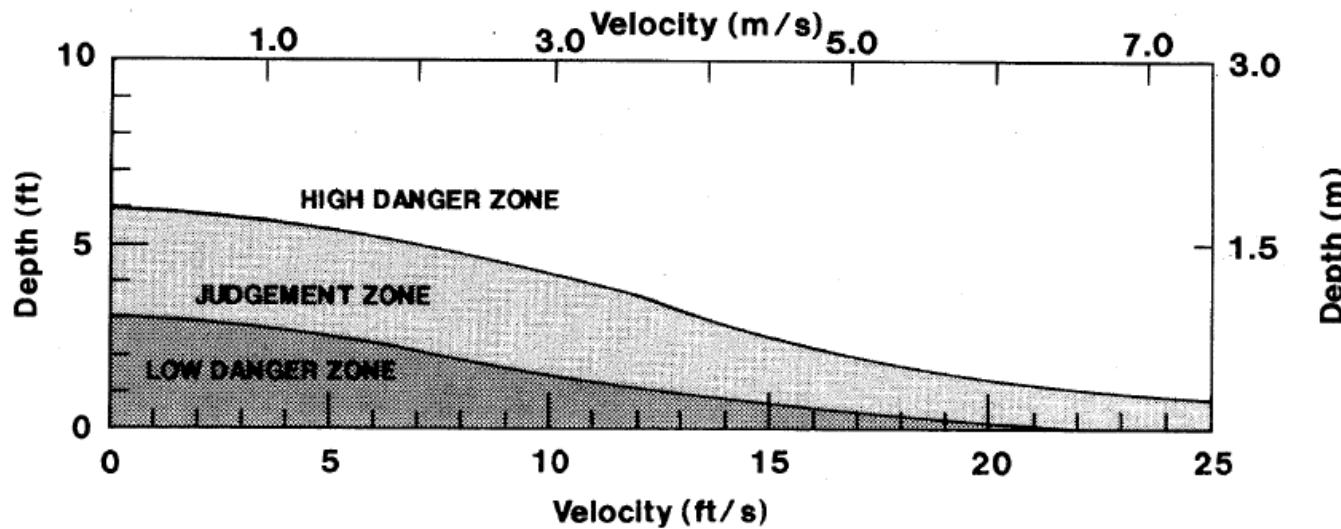


Figure 2. – Depth-velocity flood danger level relationship for houses built on foundations.

Next Step for Reclassification

- State must make a final determination of hazard-potential
- Notification to Owner
- Owner may request a hearing to present technical evidence to show that the dam should not be reclassified.

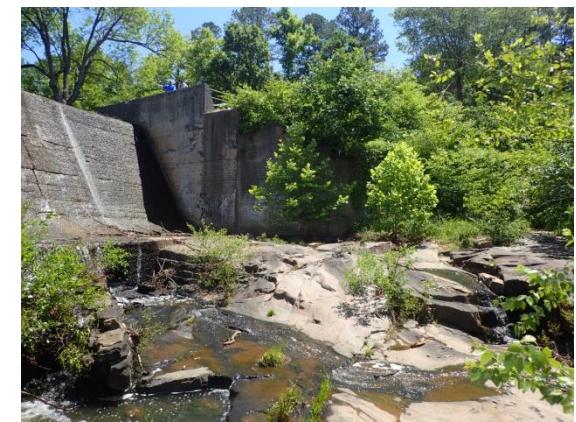


Could maintain low hazard classification if breach and non-breach flood are within one foot.

Technical Assistance to Dam Owner



Knight Lake Dam



Hominy Dam

Carlton and Clayton Lake

Questions