Public Comment on August 9, 2022 Draft 37.03.06 – Safety of Dams Rules and 37.03.05 - Mine Tailings Impoundment Structures Rules, Docket No. 37-0305-2201 (IDAPA 37.03.05 & IDAPA 37.03.06)

By Tami Thatcher, August 19, 2022.

Comments are due August 26 and can be submitted by email to rulesinfo@idwr.idaho.gov

BACKGROUND

The current regulations, "Safety of Dams Rules" (IDAPA 37.03.06) and "Mine Tailings Impoundment Structures Rules" (IDAPA 37.03.05), are being modified.

This set of comments is for the proposed changes issued August 9 which now keep the Safety of Dams Rules and the Mine Tailings Impoundment Structures Rules separate. The Idaho Department of Water Resources (IDWR) has decided to make only minimal changes to the Mine Tailings Rules and also to delay further revisions to the Mine Tailings Rules. This prevents imposing more stringent design requirements on tailings dams, which have been prone to sudden failure worldwide. Tailings dams release toxic material into the environment as mine tailings slurry is released from structural failure of mine tailings impoundment structures. Importantly, the bonding secured for tailings dams would cover closure only in the most ideal conditions and would not cover the cost of damage or remediation in the event of a tailings structure failure.

The first round of comments for the first Strawman which had combined Safety of Dams Rules ("DS Rule") and Mine Tailings Impoundment Structures Rules ("MT Rule") into a single rule were previously submitted and were due June 17, 2022 and IDWR provided written responses to those comments on August 9, 2022. The first Strawman had incorporated many updates to the Mine Tailings Impoundment Structures (MTISs); however, these updates have now been removed from the rulemaking effort.

The first public (in person and virtual) meeting was held May 27, 2022. A second public (in person and virtual) meeting was held July 7, 2022; however, there was no written response to comments received and no revised Strawman. A third meeting was planned for July 28, but was postponed until August 19.

The May 4, 2022 Idaho Administrative Bulletin identified rulemaking for the Idaho Department of Water Resources and announced a May 27 meeting. [1]

The draft rule can be found at https://idwr.idaho.gov/wp-content/uploads/sites/2/legal/rule-37-03-05/rule-37-03-05-and-rule-37-03-06-202205223-strawman-v1.0.pdf (or link). The existing rules can be found at https://adminrules.idaho.gov/rules/current/37/ . The dam safety rulemaking webpage is located at this https://idwr.idaho.gov/legal-actions/rules/idwr-rulemaking-2022-2023/mine-tailings-impoundment-structure-safety-of-dams-rules/ .

[1] The May 4, 2022, Idaho Administrative Rules Bulletin, Volume 22-5, available in May 2022 at https://adminrules/idaho.gov/bulletin/2022/05.pdf

COMMENT SUBMITTAL FOR THE AUGUST 9, 2022 PROPOSED CHANGES TO THE MT RULE AND DS RULE

EXECUTIVE SUMMARY

For the August 9 proposed rule changes, the IDWR has decided not the combine the Safety of Dams and the Mine Tailings Impoundment Structures Rules in to a single rule. The rules will remain as separate rules. But for reasons unknown, the IDWR has decided to make only minimal changes to the Mine Tailings Impoundment Structures Rule, despite it being about 30 years out of date and containing obsolete language regarding selection of the design earthquake. Serious deficiencies remain in both the Safety of Dams Rules (DS Rule) and the Mine Tailings Impoundment Structures Rules (MT Rules) in the rule changes proposed on August 9. Problems include the IDWR's hazard classification criteria, selection of appropriate design flood release capability and selection of seismic design criteria.

The IDWR removed draft rules that it had already developed for mine tailings impoundment structures proposed in the June "strawman." The rules proposed in June would have imposed more stringent requirements for the selection of an appropriate design earthquake for MTISs, but now IDWR has chosen to retain outdated Zone 2 and Zone 3 language in the MT rule. Developments in seismic hazard studies by the U.S. Geological Survey have continued finding increased seismic hazard levels, above the levels recognized and located geographically differently than understood when these rules were originally developed.

Two very important design criteria for dams and Mine Tailings Impoundment Structures (MTISs) are for water release capacity and seismic capacity. Despite long known increasing risk of severe weather events due to climate change, the IDWR has proposed reducing the size of design probable flooding inflows to consider for selection of the design criteria for flooding inflows.

This is despite recent flooding in the neighboring state of Montana, which this June exceeded 1-in-500-year flood levels due to unexpected heavy snow followed by heavy rain this spring, despite a dry winter. [2]

By 2017 it had been recognized by professionals that climate change increases the risk of severe weather and flooding and the risk of failure of MTISs. [3] Western states can expect storms that produce more frequent and stronger precipitation extremes even while the frequency of light and moderate precipitation decreases, according to a recent report by Thomas W. Corringham

[2] Associated Press, *The Idaho Falls Post Register*, "High and Fast – How heavy snow, rain flooded Yellowstone," June 19, 2022.

[3] Roche, C. Thygesen, K., Baker, E. (Eds.) *Mine Tailings Storage: Safety Is No Accident*. A UNEP Rapid Response Assessment. United Nations Environmental Programme and GRID-Arendall, Nairobi and Arendal, www.grida.no. 2017. ISBN: 978-82-7701-170-7

and others. [4] [5] This rulemaking by the IDWR ignores this reality as they propose reducing design requirements for dam release capability from outlet works and spillways for all but the least hazard, smallest size dams and as they continue to allow the Director to accept dam release capabilities even below the stated inflow design flood levels.

The selection of the maximum flooding inflows and the appropriate seismic criteria and also the inspection frequency depends on the Hazard Classification of the dam or MTIS. The proposed MT Rules does not clarify in any manner what hazard classification criteria are to be used. Mine tailings contain toxic materials that can cause prolonged environmental damage even if developed property is not damaged and even if no lives are lost due to the failure of the structure.

The Hazard Classification criteria that were added to the Safety of Dams Rule create ambiguity for low hazard structures and the level of harm from significant and from high hazard structures appear to both be very high, yet the IDWR's proposed rule changes generally relieve, inappropriately, the significant hazard structures of more stringent design criteria applied to high hazard structures.

The U.S. Geological Survey has continued to find higher seismic hazard levels and the proposed rules for seismic criteria were not updated in the MT Rule and are not clearly appropriately specified in the DS Rule to assure appropriately stringent requirements.

While a redline-strikeout of the changes from the June Strawman to the August 9 changes, there is no redline-strikeout of the changes to the current rule to either the June or August proposed changes. There remains the lack of documentation of the reasoning behind the many changes and deletions of the current DS rule. Coupled with the high number of errors, it is difficult to ascertain which changes in the proposed rules are intentional and which changes are not. In the first public meeting, it was requested that the IDWR explain the rationale for the rule changes. The IDWR is making rule changes that in some cases significantly reduce safety requirements and they are doing so without explanation.

The problem of deteriorating dams is not even addressed by IDWR's rulemaking, [6] and the issue of never-ending compliance periods for correcting problems is only made worse in the proposed changes.

Significantly reduced estimates of Mackay Dam release capability have been found in 2020 and 2021. This means that the likelihood of failure of the Mackay Dam has increased from that of failing from 1000-year flooding to that of failing at 25-year flooding. Yet no action has been taken to ensure appropriate actions are taken to protect the lives of perhaps 600 citizens living

[4] Corringham, T.W., McCarthy, J., Shulgina, T. *et al*. "Climate change contributions to future atmospheric river flood damages in the western United States," *Sci Rep* **12,** 13747 (2022). https://doi.org/10.1038/s41598-022-15474-2

[5] Matthew Cappucci, *The Washington Post*, "A 'megaflood' in California could drop 100 inches of rain, scientists warn – It hasn't happened since 1862, but California is due for another one," August 12, 2022.

[6] Maya Wei-Haas, National Geographic, "The problem America has neglected for too long: deteriorating dams," May 27, 2020. https://www.nationalgeographic.com/science/article/problem-america-neglected-too-long-deteriorating-dams

downstream of the Mackay Dam. And the Mackay Dam, whose failure, poses the additional risk of a radiological release, violation of hazardous waste permits and subsequent unsafe conditions, and of very high costs of addressing radiological releases and of nuclear facility damage involving the Idaho National Laboratory, appears to not be responded to appropriately by state and federal agencies.

IDWR's DECISION NOT TO UPDATE SEISMIC AND OTHER DESIGN REQUIREMENTS IN THE MINE TAILINGS IMPOUNDMENT STRUCTURES RULES REQUIRES EXPLANATION OF SAFETY IMPACTS

The Idaho Department of Water Resources has limited it's updating the "Mines [sic] Tailings Impoundment Structures Rules" to only minimal changes. The original rule is about 30 years out-of-date and the understanding of seismicity in the state has changed considerably. The IDWR has limited its changes to the outdated rule to effectively lengthen the duration of time between recertification of a mine tailings impoundment structure beyond 2 years (Rule 010.13). And to effectively lengthen the time a bond shall run, based on the certificate of approval (Rule 040.01).

Despite the problem, world-wide, of tailings dam failures and tailings dams being less reliable structures typically than dams that hold water, the IDWR chose not to review or strengthen design criteria for flooding or seismic events for new tailings dams, despite having developed changes in their first "Strawman" of proposed rule changes in June.

The schedules for inspections and recertification of mine tailings dams depend on hazard classification. **And yet there are no stated hazard classification criteria associated with the mine tailings rule nor does there appear to be an explicit requirement for the IDWR to perform hazard classification of MTISs.**

The proposed MT Rule does not specify where the criteria for hazard classification for mine tailings impoundment structures (MTISs) are found. In the June 2022 Strawman, the hazard criteria were the same for MTISs as for dams. Hazard classification categories of low, significant and high are not defined in Idaho statute, that I can find. The IDWR needs to explain specifically where the criteria for MTISs are to be found. In practice, the IDWR may have used the 2018 Administrator's Memorandum which states, "…a High Hazard classification presumes that the downstream consequences of a dam failure and uncontrolled release of water will result in direct loss of human life. Significant Hazard implies that significant economic damage will occur to developed property, and includes also the potential for indirect loss of human life. A Low Hazard classification suggests that developed property may suffer minor damage, with a low potential for loss of life, or that damage will be limited to the dam owner's property." [7] The 2018 Administrator's Memorandum is not Idaho Statute and would be out of date, particularly when new changes to DS Rules are issued. So, the criteria for hazard classification to be used by the IDWR in classifying MTISs is vague and ambiguous and does not appear to be adequately defined in existing statute or in the proposed MT Rule.

[7] Administrator's Memorandum, Dam Safety No. 1, From Jeff Peppersack, Water Allocation Bureau Chief to Water Allocation Bureau and Regional Offices, May 11, 2018.

Importantly, mine tailings dam failures can release toxic material that cause prolonged environmental damage. The bonding money will not cover the cost of damage or cleanup following a tailings dam failure, as the bonding level is tied only to the most ideal closure conditions. So, the rule making for the "Mine Tailings Impoundment Structures Rules" was limited to only two changes and these changes are favorable to the mining industry but do not address the appropriateness of the selection of the design earthquake for new structures.

The IDWR has admitted that the system that defined Seismic Zones (0,1,2,3,4) was used originally for building codes and is now obsolete. The IDWR must explain why it has chosen not to review and update the mine tailings impoundment structures rule for appropriate selection of seismic design criteria. The proposed MT rule continues to use language that only requires structures located east of Range 22 E., Boise Meridian, corresponding to Seismic Zone 3. This boundary has been explained as being approximately the 114th meridian, and IDWR recognizes that their MT rule only requires seismic analysis be conducted for structures located to the east of this boundary. As the U.S. Geological has made many revisions to its seismic hazard models, this obsolete boundary line may unjustifiably exclude appropriate seismic evaluations, see MT Rules 035.16(g) and also 045.01(b).

At least one new MTIS is currently planned to be built west of this boundary line, at Yellow Pine. It appears that it may not be held to appropriately stringent seismic design requirements because the outdated MT Rule is not being fully updated by the IDWR.

The geographical location of boundaries of seismic zones 2 and 3 have also changed (and are no longer used). The seismic hazard maps from 1970 depicting seismic zone 3 show zone 3 to be east of the Nevada-Utah boundary. More current maps of seismic hazards show high seismic hazards throughout Custer County in the center of Idaho and extending further west than previous maps.

The IDWR must also address whether it has required less than the maximum credible earthquake as the design earthquake for structures other than low hazard MITS structures. And IDWR needs to address whether the maximum value obtained from a probabilistic evaluation based on existing USGS Seismic Hazard maps would result in higher seismic loading than the maximum credible earthquake.

COMPENSATION FOR DAM OR MTIS FAILURES

According to a 2017 report, *Mine Tailings Storage: Safety Is No Accident*, [8] there is no financial assurance requirement for catastrophic failure.

The 2017 report states: "If a catastrophic failure occurs, either the operator must be able to provide financial compensation, and/or that responsibility falls to government. If neither is able

[8] Roche, C. Thygesen, K., Baker, E. (Eds.) *Mine Tailings Storage: Safety Is No Accident*. A UNEP Rapid Response Assessment. United Nations Environmental Programme and GRID-Arendall, Nairobi and Arendal, www.grida.no. 2017. ISBN: 978-82-7701-170-7

to provide compensation, then the environmental and social costs fall on those who live near the mine."

The lack of financial assurance requirement for catastrophic failure of dams or MTISs continues to be true in Idaho. Importantly, IDWR regulates dams with inadequate designs and inadequate construction quality. And IDWR regulates MTISs, which continue to fail catastrophically at a high rate of failure, around the world.

In proposed (and existing) MT Rule 40.02, the "Bond provisions shall provide that the surety may be held liable for a period of up to five (5) years following notice of default of the bond." Why only up to five years? As written, the bond provisions may be allowed to end far earlier than after five years. It is an example of mining industry favorable regulations, to the expense of property owners who may never be compensated or tax payers who pay for the abandonment.

Also, the Rule 40 for "current costs for abandonment" uses the present condition which seems designed to reduce the estimated costs for abandonment.

The bonding requirements do not pay for the cost of remediation should a mine tailings impoundment structure fail. Even if criminal charges are successful against mining engineers for faulty designs or quality, bankruptcy of the mining companies tends to mean that the mining companies don't pay for their mistakes if a structure fails.

According to a 2017 report, *Mine Tailings Storage: Safety Is No Accident,* [9] chronic problems at closed MTISs may require long-term or perpetual management, with the costs often borne by local communities and authorities. The true costs of managing mine tailings waste, even when no catastrophic tailings dam failure occurs, are often not revealed.

DAM RELEASE CAPABILITY ISSUES

Reduced "Inflow Design Flood" Design Requirements (Rule 50)

In the draft rule for "Safety of Dams" the "Inflow Design Flood" design requirements have changed, with many of the stated "Inflow Design Flood" flow rates being reduced. (See the current Rule 050.11 and proposed Rule 050.11) See Table 1a for the existing "Inflow Design Flood" requirement, Table 1b for the proposed range of requirements, and Table 1c for a summary of the reduced minimum "Inflow Design Flood" requirement in the draft rule.

[9] Roche, C. Thygesen, K., Baker, E. (Eds.) *Mine Tailings Storage: Safety Is No Accident*. A UNEP Rapid Response Assessment. United Nations Environmental Programme and GRID-Arendall, Nairobi and Arendal, www.grida.no. 2017. ISBN: 978-82-7701-170-7

Table 1a. Current "Inflow Design Flood" requirements in "Safety of Dams Rules."

Downstream Risk Category	Size Classification	Inflow Design Flood
Low	Small	Q50
Low	Intermediate	Q100
Low	Large	Q500
Significant	Small	Q100
Significant	Intermediate	Q500
Significant	Large	0.5 PMF
High	Small	Q100
High	Intermediate	0.5 PMF
High	Large	PMF

Note: Q50 is a 50-year flood. Q100 is a 100-year flood. Q500 is a 500-year flood. The flow waters of a 500-year flooding event exceed those of a 100-year flooding event. The Probable Maximum Flood (PMF) exceeds that of a 500-year flood.

Table 1b. Draft "Inflow Design Flood" requirements of new combined rule.

Hazard Classification	Size Classification	Inflow Design Flood
Low	Small	Q100
Low	Intermediate	Q100
Low	Large	Q100
Significant	Small	Q100
Significant	Intermediate	Q100 to Q500
Significant	Large	Q500
High	Small	Q100
High	Intermediate	Q100 to Q500
High	Large	Q500 to PMF

Note: Q50 is a 50-year flood. Q100 is a 100-year flood. Q500 is a 500-year flood. The flow waters of a 500-year flooding event exceed those of a 100-year flooding event. The Probable Maximum Flood (PMF) exceeds that of a 500-year flood.

Where the draft rule *states a range*, from Q100 to Q500, for example as shown in Table 1b, the draft rule (37.03.05.050.11 on page 13 of the draft rule) would apparently be met by the lowest specified value and it would appear to be difficult for IDWR to enforce the higher value.

Table 1c. Summary of reduced minimum "Inflow Design Flood" requirements.

Risk Category or Hazard Classification	Size Classification	Inflow Design Flood, rules since at least 1993	New Proposed Inflow Design Flood. Reduced minimum requirement shown in Bold
Low	Small	Q50	Q100
Low	Intermediate	Q100	Q100
Low	Large	Q500	**Q100**
Significant	Small	Q100	Q100
Significant	Intermediate	Q500	**Q100**
Significant	Large	0.5 PMF	**Q500**
High	Small	Q100	Q100
High	Intermediate	0.5 PMF	**Q100**
High	Large	PMF	**Q500**

Note: Q50 is a 50-year flood. Q100 is a 100-year flood. Q500 is a 500-year flood. The flow waters of a 500-year flooding event exceed those of a 100-year flooding event. The Probable Maximum Flood exceeds that of a 500-year flood. See draft rule under "Emergency Spillway Flow Capacity." See existing dam safety rule under "Release Capability."

IDWR responded to comments that I made in the first Strawman draft, in the IDWR's August 9, 2022 "Summary Comment & Response Memo." Where the IDWR response raises additional issues that require comment, I have provided the comment here, with some overlap of my original comments, for clarity.

In the August 9, 2022 "Summary Comment & Response Memo," Comment 15 is "IDWR must provide the technical justification for the reduced minimum "Inflow Design Flood" design requirements for new structures in the [Draft DS-MT Rule.]."

IDWR offered the explanation for reducing the Probable Maximum Flood (PMF) of 0.5 PMF to the 500-year flood because there was no consensus on how to estimate the 0.5 PMF. This is an indefensible excuse. Reducing the requirement, perhaps by a factor of 14, because there was no consensus on how the estimate the 0.5 PMF does not provide an adequate rationale for the decision.

The IDWR had responded, in part: "Specifically regarding IDWR's removal of the 0.5 Probable Maximum Flood ("PMF") IDF, IDWR has removed this value for its inherent ambiguity, recognizing that the engineering community does not uniformly interpret this design event or deploy common practices in calculating it. For example, one approach might be to calculate a PMF and then half it, whereas another approach might be to calculate a PMF based on a 50% probable maximum precipitation event."

The IDWR also responded, in part: "The Draft Rule decreases the IDF values for a few select hazard class and dam size type (e.g., large low hazard, large significant hazard, and intermediate high hazard dams). For low hazard dams, the Draft Rule specifies a Q100 IDF value for consistency and simplicity. For large significant hazard and intermediate high hazard dams, the

Draft DS-MT Rule moves away from the 0.5 PMF standard for the reasons discussed in IDWR's response to comment #13."

The problem is that IDWR replaced the 0.5 PMF with the 500-year flood. As an example, for the Mackay dam, the PMF is 82,100 cubic feet per second (cfs) while the 500-year flood is 6,800 cfs. No matter what method used to estimate 0.5 PMF, the 500-year flood creates a far less stringent design criterion. The explanation that there was not consensus on how to estimate the 0.5 PMF as being the reason for substituting the 500-year flood is insufficient for so great a reduction of the design standard, especially for high hazard dams.

A variety of flood inflow values have been assumed over time for the Mackay Dam. The values for predicted surface inflows to the Mackay reservoir from a 1986 study are shown in Table 2. Note how the Probable Maximum Flood peak flow is over 14 times higher than the 500-year flood (Q500). Peak flooding intervals and corresponding annual exceedance probabilities are provided in Table 3.

Table 2. Predicted surface inflows to the Mackay reservoir from the 1986 report by Koslow and Van Haaften.

Recurrence Interval (Years)	Peak Flow (cfs)
25	4,030
100	4,870
500	5,760
1000	6,800
Probable Maximum Flood	82,100

Table notes: Source: K. N. Koslow and D. H. Van Haaften, Idaho National Engineering Laboratory managed by the U.S. Department of Energy, *Flood Routing Analysis for a Failure of Mackay Dam*, EGG-EP-7184, June 1986. Note that flood inflow estimates and the PMF estimate evolve over time and a variety of values have been used. I provide these values as examples, not as preferred values.

So, in effect, the IDWR greater lowered the minimum standard for the release capability for large and intermediate sized high hazard dams, and large significant hazard dams and the rationale was that there was the lack of consensus on how to estimate the 0.5 PMF flooding.

In addition, IDWR did not offer any explanation of other Inflow Design Flood reductions. The intermediate size dams of significant hazard had their minimum "inflow design flood" reduced from the 500-year flood (Q500) to a 100-year flood (Q100). Likewise, large size dams of low hazard had their minimum "inflow design flood" reduced from the 500-year flood to the 100-year flood. The 500-year flood may not be tremendously larger than the 100-year flood. For example, the Mackay dam the 500-year flood is 5,760 cubic feet per second (cfs) while the 100-year flood is 4,870 cfs. This does not seem like such a large amount but it could exceed a dam's release capability and the physical modifications to meet the criteria would be costly. The IDWR provided no explanation for those reduced "inflow design flood" design requirements.

Table 3. Peak Flood and Annual Exceedance Probability, for information.

Peak Flood Recurrence Interval	Annual Exceedance Probability	Q is the flow rate corresponding to the peak flood recurrence interval
2 Year Peak Flood	50% or 40% *	
5 Year Peak Flood	20% or 18% *	
10 Year Peak Flood	10%	
20 Year Peak Flood	5%	
50 Year Peak Flood	2%	Q50
100 Year Peak Flood	1%	Q100
200 Year Peak Flood	0.5%	
500 Year Peak Flood	0.2%	Q500

Table notes: the Q50, Q100 and Q500 notations shown are those used in the draft rule. The Exceedance Probability may be estimated as 1/recurrence interval, e.g., 1/500 = 0.2%. * It may also be more rigorously calculated as [1 – exp [-n/RP] where n is the number of events and RP is recurrence period.

The IDWR has not provided adequate and complete explanation for reduced design standards for release capability from dams, the Inflow Design Flood, in its previous response to comments.

Proposed Rule 60.01 for Existing Dams Should Not Be Reducing the Analyses Requirements

The current rule for existing dams (Rule 055.01) states: "**Analyses Required.** The analyses required by Rule 40 are not applicable to existing dams except as required in Rule Subsections 055.01.a and 055.01.e unless for good cause, the Director specifically requires the analyses." [Current Rule 055.01.a addresses release capability requirements for large, significant or high risk dams and Current Rule 055.01.e addresses seismic design for large, high risk dams. Note that high risk dams would now be called high hazard dams and significant risk dams would not be called significant hazard dams.]

The proposed rule for existing dams (Rule 060.01) states: "**Analyses Required.** The analyses required by Rule 35 shall apply to all existing dams when the Director specifically requires the analyses."

Effectively, the proposed Rule 060.01 eliminates requirements that had been in place for about 30 years which had required existing large dams of either significant hazard or high hazard to provide the level of analysis documentation as a new dam. The IDWR needs to explain why this reduction in "Analyses Required" for the essential to safety issues of release capability and seismic design are being reduced in the proposed rule.

The IDWR needs to explain whether or not it has been complying with current Rule 055.01 for large, intermediate or high hazard dams.

In fact, for existing dams that apply the rule for release capability for new dams (current Rule 50), it appears that the Inflow Design Flood (IDF) that a dam could safely pass has simply not been identified. Knowing the flow rate of a 100-year flood or the flow rate of the Probable Maximum Flood (PMF) is not the same as determining the actual release capability of a dam.

For some dams, as has been the case for the large, high hazard Mackay Dam, there does not appear to be a specified IDF that the dam could safely meet.

The maximum flow that a dam can safely release needs to be known. The flooding return interval for that amount of flooding corresponds to the probability of failure of the dam, per year, due to flooding. Other contributors to the annual probability of failure of a dam would include seismic events that fail the dam, age-related or other failures, and sabotage.

Misguided Arguments to Reduce the "Inflow Design Flood" Design Requirement for an Existing Dam (Proposed Rule 60)

Design standards for large, high hazard dams have typically required a high hazard dam to handle the "Inflow Design Flood" (IDF) corresponding to the Probable Maximum Flood (PMF). This requirement has been stated in the IDWR's own rules for over 30 years. According to the 2021 McMillen Jacobs report (Appendix A), "The standard for a large, high hazard dam is to be able to safely pass the IDF without overtopping." See the 2021 McMillen Jacobs report for the Mackay Dam. [10] [11]

When meeting the release capability of the PMF is difficult, for a large, high hazard dam, the question of the acceptability of a reduced IDF below the PMF has been the issue.

The McMillen Jacobs report (Appendix A) states: "Procedures outlined in the Federal Energy Regulatory Commission Chapter 2 Guidelines (2015) state that an IDF may be selected by evaluating the point where incremental flood damage no longer results in an addition impact to downstream life or property."

The McMillen Jacobs report (Appendix A), in a discussion of design alternatives for proposed Mackay Dam rehabilitation, states: "The IDF presented in the design criteria below was evaluated as part of the PFMA [potential failure modes analysis], and has preliminarily been discussed with IDWR Dam Safety. The reduction from the full PMF (82,100 cubic feet per second (cfs); Koslow and VanHaaften, 1986) is justified on the grounds of no incremental damage about 20,000 cfs, or 055.01.d.ii. Use of the reduced IDF will be subject to a final decision by IDWR."

Page 14 of the McMillen Jacobs 2021 report (Appendix A) also identifies current "Safety of Dams Rules" 055.01.d.iii, which has been deleted from the proposed rule without explanation. Current Rule 055.01.d.iii states: "A showing acceptable to the Director that the release capability of a dam together with other emergency release modes such as a controlled failure or overtopping of the dam would not result in a larger rate of discharge than the rate of inflow to the reservoir." Overtopping a dam when it causes failure of the dam will result in a far larger rate of discharge than the rate of inflow to the reservoir and it remains unclear how the IDWR used this

[10] McMillen Jacobs Associates, *Conceptual Design Report Mackay Dam*, State Dam Identification D34-2225, National Inventory of Dams ID 00181, Final Revision 1, June 25, 2021. (Appendix A)

[11] McMillen Jacobs Associates, *Potential Failure Mode Analysis and Risk Assessment Report – Mackay Dam*, State Dam Identification D34-2225, National Inventory of Dams ID 00181, Revision 1, June 25, 2021. (Appendix F)

rule. At what point(s) downstream was this rule applied? The IDWR should clarify what this rule meant and why it has now been deleted.

This question is usually asking this: would the Probable Maximum Flood (PMF) that fails the dam cause about the same damage downstream as a PMF occurring without a dam being present. This is what I will call the "Shakespearean Question," or "To Be or Not to Be."

The current "Safety of Dams Rules" Rule 55 for existing dams asks this question in order to determine if the release capability requirement can be relaxed.

The current "Safety of Dams Rules" Rule 055.01.d.ii states: "A showing acceptable to the Director that failure of the dam during a flood of the specified magnitude described in Rule Subsection 050.11 [for example, for large, high hazard dams is the PMF in the current rule] would not substantially increase downstream damages over and above the losses and damages that would result from any natural flood up to that magnitude." This is what I am calling the Shakespearean Question, and it is basically asking would a PMF that fails the dam cause about the same damage as a natural flood the size of the PMF without a dam present.

The sudden failure of a dam can cause a wall of water to be rapidly released from the dam. In the case of the Mackay Dam, failure of the dam due to overtopping can occur rapidly and within 30 minutes, wipe out the town of Mackay, taking hundreds of lives. The floodwater flow more than 40 miles further and in as few as 8 hours, reaches the Idaho National Laboratory. Flood depths of 4 to 5 ft are expected at various facilities including the Idaho Nuclear Technology Engineering Center (INTEC) where spent nuclear fuel and high-level waste (calcine and liquid waste) are stored, the Advanced Test Reactor and to the Naval Reactors Facilities. Radiological releases are possible, and very high economic costs can be expected even if no radiological releases occur.

It is estimated that about 0.5 ft of overtopping would fail the Mackay Dam. There are probably other reasons, but given the design and condition of the outlet tunnel at the toe of the dam, which is loose fill and a degrading timber and rail apron, this appears appropriate.

When a dam is in place, the flooding causes the level of water to rise in the dam and the flow of water released from the dam may remain steady, at maximum outlet release capability until the dam is full and flow is also released by the spillway. When the release capability of both the outlet and spillway are exceeded, then with continued inflows to the reservoir, the dam can overtop and fail.

For the Mackay Dam, the PMF of 82,100 cfs was compared to a reduced 20,000 cfs flooding event. The PMF causing failure of the dam would release 306,700 cfs (see Table 4). The 20,000 cfs flood event that the dam survives would release the 20,000 cfs, while over and above that, the dam would fail, releasing over 100,000 cfs. The normal releases do not exceed around 2000 cfs.

Table 4. Four cases of peak flood flow to the Mackay Dam from the 1986 report by Koslow and Van Haaften.

Dam Failure Case	Breach Type	Estimated Peak Reservoir Inflow, cfs	Estimated Peak Flow Below Dam, cfs (Total Reservoir Release, acre-feet)
No failure, maximum flow from Mackay Dam in 2017	No breach	Howell Gage, 3,160 to 4,200 cfs reported	2,200 cfs
Seismic failure (characterized by assuming during 25-year flood inflow)	Trapezoid	4,030 cfs	107,480 cfs (44,830 acre-feet release)
Internal piping failure (characterized by assuming 100-year flood inflow)	Triangle	4,870 cfs	57,740 cfs (41,850 acre-feet)
Internal piping failure (characterized by assuming 500-year flood inflow)	Trapezoid	5,760 cfs	106,680 cfs (44,710 acre-feet)
Probable Maximum Flood (PMF) with dam overtopping	Trapezoid	82,100 cfs	306,700 cfs (142,330 acre-feet)

Table notes: Source: K. N. Koslow and D. H. Van Haaften, Idaho National Engineering Laboratory managed by the U.S. Department of Energy, *Flood Routing Analysis for a Failure of Mackay Dam*, EGG-EP-7184, June 1986. Time to failure is assumed 1 hour. Probable Maximum Flood as estimated by Dr. David L. Schreiber, P.E., Schreiber Consultants, Inc., in 1986 and included in Appendix B of the 1986 Koslow and Van Haaften report. The previous PMF was 41,000 cfs as estimated from US Bureau of Reclamation (USBR) experience curves (see State of Idaho, Department of Water Resources, *Phase I Inspection Report, National Dam Safety Program, Mackay Dam*, September 1978).

The argument is that designing the spillway to release 82,100 cfs is not beneficial enough and that a spillway that could release 20,000 cfs would be sufficient.

When the flooding inflows are not released and the dam overtops and fails, a wall of water is rapidly released on the downstream town of Mackay, Arguments of "incremental increase" that are allowing grossly inadequate spillway size for the Mackay Dam are grossly misguided.

What was then argued in the 2021 McMillen Jacobs Mackay Dam Rehabilitation project (Appendix A) was that basically something around the 500-year flood release capability (5,210 cfs) could be achieved by the Mackay Dam rehabilitation (that remains unfunded). The effort to meet even the release capability of 20,000 cfs, that had been reduced from the 82,100 cfs PMF, was abandoned.

And behold, the proposed IDWR proposed rule changes have reduced the Inflow Design Flood (IDF) requirement from the Probable Maximum Flood (PMF) to that of the 500-year flooding inflows – stating its basis as being those methods for estimating 0.5 PMF lacks consensus.

It appears that the IDWR has extended the argument that lowered the Inflow Design Flood (IDF) from the PMF of 82,100 cfs to a proposed 20,000 cfs, is that the IDW is arguing that since some property damage begins to occur at flooding greater than 2000 cfs, that the damage due to a flood **that fails the dam** only causes incrementally more damage. The IDWR needs to provide as an example, the analyses performed for the flood depths and timing of flooding from natural flooding and from failure of the dam to the town of Mackay.

So, back to the proposed rule, the proposed rule analogous to the current "Safety of Dams Rules" Rule 055.01.d.ii, is proposed Rule 060.01.c.ii which states: "A showing acceptable to the Director that potential failure of the dam during a flood of the specified magnitude described in Rule 050.11 [which, for example, would include the proposed changes for large, high hazard dams that is now is a range between the 500-year flood and the PMF] would be incrementally small in comparison to the flood being considered, and that the release of reservoir would not substantially increase downstream damages to life and property which are anticipated to result from any natural flood equal to or exceeding that magnitude." In its different wording, this is even more difficult to translate than the existing rule. But I gather that is the same Shakespearean Question as existing rule 055.01.d.ii.

There are other unexplained and unjustified changes to proposed Rule 060 (existing dams) compared to the current Rule 055 (existing dams) that pertain to what has been deleted. Current Rule 055.01.a "For large, significant or high risk dams, the release capability required by Rule Subsection 050.11 shall be evaluated and applied to the structure. Dams of other size and risk are required to provide the release capability of Rule Subsection 050.11 but are not required to conduct the analyses." This has been deleted from proposed DS Rule 060, without explanation.

Also deleted from the proposed rules is the portion of current Rule 055.01 (for existing dams) was the statement that the analyses required by current Rule 40 (analogous to proposed Rule 35) was applicable to dam release capability and selection of seismic criteria (see Rule 055.01.a for existing dams (pertaining to release capability of Rule 050.11) and Rule 055.01.e (pertaining to seismic analysis of large, high risk dams). The proposed Rule 060.01 (for existing dams) now only requires analyses "when the Director specifically requires the analyses."

The IDWR appears to be putting forth the argument that for the Mackay Dam, since flooding damage begins at around 2000 cfs, that a flood that released 50,000 or 100,000 cfs or more in a sudden wall of water from failure of the dam that takes about 600 lives is only incrementally worse than flooding some roads, bridges and limited private property. I really hope that I am wrong. Perhaps the IDWR would care to explain how they accepted the 1000-year flood release capability in 2019, the 500-year flood release capability in 2020 at the McMillen Jacobs draft Appendix F meeting and the 25-year flood release capability in the 2021 McMillen Jacobs report for the Mackay Dam.

The IDWR responded to the issue in Comment 28 about existing dams as follows: "IDWR anticipates Draft Rule 60.01.c.ii (for existing dams) will be met by technical analyses conducted by the design engineer and with review by IDWR before approving the design for construction."

The problem is that IDWR's response would only apply to a **new dam**, or possibly to the modification of an existing dam, but it does not apply to an **existing dam**, which this rule, Draft Rule 60.01.c.ii applies to.

IDWR then states: "The only criterion that IDWR is authorized to consider, to the extent required, is the protection of public safety (Idaho Code, Section 42-1710).

But Idaho Code, Section 42-1710 authorizes IDWR to protect life and property and the IDWR's statement of public safety being the only criterion it is authorized to consider **is false**.

Then IDWR further states in response to Comment 28: "Acceptable analyses and reports contain site-specific failure postulations and sensitivity analyses that don't lend themselves to broad prescriptive criteria or to be used in rule as example(s) of criteria that would be applied. As a result, IDWR does not propose adding criteria to the rule, in recognition that "one size does not fit all." This response is unresponsive to the questions and comments raised.

The IDWR is saying that they have studies, studies not required by the rules, but trust them, they have studies. I asked for an example to be provided in the response to comments, not necessarily to be placed in the rules. The IDWR response that "one size does not fit all" does not explain why IDWR does not enforce any release capability requirement for existing dams, not even large, high hazard dams, especially since the criteria for new dams was tiered according to dam size and hazard classification. Nor did they answer how far they are going to go to justify the adequacy of the existing dams that do not meet the "inflow design flood" release requirements that would apply to new dams."

The IDWR's response to Comment 28 of the August 9, 2022 "Summary Comment & Response Memo" is very revealing indeed of their mindset and should be deeply troubling to citizens in Idaho who live downstream of exiting dams and mine tailings impoundments.

In addition, for comment 15, IDWR states: "The IDF is the threshold flow above which any incremental increase in the water surface elevation of a flood wave resulting from a catastrophic dam failure will have minor additional influence on the risk to population or property damage."

Because I would like to see how the "incremental increase" is assessed and IDWR refuses to provide any examples, I respectfully request the names of technical source documents that are the basis for this statement.

What it appears to be is an argument for ignoring having a dam that will fail at rather small flooding events, less than 500-year flooding events. And ignoring that, if there were no dam, there would be many hours or days of unfolding flooding in contrast to the sudden catastrophic failure of a dam. And so, IDWR really does need to provide more information about how the IDWR plans to address Rule 060.01.c.ii. which applies to existing dams.

When the IDWR explicitly states a rule is for public safety, is that actually saying that prolonged environmental damage or economic consequences are being excluded from consideration in the specification of and the enforcement of design requirements?

If the emphasis is on public safety (Idaho Code, Section 42-1710), wouldn't the potential radiological releases created by a Mackay Dam failure become somewhat of a priority for the IDWR in addition to the immediate loss of life in downstream communities from a Mackay Dam failure?

The failure of a dam causes the entire storage of the reservoir to flow downstream in addition to the reservoir inflows, and the dam's failure far exceeds the "inflow design flood" flow rates.

Is two feet of slow flooding considered as damaging as a sudden 10 ft high wall of water as long as the inundation map seems about the same? The IDWR needs to provide some criteria for how draft rule 060.01.c.ii (for existing dams) would be applied.

Not only the "inflow design flood" flow rates but also **the flood wave due to the failure of the dam must be considered** when discussing release capacity and design requirements of the dam. In Table 4, see a comparison of peak reservoir inflows to peak flows below the dam if the dam fails.

Why Has Rule 55 (Proposed Rule 60) for Existing Dams Failed the Mackay Dam?

The current Rule 55 required large, high hazard dams to provide analyses for the dam's release capability and the dam's seismic capability. For the Mackay Dam, there are decades of not having analyses for either.

The plan to gather information needed for a seismic evaluation were apparently abandoned after the 1978 report [12] recommended it.

From the 2021 McMillen Jacobs report for the Mackay Dam, [13] [14] we learn the following:

The 1986 report by Koslow and Haaften estimated (wrongly it turns out) that the Mackay Dam could safety pass 1000-year flooding, around 6,800 cfs before the dam would fail.

The 2021 Appendix F by McMillen Jacobs estimated that the Mackay Dam could currently pass roughly a 500-year flood (5,210 cfs) beyond which the dam would fail. This was based on an outlet capability of 3010 cfs plus the spillway capability of 2,200 cfs.

Then, the 2021 Appendix A by McMillen Jacobs, completed after Appendix F, it was estimated that the spillway would fail with sustained flows to the spillway about 500 cfs and furthermore, that this would fail the dam. This corresponds to a flooding event that fails the Mackay Dam of a 25-year flood (3510 cfs) for the same outlet capability of 3010 cfs but a spillway flow of 500 cfs. The 500 cfs flows on the spillway cause the "zipper effect" dismantling

[12] State of Idaho, Department of Water Resources for U.S. Army Engineer District, Walla Walla, Corps of Engineers, *Big Lost River Basin Mackay Dam Custer Country Federal Number ID 181 State Number D34-2225, Phase I Inspection Report National Dam Safety Program*, September 1978.

[13] McMillen Jacobs Associates, *Conceptual Design Report Mackay Dam*, State Dam Identification D34-2225, National Inventory of Dams ID 00181, Final Revision 1, June 25, 2021. (Appendix A)

[14] McMillen Jacobs Associates, *Potential Failure Mode Analysis and Risk Assessment Report – Mackay Dam*, State Dam Identification D34-2225, National Inventory of Dams ID 00181, Revision 1, June 25, 2021. (Appendix F)

the spillway and causing failure of the dam. (See page 15 of the 2021 Appendix A Conceptual Design Report.)

To summarize the annual probability of dam failure from flooding:

1986, 1000-year flooding of 6,800 cfs would fail the dam at 1.0E-3 failures/year

2020 or 2021, 500-year flooding of 5,210 cfs would fail the dam at 2.0E-3 failures/year

2021, 25-year flooding of 3510 cfs would fail the dam at 4.0E-2 failures/year

What had been "unlikely" has become an "anticipated" and one that poses a higher likelihood of failure than may have been assumed in previous nuclear safety analyses and may also now be higher than allowed in hazardous waste permits at the INL.

Why was there no action taken with regard to this highly unsafe condition of the Mackay Dam, which puts hundreds of lives at risk and may assure or increase the risk of radiological releases and very high additional costs at the Idaho National Laboratory? Keep in mind that the Idaho National Laboratory had representative(s) in attendance of at least one meeting of the 2021 McMillen Jacobs studies.

SEISMIC HAZARD BACKGROUND

For background, in Table 5 below, I present the relationship of certain probabilities of exceedance to earthquake return interval or return period. Note that the seismic event is more severe and the loading of the structure more challenging for the 2 percent in 50-year probability of exceedance, than the 10 percent in 50-year probability of exceedance. And the "maximum credible earthquake" is the most severe earthquake considered, with the highest loading of the structure.

Table 5. United States Geological Survey Seismic Probabilistic Maps.

Probability of Exceedance	**Earthquake Return Period**	**Severity of Earthquake**
10 percent in 50 years	500-year	Lower peak ground acceleration, lower on Modified Mercalli Intensity (MMI) Scale
5 percent in 50 years	1000-year	More severe earthquake than the 500-year earthquake
2 percent in 50 years	2500-year (or 2475-yr)	More severe earthquake than the 1000-year earthquake
Maximum Credible Earthquake (no stated probability of exceedance)	(Sometimes considered 10,000-year return interval, although may not be estimated.)	Highest peak ground acceleration, highest on MMI Scale

Table notes: Probability of exceedance relates to return interval. For example, 1/50 year * 0.1 = 1/500 years, where 0.1 is 10 percent divided by 100.

In the existing rules, there is a long history of evolving new information about the seismic hazard. In the past, seismic zones 2 and 3 have often used in the regulations for dams and MTISs. Seismic zone 3 was expected to experience more severe earthquakes than zone 2. However, the estimates of seismic hazard have continued to evolve and may no longer use zone 2 and 3. The geographical location of boundaries of seismic zones 2 and 3 have also changed (and are no longer used). The seismic hazard maps from 1970 depicting seismic zone 3 show zone 3 to be east of the Nevada-Utah boundary. More current maps of seismic hazards show high seismic hazards throughout Custer County in the center of Idaho and extending further west than previous maps.

Zone 2 had corresponded to Modified Mercalli Intensity Scale MM VII, moderate damage, while Zone 3 had corresponded to MM VIII, major damage.

Importantly, more recent seismic hazard estimates of the seismic hazard at various locations have generally increased the estimated seismic hazards, meaning that more severe earthquakes are now expected than were expected in past estimates by the United States Geological Survey. This means structures that were thought to not need to follow stringent seismic design criteria are not necessarily adequately designed. Updates to USGS seismic hazard include updates in 2014.[15]

The IDWR must also address whether it has required less than the maximum credible earthquake as the design earthquake for structures other than low hazard MITS structures. And IDWR needs to address whether the maximum value obtained from a probabilistic evaluation based on existing USGS Seismic Hazard maps would result in higher seismic loading than the maximum credible earthquake.

For dams and as well as MTISs, there are two aspects of seismic evaluation that must be addressed:

(1) the site seismicity assessment at the location of the structure and
(2) the selection of the design earthquake. The most stringent design earthquake, with the highest loading on the structure, is the maximum credible earthquake.

The past regulations for dams and MTISs have confusingly spread the seismic analysis criteria among the Rule for design reports, the Rule for new structures and the Rule for existing structures. In the August 9 draft, seismic analysis criteria are spread among Rule 35 (reports), Rule 50 (new dams and reservoirs), and Rule 60 (existing dams).

In the proposed Rule 35, (035.12.d.i), the rule says to "use the maximum credible earthquake." But this is undermined by the following statement that "seismic analysis may be waived…" The subsequent qualifying statements for waiving the seismic analysis is said to be based on the "consequence of failure" yet there is no stated association to Rule 25, Hazard

[15] Allison M. Shumway et al., *Additional Period and Site Class Maps for the 2014 National Seismic Hazard Model for the Conterminous United States*, United States Geological Survey Open-File Report 2018-1111, 2018. https://doi.org/10.3133/ofr20181111

Classification, the identified hazard classification for the structure or to any specific criteria for evaluating the consequence of failure.

In the proposed Rule 50.01.d.iv (new dams, proposed rule, in a section titled Embankment Stability): "The engineer shall include in the stability analysis peak ground accelerations obtained from Seismic Hazard Maps published by the United States Geologic [sic] Survey (USGS) using a minimum return interval of 2 percent (2%) probability of exceedance in fifty (50) years, or greater interval, as determined by the Director." The 2 percent probability of exceedance in 50 years would correspond to a 2500-year interval (or without rounding, a 2475-year interval). The interval for the maximum credible earthquake is typically assumed as having a 10,000-year interval.

In the proposed Rule 60 for existing dams, the rule says "use the maximum credible earthquake" for high hazard structures. The requirement for existing dams in Rule 60 is more stringent that for new dams/embankments in Rule 50.

In addition, the proposed Rule 60 for existing dams, which says "use the maximum credible earthquake" for high hazard structures is then undermined by following this by saying that any other unstated "specified return period" may be accepted. Effectively, this allows an unstated bottomless minimum on the selection of the seismic loading that may be chosen. This provides citizens of Idaho with no assurance of reasonable regulatory decisions by IDWR.

Citizen stakeholders concerned by the stringency of design standards need to have assurance as to what design criteria the IDWR is even aiming for, even for new structures or for modifications to structures.

THE PROPOSED CHANGES DO NOT ASSURE APPROPRIATE SELECTION OF THE DESIGN EARTHQUAKE

The first Strawman draft in several sections stated that certain dams and Mine Tailings Impoundment Structures (MTISs) are to use the seismic design criteria that is based on the "maximum credible earthquake." Yet, generally, the proposed regulations watered down this requirement in later sentences. Effectively, the design criteria are to be the "maximum credible earthquake" or a less severe earthquake or the seismic analysis may be waived completely.

The current "Safety of Dams Rules" for new dams that are large in size and significant or high hazard were to select the "maximum ground motion/ acceleration generated by the maximum credible earthquake, which could affect the dam site." (Current Rule 040.14.d.i)

The proposed rule, Rule 035.12.d.i, requires the maximum credible earthquake (MCE) for large dams or high hazard structures. This would apply to new structures and may apply to modification of existing structures.

For Rule 50, New Dams and Reservoirs, (50.01.d.iv) the minimum seismic event return interval of 2 percent probability of exceedance in 50 years or greater, is required. But this may apply only to the embankments of large dams or high hazard dams? This seems to conflict with Rule 35.12.d.i, which would require structures associated with large dams or high hazard

structures to use the maximum credible earthquake. Outlet tunnels, for example, are not "embankments" yet are essential to dam safety.

Should the interpretation of proposed Rule 35 be that it applies to embankments, outlets tunnels and other appurtenances, but Rule 50.01 applies only to embankments for new dams?

Throughout the rules, the rationale for selecting the less severe earthquake or waiving the requirement are unclear and not clearly tied to public safety, hazard classification or size of the structure.

The August 9 proposed change to Rule 060.01.d for existing structures states "The evaluation of seismic loads for high hazard structures shall use the maximum ground motion/acceleration generated by the maximum credible earthquake. **Note that the June Strawman had not limited the evaluation of seismic loads to only high hazard structures but had applied to all structures.**

Then Rule 60 for existing dams (060.01.d) now limited to high hazard structures (changed from the June "Strawman," but would not include large structures that are significant or low hazard. Rule 060.01.d states: "The Director may accept maximum ground motion/acceleration corresponding to specified return intervals using a probabilistic evaluation of earthquake history in accordance with USGS hazard maps." But this does not establish a minimum design earthquake.

Rule 60 had been proposed to apply to all sizes and hazard levels but is now limited to only high hazard structures. Why are all large size dams not included, as required in Rule 35? And since significant hazard structures have such severe adverse consequences, why are significant hazard structures excluded?

In the current regulation of dams, large dams that are **significant or high "risk"** (basically corresponding to significant hazard or high hazard) shall use the maximum credible earthquake. The proposed Rule 35.12.d.i would limit use of the maximum credible earthquake to large dams or high hazard but leaves out significant hazard dams and it would allow the seismic analysis to be waived without clear criteria or linkage to the hazard classification in proposed Rule 35.12.d.ii.

The wording in the existing and proposed regulations regarding the selection of seismic criteria and when seismic analyses are required, are difficult to follow. The IDWR should be providing an explanation and justification of the increased or decreased requirements in the proposed changes compared to existing regulations.

For new MTISs, the Strawman proposed in June had included that high hazard MTISs use the "maximum credible earthquake" as the design earthquake. In the past, it is unclear what design earthquake was used for structural analysis of MTISs. But all MTISs in seismic zone 3 required seismic analysis and this could sometimes apply to zone 2. By IDWR's decision to not update the MT rule, considerable ambiguity remains.

The current and proposed rules are difficult to compare. But one thing is clear - the hazard classification of the dams and of MTIS matters a great deal with regard to selection of appropriate seismic hazard as does the tremendous personal judgement of the Director.

What return periods have been allowed by IDWR for existing dams?

HAZARD CLASSIFICATION ISSUES

The hazard classification is typically used to determine the design standards as well as the inspection intervals.

Rule 25.2, regarding hazard classification has added the statement "Any dam classified as Significant or High hazard regardless of its height and storage capacity shall meet the requirements specified in Rule 35, 45, 50, 55 and 60 of these rules. While this statement would seem to emphasize the importance of really having to meet the requirements in the rules it actually implies that "low hazard" dams do not need to comply with Rule 35, 45, 50 or 60 of the rules as it is not considered a "shall" comply status but may be considered only a "kinda-outta-should" comply. It implies also that "low hazard" dams don't really need to even read these rules, even though there is considerable ambiguity about which dams will be classified as "low hazard" and even though Rule 45 emphasizes that all dams need an Emergency Action Plan. And Rule 50 and Rule 60 require even low hazard dams to address specific release capabilities. Specifically, Rule 60 for existing dams requires all existing dams to have a spillway capacity meeting the 100-year flood, (Q100). It's a really bad addition to proposed Rule 10.2. And just because Rule 45 says the Director may waive the EAP requirement for low hazard dams does not mean that Rule 10.2 should signal that low hazard dams should disregard Rule 45 and other rules.

Rule 25 for "Hazard Classification" may be inconsistent with the wording in Rule 10, Definitions. The wording in definitions could be construed such that only life and property matter, with the word property left up to interpretation. With the prolonged environmental contamination from mine tailings releases, the table in Rule 25 properly considers "prolonged environmental loss" in addition to loss of life, damage to developed property, or damage to commercial or industrial facilities, or agriculture, etc.

The definition for hazard classification should be clear that the criteria for determining hazard classification will be based on criteria in the table in Rule 25.

The hazard classification table in Rule 25 should have the consideration of environmental damage under its own heading in the hazard classification table in addition to the headings for estimated loss of life, and economic losses.

The "low hazard" category in Rule 25 fails to mention criteria for environmental damage and needs to state that no environmental damage is caused or characterize the limited amount of environmental damage allowed on the "low hazard" category. As there are no hazard criteria in the MT rule, the hazard criteria in the DS rule apply to an MTIS. The failure of an MTIS that causes damage beyond what is covered by existing bonding should surely not be classified as "low hazard." The proposed rules are also too lax with regard to design requirements for significant hazard structures,

An adequate hazard classification should be utilized in the regulations rather than independent statements not linked to the hazard classification as in proposed Rule 35 "if the consequences of failure is demonstrated to be sufficiently low…" (Rule 35.12.d.ii)

Also, in the way that the criteria for "low hazard" are stated, there needs to be more clarity so that low hazard means "no prolonged environmental loss' due to failure of the structure. In fact, due the toxic material they could release and the streams, rivers, groundwater, and land that would be affected, all MTISs should be deemed high hazard structures, even if there is little or no developed property downstream. In addition to their hazard classification, MTISs can be higher risk due to their more vulnerable design and higher likelihood of failure based on the continuing high rate of failures world-wide. MTISs should have more stringent, not less stringent design requirements for seismic capability (and other design requirements).

The "significant hazard" category allows so much damage to the environment and economic losses that any structure could be designated "significant hazard" when it actually is high hazard. The "significant hazard" category does not require stringent design criteria, particularly lacking in seismic design criteria. In fact, the existing rule for dams has more stringent criteria for "significant hazard" dams than the proposed changes. This is a serious flaw.

Designating MTISs as high hazard structures (or including a framework for hazard levels higher than "high" as Canada has, would appear to be appropriate and would alleviate some of the regulatory uncertainty stakeholders have. Other schemes have hazard classification categories above high hazard: very high hazard and extreme hazard. [16] With the unlimited size of MTISs, such distinctions can be relevant and provide a rational basis for selecting a more stringent seismic design earthquake. In the Canada example, high hazard dams would require using as the design earthquake at least the 1-in-2500-year earthquake. Extreme hazard structures would use the 1-in-10,000-year earthquake or maximum credible earthquake. In the proposed DS Rule, there remains too much ambiguity about the selection of the design earthquake. This means that stakeholders concerned about the protection of environment or property have no way to predict how stringent the design requirements will be, even for new structures.

Environmental damage to streams, lakes, aquatic life, and land that cannot be remediated should be considered extreme hazard. And yet, the proposed changes allow the Director to waive or reduce the size of the design earthquake in undefined, undescribed ways.

Also, the regulations should explicitly address the potential cascade of dam or MTIS failures should the failure of one structure cause the failure of another. The consequences then of the cascade of failures need to be considered in the hazard classification.

No stakeholder should accept the IDWR's ultra flexible approach that allows the Director to greatly reduce the design earthquake selected based on no stated criteria or to waive the requirement for seismic analysis altogether.

Including in the proposed Rule 25, criteria for "prolonged environmental loss" is crucial and is a step in the right direction. But ambiguity remains because of the way low hazard criteria are stated and the possible restricted way that the definition of hazard classification could be narrowly interpreted in Rule 10, Definitions.

[16] Marc E. Orman, P.E., G.E., et al., Amec Foster Wheeler, Tailings Dam Classification and Breach Analyses, Perspectives from the Canadian Dam Association, Presentation, 2017.

Here is the definition of "Hazard" in the proposed changes:

> Hazard: "The potential consequences to downstream life and property resulting from a dam failure and uncontrolled release of water, exclusive of the size or the physical condition of the dam or mine tailings impoundment structure. Hazard Classification shall be assigned to new and existing dams or mine tailings impoundment structures based on the severity of failure consequences to life and property."

Notice how this definition is first limited to dams and uncontrolled release of water, not mine tailings slurry. Also notice the way consequences are narrowly limited to "life and property."

In contrast, a better definition that has been used in Canada is as follows:

> Dam Classification as defined by the Association of Dam Safety Officials: "The hazard potential classification for a dam is intended to rank dams in terms of potential losses to downstream interests if the dam should fail for any reason. The classification is based on the incremental adverse consequences (after vs. before) of failure or mis-operation of the dam, and has no relationship to the current structural integrity, operational status, flood routing capability, or safety condition of the dam or its appurtenances. The hazard potential classification is based on potential adverse impacts/losses in four categories: environmental, life line, economic, and/or human life."

An example of dam classification from Canada is shown in Table 6 from a presentation and may not be complete or current. [17] It is not a perfect example as it is lacks specifics about how the level of loss, such as "Major loss" versus "Significant loss" of environment, would be determined. And it lacks information about whether, when restoration is considered probable, where the money for restoration would come from.

[17] Marc E. Orman, P.E., G.E., et al., Amec Foster Wheeler, Tailings Dam Classification and Breach Analyses, Perspectives from the Canadian Dam Association, Presentation, 2017.

Table 6. Dam classification example from Canada Dam Association.

Consequence Category	Population at Risk	Loss of Life	Environmental and Cultural Values	Infrastructure and Economics
Extreme	Permanent	More than 100	Major loss…Restoration impossible…	Extreme losses…
Very High	Permanent	100 or fewer	Significant loss… Restoration impractical…	Very high economic losses…
High	Permanent	10 or fewer	Significant loss…Restoration probable…	High economic losses…
Significant	Temporary Only	Unspecified	No significant loss…	Loss to recreational facilities…
Low	None	0	No long term loss...	Low economic loss…

The relationship of the hazard category to selection of the seismic design criteria is shown, for the Canada example, is shown in Table 7.

In the selection of design earthquakes in the Canada example, for high hazard dams or above, in no case is the design earthquake less severe than the 2 percent in 50 years which corresponds to roughly the 2,500-year return period earthquake.

Table 7. Example of design earthquake selection based on hazard classification (Canada example).

Dam Classification (Canada example)	Return Interval for Earthquakes
Low	100-year
Significant	100-year to 1000-year
High	2,500-year (2 percent in 50 years)
Very High	Between 2,500-year to 10,000-year or maximum credible earthquake
Extreme	10,000-year or maximum credible earthquake

Table notes: Canada Dam Association uses 2,475-year rather than 2,500-year.

In the Canada example, for “Extreme” hazard level, the maximum credible earthquake would be the required earthquake for the structure to be designed to withstand. In contrast, the IDWR’s proposed changes could allow waiving the seismic design requirement or allow selecting a very small earthquake return interval.

The proposed Rule 25, Hazard Classification, is shown below in Table 8. Notice how the three categories listed do not specifically include environmental damage. Environmental damage is tossed in for the significant and high hazard categories under the heading of economic losses but it needs to have its own heading.

Notice how for the low hazard category, under economic losses, environmental loss is not included. And notice the odd wording for economic losses in the low hazard category: “Low probability for economic loss or damage to or disruption of essential infrastructure.” Why is “low probability” being used? The wording for criteria for low hazard should require “No or low economic loss and no or very low damage to the environment.”

For the low hazard category, the criteria under the heading economic loss, is worded to allow estimation of the probability for economic loss rather than simply stating “No economic loss.” It also leaves out any criteria for damage to the environment. As worded, it creates ambiguity. It should say “No economic and environmental loss.” And again, it highlights the need for a heading specifically for environmental loss. Cultural loss could also be added as in the Canada example.

Also, for the low hazard category, given the speed at which dams or MTISs can fail and fail unpredictably, why does it matter if a dwelling is not permanently occupied? It would seem that the flood water depth criteria of 2 ft. or less should be described and that it should not be asked whether or not dwellings are permanently occupied. And flood water depth does not address thick toxic tailings slurry depth. IDWR now requires the hazard classification of mine tailings impoundment structures but it seems that adding MTISs has not been fully thought out and included in the proposed Rule 25 Hazard Classification table.

Table 8. Proposed Rule 25 hazard category table.

Hazard Category	Downstream Development	Estimated Loss of Life	Economic Losses
Low	Undeveloped property, no permanent or permanently occupied structures for human habitation.	No loss of life	Low probability for economic loss or damage to or disruption of essential infrastructure.
Significant	No concentrated urban development. 1 or more permanent structures for human habitation within the flood zone that are potentially inundated with flood water at a depth of 2 ft. or less.	Loss of life is unlikely to occur	Significant damage to agricultural, commercial or industrial facilities; damage to or the disruption of transportation, utilities or other public facilities or values including environmental loss.
High	Urban development, or any permanent structure for permanent or temporary human habitation which are potentially inundated with flood water at a depth of more than 2 ft.	High probability for loss of life	Major damage to agricultural, commercial or industrial facilities; damage to or the disruption of transportation, utilities, or other public facilities or values including prolonged environmental loss.

Notice that the proposed changes to the "Significant hazard" category allow significant damage to agriculture, industrial facilities and to the environment. In contrast, in the Canada example, the significant hazard category allows no significant environmental loss and only loss to recreational facilities. There are no clear criteria between significant hazard and high hazard in the IDWR's Rule 25, so one could expect the designation of "significant hazard" to what should be deemed a high hazard structure (or extreme hazard structure). When designated anything less than high hazard, the IDWR now has no seismic design criteria required, even though it did for dams in the existing rule (Rule 40).

Importantly, MTISs in the current rule required a seismic evaluation if in seismic zone 3. In the proposed Strawman for June, MTISs would not require a seismic evaluation unless deemed High hazard. There is no way to predict how IDWR will classify an MTIS. Even if an MTIS is classified as high hazard, the Strawman for June and the proposed changes as of August 9 appear to allow unspecified criteria not related to the hazard classification to be used to waive seismic design requirements.

REGULATORY PRESSURES TO REDUCE REQUIREMENTS

The IDWR must balance regulatory enforcement burden on the owner of the dam or MTIS with the need to protect citizens, property and the environment. It is not an easy job.

The challenges of regulating an industry that generally seeks to reduce it costs are large. Every project tends to seek special dispensation to reduce design requirements and reduce costs.

While world-wide concern over the continuing catastrophic failure of MTISs has been growing, the IDWR has been lagging, not leading in creating appropriate regulations to protect Idaho citizens and the environment.

PAST OR CONTINUING REGULATORY FAILURES NOT ADDRESSED

The IDWR has the problem of structures constructed without appropriate documentation or quality inspections. The IDWR has the problem of having appropriately denied dam capacity increases, and then having the denial overturned in court. [18] This means the capacity of a dam that was not safe to enlarge was enlarged, as is the case of the Mackay Dam.

What the IDWR seems to do in the proposed changes to the DS Rule is to create so much flexibility that its job is simplified by allowing the Director to simply waive any requirement, even essential design requirements for dam release capability and seismic design.

This is unacceptable and does not protect Idaho citizens or the environment.

DAMS AND RESERVIORS CONFUSION

For about 30 years, there has been a "Safety of Dams Rules" and rule sections of these rules for new dams and for existing dams. Now within the "Safety of Dams Rules" it is deemed necessary to have Rule 050 "New Dams and Reservoirs" and Rule 060 "Existing Dams and Reservoirs." If adding "reservoirs" is really necessary, shouldn't the name of the regulation be "Safety of Dams and Reservoirs Rules"? The IDWR's definition of a reservoir in "Safety of Dams" Rule 10 is "any basin which contains or will contain the water impounded by a dam," that are not associated with dams?

Maintenance to deepen a reservoir associated with a dam can certainly be addressed without adding it to the rule section titles, can't it? Is IDWR really addressing reservoirs that are not associated with dams?

MISCELLANEOUS ERRORS OR PROBLEMS

There are many errors in the "Safety of Dams Rules" proposed in August. While a redline-strikeout of the changes from the June Strawman to the August 9 changes, there is no redline-strikeout of the changes to the current rule to either the June or August proposed changes. There remains the lack of documentation of the reasoning behind the many changes and deletions of

[18] State of Idaho, Department of Water Resources for U.S. Army Engineer District, Walla Walla, Corps of Engineers, *Big Lost River Basin Mackay Dam Custer Country Federal Number ID 181 State Number D34-2225, Phase I Inspection Report National Dam Safety Program,* September 1978.

the current DS rule. Coupled with the high number of errors, it is difficult to ascertain which changes in the proposed rules are intentional and which changes are not. In the first public meeting, it was requested that the IDWR explain the rationale for the rule changes. The IDWR is making rule changes that in some cases significantly reduce safety requirements and they are doing so without explanation.

Rule 10.26, Intermediate Dams. Rather than "twenty (20) feet in height or greater …" it should be "twenty (20) feet in height or more…" for consistency with other sections.

Rule 25.2, Determination of Hazzard [sic] Classification – subtitle misspelling of hazard.

Rule 10.2, "any dam classified as Significant or High hazard… Note there is inconsistency in the document as to capitalization of Significant or High Hazard, significant or high hazard, etc.

Rule 35.14.c, "An abandonment plan that assures the Director to his satisfaction that, upon completion of the mining operation, the site will be placed in a safety maintenance-free condition." I will ignore the gender bias in this but IDWR shouldn't. The word "placed" was added in this version and it could imply a delay. IDWR should take out the word "placed" so that it means that "upon completion…the site will be in a safe maintenance-free condition."

Rule 45, Low Hazard Dams capitalization inconsistent with low hazard dams, high hazard dams and ought to be consistent. For example, Rule 50.01.d.iii used "for large dams or high hazard dams (this was lower case and lower case is used in other places).

Rule 50.04, adding "however" to "relatively impermeable however non-cohesive material" does not seem to add clarity.

Rule 50.13.a, there are "as-built" drawings but really no "as-builts." The "completed project" would be preferred to the "completed project works."

Rule 60.01.c has i., ii., and iv. There is no iii.

Rule 60.02.c, the proposed draft cites "rules 50.03.a., 50.03.b, and 50.03.c" but it should be "Rules 60.02.a and 60.02.b."

Rule 60.02.c, the proposed draft cites "Rule 50.03.c" but it should be 60.02.b.

Rule 65 "Dams Storing Tailings and Water," Rule 65.01, "Construction of Mine Tailings Impoundment Structures Storing Fifty (50) Acre-Feet of Water or More." Please explain why these dams are now described as MTISs and why the abandonment plan was deleted. And, also please explain why the wording of Rule 65 in the DS Rule differs so much from rule with the same title in the MT Rule (Rule 50 in the Mine Tailings Impoundment Structures Rules).

Rule 65.01 "New or existing mine tailings impoundment structures intended to store fifty (50) acre-feet or more of water in addition to the water contained in the tailings material shall meet requirements specified in Rules 35, 45, and 60 of these rules. The Director may waive applicable requirements in Rule 35, 45 or 60 …" Please explain why Rule 50 was removed.

SUMMARY

Regulations for dams and MTISs need to set appropriate minimum design standards. In the proposed rule changes, design requirements may be stated, but are later followed by a statement allowing the requirement to be waived and sometimes without specifying any clear criteria.

The tremendous latitude to waive requirements does not provide citizens living downstream with any reason to have confidence that IDWR will require and enforce reasonable minimum design standards.

In Idaho, large sums of money flow into political campaigns from the mining industry. In Idaho, lawmakers can influence agencies and can also remove any regulation, line-by-line, that a regulatory agency like the IDWR creates. Motives to "reduce regulation" are not necessarily in the best interest of Idaho and require scrutiny rather than unquestioned acceptance.

It needs to be understood that dams designed to hold water, *when properly designed and properly constructed* tend to be reliable structures. Not all dams in Idaho regulated by the IDWR necessarily meet these criteria. For example, the Mackay dam was not properly designed and construction quality was flawed. The spillway capacity for the Mackay dam was never adequate and despite the IDWR not wanting the Mackay dam capacity increased, legal action allowed its storage capacity to be increased. Furthermore, in 2021 the spillway capacity for the Mackay dam was analyzed to be significantly less than previous studies.

Mine Tailings Impoundment Structures (MTISs), often simply called "tailings dams" continue to have a performance record of failure that has a far higher failure likelihood than water dams. The continuing failures of MTISs in the last twenty years continues to be alarmingly high and often with catastrophic consequences for the environment. And this is true of developed countries with supposedly stringent regulatory oversight, like Canada. Sudden catastrophic failure of tailings dams continues to occur, in countries around the world. And importantly, tailings dams release toxic metals and materials into the environment in very large amounts. [19]

As other states like Alaska were reviewing their regulations for dams and MTIS back in 2017, [20] it seems that the IDWR is still lagging behind in ensuring adequate regulations. IDWR has emphasized that this rulemaking is about "zero-based regulations" and the overriding goal of reducing regulations. At the rulemaking meetings, ensuring stringent design criteria has not been mentioned nor has the IDWR's reductions in design criteria in the proposed changes described or discussed in this rulemaking effort.

The design criteria for new dams, for example, would apply to new dams and may also apply to modifications to existing dams. The "Inflow Design Flood" design requirements in the release capability table have been reduced. In addition to reduced design requirements for "Inflow

[19] Roche, C. Thygesen, K., Baker, E. (Eds.) *Mine Tailings Storage: Safety Is No Accident*. A UNEP Rapid Response Assessment. United Nations Environmental Programme and GRID-Arendall, Nairobi and Arendal, www.grida.no. 2017. ISBN: 978-82-7701-170-7

[20] Charles F. Cobb, PE, *Alaska Business Monthly*, "Update on Mne Tailings Dam Regulation in Alaska and North America," January 2017. www.akbizmag.com

Design Floods" the agency appears to embrace ambiguous and not publicly disclosed arguments that allow inadequately designed and unreliable dams to continue operating despite not meeting release capability or spillway release requirements. I have continued studying the 2021 reports and I had only looked at Appendix F. Appendix F identified a lower spillway capacity (2200 cubic feet per second) than documented in the 1986 Koslow report (6588 cfs) which has been a value cited by IDWR in at least one inspection report.

Prior to the June comment submittal, I had reviewed only the McMillen Jacob 2021 report Appendix F. Now that I returned to study Appendix A, the Conceptual Report for Mackay Dam "rehabilitation," I found that Appendix A has identified further assessment that greatly reduced the estimated release capability of the Mackay Dam. The 2021 Appendix A McMillen Jacobs report is saying that far smaller flows on the spillway (500 cfs) would be expected to fail the spillway and would subsequently fail the dam. This example of the length that IDWR will go to accept any deterioration of structures under its purview is extremely troubling and puts Idaho citizens at risk.

COMPARISON OF CURRENT AND PROPOSED DS RULES FOR SEISMIC EVALUATIONS

Because various statements regarding seismic requirements are spread across the "Safety of Dams Rules" (IDAPA 37.03.06) and "Mine Tailings Impoundment Structures Rules" (IDAPA 37.03.05), and the proposed single new rule chapter, "Safety of Dams and Mine Tailings Impoundment Structures Rules" (draft IDAPA 37.03.05), I include Tables below containing excerpts from the current rules and the proposed combined rule for information.

The current and proposed rule are difficult to compare. The rules may give the impression of setting a clear minimum standard for selecting the design earthquake. However, as written the proposed rule allows waiving seismic analyses and although it may not have been intentional, allows any infinitely small earthquake to be selected as the design earthquake.

I have also attempted to add to the tables in a pseudo redline-strikeout form, the applicable August 9 proposed changes to the "Safety of Dams" rules.

It may be helpful to highlight some of the rule section numbering changes:

Current Rule 40 for construction plans, etc. become proposed Rule 35;

Current Rule 50 for new dams remains proposed Rule 50; and

Current Rule 55 for existing dams (large or intermediate size) becomes Rule 60.

Table 9. Excerpted text from the existing rule versus proposed Strawman for dams.

Existing Rule for Dams	Proposed Rule for Dams
Existing Rule 40, "Construction Plans, Drawings and Specifications, specifically 040.14.d.i "Seismic design loads shall be evaluated and applied at all large dams to be located in significant or high risk areas, in Seismic Zone 3, which for purposes of these rules is the area in Idaho east of Range 22 East, Boise Meridian. The evaluation required of large dams, that are classified significant or high risk, shall use the maximum ground motion/acceleration generated by the maximum credible earthquake, which could affect the dam site." And 040.14.d.ii, "Seismic analysis may be required as determined by the Director for large dams located above high risk areas in Seismic Zone 2, which for purposed of these rules is the area in Idaho west of Range 22 East, Boise Meridian." Note that "high risk areas" would appear to pertain to the seismicity of that particular location and not the hazard level posed by potential failure of a dam. Note that this is different than "high risk dams" which are now understood to be more properly referred to as "high hazard dams" based solely on the consequences of a failure of a dam.	For dams, Proposed Rule 35, Design Reports, Drawings and Specifications, specifically 035.12.d.i. "An evaluation of seismic design loads may be included in the stability analysis for all dams ~~or mine tailings impoundment structures~~ as deemed necessary by the Director for benefit of public safety. The evaluation required for large dams or high hazard structures shall use the maximum ground acceleration generated by the maximum credible earthquake which could affect the dam site." However, 035.12.d.ii also states: "Seismic analyses may be waived by the Director for new or existing dams ~~or mine tailings impoundment structures~~ if the consequence of failure is demonstrated to be sufficiently low or the critical features of design are demonstrated to be sufficiently conservative to allow minor deformation(s) without releasing the contents of the impounding structure." [The proposed rule is allowing the Director to decide the consequence of failure is sufficiently low, all without providing any criteria and without linking the criteria considered to the hazard category for the dam. And the Director may waive the seismic analyses based on apparently undocumented seismic loads and undocumented acceptability of critical features of the design pertaining to seismic performance.]
Existing Rule 50, New Intermediate or Large Dams, 050.01.f, "The design analyses for new dams located in high risk areas (in Seismic Zone 2 or 3) shall include geologic and seismic reports, location of faults and history of seismicity." And 050.01.h, "The design analyses for new large dams located in high risk areas (in Seismic Zone 3) shall include an evaluation of potential landslides in the vicinity of the dam or immediate area of the reservoir, which could cause damage to the dam or appurtenant	Proposed Rule 50, New Dams and Reservoirs, specifically 050.01.a. "Embankments ~~Dams~~ shall be designed, constructed, and maintained to assure stability under static loads and prevent instability due to seepage or uplift forces, rapid drawdown conditions and applied seismic loads." And 050.01.c, "The minimum factor of safety for a steady state loading condition shall be 1.5. The minimum factor of safety for rapid drawdown loading shall be 1.2. The minimum factor of safety for seismic

Existing Rule for Dams	Proposed Rule for Dams
structures, obstruct the spillway or suddenly displace water in the reservoir causing the dam to overtop. If potential landslides pose such a threat, they shall be stabilized against sliding, with a minimum factor of safety of 1.5. See also existing Rule 60 for small dams.	loading shall be 1.0." And 050.01.d.i, "The stability of an embankment subjected to earthquake ground motion may be analyzed by the engineer using either a dynamic response or pseudo-static analyses. Pseudo-static analyses are acceptable for embankment dams and foundations composed of non-liquifiable soils that preclude the generation of excess pore water pressures due to shaking. Otherwise, the stability analysis shall employ a dynamic response method." And 050.01.d.iii, "The design analysis for large dams or high hazard dams [added by IDWR August 9] shall include a geologic and seismic report. The seismic report shall identify the location of faults, evaluate landslide potential, and include a history of seismicity." And 050.01.d.iv., "The engineer shall include in the stability analysis peak ground accelerations obtained from Seismic Hazard Maps published by the United States Geological Survey (USGS) using a minimum return internal of 2 percent (2%) probability of exceedance in fifty (50) years, or greater interval, as determined by the Director." Note that having the engineer include the 2 percent probability of exceedance in 50 years peak ground accelerations does not specify what the required minimum seismic design criteria actually is. The IDWR's change to say "or greater interval" is an improvement which does set a minimum standard.
Existing Rule 55, Existing Intermediate or Large Dams, specifically 055.01.e, "For large, high risk dams, the seismic design loads shall be evaluated and applied to dams located east of Range 22E. B. M. The Evaluation shall use the maximum ground motion/acceleration generated by the maximum credible	Proposed Rule 60, Existing Dams and Existing Mine Tailings Impoundment Structures, 060.01.d, "Seismic loads shall be evaluated and applied to dams ~~and mine tailings impoundment structures.~~ The evaluation of seismic loads for high hazard structures [added by IDWR August 9] shall use the maximum ground motion/acceleration generated by the maximum credible

Existing Rule for Dams	Proposed Rule for Dams
earthquake. And 055.01.g addressed the compliance period for assuring safety under earthquake loads.	earthquake. The Director may accept maximum ground motion/acceleration corresponding to ~~a~~ specified return intervals using a probabilistic evaluation of earthquake history in accordance with USGS hazard maps." Also, 060.01.g discusses compliance periods for addressing seismic stability or safety concerns. [As written, the seismic loads may be far reduced below the maximum credible earthquake. Any return interval may be selected and this is unnecessarily vague and does not establish a minimum design loading. The seismic loading from a maximum credible earthquake would be far larger than the seismic loading from a 50-year return period earthquake. The smaller the specified return period, the smaller the seismic design loading. And the IDWR change to limit the rule to only high hazard structures is inconsistent with requiring all large dams to be evaluated (see Rule 35.12.d.i) and the current rule that also includes large significant hazard dams (Rule 40.14.d.i)]

Table 10. Excerpted text from the existing rule versus proposed Strawman for MTISs.

Existing Rule for MTISs	Proposed Rule for MTISs
Rule 35, Plans Drawings and Specifications, 035.16.e, "Geologic description of reservoir area, including landslide potential" and 035.16.g, "Earthquake design loads must be evaluated at all sites located east of Range 22E., Boise Meridian. This area corresponds to Seismic Zone 3 as designated by the Recommended Guidelines of the National Dam Safety Program. Earthquake analysis may be required at other impoundment structure sites if deemed necessary by the Director: …"	These changes are no longer proposed as of August 9. Proposed Rule 35, Design Reports, Drawings and Specifications, specifically 035.12.d.i., states "An evaluation of seismic design loads may be included in the stability analysis for all dams or mine tailings impoundment structures as deemed necessary by the Director for benefit of public safety. The evaluation required for **large dams or high hazard structures** shall use the maximum ground acceleration generated by the maximum credible earthquake which could affect the dam site." However, 035.12.d.ii also states: "Seismic analyses may be waived by the Director for new or existing dams or mine tailings impoundment structures if the consequence of failure is demonstrated to be sufficiently low or the critical features of design are demonstrated to be sufficiently conservative to allow minor deformation(s) without releasing the contents of the impounding structure." It is interesting that in 035.12.d.ii, no criteria are provided for determining the consequence of failure and it has not been linked to the rule for assigning a hazard category to a dam or MTIS. It is also interesting that the Director may waive the seismic analyses based on apparently undocumented seismic loads and undocumented acceptability of critical features of the design pertaining to seismic performance.
Rule 45, Mine Tailings Impoundment Structures Design Criteria, 045,01.b, "Construction by the upstream method shall not be used in the area of the state east of Range 22E., Boise Meridian, unless the engineer can provide evidence that the construction and operation of the tailings impoundment will achieve a relative density of sixty percent (60%) or greater in the embankment and	These changes are no longer proposed as of August 9. Proposed Rule 55, New Mine Tailings and Impoundment Structures, 055.01.c., "Safety factors for the stability of the embankment and underlying foundation materials shall be at least one and five-tenths (1.5) for static loads and a minimum of

Existing Rule for MTISs	Proposed Rule for MTISs
tailings to prevent liquefaction during earthquake loading." And 045.01.c, "Safety factors for the embankment shall be at least one and five-tenths (1.5) for static loads and a minimum of one (1) for static plus the appropriate earthquake load."	one (1.0) for the static plus the appropriate earthquake (i.e., dynamic load) and shall include deformations that may result in loss of freeboard due to liquefaction." Proposed Rule 60, Existing Dams and Existing Mine Tailings Impoundment Structures, 060.01.d, "Seismic loads shall be evaluated and applied to dams and mine tailings impoundment structures. The evaluation shall use the maximum ground motion/acceleration generated by the maximum credible earthquake. The Director may accept maximum ground motion/acceleration corresponding to a specified return interval using a probabilistic evaluation of earthquake history in accordance with USGS hazard maps." Also, 060.01.g discusses compliance periods for addressing seismic stability or safety concerns. Please note that this allowance of an unspecified "specified return period" appears unnecessarily vague and actually does not provide a minimum standard.