



**Association of State
Dam Safety Officials**



THE COST OF REHABILITATING OUR NATION'S DAMS

**A METHODOLOGY, ESTIMATE & PROPOSED
FUNDING MECHANISMS**

Prepared by a Task Committee
of the Association of State
Dam Safety Officials

March 2022
Previous Versions: 2019, 2016, 2012,
2009 and 2022

The Cost of Rehabilitating Our Nation's Dams

2022 Update

In 2001, an ASDSO task group was formed and tasked with preparing a report on the cost of rehabilitating our nation's dams. In 2003 the committee issued a report entitled *The Cost of Rehabilitating Our Nation's Dams: A Methodology, Estimate and Proposed Funding Mechanisms*. Based on the National Inventory of Dams (NID) at the time and available cost data, the task group developed a methodology for estimating what funding would be needed to rehabilitate the nation's non-federal dams. At the time the inventory included 65,000 such dams and it was estimated that \$34 billion would be needed. Of the \$34 billion, it was estimated that \$10.1 billion would be needed for high hazard potential dams.

Over time, improved data collection and reporting has resulted in increased number of dams in the NID. In 2009 and 2012, using the same methodology but updating the logic diagrams to account for the changing inventory numbers, inflation and percentage factors of deferred maintenance vs. non-deferred maintenance, hazard classification change and engineering assessment, the task group updated the costs. The cost estimates were again updated in 2018 based on the updated inventory and by applying an inflation factor.

The US Army Corps of Engineers published an updated NID in 2021 and the number of non-federal dams expanded to over 88,600. Accordingly, ASDSO is providing updated estimates of the cost of rehabilitating our nation's dams based on the expanded inventory and with an inflation adjustment.

Current figures place the total cost estimated for non-federal dams at \$75.69 billion, up from the last estimate of \$65.89 billion. Non-federal, high-hazard potential dams are estimated at \$24.04 billion, up from \$20.42 billion.

Detail:

Non-Federal	88,634 dams	\$75.69 Billion
Non-Federal High Hazard	15,236 dams	\$24.04 Billion

Please note that ASDSO has undertaken an effort in 2022 to update the estimation methodology and anticipates that the new methodology will be used for subsequent estimate calculations in 2023.

The Cost of Rehabilitating Our Nation's Dams

2019 Update

In 2001, an ASDSO task group was formed and tasked with preparing a report on the cost of rehabilitating our nation's dams. In 2003 the committee issued a report entitled *The Cost of Rehabilitating Our Nation's Dams: A Methodology, Estimate and Proposed Funding Mechanisms*. Based on the National Inventory of Dams (NID) at the time and available cost data, the task group developed a methodology for estimating what funding would be needed to rehabilitate the nation's non-federal dams. At the time the inventory included 65,000 such dams and it was estimated that \$34 billion would be needed. Of the \$34 billion, it was estimated that \$10.1 billion would be needed for high hazard potential dams.

Over time, improved data collection and reporting has resulted in increased number of dams in the NID. In 2009 and 2012, using the same methodology but updating the logic diagrams to account for the changing inventory numbers, inflation and percentage factors of deferred maintenance vs. non-deferred maintenance, hazard classification change and engineering assessment, the task group updated the costs. The cost estimates were again updated in 2018 based on the updated inventory and by applying an inflation factor.

The US Army Corps of Engineers published an updated NID in 2018 and the number of non-federal dams expanded to over 87,600. Accordingly, ASDSO is providing updated estimates of the cost of rehabilitating our nation's dams based on the expanded inventory and with an inflation adjustment.

Current figures place the total cost estimated for non-federal dams at \$65.89 billion, up from the last estimate of \$60.70 billion. Non-federal, high-hazard potential dams are estimated at \$20.42 billion, up from \$18.71 billion.

Detail:

Non-Federal	87,640 dams	\$65.89 Billion
Non-Federal High Hazard	14,343 dams	\$20.42 Billion

The Cost of Rehabilitating Our Nation's Dams

2016 Update

In 2001, an ASDSO task group was formed and tasked with preparing a report on the cost of rehabilitating our nation's dams. In 2003 the committee issued a report entitled *The Cost of Rehabilitating Our Nation's Dams: A Methodology, Estimate and Proposed Funding Mechanisms*. Based on the federal inventory of dams at the time and available cost data, the task group developed a methodology for estimating what funding would be needed to rehabilitate the nation's non-federal dams. At the time the inventory included 65,000 such dams and it was estimated that \$34 billion would be needed. Of the \$34 billion, it was estimated that \$10.1 billion would be needed for high hazard dams.

Over time, improved data collection and reporting has resulted in increased number of dams in the inventory. In 2009 and 2012, using the same methodology but updating the logic diagrams to account for the changing inventory numbers, inflation and percentage factors of deferred maintenance vs. non-deferred maintenance, hazard classification change and engineering assessment, the task group updated the costs.

Now, with the inventory expanding to over 87,000 non-federal dams, the task group once again is providing updated estimates of the cost of rehabilitating our nation's dams. Current figures place the total cost estimated for non-federal dams at \$60.70 billion, up from the last estimate of \$53.69 billion. Non-federal, high-hazard potential dams are estimated at \$18.71 billion, up from \$18.18 billion.

In the 2012 update, the cost of federally owned dams was also considered. In the current update, it was estimated that \$4.20 billion is needed to rehabilitate all federally owned dams with \$2.93 billion of this attributed to the federally owned high hazard dams.

Detail:

Non-Federal	87,199 dams	\$60.70 Billion
Non-Federal High Hazard	14,282 dams	\$18.71 Billion
Federal	3,381 dams	\$4.20 Billion
Federal High Hazard	1,216 dams	\$2.93 Billion

The Cost of Rehabilitating Our Nation's Dams

2012 Update

By John Ritchey, Task Group Chair

In 2001, an ASDSO task group was formed and tasked with preparing a report on the cost of rehabilitating our nation's dams. In 2003 the committee issued a report entitled *The Cost of Rehabilitating Our Nation's Dams: A Methodology, Estimate and Proposed Funding Mechanisms*. Based on the federal inventory of dams at the time and available cost data, the task group developed a methodology for estimating what funding would be needed to rehabilitate the nation's approximate 65,000 non-federal dams. It was estimated that \$34 billion would be needed at that time. Of that, it was estimated that \$10.1 billion would be needed for high-hazard potential structures.

In 2009, using the same methodology, but updating the logic diagrams to account for the changing inventory numbers, inflation and percentage factors of deferred vs. non-deferred maintenance, hazard classification change and engineering assessment, the task group concluded that it would take approximately \$51.46 billion to rehabilitate the nation's non-federal dams. Of that, it was estimated that \$16 billion would be needed to rehabilitate the nation's most critical (high-hazard potential) non-federal dams that are in need of rehabilitation. Roughly \$8.7 billion was needed to repair the publicly-owned high-hazard potential dams with the remaining \$7.3 billion needed for the privately-owned high-hazard dams.

Once again in December 2012, making appropriate adjustments to the logic diagrams, the task group revised the estimates. Current figures place the total cost estimated for non-federal dams at \$53.69 billion. High-hazard potential dams are estimated at approximately \$18.2 billion (\$11.2 billion for publicly-owned and \$7 billion for privately-owned). In this update, the task group has considered the costs for federally-owned structures using modified logic diagrams. The federal estimate is approximately \$4 billion for all federally-owned dams with approximately \$3 billion of this amount attributed to federally-owned high-hazard dams.

ASDSO would like to thank Becky Ragon, USACE for providing data from the federal inventory.

Task Group Members:

John Ritchey, Chair

Raul Silva

Eric Ditchey

Joe Kula

Ken Smith

Detail:

Non-Federal	80,410 dams	\$53.69 Billion
Non-Federal High Hazard	13,302 dams	\$18.18 Billion
Federal	3,221 dams	\$3.92 Billion
Federal High Hazard	1,248 dams	\$2.97 Billion

By State (Non-Federal only)

<u>State</u>	<u>Rehab Estimate in Millions</u>				
		LA	\$203	OR	\$685
		MA	\$567	PA	\$1,267
AK	\$ 94	MD	\$218	PR	\$95
AL	\$1,050	ME	\$239	RI	\$50
AR	\$868	MI	\$377	SC	\$1,149
AZ	\$316	MN	\$457	SD	\$1,184
CA	\$2,253	MO	\$3,890	TN	\$788
CO	\$1,616	MS	\$1,208	TX	\$4,699
CT	\$392	MT	\$1,207	UT	\$507
DE	\$23	NC	\$1,933	VA	\$1,120
FL	\$746	ND	\$361	VT	\$211
GA	\$2,545	NE	\$1,695	WA	\$469
HI	\$159	NH	\$234	WI	\$454
IA	\$2,606	NJ	\$288	WV	\$906
ID	\$393	NM	\$492	WY	\$953
IL	\$1,065	NV	\$491		
IN	\$773	NY	\$1,096	Total	\$53,693
KS	\$3,614	OH	\$1,128		
KY	\$1,052	OK	\$3,443		

Update Report
On
The Cost of Rehabilitating Our Nation's Dams

January 2009

Acknowledgements

The Association of State Dam Safety Officials would like to thank the volunteer committee members who developed the 2008-09 methodology and report:

Committee Members:

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EXECUTIVE SUMMARY

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- **There are approximately 84,000 dams in the U.S. National Inventory of Dams.**
 - **Dams are a critical piece of the nation's infrastructure.**
 - **There are currently over 4,400 unsafe dams across the U.S.**
 - **From 2005 through 2009, the states reported 132 dam failures.**
 - **The need for rehabilitation of many dams in the U.S. is critical and tops \$51.46 billion**
 - **It is estimated that \$16 billion is needed to rehabilitate the nation's most critical dams.**
-

Without proper maintenance, repairs, and rehabilitation, a dam may become unable to serve its intended purpose and could be at risk for failure. State and federal dam inspection programs can identify deficiencies in dams, but inspections alone will not address safety concerns posed by inadequately maintained or outdated dams. For most dam owners, finding the funds to finance needed repairs or upgrades is nearly impossible. The lack of reliable funding to resolve dam safety issues poses a threat to public safety nationwide.

In the thirteen years since the establishment of the National Dam Safety Program (PL 104-303), public awareness of the nation's dams—their sheer numbers, their importance, their safety requirements, and their condition—has increased. The deficient condition of many of these structures is apparent; yet we lack a focused public policy to address the problem.

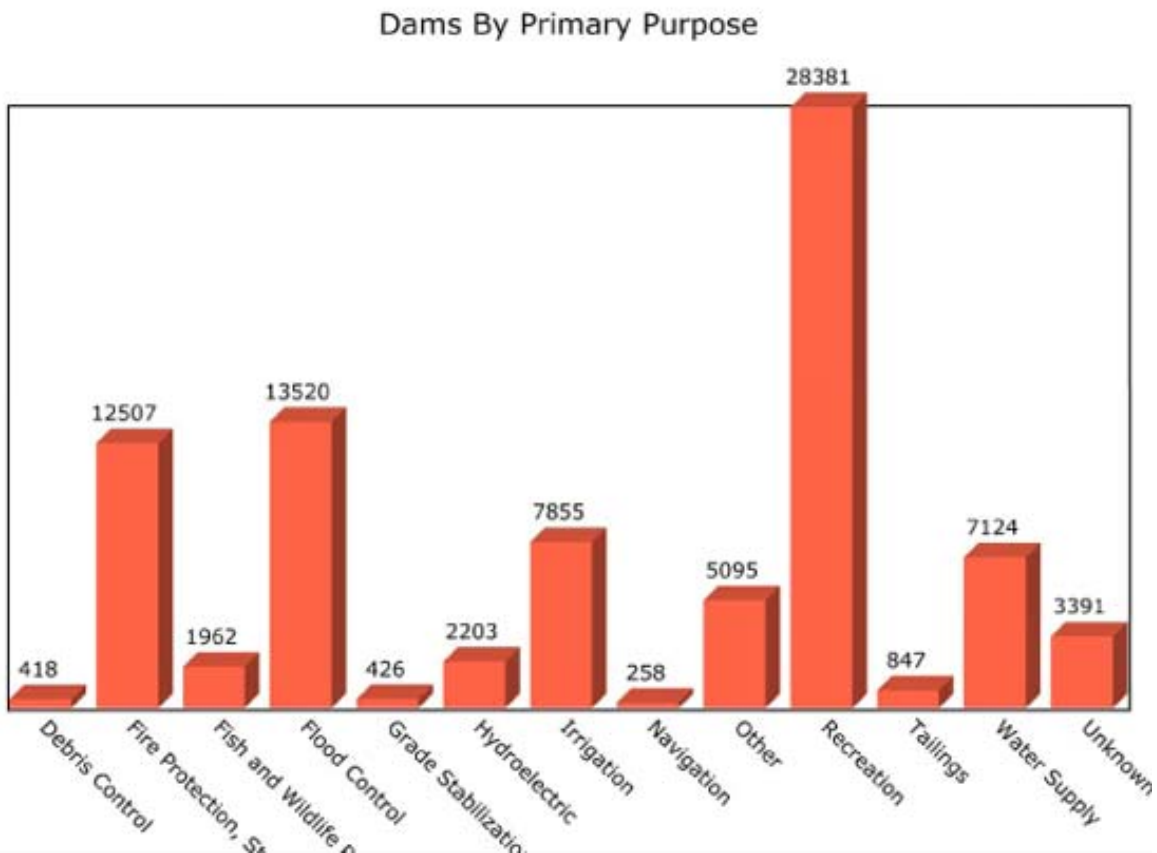
The federal government has often taken a proactive interest in funding rehabilitation of infrastructure, especially when the inadequacies of the structures threaten public health and safety. Federal funding has been used to fund improvements to highways, bridges, airports, water supply systems and waste water treatment facilities. Yet, no federal funding exists to rehabilitate most dams in the U.S.

Some of the strongest state dam safety programs in the U.S. were founded because of devastating dam failures that took hundreds of lives and destroyed homes, businesses, infrastructure, and

environment. Rather than allow additional dam disasters to occur, we must address the continued deterioration of this critical infrastructure now. The nation cannot afford to wait.

Discussion

Dams are a critical piece of the infrastructure in the United States. The approximately 84,000 dams in the National Inventory of Dams provide a range of economic, environmental, and social benefits, including hydroelectric power, river navigation, water supply, wildlife habitat, waste management, flood control, and recreation.



Like all pieces of infrastructure, dams age and deteriorate, posing a potential threat to life, health, property, and the environment. Lack of maintenance, upstream development, changing downstream land use, and weather amplify the problems. Currently, over 4,400 dams are considered to be unsafe. From 2005 to 2008, the states reported 566 dam incidents, including 132 dam failures. It is likely that there were additional incidents that were never reported.

In many cases, owners of dams that present the greatest public safety hazard because of deteriorated conditions or outdated design are the least able to finance the maintenance, repair or upgrade these structures. Although the National Dam Safety Act provides funding to strengthen state dam safety regulatory programs, improving inspections and enforcement, there is still no mechanism to assist with the owners' ability to comply. A source of funding to assist dam owners in financing dam repairs is vitally needed.

Devising a funding solution requires an estimate of the magnitude of the problem. In 2001 and again in 2008, a group of dam safety professionals formulated cost estimates for dam rehabilitations and identified potential funding options for dam repair or rehabilitation. Their estimates are based on a methodology that incorporates the size of the dam, the costs of deferred maintenance, engineering evaluation and design, rehabilitation, and capacity and structural upgrade. According to the group's latest estimate, rehabilitation of the nation's non-federally owned dams would cost \$51.46 billion. The estimate does not include costs for administration of a funding mechanism, nor does it take into account the continually increasing number of high-hazard potential dams.

Federal Programs

There is currently only one comprehensive federal program available for rehabilitation of non-federally owned dams. The Watershed Rehabilitation Act of 2000 (P.L. 106-472, Section 313) authorized \$90 million over five years to assess and rehabilitate a portion of the 10,000 dams constructed by the Department of Agriculture under Public Law 566, the Small Watershed Dam Act. In 2002, additional funding totaling \$600 million over five years was authorized by Congress in the Farm Bill to help rehabilitate watershed dams. Currently the federal budget provides funding at \$40 million for the dam rehabilitation program.

There is also some federal funding that is occasionally appropriated to the U.S. Army Corps of Engineers, on a case-by-case basis, for the rehabilitation of some non-federal dams. Similarly, the Federal Emergency Management Agency has in the past funded repair to dams which have failed due to a presidentially declared disaster.

ASDSO is continually advocating for the passage of a Dam Rehabilitation and Repair bill. At the time of this report, the bill is circulating through both houses as H.R. 1770 in the House and as S. 732 in the Senate. Both bills would provide \$200 million over five years to repair state and locally owned dams.

State Programs

In 2003, nine states had funding programs that provided loans or grants to repair unsafe dams; by 2008, 22 states offered these programs. Most can provide funding only for dams that are publicly

owned or backed by a public entity, and many are threatened by state budget cuts. Even the most successful of these programs can address only a small portion of dams needing upgrades or repairs, as well over half of the dams in the U.S. are privately owned. See Attachment 3 for details.

Recommendations

A dam safety program cannot be complete without a mechanism to address funding for the most critical dam repairs and rehabilitation. To address the estimated \$51.46 billion cost, the dam safety community advocates a federally backed funding source for dam repair, rehabilitation and, where appropriate, removal.

It is estimated that \$16 billion is needed over the next 12 years to address the nation's most critical dams—those whose failure would pose direct risks to human life. A stable funding source is essential to begin the task of addressing the safety of these dams.

The number of state programs that offer funding assistance to dam owners needs to increase. Any federally backed program should be designed to work with existing state programs to encourage the continuation and maximize the benefits of both funding sources. This type of federal-state-private partnership is essential in order to address a problem of this magnitude.

It is strongly recommended that the findings within this report should be addressed by individual states, the U.S. Congress, the Federal Emergency Management Agency (FEMA), the Association of State Dam Safety Officials (ASDSO), and the dam safety community in the effort to increase the availability of funding sources.

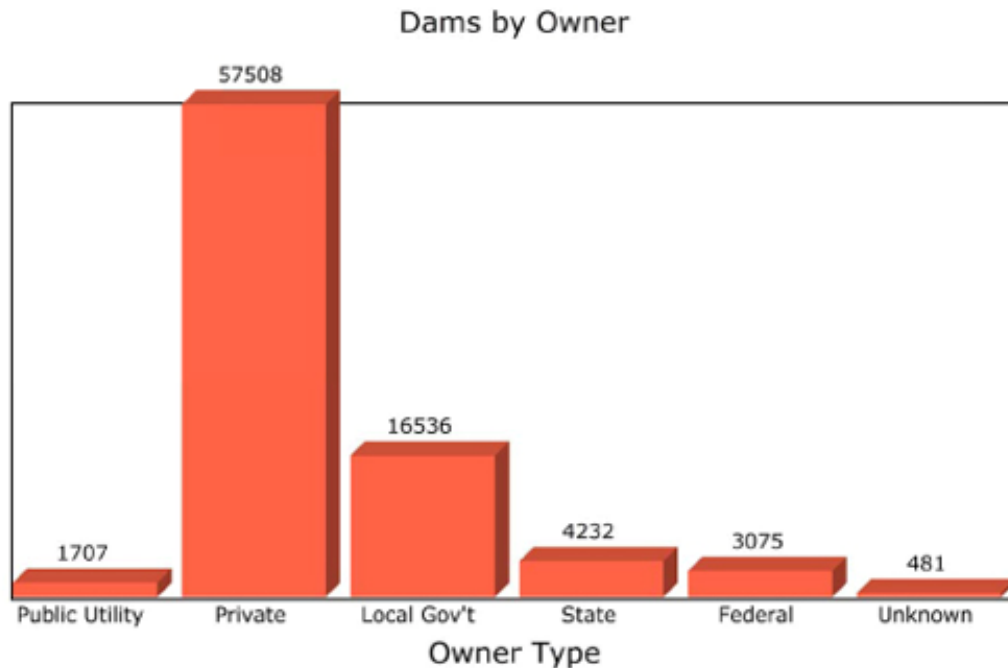
INTRODUCTION

Background

Infrastructure safety has always been an important issue at local, state, and national levels. A dam failure can be devastating to the dam owner, to the dam's intended purpose, and especially to downstream populations and property. A single dam failure can affect several states and large populations and cause thousands to billions of dollars worth of property and environmental damages. No price can be put on the lives that have been lost or could be lost in the future because of dam failure.

Some of the strongest state dam safety programs in the U.S. have been established as a response to devastating dam failures. Pennsylvania enacted dam safety legislation in the 1913 after the state experienced two calamitous dam failures that took 2,300 lives. The California Division of Safety of Dams was established in 1929 following the St. Francis dam failure, which killed more than 450 people and destroyed bridges, roads, homes, and 24,000 acres of farmland. State programs in Hawaii, New Jersey and New Hampshire have seen significant increases in resources as a follow-up to catastrophic flood events.

Of the approximately 84,000 dams in the National Inventory of Dams, most are owned by private businesses, citizens, state governments, and local governments. Many dam owners are unable to undertake dam repairs and rehabilitation due to lack of funding. This situation often results in dangerously neglected and deteriorated dams.



Some states have established innovative funding programs to assist dam owners, but the coffers of most are inadequate to meet the need. Most states cannot afford to fully fund rehabilitation of publicly owned dams, much less the far-more-common privately owned dams, which are ineligible for most funding programs. There is no broad-based program at the federal level to assist dam owners with the funding of needed repairs; the establishment of such a program would help prevent disastrous dam failures.

Origins of the Study

The National Dam Safety Program Act of 1996 (NDSPA, PL 104-303) called for the Federal Emergency Management Agency (FEMA) to carry out a program of technical and archival research to develop (1) improved techniques, historical experiences, and equipment for rapid and effective dam construction, rehabilitation, and inspection, and (2) devices for the continued monitoring of the safety of dams.

The NDSPA also established the Interagency Committee on Dam Safety (ICODS). The ICODS Subcommittee on Dam Safety Research (SDSR) determined that funding for the rehabilitation of dams is an important part an effective dam safety program.

In fiscal year 2000, the SDSR recommended and FEMA provided funding for a task committee to research and develop options the federal government could consider in establishing funding

programs for dam rehabilitation projects. FEMA and the SDSR called on the Association of State Dam Safety Officials (ASDSO) to establish this committee. Its nine members were charged with:

- 1) researching and estimating the total dam rehabilitation costs for the United States;
- 2) collecting information on existing funding programs;
- 3) developing recommendations for the establishment of federal dam restoration grant and/or loan programs; and
- 4) drafting model state legislation, rules, and guidelines for state dam restoration grant and/or loan programs.

It was hoped that the findings of the committee would be utilized by Congress, individual states, FEMA, ASDSO, and the dam safety community in an effort to increase the availability of funding sources.

The committee began its work in October 2000 and completed its initial report—entitled *The Cost of Rehabilitating Our Nation's Dams: A Methodology, Estimate and Proposed Funding Mechanisms*—in December 2002. A revised version of this report was published in October 2003.

2000-2002 Rehabilitation Costs Study

The committee's intensive two-year, peer-reviewed study considered the number of state-regulated dams, the size of the dams, the costs of deferred maintenance (any maintenance activity that does not require formal engineered plans or the approval of a professional engineer), the cost of engineering evaluation and design, the cost of rehabilitation (whether repair, replacement or removal), and the cost of increasing storage capacity or structural upgrades. Estimates did not include costs for administration of a funding mechanism; nor did they take into account the increasing number of high-hazard-potential dams, those whose failure would cause loss of human life.

The committee concluded that:

The cost of upgrading or repairing all non-federal dams in the U.S. would exceed \$36 billion.

Almost one-third of this amount—\$10.1 billion—would be needed for the nation's most critical dams, the more than 10,000 non-federal dams across the nation whose failure would cause loss of human life.

It recommended the creation of a national dam rehabilitation loan program. Subsequently, ASDSO worked with lawmakers to draft the Dam Rehabilitation and Repair Act that would provide funding for repairs to high-hazard-potential dams. Congress has not yet passed this legislation.

The 2009 Update

In the spring of 2008, ASDSO convened a task force to update the initial rehabilitation costs study. Several members of this group had worked on the original project. The principal objectives of this effort were:

- to review the existing methodologies, eligibility criteria, and associated cost estimates utilized in the 2003 report;
- to determine an accurate estimate of the current national cost of dam rehabilitation; and
- to recommend ideas for addressing the need.

Over the next 9 months, the committee completed its review and update, concluding that a sound national cost estimate to repair the nation's dams, based on available data, is \$51.46 billion. Of this figure, approximately \$16 billion is needed for repair of high-hazard potential dams (those dams whose failure would likely cause loss of human life): Just over half of this figure—roughly \$8.7 billion—is needed to repair publicly-owned high-hazard potential dams, with the remaining \$7.3 billion needed for privately owned dams.

These numbers have increased significantly since the 2003 report. The estimated cost of rehabilitating all dams has risen by 42%, while the cost to rehabilitate high-hazard potential dams is up by 58%. These numbers will likely continue to rise until a comprehensive state and federal rehabilitation strategy is implemented.

The latest data from the National Inventory of Dams (NID), maintained by the US Army Corps of Engineers, underscores the urgent need for immediate investment in the nation's dams: As evidence of the increasing need, data submitted to the NID by state and federal regulators shows that the number of deficient dams in the nation has increased by 36% in the last five years.

NATIONAL COST OF DAM REHABILITATION

Eligibility

Included in this study are all non-federally owned dams listed in the National Inventory of Dams (NID)¹. The NID includes 83,690 dams, all of which:

Are at least 25 feet in height, OR

Store at least 50 acre-feet of water, OR

Pose high or significant risks to life or property.

Excluded from this study were the 3,075 federally owned dams listed in the NID. The remainder of dams listed in the NID were determined eligible for proposed funding under the study.

Methodology & Estimate

The overall estimate of dam rehabilitation costs is based on a methodology that incorporates the size of the dam (height), the costs of deferred maintenance, engineering evaluation and design, rehabilitation, and capacity and structural upgrade. In order to facilitate the development of a national estimate, the following baseline assumptions were made:

- First: that the working definition of a rehabilitation scope would include repair, replacement, and removal;
- Second: that dam height would be the primary criteria in categorizing the National Inventory of Dams (NID) into more manageable groups; and
- Third: that any estimate would exclude federally owned dams.

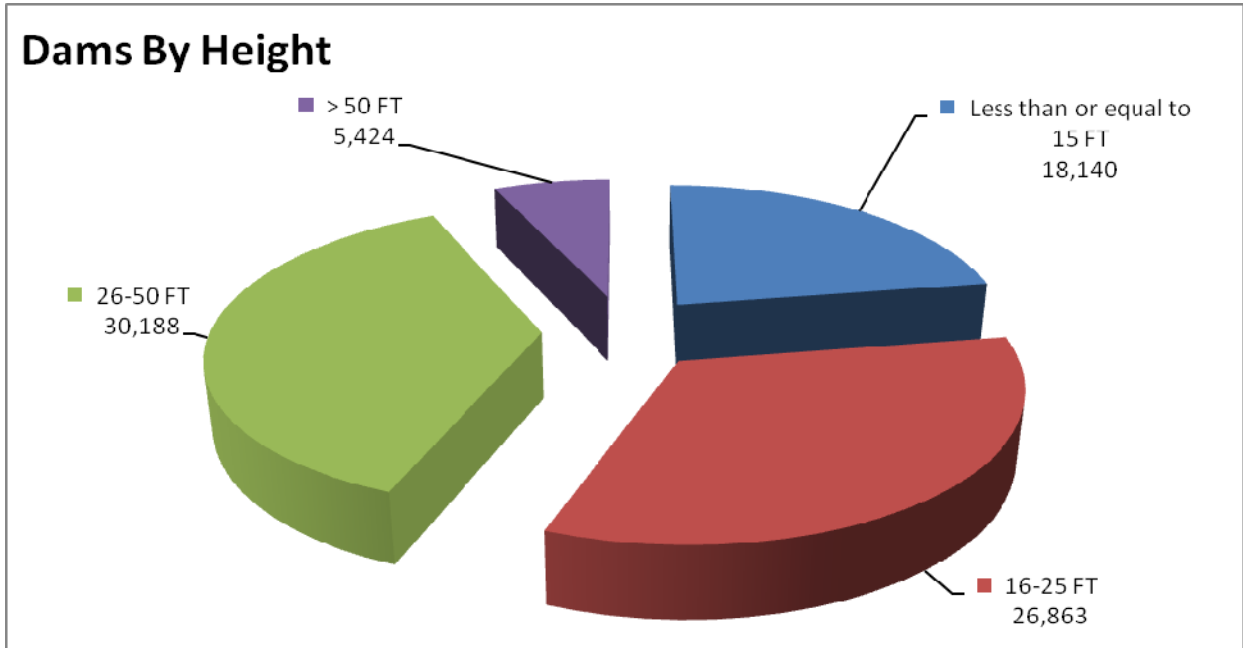
The baseline uses the results of specific logic diagrams for each size group that focuses on percentages of dams that require some level of remedial measures. These potential measures would be taken in order and include the following:

- Deferred maintenance
- Detailed engineering assessment

¹ The National Inventory of Dams is a database program administered by the US Army Corps of Engineers that houses information on dams regulated either by the federal government or state governments.

- Hazard potential reclassification
- Physical improvements.

Dam height was selected as a primary criterion because it was determined to be the single most effective indicator of overall size and cost of repair. The NID was divided into four height categories: dams less than or equal to 15 feet, over 15 and less than or equal to 25 feet, over 25 and less than or equal to 50 feet, and over 50 feet.



The next task was the development of specific logic diagrams for each size group that would focus on percentages of dams that require some level of remedial measures. These potential measures would be taken in order and include:

- Deferred maintenance,
- Detailed engineering assessment,
- Hazard potential reclassification, and
- Physical improvements.

The first step of this methodology exercise was to divide all dams within each category by the need for correcting deferred maintenance deficiencies. Typically, this would include tree cutting, slope clearing, patching concrete, gate repair, etc. Generally, only a contractor or heavy equipment would be necessary for this work. Conversely, other dams would be considered well maintained.

Estimates were made for the two groups: percentage of dams that require maintenance and the percentage which do not. Deferred maintenance costs were assigned to those dams that do require maintenance.

The second step was to estimate for each of the two groups—

1) maintenance

or

2) no maintenance—the percentage of dams that require an engineering assessment.

For dams requiring an engineering assessment, the estimated cost of such an assessment was assigned. For dams with no deferred maintenance and no need for an engineering assessment, no further breakdown was necessary and a \$0 cost was assigned.

For dams that require maintenance but do not require an engineering assessment, no further breakdown was necessary and the cost of deferred maintenance was assigned as the final cost for the dams.

For dams in both maintenance categories that do require engineering assessments, the percentages were broken down into dams that would and would not require a change in hazard classification as a result of the assessment findings.

The next breakdown was an estimate of the percentages of dams that either require a change in hazard classification or do not. Each group (hazard classification change or no change) was then broken down into dams that require remedial action or not.

For each category, an estimated cost of the remedial action was assigned.

This completed the placement of dams into various treatment scenarios and the estimate of dams that require remedial action. To complete the chart, the percentages were multiplied across the table to compute the total estimated percentage of dams in each treatment scenario. The cost of each dam grouping was figured by multiplying the total number of dams in the treatment scenario by the estimated cost of rehabilitation for that particular scenario. Average rehabilitation cost figures were determined based on collective experience of the committee and actual project histories. The total cost for rehabilitation of all dams in each height category was attained by

An engineering assessment would include hydraulic/hydrologic, dam failure, stability and geotechnical analyses, and the development of alternatives, cost estimates and any necessary instrumentation installation

Deferred maintenance is defined as any maintenance activity that does not require formal engineered plans or the approval of a professional engineer

adding all the costs in the total cost column. Copies of the complete logic diagrams are contained in Attachment 1.

In 2003, a review and update of the existing methodology resulted in the following revisions:

- 25% cost escalation factor to deferred maintenance and remedial actions to dams without maintenance
- 25% cost escalation factor plus a one-time 15% premium for rehabilitation of dams with deferred maintenance
- Adjusted Phase 2 engineering costs by 67%
- Cost of remedial action will include design, construction, permitting, EAP, construction management and any land acquisition costs
- All federally-owned dams were excluded from cost numbers
- All non-federal dams were included (states with existing funding programs were included in final totals)
- Assignment of NID condition assessments to algorithm outputs (satisfactory, fair, poor, unsatisfactory)

Results

Using this formula, it was estimated that it would cost approximately \$51.46 billion to rehabilitate all non-federally owned dams in the U.S. identified as needing rehabilitation in 2009. Additional funding would be required for state and federal administrative costs.

Summary

Size-Based Category	Percent of Dams in Need of Rehab	Cost Estimate Per Rehab Project	Total Cost
Category #1 <= 15'	42% = 7,635	\$276,098/project	\$2.273 Billion
Category #2 16'<=25'	44.2% = 11,900	\$649,821/project	\$8.13 Billion
Category #3 26'<=50'	43% = 13,005	\$1,685,834/project	\$22.569 Billion
Category #4 greater than 50'	38% = 2,068	\$8,851,025/project	\$18.484 Billion
Total cost for all projects			\$51.456 Billion

See Attachment 1 for details on cost calculations.

The task force also calculated the residual economic benefits of creating a federal dam rehabilitation program. Such a program would not only address an urgent public safety need but also positively impact the national economy through job creation: Using cost documentation for previous projects, job generation data from National Economic Development account summaries, IMPLAN software, and historical data, the task force calculates that an investment of \$12 billion would multiply into a \$16 billion dollar benefit to local economies across the nation and create a minimum of 100,000 direct project contact first line jobs. While difficult to estimate precisely, it is known from experience that a significant number of secondary and tertiary support sector jobs are created in the areas where these projects take place.

IMPROVING ASSISTANCE AT THE STATE LEVEL

Background

For state regulated dams, financing of dam repairs has traditionally been the responsibility of the owners. Where the owner derives financial benefit from the dam or where the dam is owned by a public entity with taxing authority, a means to pay for dam repairs is available. However, more than half of the state-regulated dams on the NID are owned by private entities, many of whom do not derive direct economic benefit from the dam and therefore do not have a direct means of financing repairs. Additionally, as dams age they often require more costly repairs, or major rehabilitation to meet modern design criteria and current dam safety requirements. The cost of these measures is often beyond the means of many dam owners, regardless of whether they derive economic benefit from the dam.

As part of this project, the original committee was charged with developing a model state assistance program. This model, developed in 2001, is intended to provide a starting point for any state desiring to develop a program that could provide assistance to dam owners for rehabilitation or major maintenance of their dams.

The committee recommends that the assistance program model should be set up as a low interest, revolving loan program. This would be the most effective program for establishing a long-term, stable funding source for dam rehabilitation. This model could also be applied as a starting point for states desiring to use grants for assistance.

Existing Programs

Recognizing that inspection and enforcement alone will not guarantee safe dams, twenty-two states have established programs to fund dam rehabilitation. The programs vary as to their size and success. Several of the programs are a part of larger, water resource infrastructure rehabilitation efforts while others are small, segregated funds that focus on one or two projects a year. Attachment 3 shows a summary of the state funding programs as of 2008.

The 2000-2002 task committee agreed that the following list of key considerations should be addressed by states as they develop specific guidelines and/or rules for a funding program:

Application Criteria – The following are offered as potential criteria necessary to apply for funding from the loan program:

- Ownership – all owners except federal and perhaps state-owned (for a state backed program)
- Plans & Specifications should be ready to bid
- All easement and ownership issues should be resolved
- State dam safety officials must have given sign off on project. (This will allow for concurrence that the project design has addressed all compliance issues and alternatives have been considered)
- Construction cost estimate is completed

Eligible Costs – The following is a potential list of eligible costs for funding under a dam rehabilitation program:

- Application preparation
- Alternatives analysis
- Preliminary design
- Project design
- Bidding
- Construction related services
- Actual construction/removal costs
- Preparation on EAP/IOM
- Instrumentation and monitoring

Ineligible Costs – The following is a potential list of activities that should not be eligible for funding under a dam rehabilitation program:

- Legal fees
- Acquisition
- Prior construction costs
- Administrative overhead for owner
- Beautification
- Recreation enhancement

- Dredging
- Enhancements to hydropower generation

Other issues that should be considered while developing laws/rules:

- Contingency funds – whether contingency costs may be added to project costs estimates to make sure adequate funds will be available to cover all project costs including unexpected expenses.
- Change orders – how will change orders be handled. Will they be eligible for funding under the program
- Phased projects – will the funding program allow phased projects
- Alternatives analysis – is one required for good value and proper water resource management.
- Higher standards – can the state funding be used to bring the dam into compliance with standards not required by the state regulations
- Emergency Action Plan (EAP) and Inspection, Operation and Maintenance Plan (IOM) have been developed upon project completion

Model Program Law

The traditional way for a state to start a funding program is through legislative act. While each state will have its own procedures and format for writing these laws, most will identify the funding source for the program and the key elements necessary to accomplish the desired objectives.

To assist states in their effort to develop dam rehabilitation funding programs, a Model Program Law is included in Attachment 4. This model was written to provide the elements that are important in authorizing legislation. It is included for consideration and to be used by those drafting specific legislation for a state. There is no intent to force a certain format or specific language. Drafters should feel free to use only the parts of the Model Program Law that will work in their state and add any language necessary to meet state specific requirements.

The Model Program Law does not identify specific source of funding for the proposed state program. Each state will need to address the means to fund their program. The most common funding sources for existing state programs are using general tax revenue, issuing bonds, tapping into existing infrastructure rehabilitation revolving loan funds, and using fees from dam permitting or licensing.

Administration and Implementation

In most cases a legislative act establishing a loan program will require the development of administrative codes. This is reflected in the “Model Program Law.” The purpose of the codes will be to implement the objectives of the enabling legislation, establish policies and procedures for the administration of the funds. The codes protect the public and the state by ensuring that the funds are spent in a proper manner and for the intended purpose and ensure that the distribution and use of the funds is consistent with the laws and policies of the state.

Following is a suggested outline for developing a set of codes for a State Dam Rehabilitation Loan Program. It is recognized that individual states may have varying degrees of administrative requirements and implementation procedures, however, this general outline should provide a starting point for the development of administrative codes. Additionally, links to a generic administrative code and administrative codes from established programs can be obtained from ASDSO’s website: www.damsafety.org.

General Provisions

This section will provide all of the general information and requirements for the loan program. The following sub-sections are suggested:

- **Scope and construction:** Describes the development of the rules.
- **Purposes:** Defines the purposes for which the rules are being developed.
- **Project Eligibility:** Defines the type of projects and general requirements a project must meet in order to be eligible to receive funding under the loan program.
- **Project Phases:** Identifies the progression the project will follow to obtain a loan (i.e., pre-application conference, application submittal, application review, loan development, etc.).
- **Definitions:** Defines the words and terms used in the loan rules.

Project Application Phase

This section will define, for the potential applicant, the procedures they must follow in order to apply for a loan and the agency’s review and response procedures. The following sub-sections are suggested:

- **Pre-application procedures:** Defines the requirements for a pre-application conference.
- **Application procedures:** Defines the information that an applicant must submit as part of their loan application.

- Allowable project costs: Defines the portions of the project that will be eligible to be funded under the loan program (i.e., engineering, construction, etc.).
- Application review: Describes the protocol in which the reviewing agency will follow for review of the loan applications including approval and disapproval and notification procedures.

Project Development Phase

After a project is selected for funding, a loan agreement must be developed. This section describes the procedures in which the loan agreement will be developed. The following subsections are suggested.

- Required submittals for execution of loan agreement: Identifies the information that must be submitted by the applicant in order for the agency to develop a loan agreement.
- Execution of the loan agreement: Defines the procedures in which the loan agreement is to be executed.

Project Implementation Phase

This section includes all of the requirements that the applicant must adhere to and the information that will be important to the applicant as they implement the project that is being funded. The following subsections are suggested:

- Amount and terms of the loan: Defines the amount of the loan and includes the loan terms (i.e., interest rate, maturity period, repayment requirements, etc.).
- Loan conditions: Identifies the requirements that will be a condition of the loan agreement including but not limited to certifications of performance, performance bonds, bidding requirements, etc.
- Amendments, modifications and changes to loan agreement: Explains the procedures for making changes to the loan agreement.
- Loan disbursements: Defines the procedures in which loan funds will be disbursed.
- Non-compliance provisions: Defines the remedies available to the agency when a borrower is not in compliance with conditions of the loan agreement. This includes withholding of funds, stop work orders, termination or annulment of loans, and hearing provisions.
- Accounting procedures: Defines the procedures the applicant must follow to document the expenditure of the loan funds.

Priority Ranking of Projects

This section is developed for the purpose of ranking projects to determine which projects are to receive funding when funds are limited. There are varying opinions on what to include in a priority ranking; however, the consensus is that high hazard dams should be the first projects to be funded.

One approach is to rank projects based upon the impacts a dam failure may have on the downstream reaches (loss of life, structures affected, lifelines impacted, etc.). However, this approach will require that a dam breach analysis and downstream routing be performed prior to application in order to establish the priority.

A second approach is to utilize basic information regarding the dam itself to establish a priority. This can include parameters such as hazard, height of dam, volume of water stored, etc.

Another approach is a procedure in which points are assigned based upon the condition of the dam (i.e., spillway adequacy, structural adequacy, concrete condition, condition of earth embankments, etc.).

In Attachment 5 is a simple ranking procedure developed by Anthony Basile of American Waterworks Service Co. to rank the rehabilitation needs of their dams. Other ranking schemes can be found in the administrative codes of states with existing programs.

NEED FOR A FEDERAL ASSISTANCE PROGRAM

Existing Programs and Mechanisms

Current available federal funding assistance for dam rehabilitation is limited to the Small Watershed Rehabilitation Program administered by the Department of Agriculture, Natural Resource Conservation Service, and a few other funding mechanisms such as specific legislative earmarks, FEMA disaster assistance, Water Pollution grants through EPA, and limited assistance programs through the US Army Corps of Engineers.

On November 9, 2000, President Clinton signed into law the Small Watershed Dam Rehabilitation legislation. The legislation authorized \$90 million over five years to provide up to 65 percent of total costs to a local organization for rehabilitation of structural measures of small watershed dams—dams built by the federal government under the Small Watershed Protection and Flood Prevention Act and other flood control programs. The program allows decommissioning of the dam if the sponsoring organization requests it.

In 2002, through the “Farm Bill” (PL 107-171), Congress added funding that endorsed and enhanced the Small Watershed Dam Rehabilitation Program in the amount of \$275 million obligated over five years, with an additional \$325 million over five years, authorized for appropriation. In 2008, \$40 million was appropriated to maintain this program.

This funding focuses on the 10,450 small flood control dams that are located across the nation. These dams were built by the federal government, given over to local districts to maintain and are generally in need of safety upgrades and rehabilitation.

To learn more about the Small Watershed Rehabilitation Program go to www.nrcs.gov.

RECOMMENDATIONS

The task force recommends:

- The establishment of State-created dam rehabilitation loan and grant programs, and
- The establishment of a national dam rehabilitation funding program.

These recommendations are consistent with current ASDSO strategic policy. ASDSO is advocating for a federal dam rehabilitation program that would provide federal funds to be cost-shared at 65 percent federal to 35 percent state/local for non-federal publicly owned dams. The legislation would provide funds to states based on the number of high-hazard dams in each of the participating states. Bills are currently circulating within the 111th Congress (see federal bill language—Attachment 2).

Concurrently, ASDSO is endorsing similar programs within state governments, which could leverage federal funds to fix more dams. A list of 22 current state loan/grant programs is included in Attachment 3.

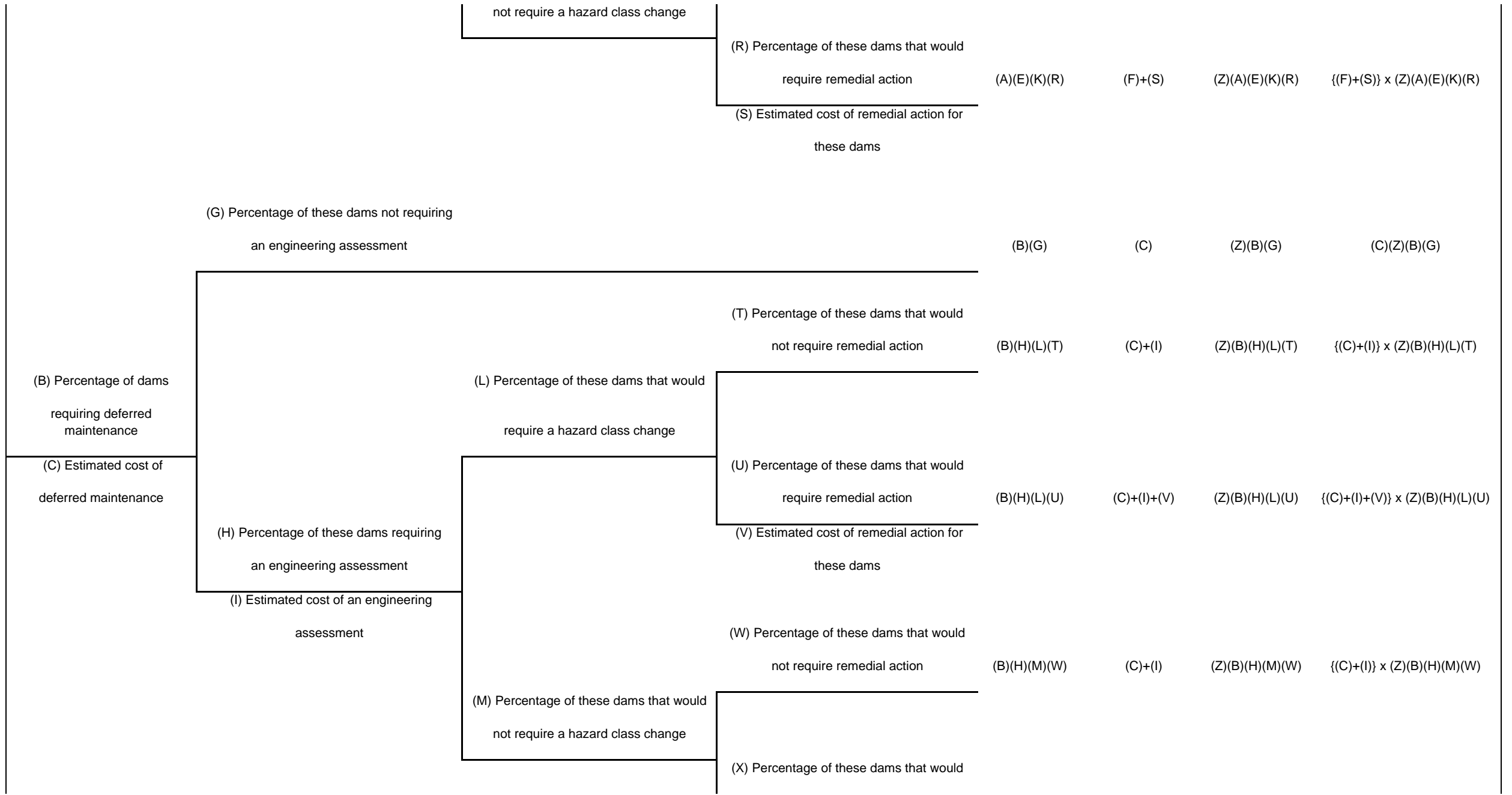
The methodology can be used to calculate state-specific dam rehabilitation cost numbers in order to supply data to states for many uses, including determination of the need for state loan/grant programs. Note that the methodology uses data from the current National Inventory of Dams (NID): State dam inventory numbers may be different than the numbers housed in the NID; therefore, cost estimates may vary slightly.

The task force recommends that ASDSO launch a program to create and maintain a library of rehabilitation case studies and make it available via its website. State-specific summaries would not include dam names/locations. This would serve to increase the viability of cost numbers in the future and would improve the methodology.

The final recommendation of the task force is for ASDSO to routinely update these rehabilitation numbers as a byproduct of updates to the National Inventory of Dams (NID). This action would maintain a current estimate and allow for future revisions to the methodologies and cost indices used.

ATTACHMENT 1 - FORMULAS

Dams By Category				No. of Dams = Z			
Deferred Maintenance	Engineering Assessment	Hazard Class Change	Remedial Action	Fraction	Cost per dam	No. of Dams	Total Costs
	(D) Percentage of these dams not requiring an engineering assessment			(A)(D)	\$0	(Z)(A)(D)	\$0
(A) Percentage of dams not requiring deferred maintenance	(E) Percentage of these dams requiring an engineering assessment	(J) Percentage of these dams that would require a hazard class change	(N) Percentage of these dams that would not require remedial action	(A)(E)(J)(N)	(F)	(Z)(A)(E)(J)(N)	(F)(Z)(A)(E)(J)(N)
			(O) Percentage of these dams that would require remedial action	(A)(E)(J)(O)	(F)+(P)	(Z)(A)(E)(J)(O)	{(F)+(P)} x (Z)(A)(E)(J)(O)
	(F) Estimated cost of an engineering assessment		(P) Estimated cost of remedial action for these dams				
		(K) Percentage of these dams that would	(Q) Percentage of these dams that would not require remedial action	(A)(E)(K)(Q)	(F)	(Z)(A)(E)(K)(Q)	(F)(Z)(A)(E)(K)(Q)



				require remedial action	(B)(H)(M)(X)	(C)+(I)+(Y)	(Z)(B)(H)(M)(X)	{(C)+(I)+(Y)} x (Z)(B)(H)(M)(X)
				(Y) Estimated cost of remedial action for				
				these dams				Sum of column = Total cost
					sum of fractions			
							Sum of costs for dams requiring remedial repair	
		Total costs for dams requiring deferred maintenance and engineering studies but no remedial action					No. of Dams Requiring Remedial Action	Average Cost of Rehabilitation Project (Sum of costs for dams requiring remedial repair / No. of Dams Requiring Remedial Action)

Earth Dams Smaller than 15 Feet in Height

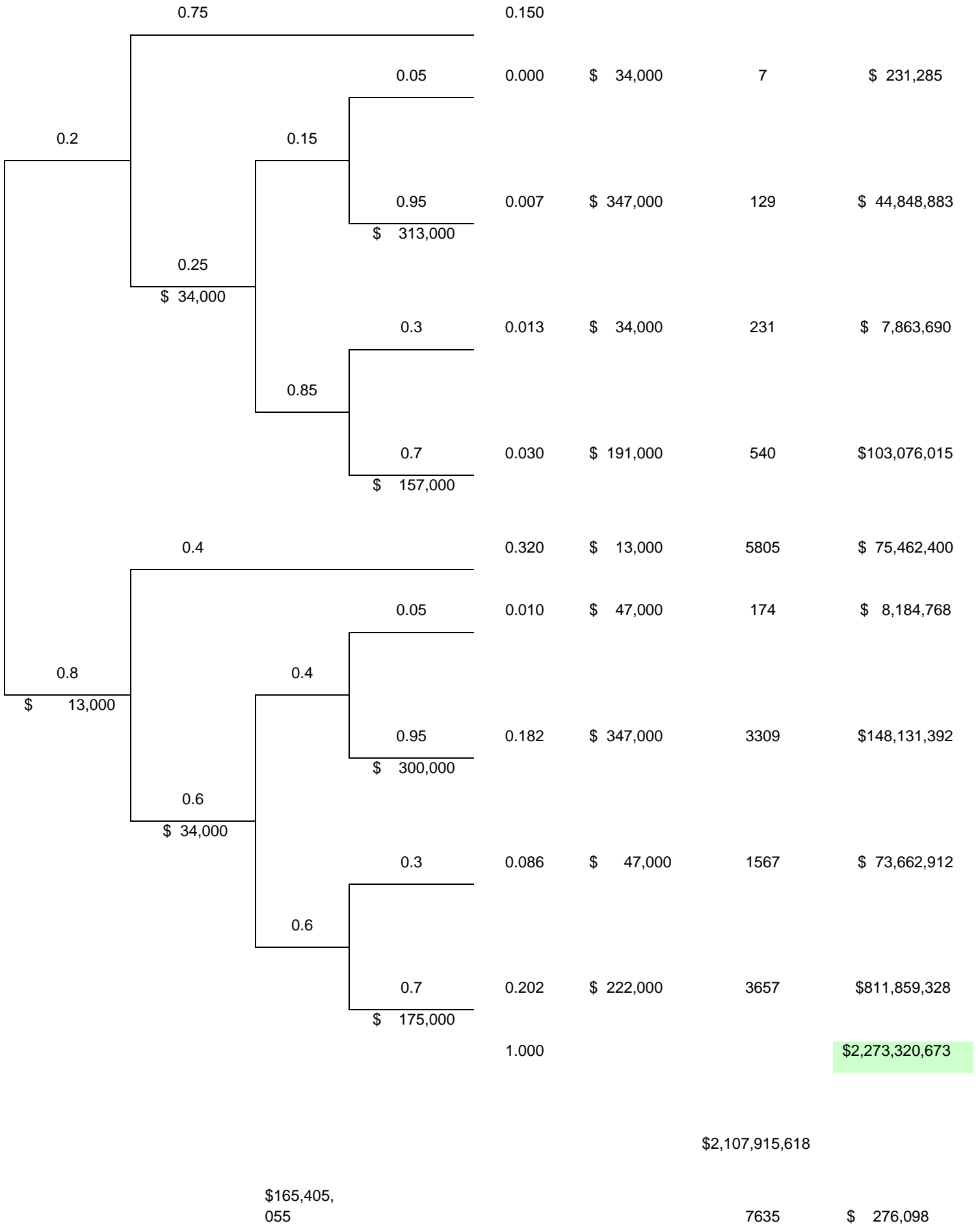
Category #1 Dams

<=15 Feet

No. of Dams

18140

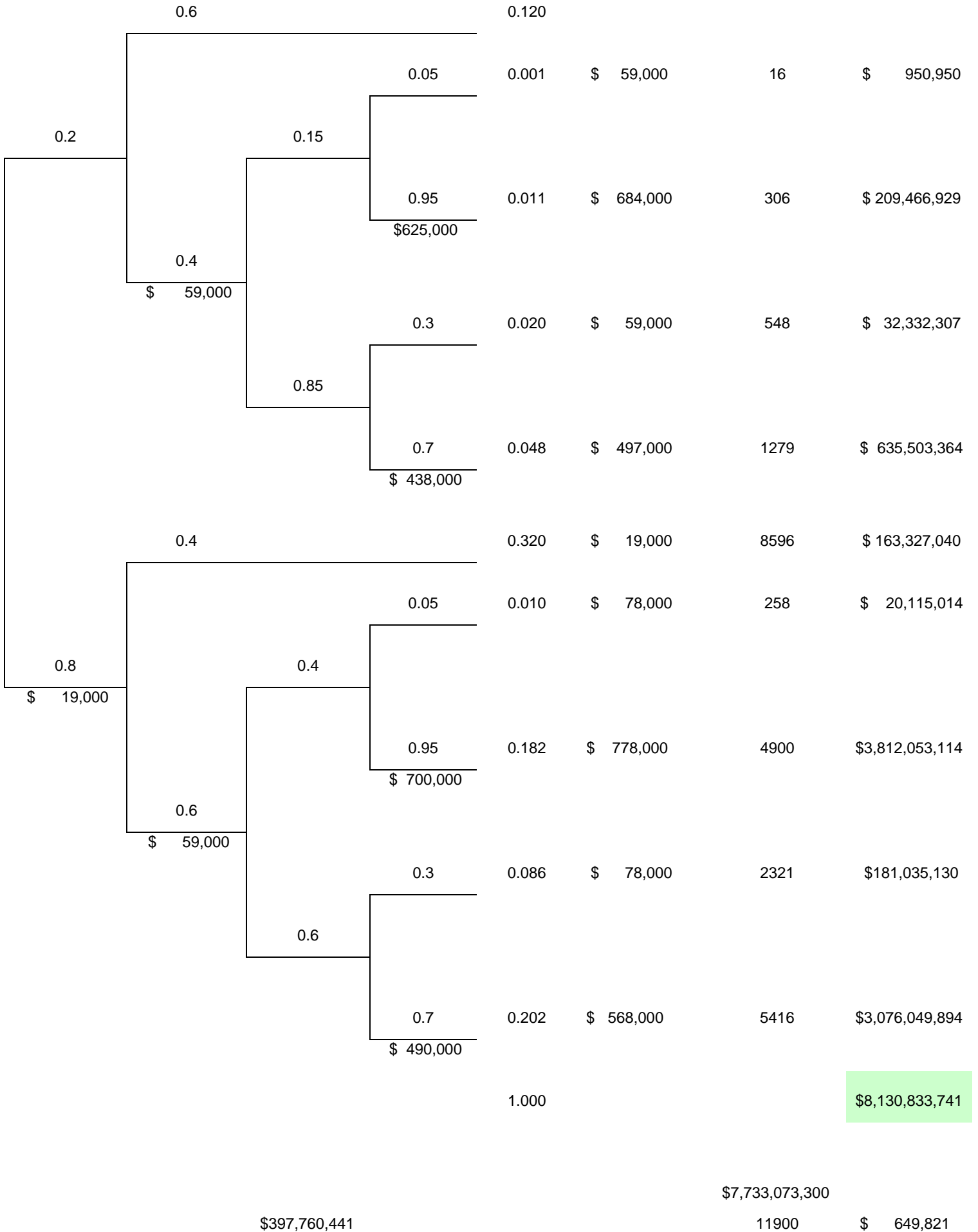
Deferred Maintenance	Engineering Assessment	Hazard Class Change	Remedial Action	Fraction	Cost	No. of Dams	Total Cost
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Earth Dams Equal to 15 Feet and Less Than 25 Feet in Height

Category #2 Dams 16-25 Feet No. of Dams 26863

Deferred Maintenance	Engineering Assessment	Hazard Class Change	Remedial Action	Fraction	Cost	No. of Dams	Total Cost
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Earth Dams Equal to 25 Feet and Less Than 50 Feet in Height

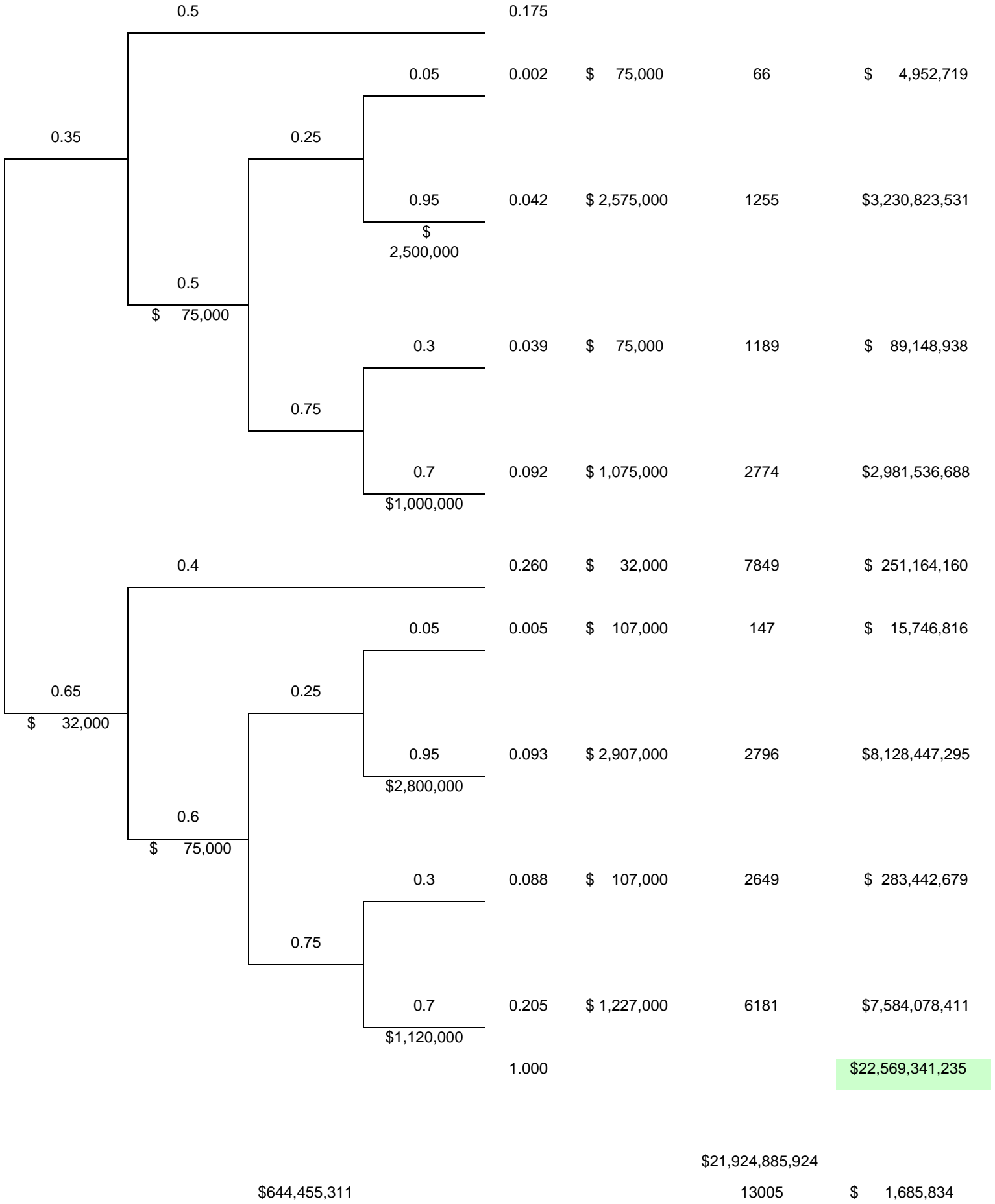
Category #3 Dams

26-50 Feet

No. of Dams

30188

Deferred Maintenance	Engineering Assessment	Hazard Class Change	Remedial Action	Fraction	Cost	No. of Dams	Total Cost
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Earth Dams Greater than 50 Feet in Height

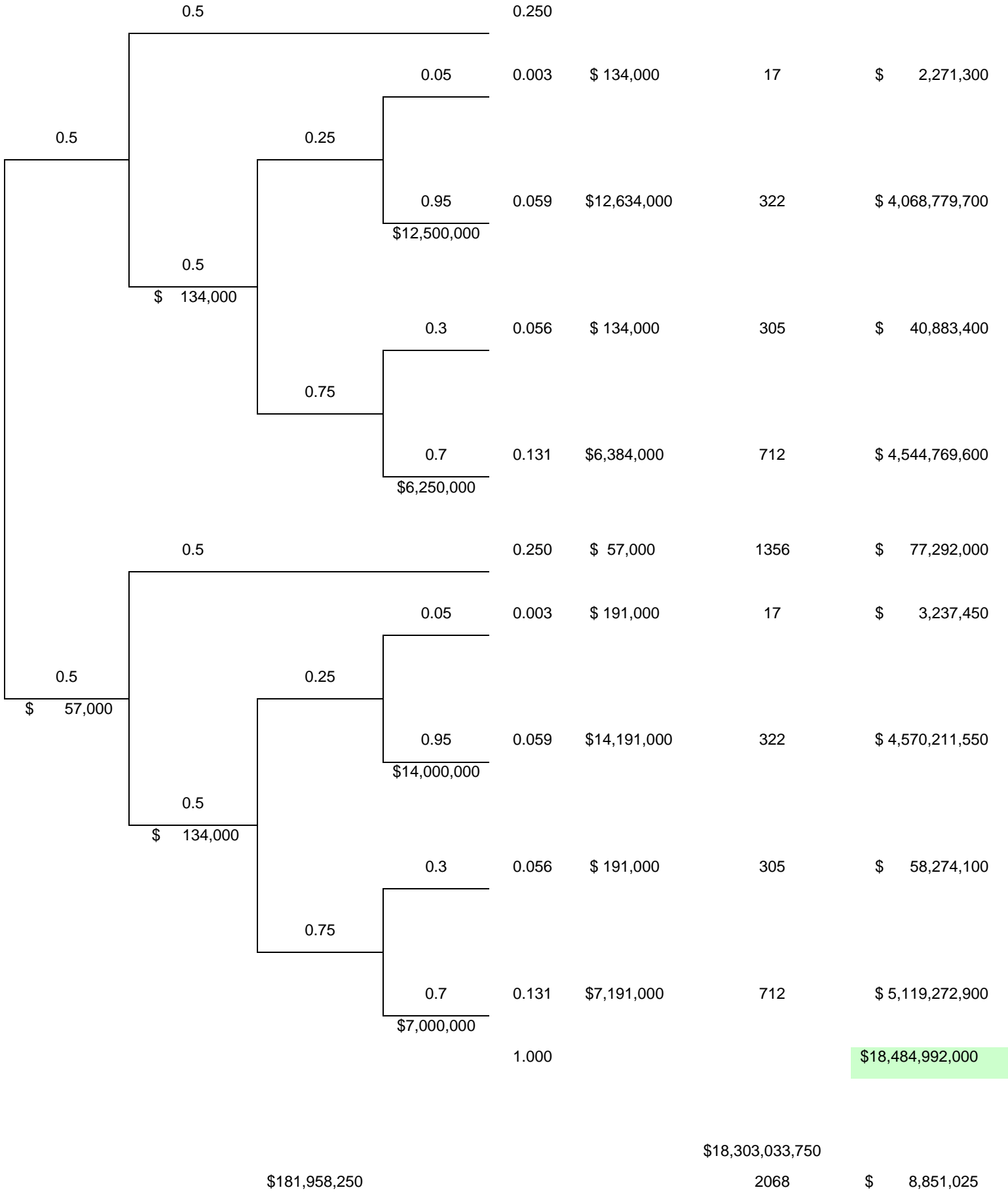
Category #4 Dams

>50

No. of Dams

5424

Deferred Maintenance	Engineering Assessment	Hazard Class Change	Remedial Action	Fraction	Cost	No. of Dams	Total Cost
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ATTACHMENT 2 – NATIONAL DAM REHABILITATION AND REPAIR ACT

HR 1770 IH

111th CONGRESS

1st Session

H. R. 1770

To amend the National Dam Safety Program Act to establish a program to provide grant assistance to States for the rehabilitation and repair of deficient dams.

IN THE HOUSE OF REPRESENTATIVES

March 26, 2009

Mr. SALAZAR (for himself, Mrs. CAPITO, and Ms. MARKEY of Colorado) introduced the following bill; which was referred to the Committee on Transportation and Infrastructure

A BILL

To amend the National Dam Safety Program Act to establish a program to provide grant assistance to States for the rehabilitation and repair of deficient dams.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the 'Dam Rehabilitation and Repair Act of 2009'.

SEC. 2. REHABILITATION AND REPAIR OF DEFICIENT DAMS.

(a) Definitions- Section 2 of the National Dam Safety Program Act (33 U.S.C. 467) is amended--

(1) by striking paragraph (3);

(2) by redesignating paragraphs (1) and (2) as paragraphs (2) and (3), respectively;

(3) by inserting before paragraph (2) (as redesignated by paragraph (2) of this subsection) the following:

`(1) ADMINISTRATOR- The term `Administrator' means the Administrator of the Federal Emergency Management Agency.';

(4) by redesignating paragraphs (4), (5), (6), (7), (8), (9), (10), (11), (12), and (13) as paragraphs (5), (6), (7), (8), (9), (10), (13), (14), (15), and (16), respectively;

(5) by inserting after paragraph (3) (as redesignated by paragraph (2) of this subsection) the following:

`(4) DEFICIENT DAM- The term `deficient dam' means a dam that the State within the boundaries of which the dam is located determines--

`(A) fails to meet minimum dam safety standards of the State; and

`(B) poses an unacceptable risk to the public.'; and

(6) by inserting after paragraph (10) (as redesignated by paragraph (4) of this subsection) the following:

`(11) PUBLICLY-OWNED DAM-

`(A) IN GENERAL- The term `publicly-owned dam' means a dam that is owned by 1 or more State agencies or governments, local governments, or municipal governments.

`(B) INCLUSIONS- The term `publicly-owned dam' includes a dam owned by a nonprofit organization that--

`(i) is established by 1 or more State, local, or municipal governments; and

`(ii) provides public benefits, such as--

`(I) local flood control districts;

`(II) regional public water utilities; and

`(III) local irrigation districts.

`(12) REHABILITATION- The term `rehabilitation' means the repair, replacement, reconstruction, or removal of a dam that is carried out to meet applicable State dam safety and security standards.'.

(b) Program for Rehabilitation and Repair of Deficient Dams- The National Dam Safety Program Act is amended by inserting after section 8 (33 U.S.C. 467f) the following:

`SEC. 8A. REHABILITATION AND REPAIR OF DEFICIENT DAMS.

`(a) Establishment of Program- The Administrator shall establish, within FEMA, a program to provide grant assistance to States for use in rehabilitation of deficient dams that are publicly-owned dams.

`(b) Award of Grants-

`(1) APPLICATION-

`(A) IN GENERAL- A State interested in receiving a grant under this section may submit to the Administrator an application for the grant.

`(B) REQUIREMENTS- An application submitted to the Administrator under this section shall be submitted at such time, be in such form, and contain such information as the Administrator may prescribe by regulation.

`(2) GRANT-

`(A) IN GENERAL- The Administrator may make a grant in accordance with this section for rehabilitation of a deficient dam to a State that submits an application for the grant in accordance with the regulations prescribed by the Administrator.

`(B) PROJECT GRANT AGREEMENT- The Administrator shall enter into a project grant agreement with the State to establish the terms of the grant and the project, including the amount of the grant.

`(3) APPLICABILITY OF REQUIREMENTS- The Administrator shall require a State receiving a grant under this section to comply with requirements applicable to contributions of Federal funds under section 611(j)(9) of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5196(j)(9)), as in effect on the date of enactment of this section, in carrying out a project funded using amounts from the grant.

`(c) Priority System- The Administrator, in consultation with the Board, shall develop a risk-based priority system for use in identifying deficient dams for which grants may be made under this section.

`(d) Allocation of Funds- The total amount of funds appropriated pursuant to subsection (h)(1) for a fiscal year shall be allocated for making grants under this section to States applying for the grants for that fiscal year as follows:

`(1) 1/3 divided equally among applying States.

`(2) 2/3 divided among applying States based on the proportion that--

`(A) the number of non-Federal publicly-owned dams that the Secretary of the Army identifies in the national inventory of dams maintained under section 6 as constituting a danger to human health and that are located within the boundaries of the State; bears to

`(B) the number of non-Federal publicly-owned dams that are so identified and that are located within the boundaries of all applying States.

`(e) Use of Funds- None of the funds provided in the form of a grant or otherwise made available under this section shall be used--

`(1) to rehabilitate a Federal dam;

`(2) to perform routine operation or maintenance of a dam;

`(3) to modify a dam to produce hydroelectric power;

`(4) to increase water supply storage capacity; or

`(5) to make any other modification to a dam that does not also improve the safety of the dam.

`(f) Cost Sharing- The Federal share of the cost of rehabilitation of a deficient dam for which a grant is made under this section may not exceed 65 percent of the cost of the rehabilitation.

`(g) Contractual Requirements-

`(1) IN GENERAL- Subject to paragraph (2), as a condition on the receipt of a grant under this section, a State that receives the grant shall require that each contract and subcontract for program management, construction management, planning studies, feasibility studies, architectural services, preliminary engineering, design, engineering, surveying, mapping, and related services entered into using funds from the grant be awarded in the same manner as a contract for architectural and engineering services is awarded under--

`(A) chapter 11 of title 40, United States Code; or

`(B) an equivalent qualifications-based requirement prescribed by the State.

`(2) NO PROPRIETARY INTEREST- A contract awarded in accordance with paragraph (1) shall not be considered to confer a proprietary interest upon the United States.

`(h) Authorization of Appropriations-

`(1) IN GENERAL- There are authorized to be appropriated to carry out this section--

`(A) \$10,000,000 for fiscal year 2010;

`(B) \$15,000,000 for fiscal year 2011;

`(C) \$25,000,000 for fiscal year 2012;

`(D) \$50,000,000 for fiscal year 2013; and

`(E) \$100,000,000 for fiscal year 2014.

`(2) STAFF- There is authorized to be appropriated to provide for the employment of such additional staff of FEMA as are necessary to carry out this section \$400,000 for each of fiscal years 2010 through 2014.

`(3) PERIOD OF AVAILABILITY- Amounts made available under this section shall remain available until expended.'

SEC. 3. RULEMAKING.

(a) Proposed Rulemaking- Not later than 90 days after the date of enactment of this Act, the Administrator of the Federal Emergency Management Agency shall issue a notice of proposed rulemaking regarding the amendments made by section 2 to the National Dam Safety Program Act (33 U.S.C. 467 et seq.).

(b) Final Rule- Not later than 120 days after the date of enactment of this Act, the Administrator of the Federal Emergency Management Agency shall promulgate a final rule regarding the amendments described in subsection (a).

END

ATTACHMENT 3 – STATE DAM LOAN/GRANT FUNDING PROGRAM SUMMARY (2008)

Repair, Abandonment or Removal Funding Programs

Does your State have in place a loan/grant program for dam owners?

Alabama:	No	
Alaska:	No	
Arizona:	Yes	Arizona: Dam Repair Fund consisting of monies appropriated by the legislature and monies collected for application and inspection fees. Owners of Unsafe Dams are eligible for grants or loans.
Arkansas:	No	
California:	Yes	-California: On occasion bond funds are available for a variety of water supply and water quality projects. The last funding available was through proposition 13, the Safe Drinking Water, Clean Water, Watershed Protection and Flood Protection Act which authorized \$1.97 billion in bonds. Dam safety improvements were made as part of these grant which in turn made improvements to conjunctive water supply.
Colorado:	Yes	Colorado: Colorado Water Conservation Board has a dam construction assistance program that provides low interest loans to dam owners for new dams and rehabilitation of existing of dams.
Connecticut:	Yes	Connecticut: Connecticut has in place a program to cost share in the repair of municipally owned dams. Funding for such dam repairs is provided by bonding from the state legislature on an as requested basis. There is no loan program or cost sharing program available for privately owned dams in the state.
Delaware:	No	
Florida:	No	
Georgia:	No	

Hawaii:	No	
Idaho:	Yes	Idaho: The state Water Resources Board can provide loans and grants to deserving owners. However, the program is NOT dedicated exclusively to dams and reservoirs, but instead includes ALL water development projects and concepts. All awards and/or loans are competitive based on perceived benefit(s) to life, property and economic improvement.
Illinois:	No	
Indiana:	Yes	Indiana: The State has a low interest flood control revolving fund loan program. By statute the loan cannot exceed \$300,000 dollars, but it is limited to only public owners.
Iowa:	No	
Kansas:	Yes	Kansas: The Kansas State Conservation Commission has a cost share rehabilitation program for watershed dams. This program includes funding for rehabilitation of dams and developing inundation maps for existing low hazard watershed dams. Priority for inundation map funding is given to watershed dams in counties where there is zoning within the mapped breach inundation areas in order to prevent a hazard classification upgrade. Fund amount is for July 1, 2008 through June 30, 2009.
Kentucky:	No	
Louisiana:	No	
Maine:	No	
Maryland:	Yes	Maryland: DRINKING WATER STATE REVOLVING LOAN FUND PROGRAM-To utilize the total financial resources of the Fund by providing low interest rate financing and other subsidies to eligible drinking water system owners while maintaining a perpetual source of capital funds for future projects. The DWSRF could finance approximately \$52 million in additional direct loans (without leveraging or transfers, and 31% allocated towards set asides annually) from capitalization grants, State match, repayments, and investment earnings between FFY 2005 and FFY 2009 IUPs. This is in addition to the \$96 million capacity on existing IUPs (1997 - 2004). This analysis takes into account existing and anticipated investment earnings, loan repayments and assumes Maryland's annual Federal Capitalization Grant of \$9.60 million per year (based

		<p>on the anticipated annual national appropriation of \$850 million) for FFY 2004 through FFY 2008. The cumulative loan capacity of the DWSRF is projected to reach \$148 million by FFY 2009.</p> <p>Water Quality Infrastructure Program, Maryland Linked Deposit Program-The Linked Deposit Program provides a low-interest source of financing for water quality capital improvements. The Program makes the loan program more accessible to private entities by utilizing the existing commercial lending community. This Linked Deposit Program is targeted to fund: agricultural best management practices to reduce water pollution; community and nonprofit non-community water system capital improvements to meet federal and State requirements; correction of failing septic systems through replacement or connection to public sewer system; repair/enhancements to existing stormwater management facilities to protect water quality; nonstructural shoreline erosion control; structural shoreline erosion control where nonstructural techniques will not provide adequate protection; wetland creation/enhancement/restoration; stream restoration/stream bank stabilization and.Brownfields/Voluntary cleanup activities. Project Selection Criteria: Project eligibility is determined by the local Soil conservation District/Natural Resource Conservation Service Office, local Health Department, or other local or State approving authority, through a project certification process. Loan application is made directly to a participating lending institution, which will determine the credit worthiness of the applicant and set loan terms and conditions. Upon a determination that the project is eligible and the loan is approved, the lending institution and the Maryland Department of the Environment enter into an investment contract that provides low interest terms to the borrower. Loan repayments are made by the borrower directly back to the lending institution. It is the sole responsibility of the borrower to obtain all necessary federal, State, and local permits for the project.</p> <p>MD Department of Natural Resources also has limited funds to assist dam owners to remove dams which no longer needed or block passage of fish and eels.</p>
Massachusetts	No	
Michigan:	No	
Minnesota:	Yes	Minnesota: Loans and grants available for publicly owned dams

		only.
Mississippi:	No	
Missouri:	No	
Montana:	Yes	Montana: Publically owned dams can receive up to \$100,000 grant, and low interest loans. Grants are competitively awarded for all infrastructure projects (including wastewater, drinking water etc). Privately owned dams have no grant options although loans are available.
Nebraska:	No	
Nevada:	No	
New Hampshire:	Yes	New Hampshire: Established under State Statute RSA 482. Rules have yet to be developed.
New Jersey:	Yes	New Jersey: This is a low interest rate dam rehabilitation loan program. Municipality must co-sign low interest rate loan for private dam owners.
New Mexico:	Yes	New Mexico: Owner must be a political subdivision of the state. Funds are not permanent and each year additional capital improvement funds are requested for dams but not always approved.
New York:	Yes	New York: Competitive reimbursement grant program for municipal dam owners
North Carolina:	No	
North Dakota:	No	North Dakota: We have a cost share program for political subdivisions of the state, not a grant program. The state will contribute a certain % of the repair or rehabilitation cost in cases of dam safety repairs. The cost share % is based on the purpose of the dam, for example a flood control project is eligible for 50% cost share, whereas a recreation project is only eligible for 33.3% cost share.
Ohio:	Yes	Ohio: The Ohio Water Development Authority has two low-interest loan programs for the repair or removal of existing dams. The Dam Safety Loan Program offers loans to local governments, and the Dam Safety Linked Deposit Program offers low-interest loans to private

		dam owners. To be eligible for these programs, the dam owner must have plans for repair or removal of the dam approved by the Division of Water and they must qualify based on their ability to repay the loan. The Linked Deposit Program is offered through private banks.
Oklahoma:	Yes	Oklahoma: Owner must be a political subdivision of the state and the reservoir is being used a source of public water supply. Grants are awarded if an emergency exists and based on a priority point system. Loans are made based on borrower's repayment comparability.
Oregon:	No	
Pennsylvania:	Yes	Pennsylvania: The state has a low interest loan program (Pennvest) for publicly owned water supplies, waste water systems and dams. The state also initiated a Growing Greener II program which can be used for dam repair or removal. There are no specific dedicated amounts for dam related work. In late 2008, Act 63 was passed by the legislature known as the H2O PA Act. This act provided grant monies through an application and ranking program to state and municipally owned unsafe high hazard dams.
Puerto Rico:	No	
Rhode Island:	No	
South Carolina:	No	
South Dakota:	No	
Tennessee:	No	
Texas:	No	
Utah:	Yes	Utah: The Utah Division of Water Resources administers a low interest loan program to assist water users in the state with water development and maintenance of water infrastructure. A grant program is also available that helps dam owners rehabilitate existing high hazard dams to meet current safety standards.
Vermont:	Yes	Vermont: Provides for loans or grants for rehabilitation or removal. Details will be established in regulations, which are yet to be developed.

Virginia:	Yes	Virginia: Virginia Dam Safety Flood Prevention and Protection Assistance Fund allows high and significant hazard dams with emergency spillway deficiencies to apply for a low interest loan not to exceed \$300,000. The dam owner must provide 10 percent matching funds. The applicant must have an approved Alteration Permit with plans and specifications approved to qualify for the funds. At this time, funds are too small to offer to Low hazard classification dams. Two dam owners applied in early 2008 and decided to not take the offer, each requesting \$300,000.								
Washington:	No									
West Virginia:	Yes	West Virginia: 2007 legislature passed bill to create revolving loan fund for deficient dams. Deficient dam means a noncoal-related dam that exhibits one or more design, maintenance, or operational problems that may adversely affect the performance of the dam over a period of time or during a major storm or other inclement weather that may cause loss of life or property; or a noncoal-related dam that otherwise fails to meet the requirements of this article. To date, program is not operational.								
Wisconsin:		<p>Wisconsin: The state has established grant programs to fund repair, reconstruction or removal of municipally owned dams and removal of small dams (including private owners) or dams that have been abandoned by their owners. These programs have not received new funding since 2001 and the majority of funds are committed to projects or have been expended. There is a current state budget proposal to refund the program at \$3 M per biennium. We will likely know the outcome of this by July 2009.</p> <p>Publicly Owned Dams:</p> <table> <tr> <td>Fund Amount:</td> <td>\$66,394,447</td> </tr> <tr> <td>Amount Committed:</td> <td>\$26,000,000</td> </tr> </table> <p>Privately Owned Dams:</p> <table> <tr> <td>Fund Amount:</td> <td>\$47,517,500</td> </tr> <tr> <td>Amount Committed:</td> <td>\$9,000,000</td> </tr> </table>	Fund Amount:	\$66,394,447	Amount Committed:	\$26,000,000	Fund Amount:	\$47,517,500	Amount Committed:	\$9,000,000
Fund Amount:	\$66,394,447									
Amount Committed:	\$26,000,000									
Fund Amount:	\$47,517,500									
Amount Committed:	\$9,000,000									
Wyoming:	No									

ATTACHMENT 4 – MODEL LAW FOR STATE SUPERVISION OF A LOW INTEREST REVOLVING DAM REHABILITATION LOAN PROGRAM

Chapter 1. Vision, Declarations and Purpose

Article 1. Vision

1000. The loss of lives, property, and environmental and cultural damage caused by dam failure floods is a matter of deep concern to the State affecting the life, health, property, and vital utility lifelines of the people. Regardless of ownership, funding must not stand in the way of safety of dams that present a public safety risk.

Article 2. The following are declared:

2000. Dams are inherently hazardous structures because of the energy that can be released by elevated stored water.

2001. Many privately owned dams in the State present public safety risks if they were to fail. Many of these privately owned dams also provide public benefit.

2002. Dam safety is an issue of growing national, regional and State importance as:

(a) Like any man-made infrastructure item, dams age.

(b) With age comes potential deterioration. Minor issues can grow into larger compounding problems. The risk of failure increases.

(c) Many dams were built before downstream areas become heavily populated. This ongoing development below dams continues to increase the risk to more lives and property.

(d) The number of dams continues to increase.

2003. Inspections alone will not make dams safe.

2004. Many privately owned dams and many local government owned dams in the State require rehabilitation, repair, or removal in order to reduce their public safety risk to areas downstream.

2005. In order to begin reducing the public safety risk downstream of dams within the State, the State Legislature hereby creates the Dam Rehabilitation Loan Program Fund, and appropriates XX million dollars as an initial appropriation to the Fund.

2006. Money in the Fund does not revert to the State general fund. The Fund is a revolving fund to be used exclusively for the purposes of this law.

2007. The State Legislature authorizes staff positions, required funding, and organizational structure, to administer the Dam Rehabilitation Loan Program.

Article 3. Purpose

3000. This law's intent is to improve downstream safety by providing a low interest revolving rehabilitation loan program so that owners of existing, private, and local government dams can obtain funding needed to reduce the public safety risk posed by their dams.

3001. The intent of this law is not to promote dams, or provide funding for new dams.

Chapter 2. Definitions

Article 1. Incorporation of other definitions

1000. Unless this law specifically states otherwise, the definitions in the Model Law for State Supervision of Dams and Reservoirs (insert actual state law citation in place of Model Law reference);are incorporated as definitions.

Article 2. Context and definitions

2000. Unless the context otherwise requires, the definitions in this chapter govern the construction of this Model Law.

2001. "Dam Rehabilitation Loan Program" means a low interest revolving dam rehabilitation loan program, created through this Statute.

2002. "Agency" means that agency, department, division, office, or other unit of State government, created, empowered, or designated by statute to be responsible for implementation, direction, or administration of this Model Law for State supervision of a low interest revolving dam rehabilitation loan program.

2003. "State Dam Safety Office" means that agency, department, division, office, or other unit of State government, created, empowered, or designated by statute to be responsible for implementation, direction, or administration of The Model Law for State supervision of safety of dams and reservoirs.

2004. "Emergency Action Plan" means a plan that identifies the area that would likely be inundated by the failure of a dam and the actions that should be taken in the event of a failure or threatening condition at the dam. The plan is usually done in conjunction with the local and regional emergency government personnel.

Chapter 3. General Provisions

Article 1. Owners' responsibilities

1000. Once a loan has been granted under this statute, the owner of a dam must have an operation and maintenance plan with written, regularly scheduled reports, so as to maintain and keep the structure and its appurtenant works in the state of repair and operating condition required by the exercise of prudence; due regard for life or property; the application of sound and accepted engineering principles; the provisions of the Model Law for State Supervision of Dams and Reservoirs and any associated rules, guidelines, or policies.

1001. As part of any rehabilitation project utilizing funds from this program the owner must have an emergency action plan developed (if one doesn't currently exist).

1002. The owner of a dam, levee, dike, or floodwall and appurtenant works shall do the following:

(a) Cooperate with the Agency's agents, engineers, and other employees in the conduct of the statute.

(b) Facilitate access to the structure or appurtenance.

(c) Furnish upon request the plans, specifications, operating and maintenance data, or other information that is pertinent to the structure, appurtenance, and loan.

Article 2. Dam Rehabilitation Loan Program

2000. The Agency shall create a Dam Rehabilitation Loan Program; or may partner with other public or private agencies or organizations to create a Dam Rehabilitation Loan Program.

2001. The Agency may participate in and obtain funds from any program created by the Federal Government for the purpose of funding dam rehabilitation.

2002. The Dam Rehabilitation Loan Program may obtain funds through partnerships with any private or public, bonding or loaning, agency or organization.

2003. The State Legislature may authorize required funding to expand the financial size of the Dam Rehabilitation Loan Program.

2004. State funding to the Dam Rehabilitation Loan Program cannot be reduced because of federal funds provided for a rehabilitation loan program.

2005. Owners of dams without taxing authority should be allowed to participate in the Dam Rehabilitation Loan Program.

2006. Complete rehabilitations are to be encouraged, but phased projects can be funded.

2007. Removal of dams as a rehabilitation alternative should be allowed.

2008. As part of the application process, owners should demonstrate the ability to appropriately operate and maintain the dam after rehabilitation is complete.

2009. Owners are allowed to partner with an individual, local agency, or organization, for purposes of the loan, and for purposes of operation and maintenance.

2010. Rehabilitation projects that are in compliance with State statute and rules, and are permitted, accepted, and approved by the State Dam Safety Office are eligible to be funded through the Dam Rehabilitation Loan Program.

2011. If a dam is exempt from State regulation, to obtain funding through the Dam Rehabilitation Loan Program, the project must adhere to State standards that relate to design, construction and provisions of this act.

2012. Costs for lake enhancement projects such as, lake dredging, sediment removal projects, or boat ramps, which do not enhance the safety of the dam, are not eligible to be funded through the Dam Rehabilitation Loan Program.

Article 3. Eligible Costs

3000. Any costs directly related to rehabilitating safety deficiencies of a dam shall be eligible to be funded through the Dam Rehabilitation Loan Program.

3001. Fees for analysis, feasibility work, alternative evaluation, and engineering design, are only eligible retroactively after construction has been initiated, or at the point that analysis has shown a dam to be in compliance.

3002. Up to 100% of rehabilitation costs for a dam may be loaned.

3003. Dam owners may use multiple programs or sources to fund the rehabilitation costs for a dam, up to 100% of rehabilitation costs.

3004. Rehabilitation costs for any dam is eligible, except for dams owned by the federal government.

3005. Any costs directly related to compliance with other laws and regulations, above the State's minimum dam safety requirements are eligible as part of an overall rehabilitation project.

3006. Any costs for State agency required fish passage is eligible if it is part of an overall rehabilitation project; but such costs are not eligible if they are not part of an overall rehabilitation project.

Chapter 4. Administrative Provisions

Article 1. Rules

1000. The Agency shall adopt administrative rules that are required to administer this statute.

Article 2. General

2000. The Agency and its agents, engineers, and other employees may, for the purposes of this Model State Law, enter upon any land or water in the State without a search warrant or liability for trespass.

2001. This statute does not create a liability for damages against the Agency, its officers, agents, and employees caused by or arising out of any of the following:

(a) The construction, maintenance, operation, or failure of a dam, or appurtenant works.

(b) The issuance and enforcement of an order or a rule issued by the Agency to carry out the Agency's duties.

2002. The Agency may take any administrative or legal action necessary for the administration of this statute.

2003. The State does not assume ownership obligations, responsibilities, or liabilities if an owner defaults on a loan.

ATTACHMENT 5: PROJECT RANKING MODEL

This is a simple ranking procedure developed by Anthony Basile of American Waterworks Service Co. (AW) to rank the rehabilitation needs of their dams. Other ranking schemes can be found in the administrative codes of states with existing programs.

Dam Summary Report Risk Assessment Criteria A ranking of the American Water Works (AW) dams has been undertaken to prioritize capital improvement projects based on risk analysis summaries. The purpose of the summary is to determine a logical method for ranking priorities of needed work on our dams. To minimize subjective thinking, this ranking was based on probabilistic theory.

Two main factors were used to define the Risk Assessment Number (RAN).

The first factor was a function of the risk involved to downstream property and persons should the dam fail. Risk values were assigned to low, moderate, and high hazard dams accordingly. The States provided these hazard classifications. The second factor was to assign a probability value to the key element of the dam identified as a deficiency in the inspection report, such as a spillway or embankment defect. To simplify matters, the single most critical defect of each dam was chosen for the calculations. A ranking of these elements and their assigned values follows, and was a function of engineering judgment based on material corrosion rates, sediment transport models, stress conditions, etc.

An importance factor was added as the third element. Dams whose failure would prevent operations of the water plant, as a result of loss of source of supply, were given values greater than one. Dams that are not being used by the Water Company were given values less than one.

Based on probability theory, the probability of an event for mutually exclusive events (events which do not influence the occurrence of the other) is simply the product of the probability of each event. Therefore, the RAN was assigned as:

$$\text{RAN} = \text{hazard class} \times \text{probability of occurrence} \times 10,000 \text{ (to eliminate the decimal)} \times \text{importance factor}$$

EXAMPLE: $2250 = .75 \text{ (high hazard)} \times .25 \text{ (most critical deficiency)} \times 10,000 \times 1.2 \text{ (critical importance)}$

The higher the RAN value, the higher is the risk. Although the assignment of individual probability values is not absolute, the relative ranking is reasonable as long as the assignment of values is done consistently to each and all the dams. It must be remembered

that the ranking is relative rather than absolute. Therefore, the RAN suggests a relative need for rehabilitation rather than an expectation of failure of the dam.

DAM STATUS RISK FACTORS

Hazard Class	Factor
Low	0.25
Moderate	0.50
High	.75
Multiple dam effect	0.90

Probability of Occurrence

Embankment Condition

General erosion	0.10
Depressions/animal burrows	0.20
Tension cracks in soil	0.25
Sloughing/sinkholes	0.30
Movement (horizontal & vertical)	0.30
Calculated unstable	0.50

Spillway Design Flood Capacity

$\frac{3}{4}$ SDF	0.25
$\frac{1}{2}$ SDF	0.50
$\frac{1}{4}$ SDF	0.75
< $\frac{1}{4}$ SDF	0.90

Concrete/Masonry Condition

Spalls/exposed rebar/exposed aggregate	0.10
Moderate to wide cracks	0.20
Noted movement	0.30
< 25% loss of section	0.25
<50% loss of section	0.50
> 50% loss of section/calculated unstable	0.75

Seepage

Clear seepage noted/clogged drain	0.10
Muddied seepage noted	0.25
Some boiling downstream	0.50
Seepage w/sinkholes	0.75
Vigorous boiling downstream	0.90

Miscellaneous

Miscellaneous minor defects noted in report	0.05
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Importance Factors

Idle/inactive dam	0.80
Normal use	1.00
Critical	1.20