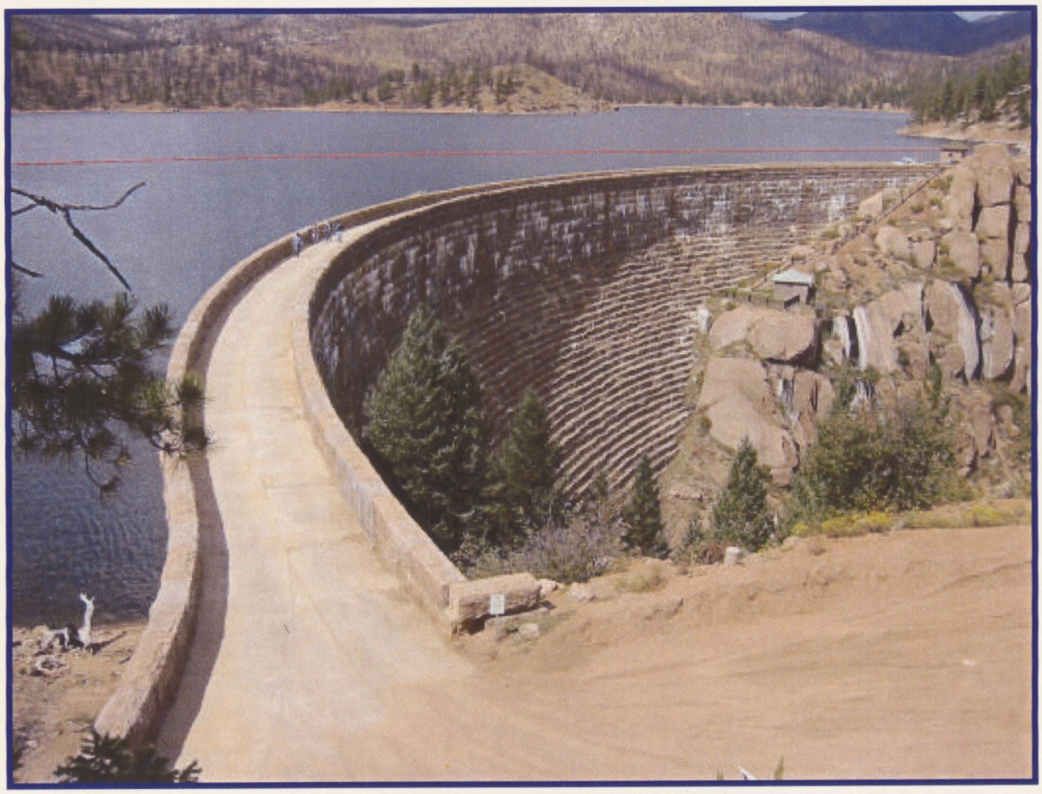
State Engineer's 21st Annual Report on Dam Safety to the Colorado General Assembly

Fiscal Year 2004-05



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STATE OF COLORADO 1876

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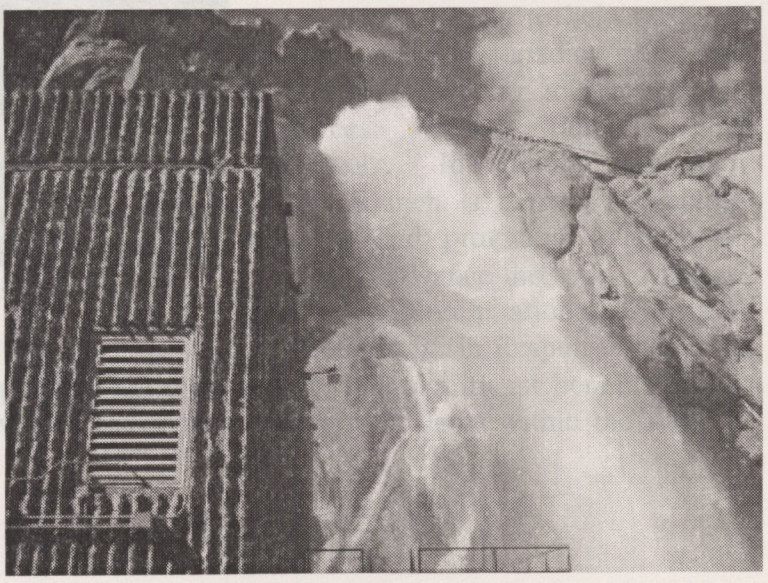
EXECUTIVE SUMMARY

The Colorado Division of Water Resources' Dam Safety Branch mission is to prevent the loss of life and property damage and protect against the loss of water supplies due to the failure of dams in Colorado. The Dam Safety Program accomplishes that mission primarily through Safety Evaluations of Existing Dams (SEED) to determine the safe storage levels of reservoirs within the state. Additional program tools include a comprehensive set of regulations, policies, and procedures for the design, construction, and maintenance of dams; the safe operation of reservoirs; and emergency preparedness planning.

The Dam Safety Program is managed by the State Engineer in accordance with Title 37, Article 87 of C.R.S. and the Livestock Water Tank Act, Title 35, Article 49 of C.R.S. The program is implemented by the State Engineer through the Dam Safety Branch and Water Division field offices. The Colorado Dam Safety Program oversees a total of about 2,900 dams with 1,886 dams of jurisdictional size. Of these, about 1,763 are non-federal dams. Of the non-federal dams, approximately 598, or about one-third of the total non-federal dams, are classified as dams that, in the event of a failure, would be expected to cause loss of life and/or significant property damage within the flood plain areas below the dams.

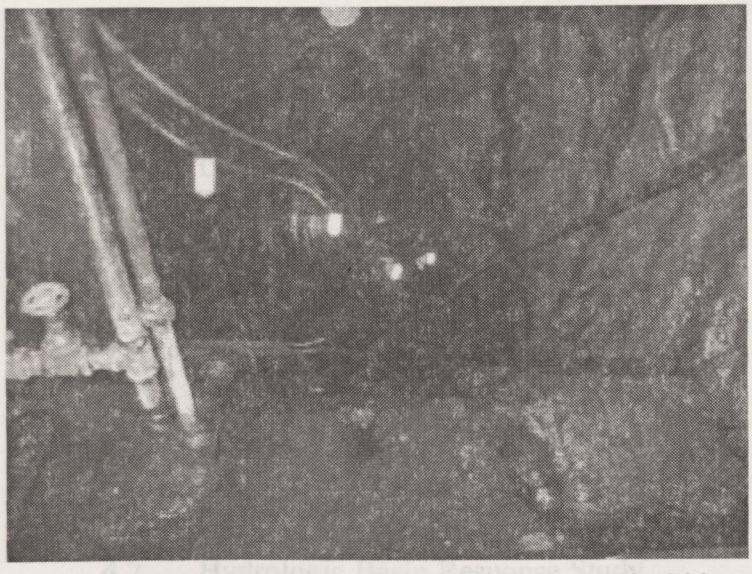
For FY 04-05, the Dam Safety Program accomplished a number of the goals and objectives identified in the past annual report. Through the diligent field observations of dam safety engineers statewide, several near-incidents were acted upon in time to diffuse potentially dangerous situations. As a direct result of these actions, no loss of life or significant property damage occurred in Colorado in the 2004-05 timeframe. This is attributed to the increased awareness and responsibility of the dam owners for their dams - including emergency preparedness planning - and to the enforcement of the regulations, policies, and procedures by our office.



Cheesman Dam Mid-Level Outlet From Outlet Building

During FY 04-05, the State Engineer's Office approved plans for new dams and plans for alteration, modification, or enlargement of existing dams. Hydrology studies were also approved for determination of the inflow design flood for spillway design. The estimated cost of construction for the submitted plans was over $38.5 million dollars.

During FY 04-05, a total of 699 dam safety inspections and 190 construction inspections were conducted for a total of 888 inspections. In addition, 122 follow-up inspections were performed. At the conclusion of the reporting period, there were 189 dams restricted from full storage due to various structural deficiencies such as significant leakage, cracking and sliding of embankments, and inadequate spillways. Total storage restricted was 134,492 acre-feet. The restrictions provide risk reduction for the public and environment until the deficiencies identified are corrected. Although many dams were repaired and removed from the restricted list within the last year, a number of dams were also added to the list during the same time period. The change in the restriction from the same time last year resulted in a slight increase in the number of dams on the restricted list while the volume of the restrictions decreased approximately 3,000 acre-feet. Approximately half of the dams on the Colorado Division of Water Resources restricted list have been on that list for ten years or longer.



Interior of Cheesman Dam Outlet Works (carved within solid granite)

The state has been able to acquire and maintain a solid group of experienced professional engineers, and has adequate statutes, regulations, policies, and procedures to implement and carry out the program.

The Dam Safety Branch continues to use risk-based tools to help evaluate and prioritize the jurisdictional dams in Colorado in order to use program resources more efficiently and effectively. In addition, the Dam Safety Branch is currently directing research and providing funding for studies to advance the state-of-the-art in Extreme Precipitation analysis and Hydrologic Basin Response modeling in Colorado. These exciting research projects are expected to yield significant benefits in the engineering analysis and dam safety evaluations of new and existing dams within the state of Colorado.

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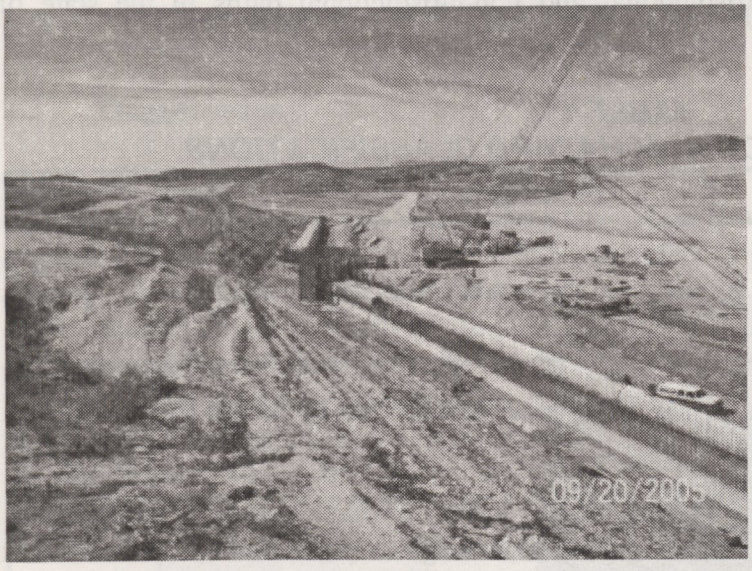
1.0 INTRODUCTION

1.1 Program Mission

The mission of the Colorado Dam Safety Program is to prevent the loss of life and property damage, determine the safe storage levels of reservoirs, and protect the state's water supplies from the failure of dams through the effective and efficient use of available resources. The program is firmly grounded in the use of periodic field observation of existing dams by highly qualified licensed professional engineers. The field observations, combined with engineering analyses form a basis for determining the safe storage levels of reservoirs within the state. Additional program tools include a comprehensive set of regulations, policies, and procedures for the design, construction, inspection, and maintenance of dams; the safe operation of reservoirs; and emergency preparedness planning. In the event a dam is found to be unsafe, the risk of adverse consequences due to failure of the dam is reduced by restricting the storage in the reservoir to a safe level. Plans for new dams in Colorado must be approved prior to being approved for construction. A comprehensive review and approval process ensures the highest possible standards are met with regard to public safety. The program is managed by the State Engineer in accordance with Title 37, Article 87 of C.R.S. and the Livestock Water Tank Act, Title 35, Article 49 of C.R.S. The "Rules and Regulations for Dam Safety and Dam Construction" and "Standard Specifications for Livestock Water Tanks and Erosion Control Dams" establish the procedures and requirements of the State Engineer in the implementation of these statutes.



Outlet works construction at Rueter-Hess Dam

1.2 Report Purpose

This report is submitted in compliance with Section 37-87-114.4, C.R.S., concerning the dam safety activities of the State Engineer and the Colorado Division of Water Resources relating to Sections 37-87-105 to 37-87-114, C.R.S.

2.0 PROGRAM OVERVIEW

2.1 Goals and Objectives

The Dam Safety Program is responsible for the approximately 2,900 "jurisdictional" and "non-jurisdictional" dams within the state. To effectively and efficiently allocate available resources, the Dam Safety Branch concentrates on "jurisdictional" dams and reservoirs as defined in Section 37-87-105, C.R.S. Dams that are greater than ten feet high as measured at the spillway, that impound a reservoir with twenty acres or more in surface area, or one hundred acre-feet or more in reservoir capacity at the high water line qualify as Jurisdictional. Both jurisdictional and non-jurisdictional dams are classified as to the estimated downstream consequences as a result of failure of the dam in the absence of flooding conditions. Table 1 describes the hazard classifications currently in use for jurisdictional and non-jurisdictional dams in the state of Colorado.

TABLE 1
STATE OF COLORADO DAM HAZARD CLASSIFICATIONS

Classification	Description
1 (High)	Loss of human life is expected in the event of failure of the dam.
2 (Moderate)	Significant damage is expected to occur, but no loss of human life is expected.
3 (Low)	Loss of human life is not expected and damage to structures and public facilities is not expected.
4 (NPH)	No loss of human life is expected and damage will occur only to the dam owner's property.

Note: High, Moderate, Low, and NPH (No Public Hazard) classification nomenclature is currently being proposed to take the place of the number system currently in use.

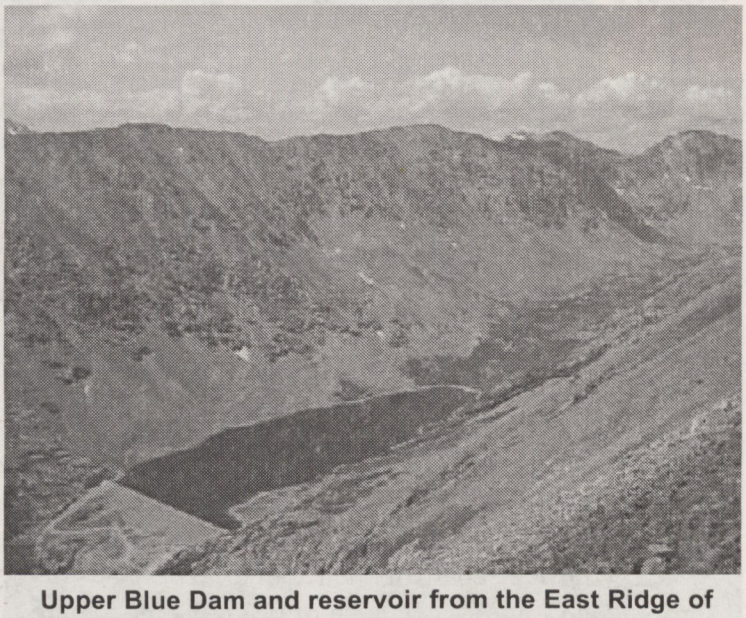
Identified goals of the program are as follows:

1. In order to protect the public, the Dam Safety Branch shall determine the amount of water that is safe to impound in reservoirs of the state.
2. In order to protect the public from failure of dams, the Dam Safety Branch shall review and recommend approval of plans and specification for the construction, modification, and repairs of dams, in accordance with the Rules and Regulations for Dam Safety and Dam Construction, implemented on September 30, 1988.

3. To reduce the risk of dam failure and adverse consequences and to more efficiently and effectively use the available resources within the program, the Dam Safety Branch shall implement and utilize a risk-based approach to prioritize the jurisdictional dams within the program.
4. In order to improve the functions of the Branch and to meet the public information needs, the Dam Safety Branch shall maintain a data information system.
5. In order to improve the technical proficiency of the Branch, the Division of Water Resources shall provide for training and professional development of the Branch personnel.
6. In order to improve the Dam Safety Program, to participate in the development of national policies on dam safety, and to take advantage of the continuing education and information available, the state shall be a full voting member of the Association of State Dam Safety Officials (ASDSO).

2.2 Organization

The State Engineer, through the Dam Safety Branch and the Division Engineers' offices, executes the Colorado Dam Safety Program. The Branch is overseen by the Deputy State Engineer and consists of a branch chief, dam safety engineers, and design review engineers. Starting in the mid-1980s the Dam Safety Branch was decentralized from the Denver office to enable a statewide presence. Dam safety engineers were transferred from the Denver office to the Division offices throughout the state. Dam safety engineers were positioned in Greeley, Pueblo, Durango, Montrose, Glenwood Springs, and Steamboat Springs. This allowed a more even distribution of dams to dam safety engineers and allowed the engineers to be in close proximity to the dams they are assigned to regulate. The process of relocating dam safety engineers to the Division offices took until approximately the mid 1990s. After several years of working with the newly decentralized Dam Safety Branch, the need for additional strategic positioning of dam safety engineers within the state was identified. Between 2003 and 2005, two dam safety engineers were relocated to field offices in Grand Junction and Colorado Springs. Figure 1 shows the current distribution of dam safety and design review engineers within the state.



Upper Blue Dam and reservoir from the East Ridge of Quandary Peak

The dam safety engineers are responsible for execution of the program in their geographic area. The design review engineers and branch chief have responsibilities throughout the state and are

located in Denver. A summary of the branch organization and personnel is included in Appendix A.

Interagency coordination occurs as necessary. A Memorandum of Understanding has been executed with the Division of Wildlife (DOW) regarding the responsibilities of each agency in carrying out the safety inspection of DOW dams. The DOW is making safety inspections of their Class 3 (low hazard) dams.

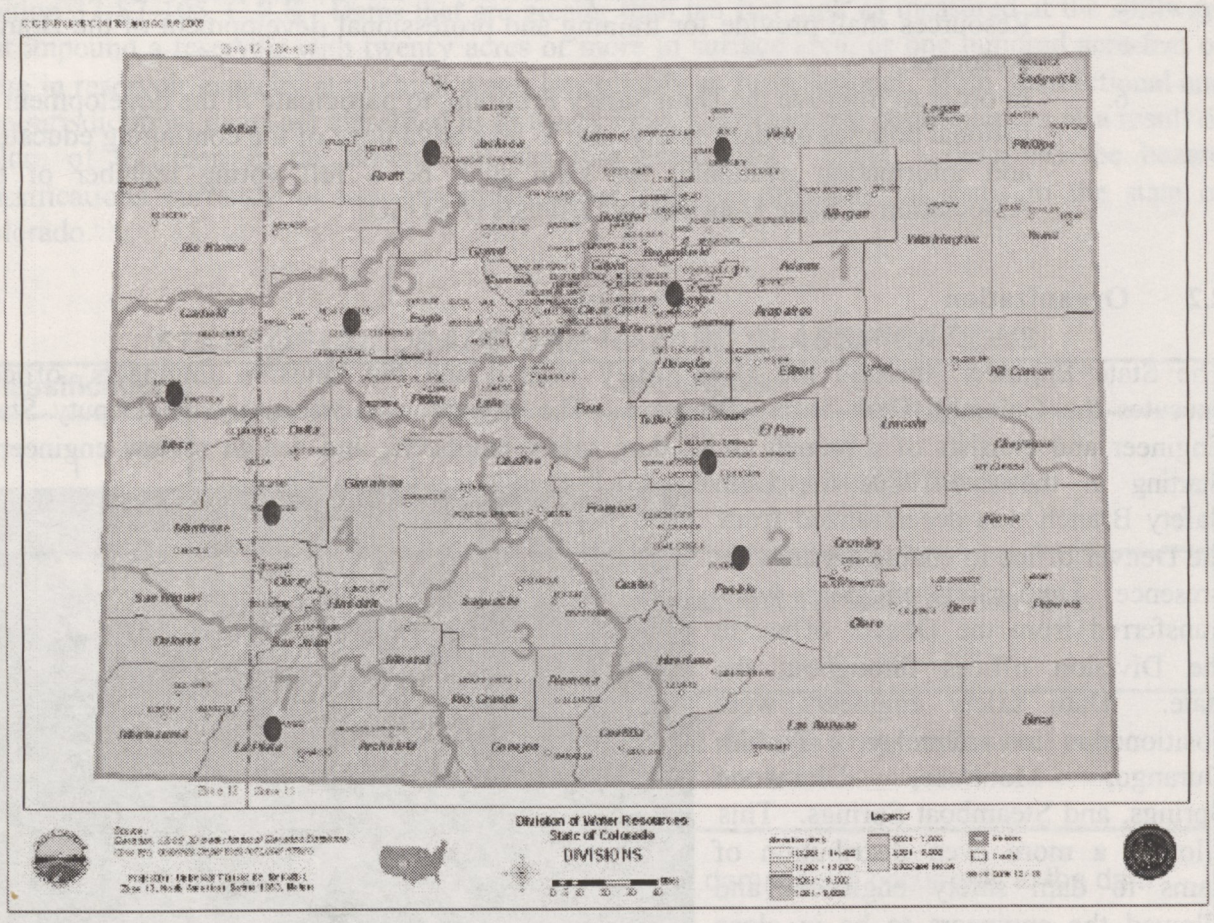


Figure 1 – Map of Colorado Showing Locations of Dam Safety Branch Personnel.

The Colorado Water Conservation Board (CWCB) makes its construction fund available to assist owners with the repair of their dams. The Dam Safety Branch closely coordinates the review, approval, and final acceptance of CWCB funded dam construction and/or rehabilitation projects.

2.3 Roles and Responsibilities

The branch chief has program-wide responsibility for formulating the goals of the program, recommending policies for implementing the rules and regulations, preparing procedures for carrying out the policies, providing technical guidelines for conduct of the work, communication, training, and coordination. The branch chief directly supervises the Design Review and Construction Inspection Unit activities.

The dam safety engineers' principal duties are to:

1. Respond to emergency situations
2. Conduct dam safety field inspections of existing dams which provide the basis for determining the safe storage level of the reservoir
3. Review the adequacy of spillways under the rules
4. Set the safe storage level of reservoirs based in part on the results of field inspections and spillway adequacy reviews
5. Review and recommend changes to dam Hazard Classifications
6. Enforce the requirement for emergency planning
7. Assist dam owners in developing their Emergency Preparedness Plans (EPP)
8. Provide design review and construction inspection of repairs and alternations when necessary
9. Investigate complaints on the safety of dams.

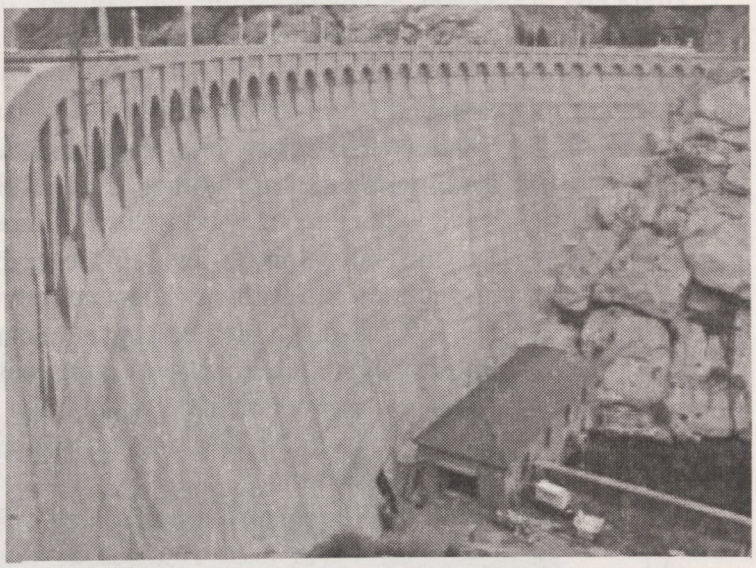
Safety Evaluations of Existing Dams field inspections are performed periodically with the frequency of inspections determined by the hazard classification. Class 1 (High Hazard) dams are inspected annually, Class 2 (Moderate Hazard) dams are inspected every other year, Class 3 (Low Hazard) dams are inspected every 6 years, and class 4 (No Public Hazard) dams do not have a set inspection frequency. Class 4 dams are typically only inspected at the owner's request or in the event of a specific event such as a complaint or for a hazard classification review.

Dam safety engineers also investigate dams constructed in violation of Section 37-87-105 (1) and (4), C.R.S., and conduct training on the inspection of dams for Division personnel, dam owners, interested agencies, engineers, and the public. In addition, they review and approve Livestock Water-tank and Erosion Control Dam applications and do other related work as assigned.

Internal inspection of the low-level outlet works at Cheesman Dam

The design review engineer's primary duties are to review the design and construction documents for the construction, alteration, modification, repair, and enlargement of reservoirs or dams in accordance with Section 37-87-105, C.R.S. This involves a comprehensive engineering reviews of the design and construction documents prepared by registered professional engineers experienced in the design and construction of dams. The reviews determine the adequacy of the design, compliance with the applicable state statutes, Rules and Regulations for Dam Safety and Dam Construction, and industry standards, and recommend approval of the project for construction to the State Engineer

once all conditions have been met. The design review engineers also perform periodic inspections of dam construction projects to assure compliance with the approved plans and specifications and to evaluate proposed change orders. Upon successful completion of the projects, the design review engineer recommends issuance of orders to allow water storage. Design review engineers also provide dam related technical assistance to other state agencies such as the Department of Health, the Division of Wildlife, Oil and Gas Conservation Commission, the Division of Minerals and Geology, the state's joint review process with the Department of Natural Resources, and the Division Engineers' offices, and perform other related work as required.



Eleven-Mile Canyon Dam and valve house looking north from the right abutment.

2.4 Summary of Colorado Dams

Currently, the Dam Safety Branch oversees a total of approximately 2,900 dams within Colorado. Of these, 1,886 are considered jurisdictional dams, of which about 1,763 are non-federal dams. Of the non-federal dams, approximately 598, or about one-third of the total non-federal dams in Colorado, are classified as dams that, in the event of a failure, would be expected to cause loss of life and/or significant property damage.

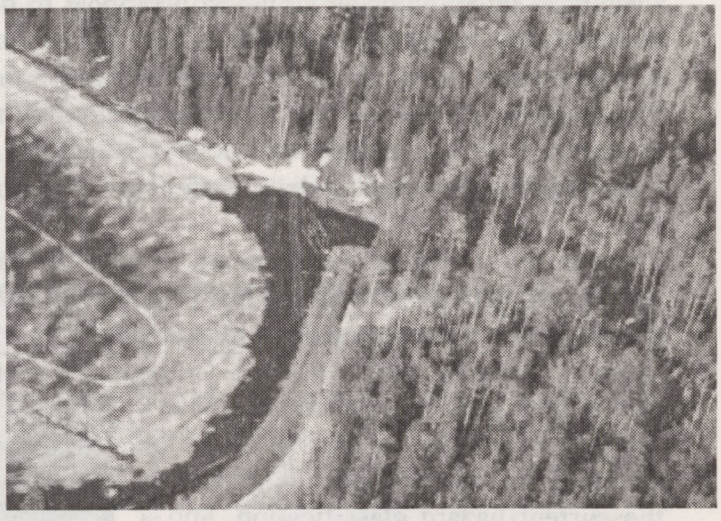
Table 2 summarizes the distribution of dams by water division and hazard classification in Colorado.

TABLE 2
SUMMARY OF DAMS BY HAZARD CLASSIFICATION AND WATER DIVISION

HAZARD CLASS	WATER DIVISION							FEDERAL DAMS	TOTAL
	1	2	3	4	5	6	7		
1	146	42	12	31	39	13	16	42	**341**
2	121	49	15	37	44	13	20	13	**312**
3	425	97	28	147	106	107	50	54	**1014**
4	40	101	18	5	23	12	6	14	**219**
TOTALS	**732**	**289**	**73**	**220**	**212**	**145**	**92**	**123**	**1886**

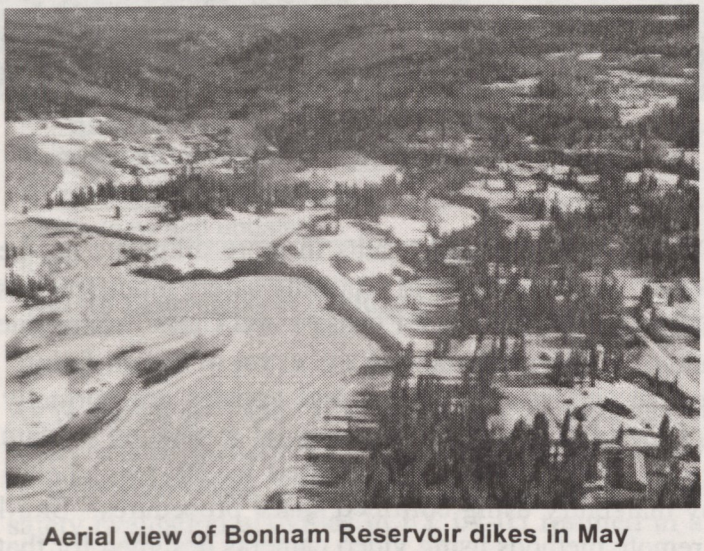
3.0 PROGRAM ACCOMPLISHMENTS

3.1 General



Aerial view of Bull Creek #5 Dam embankment and spillway in May 2005

The strategic placement of dam safety engineers throughout the state paid dividends this year. As an example, at the beginning of May 2005, the snowpack on the Grand Mesa was at approximately 150 percent of average. With a multitude of inaccessible dams located within the Grand Mesa watershed, questions regarding their ability to handle the highest runoff in several years arose. Calling upon working relationships with the Colorado Division of Wildlife (DOW), arrange-ments were made to perform an aerial survey of the Grand Mesa using a DOW fixed-wing aircraft. The aerial survey allowed information to be quickly gathered from an otherwise inaccessible region. Two dam safety engineers flew with the DOW pilot to perform the survey. The condition of several known, questionable, dams and many others was quickly determined. A third dam safety engineer worked on the ground to provide dam owners and downstream county's emergency managers with the survey information. Positive working relationships were established and an effective information exchange resulted. The aerial survey revealed that several potentially hazardous situations were developing. This early notification allowed the use of alternative modes of transportation (snowmobiles) to access the specific dam sites and diffuse the situations identified, effectively eliminating the hazards before further complications could develop. A second aerial survey performed at the end of May confirmed that potentially hazardous conditions had been neutralized.



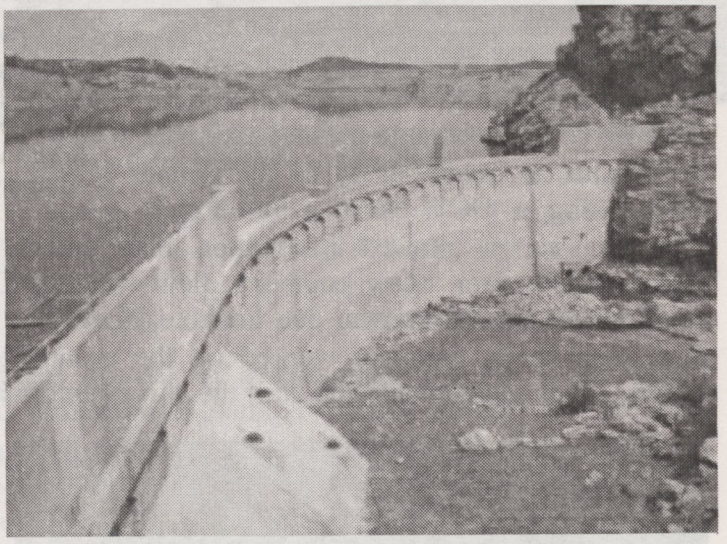
Aerial view of Bonham Reservoir dikes in May

The permanent positioning of dam safety engineers throughout the major drainage basins of the state allows these types of observations and regional relationships to be developed. The result is an overall reduction in the risk from dam failure emergencies to the residents of the entire state. Additionally, there is no extra cost to the program or the state when unique situations such as those described above develop. The engineers are already there and handling these situations becomes a routine part of the job.

3.2 Dam Safety Inspections

Each dam safety engineer's highest priority is to perform periodic field safety inspections of the dams in their territory of responsibility. These inspections are also often referred to as "Safety Evaluations of Existing Dams" or SEED inspections. Dams rarely fail without first showing visible signs of distress, which when detected by a trained eye can be the difference between a catastrophic failure and prompt corrective action. Regular visual observation is, therefore, the most important tool available to each dam safety engineer.

The statutes specify that dam safety inspections consist not only of field inspections of the dam and appurtenant structures, but also include the review of previous inspection reports, drawings, and periodic monitoring reports provided by dam owners.



Tarryall Dam with full reservoir behind following construction of required dam safety improvements.

The review portion of each dam safety inspection includes an evaluation of the adequacy of the spillway, a review of the current hazard classification, and a review of the Emergency Preparedness Plan (Class 1 and 2 dams only). Spillways for all dams are required to be able to pass the appropriate inflow design flood. The determination of the appropriate inflow design flood for a given dam is based on the size and hazard classification of the dam. The hazard classification review accounts for changes in the development of the flood plain below the dam. Recent suburban development below once rural dams may result in the potential for increased property damage or likely loss of life in the event of a dam failure. An increased hazard classification results in more diligence on the part of the dam safety engineer and dam owner, and may result in requiring safety modifications to the dam. Emergency Preparedness Plans (EPP) are required for Class 1 and Class 2 dams due to the increased potential for loss of life and/or property damage in the event of a dam failure. EPPs must be kept up to date to be effective and yearly reviews and updates are normally appropriate. Periodic internal inspection of the outlet works and an annual evaluation of dam instrumentation monitoring data are also part of the workload as required by the regulations. Large diameter outlets can be inspected by man-entry using confined space procedures. Small diameter outlets are typically inspected by remote methods using video cameras designed for that purpose. The video inspection of outlets is the responsibility of the dam owner, with review of the videotape or DVD provided being performed by the dam safety engineers.

The findings of the dam safety inspection are documented in a report that rates the condition of the dam and appurtenant structures based on the field observations and document reviews. A copy of the Dam Safety Inspection Report Form is shown in Appendix B. The overall condition

of the dam and reservoir is rated as satisfactory, conditionally satisfactory, or unsatisfactory (unsafe) for full storage and a recommendation is made for the safe storage level of the reservoir. The report also identifies repair and maintenance work the owner should perform to extend the useful life of the structure through normal annual activities. For items requiring more than a normal level of maintenance, and any engineering and monitoring requirements that are deemed necessary to assure the safety of the dam, the dam safety engineer may require the owner hire a Colorado licensed professional engineer to design and direct the work. Table 3 shows a summary of the state wide Safety Evaluation of Existing Dams activities for the report period.

TABLE 3
SAFETY EVALUATION OF EXISTING DAMS ACTIVITIES SUMMARY 04-05

Activity	Dam Hazard Classification					Total
	Class 1	Class 2	Class 3	Class 4	Other	
Inspections/Site Visits						
Dam Safety	263	167	166	5	16	617
Interim Dam Safety	0	59	22	0	0	81
Follow-up	42	13	58	5	4	122
Outlet Works	16	4	3	0	0	23
Federal Dams (non-FERC)	1	1	1	0	0	3
FERC Dams	1	0	0	0	0	1
Other	20	13	13	3	6	55
Reviews						
Hydrologic Studies	15	2	6	0	0	23
Stability Analyses	1	1	0	0	0	2
NJ/ECD/LSWT Dam Applications	18	1	97	26	0	142
Outlet Inspection Reports	6	0	1	0	0	7
Federal Reports	2	0	0	0	0	2
FERC Reports	2	0	0	0	0	2
Monitoring Reports	30	5	6	0	0	41
Monitoring Data Evaluations	34	2	1	0	0	37
EPPs (new and updated)	57	15	5	0	0	77
Other	10	2	14	0	2	28
Hazard Classification Evaluation	4	4	4	2	0	14

As is shown in Table 3, the dam safety engineers collectively conduct about 800 to 900 dam safety related inspections each year. The dam safety engineers also spend a significant amount of time performing various reviews and analyses also shown in Table 3. The combined dam safety evaluation activities in FY 04-05 resulted in a relative stable workload performed by the dam safety staff.

As is shown in Table 2, over half of the jurisdictional dams in Colorado fall within the Class 3 (Low Hazard) classification and are, therefore, only inspected every six years. In order to maintain a high level of confidence regarding the condition of these dams between regular inspections, water commissioners within the various water districts are often tasked to perform inspection of Class 3 dams. Dam safety engineers and water commissioners both spend much of

their time working in the field. This cooperative working arrangement allows efficient use of the water commissioners' field time when they are near jurisdictional dams as part of their regular water administration duties. They are also dispatched as needed to make specific observations and report on the condition of dams at critical times, such as during runoff season or following storms. A sample water commissioner inspection report form is shown in Appendix C. Dam safety engineers review the reports and observations of the water commissioners to determine if additional work is warranted or necessary on their part. Efficient use of the water commissioners' field time and observational abilities allows the Dam Safety Branch to allocate this important resource to maintain a consistent level of public safety at all times.

Mesa Creek #1 Dam spillway during spring runoff

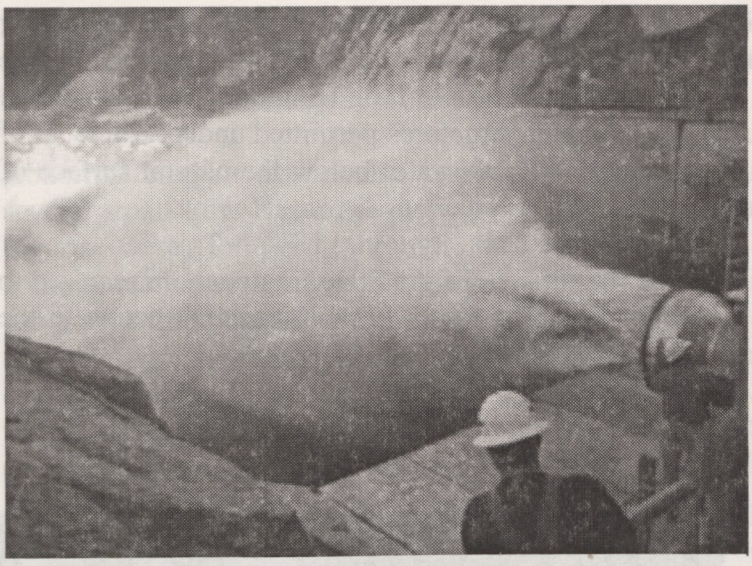
For inspections of federally-owned and FERC-regulated dams that the State Engineer's Office does not typically participate in, the reports prepared by the federal agencies are received and reviewed in accordance with Memoranda of Understanding (MOU) between the Dam Safety Branch and the various federal agencies.

3.3 Design Review and Construction Inspection

A summary of the activities related to Design Review and Construction inspection during FY 2004-05, is shown in Table 4.

TABLE 4
DESIGN REVIEW AND CONSTRUCTION ACTIVITIES SUMMARY 04-05

Activity	Dam Hazard Classification					Total
	Class 1	Class 2	Class 3	Class 4	Other	
Reviews						
Design (new/enlarge)	5	0	3	0	0	8
Design (repair/modification)	22	15	18	0	0	55
Construction Activities						
Pre-Construction Meetings	12	1	3	3	0	19
Construction Inspections	109	21	52	8	0	190
Construction Change Orders	51	3	6	7	0	67
Final Construction Acceptance	17	6	8	0	0	31
Other	10	1	1	0	1	13



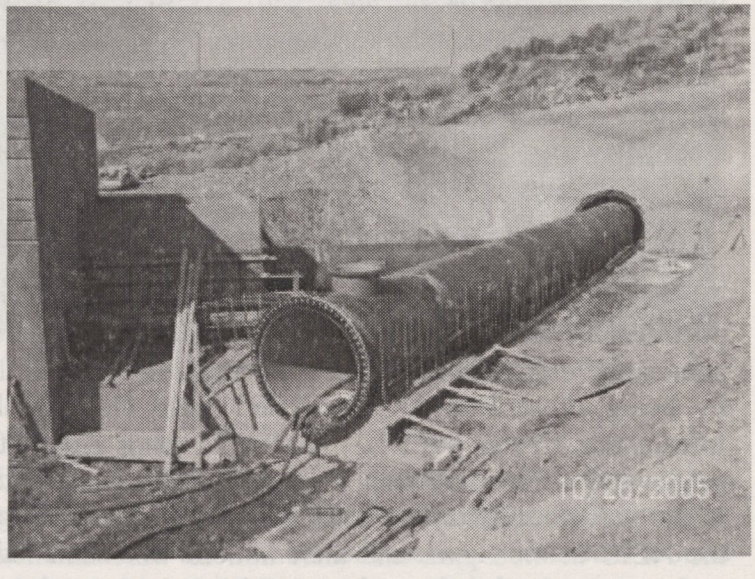
Testing of the 30-inch Fixed-Cone Ring Jet valve at the Eleven-Mile Canyon Dam Outlet Valve Replacement project.

As is shown, the State Engineer's Office approved plans for eight new dams and 55 plans for alteration, modification, or enlargement. The estimated cost of construction for the approved plans was $38,865,630.31, and $55,721.59 was collected for the examination and filing of the submitted plans.

A complete listing of the plans submited for review and approval are contained in Appendix C. In order to expedite the approval of repair plans for dams, the dam safety engineers located in the division offices review plans and specifications and perform the construction inspections on selected projects. In addition, two third-party reviews of the plans and specifications were performed in FY 04-05. This enables the owners to repair or construct their dams sooner by shortening the review time. The State Engineer provides review and approval of plans and specifications performed by third parties.

Construction inspections are important to assure that the approved plans are being followed and to assure changed conditions encountered during construction do not jeopardize the safety of the design. The construction site visits are typically preceded by a review of the file and history of performance. In addition, coordination with the owner, owner's engineer, division staff, and other interested parties is made so they also have an opportunity to take part in the inspection.

Upon completion of construction, the owner's design engineer submits copies of the "As-Constructed" plans showing any changes made during construction. These plans are reviewed by the engineer who monitored the construction for completeness before being accepted for filing. The superseded plans are disposed and the "AS-CONSTRUCTED" plans serve as the public record as required by the statutes.



New outlet tunnel and piping at the Elkhead Creek Dam Rehabilitation Project.

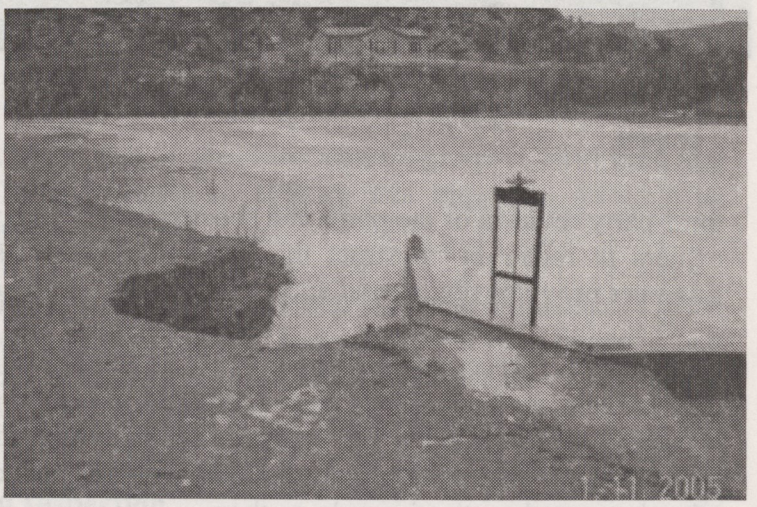
Section 37-87-114.5, C.R.S., exempts certain structures from the State

Engineer's approval. These are structures not designed or operated for the purposes of storing water, and include: mill tailing impoundments permitted under Article 32 or Article 33 of title 34, C.R.S. (Minerals or Coal Mines), uranium mill tailing and liquid impoundment structures permitted under Article 11 of Title 25 of C.R.S., siltation structures permitted under Article 33 of Title 34, C.R.S. (Coal Mines), and structures that only store water below the natural surface of the ground.

Owners of small dams that do not fall under the jurisdiction of the State Engineer are required to submit a Notice of Intent to Construct a Nonjurisdictional Water Impoundment Structure to the State Engineer prior to beginning construction under Section 37-87-125, C.R.S.

3.4 Dam Safety Incidents

No emergency incidents resulting in property damage or personal injury occurred during the reporting period. However, as is typical, a number of potentially serious dam safety problems were reported and tracked until the potential danger had passed without incident.



Piping failure in progress at Sierra Pinyon Dam, an NJ structure located in Division 5.

As is not unusual, some areas of the state entered the spring runoff season with above-average snowpack, increasing the danger of flooding and the potential for dam failure. This year, the Grand Mesa area had a snowpack approximately 150 percent of normal at the beginning of May. As was previously discussed, the condition of several dams was closely tracked and western slope emergency managers were made aware of the conditions. Emergency personnel and dam safety engineers shared emergency communication equipment (short wave radios) until the potential for hazard conditions had passed.

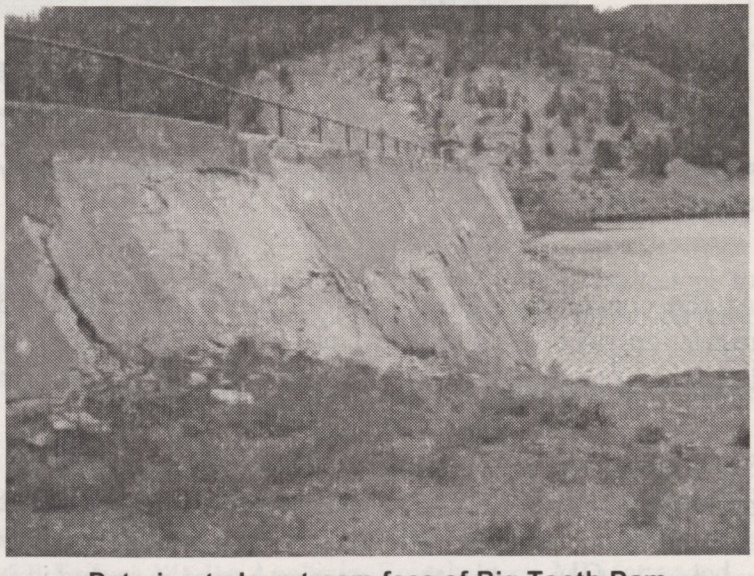
The southern and southwestern portions of the state are the most seismically active and the potential for earthquake induced damage to dams is, therefore, the highest in those areas. The dam safety engineers responsible for those areas track the small earthquakes that occur regularly by being subscribers to the United State Geological Survey (USGS) National Earthquake Information Center (NEIC). The NEIC sends emails to subscribers whenever their equipment senses and locates an event. Such was the case on August 10, 2005, when a Moment Magnitude event of 4.9 occurred near the Colorado-New Mexico state line. The earthquake was sensed by the NEIC at 4:08 p.m. and alert notices were emailed to subscribers at 4:27 p.m. The alert notices contained information on the latitude and longitude and approximate depth of the epicenter of the earthquake. Dam safety engineers used that information to quickly assess the potential for damage to dams located near the quake. In this particular case, no damage was

reported but the alert system worked well. The alerts for these small earthquakes provide the opportunity for dam safety engineers to perform "drills" that fine-tune the system that would be used in the event of a larger, more damaging event.

Abnormal rainfall events also resulted in several near-incidents this year. Near failures of several small Low Hazard dams were reported to the Dam Safety Branch during the year. The reports were followed through on, and provided good exercises of, the emergency communication system without having serious consequences. In the case of the piping failure of the non-jurisdictional, No Public Hazard, Sierra Pinyon Dam located in Water Division 5, the failure progressed slowly, allowing emergency personnel to be alerted and the situation to be closely monitored. In addition, back-analysis of the failure allowed the dam safety engineer in that area to gain confidence in the computer modeling tools used to predict dam failures. The exercise will have great value for predicting the possible extent of future, potentially more serious events, and allow quick action to remove residents of the state from harms way.

3.5 Reservoir Storage Restrictions

If the dam safety inspection finds that the overall conditions are unsafe, an order is written by the State Engineer restricting the storage of the reservoir to a safe level. Restriction letters are accompanied by orders to rehabilitate the dam to make it safe for full storage or to breach the dam. In the event the owner fails to comply with an order to make the dam safe, a breach order is issued to remove the hazard created by the dam and reservoir. If the findings are conditionally satisfactory, full storage is recommended contingent on appropriate monitoring being provided by the owner. In the event that conditions of any dam or reservoir are so unsafe as to not permit the time to issue or enforce a restriction, or a dam is threatened by a large flood, the State Engineer may immediately employ remedial measures to protect the public safety. An emergency dam repair cash fund is provided under the CWCB construction fund per Section 37-87-122.5, C.R.S.



Deteriorated upstream face of Big Tooth Dam

At the conclusion of the reporting period, there were 189 dams restricted from full storage due to various structural deficiencies such as significant leakage, cracking and sliding of embankments, and inadequate spillways. Figure 2 shows a chart of the number of reservoirs restricted around the state by hazard classification.

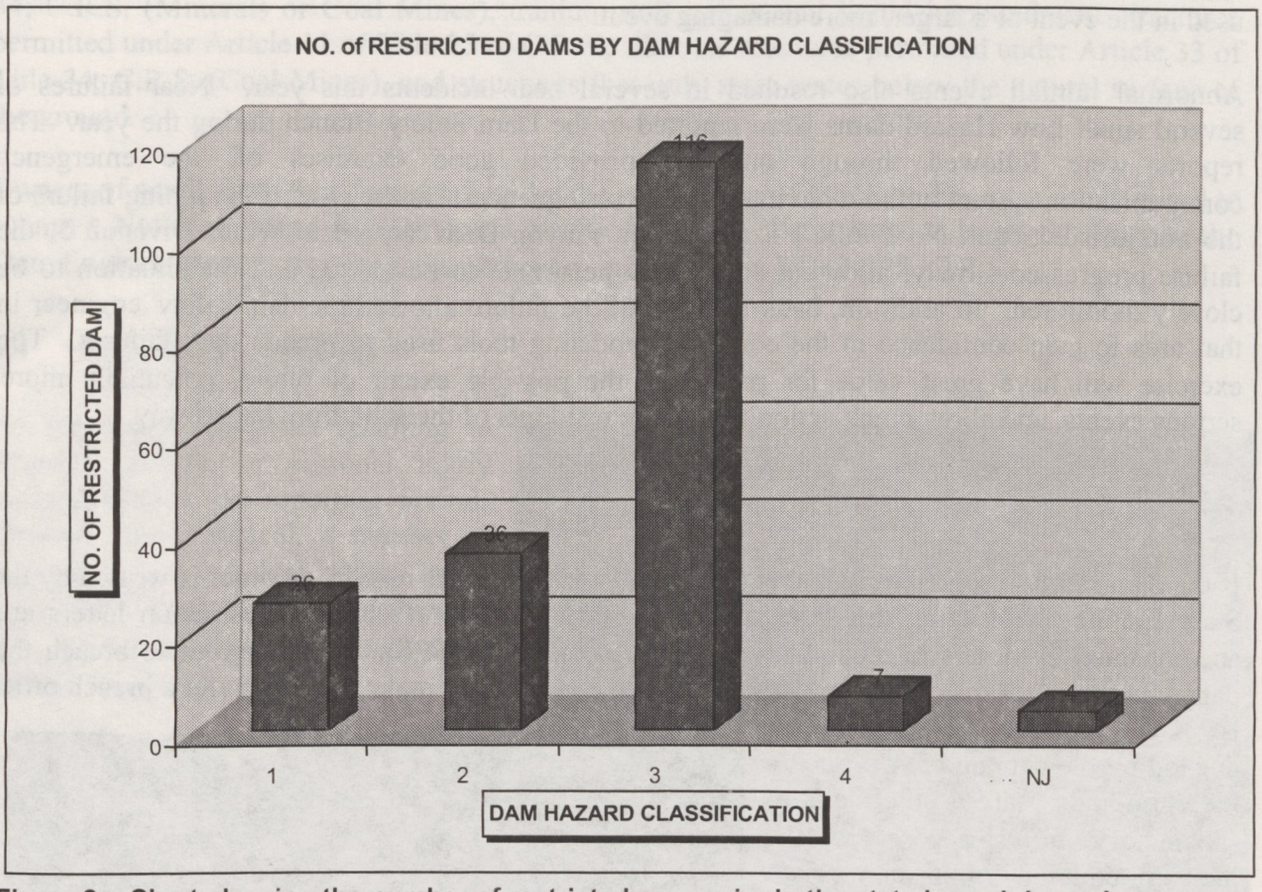


Figure 2 – Chart showing the number of restricted reservoirs in the state in each hazard classification.

At the conclusion of the reporting period, the total volume of storage lost due to storage restrictions was 134,492 acre-feet. Figure 3 presents a chart of the volume of reservoir storage lost to dam restrictions around the state in each of the hazard classifications.

Storage restrictions on dams provides risk reduction for the public and environment until the problems are corrected. The owners are responsible for following the restricted operating levels and the restrictions are enforced by the Division Engineers. A complete list of the restricted reservoirs at the end of the reporting period is included in Appendix E. Although many dams were repaired and removed from the restricted list within the last year, a number of dams were also added to the list during the same time period. The change in the restriction from the same time last year resulted in a slight increase in the number of dams on the restricted list while the volume of the restrictions decreased by approximately 3,000 acre-feet.

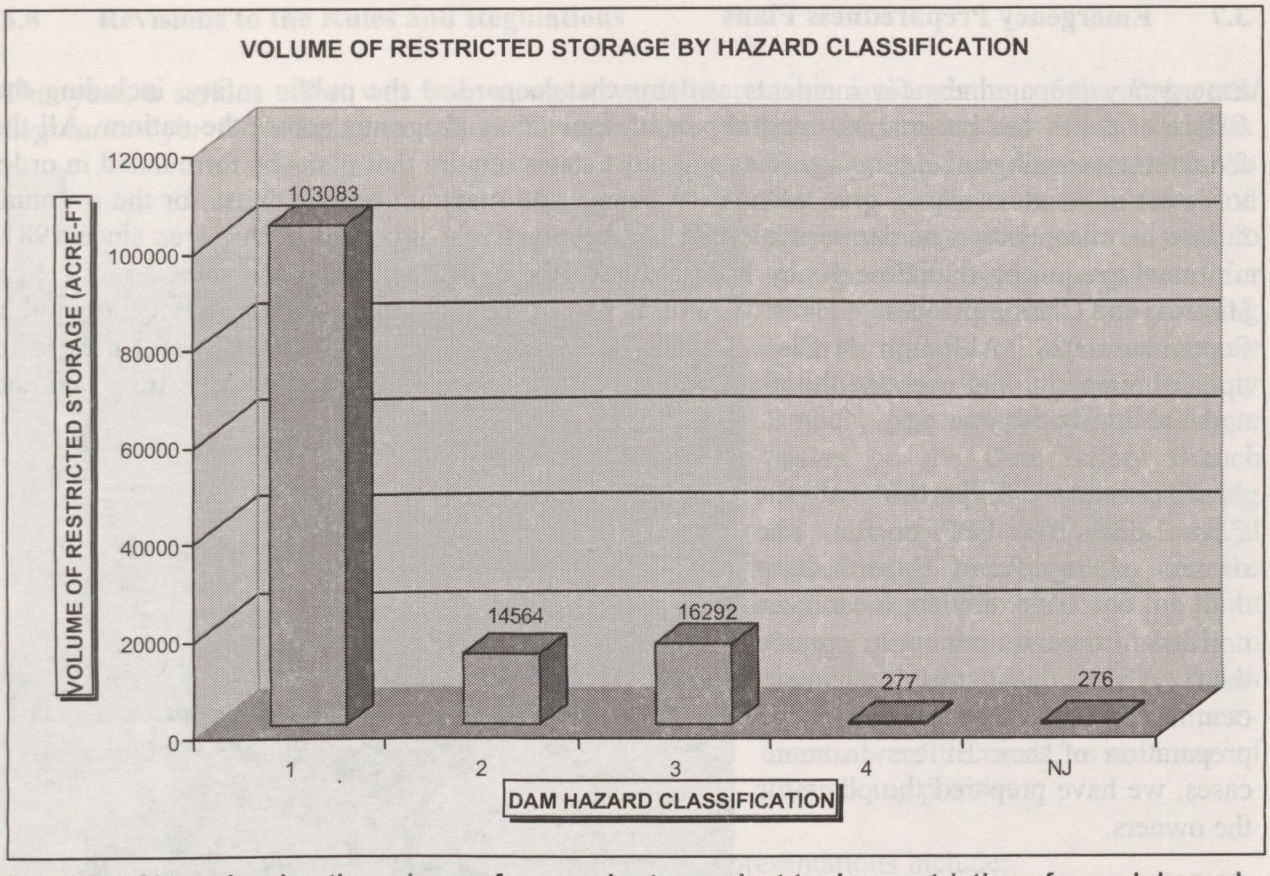


Figure 3 – Chart showing the volume of reservoir storage lost to dam restrictions for each hazard classification.

3.6 Staff Training

A critical element in the Dam Safety Program is the continued training of our personnel to maintain a high level of technical competency, to keep up with changing technology, to develop additional management and communication skills, and to keep abreast of changes in the development of dam safety programs across the country. The following training opportunities were achieved this year:

1. HEC-RAS/HEC-HMS Training with Art Miller of Penn State University, Denver, CO (attended by 9 dam safety engineers);
2. FEMA Workshop on Potential Failure Modes Analysis, Emmitsburg, MD (attended by 2 dam safety engineers);
3. ASCE Earthquake Induced Ground Motion Technical Seminar, Washington, D.C. (attended by 1 dam safety engineer);
4. ASDSO Western Regional Conference, Santa Fe, NM (attended by 2 dam safety engineers);
5. ASDSO Annual Conference, Orlando, FL (attended by 3 dam safety engineers);
6. ASDSO Advanced Technical Seminar on Dam Failure Analysis, Salt Lake City, UT (attended by 3 dam safety engineers)

3.7 Emergency Preparedness Plans

Emergency preparedness for incidents at dams that jeopardize the public safety, including the failure of dams, has become an integral part of dam safety programs across the nation. All the federal dam owning/regulating agencies and most states require that plans be formulated in order to detect incidents at dams, give adequate warning, and maintain preparedness for the eventual failure or misoperation of dams. Colorado has been actively involved in this area since 1981, ultimately requiring that Emergency Preparedness Plans (EPP) be prepared for Class 1 (High Hazard) and Class 2 (Moderate Hazard) dams as part of the regulations for dam safety adopted in September 1988. Although all Class 1 dams have such a plan, much work is still needed to update, maintain, and exercise the plans annually. Approximately 77 EPPs were reviewed and updated during the year.

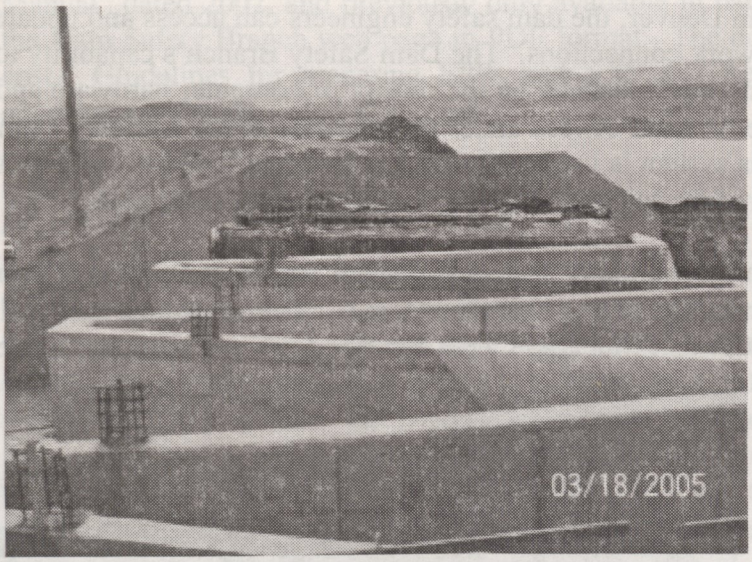
Approximately 98 percent of the Class 2 dams have EPPs on file. The owners of Significant Hazard dams that do not have a plan have been notified of the requirement to prepare them. The dam safety engineers continue to assist dam owners in the preparation of their EPPs. In some cases, we have prepared the plans for the owners.

Sierra Pinyon Dam after being breached by a piping failure.

During the fall of this year, in the wake of questions surrounding the emergency preparedness for late summer hurricanes in the Gulf Coast region, concentrated efforts were made to contact owners to initiate updating of EPPs. It is hoped that the national attention focused on the failure of levees in the New Orleans Parishes can be used as an incentive for owners to be truly prepared for emergency situations at their dams. During the preparation of this report in early December 2005, another notable dam failure made the national news. Forty-two year old Taum Sauk Dam in southeast Missouri failed under cover of night, releasing a devastating flood wave. Miraculously, no loss of life occurred, in part due to activation of the dam's emergency preparedness plan. This recent example will also be used in yearly winter dam owner training programs to emphasize the real possibility for emergency situations to develop, and the real benefits of preparing, for those situations.

3.8 Revisions to the Rules and Regulations

This year, a serious effort was been made toward the revision and updating of the *Rules and Regulations for Dam Safety and Dam Construction*, (Rules) which were last revised in 1988.



New Labyrinth spillway under construction at Blunn Dam.

The Deputy State Engineer took the first step in the revision process and presented those proposed revisions to all the dam safety engineers for review and comment. Following several months of vigorous review and discussion within the Dam Safety Branch, the proposed rules were posted on the Dam Safety Branch web site for public comment. During the winter of 2004-05, several presentations were made to the engineering communities on the Front Range and the western slope to describe the proposed Rule revisions and elicit comments. Many comments were received, with most of them being positive.

The key changes to the Rules as described in the public presentations include:

1. Elimination of the Intermediate dam size
2. Revision and updating (to National Standards) dam hazard classification nomenclature
3. Revisions to the methodology for determining the Inflow Design Flood and spillway sizing
4. Reduction of Probable Maximum Precipitation (PMP) due to elevation effects
5. General update and clean-up

Based on comments from consulting engineers on the Front Range, several consultant-lead committees were formed to take a closer look at updating specific sections of the rules. Committees for Geotechncial Engineering, Concrete Dam Engineering and Engineering Geology were formed to address specific areas of the Rules. In the fall of 2005, committees provided their comments to the Dam Safety Branch for consideration and possible inclusion into the new Rules. This process of open review and comment has resulted in positive communication between the dam owners, their engineers and the State Dam Safety Regulators. This communication has allowed all to agree that the safety of general public is of paramount concern when discussing the operation and regulation of dams in Colorado.

Additionally, the internal and public review processes brought out several shortcomings in the state-of-the-art of meteorology and hydrology as related generally to dam safety and specifically to spillway sizing. As a result, two special projects were initiated by the Dam Safety Branch to advance the art of the practice to the direct benefit of the water users of the state of Colorado. Those special projects are described in more detail in the "Special Studies" section of this report.

3.9 Dam Safety Data Management Systems

The dams database (DAMS) has been updated and upgraded this fiscal year. While the main database is kept on a computer server in Denver, the dam safety engineers can access and update the data for their divisions through network connections. The Dam Safety Branch's capability to maintain the database and analyze dams was enhanced by the receipt of computer hardware and software for the Denver office and the division offices under the auspices of the National Dam Safety Program Assistance grants. This system is used to update the National Inventory of Dams (NATDAM or NID) periodically when requested by the US Army Corps of Engineers.

During the past several years, a program of digitally scanning all dam construction drawings on file in the Dam Safety Branch archives in Denver was conducted. This year, the scanned documents were combined with IBM Content Manager Client for Windows software and made into the DAM CONSTRUCTION DRAWINGS database. The new database allows Dam Safety Engineers located throughout the state to access all the dam construction drawings available in the main storage archive in Denver. The database can be searched by DAMID or dam name and all construction drawings associated with those identifiers are displayed. The digital files reside in a .TIF format and can be printed at the remote locations for quick and easy analysis, once only available with paper drawings at the Denver office. This database is proving to be invaluable when performing dam safety inspection reviews and updating dam files in the Division and field offices. Due to concerns for infrastructure security, access to the Dam Construction Drawings database is limited to authorized Dam Safety Branch personnel only.

Core trench fill and chimney drain installation at Rueter-Hess Dam.

3.10 Publications/Internet

In a major step this year, a number of new and revised publications were made available on the Dam Safety web page at http://water.state.co.us/damsafety/dams.asp. The documents are in a variety of common formats including Microsoft Word and Adobe Acrobat PDF. Previously available documents include the 1988 Rules and Regulations, Project Review Guide, application forms, sample plans, Livestock and Erosion Control Dam Permits, and Notice to Construct a Nonjurisdictional Water Impoundment Structure.

The "Guide to Construction and Administration of Dams in Colorado" was updated and revised this year. The brochure contains general information on requirements for approval of plans, water rights, financing, liability, insurance, Emergency Preparedness Plans, statutes, publications, and Division Engineer and Water Court addresses. In 2005, the "Dam Safety Manual" dated 2002, and previously only available in paper copy for a small fee, was placed on the Dam Safety Branch web page in PDF format. The document can now be downloaded at no cost. Guidelines for preparing EPPs and a Project Review Guide for submitting plans for approval are also provided at no cost.

3.11 Risk-Based Approach

As described in previous annual reports, in the late 1990s the Dam Safety Branch embarked on a program to utilized Risk-Based methods to rank dams according to potential failure modes and consequences. An Intergovernmental Agreement between the Bureau of Reclamation (USBR) and the Dam Safety Branch was issued to allow the USBR to revise their Risk-Based Profiling System (RBPS) to meet the needs of the Colorado Dam Safety program. The goal of the Colorado RBPS program was to develop a relatively simple (to the user) software tool to quickly rank the relative condition of Class 1 (High Hazard) and Class 2 (Moderate Hazard) dams in the state. The rankings would then be used to more efficiently allocate resources to those dams determined to present the greatest risk to public safety.

The upstream face of Manitou Dam during the Fall annual inspection.

After several iterations of evaluating prototype software, in the summer of 2005, a RPBS software tool suitable for use by the Dam Safety Branch was delivered. Since the software was delivered at a time when safety evaluation of existing dam field inspections were at their peak, the tool was temporarily shelved. More recently, a commitment was made by all dam safety engineers to have RPBS rankings for the Class 1 and 2 dams in their areas of responsibility no later than March 1, 2006. Those ranking will be an important tool for the dam safety engineers as they develop schedules and priorities for the 2005-06 inspection season.

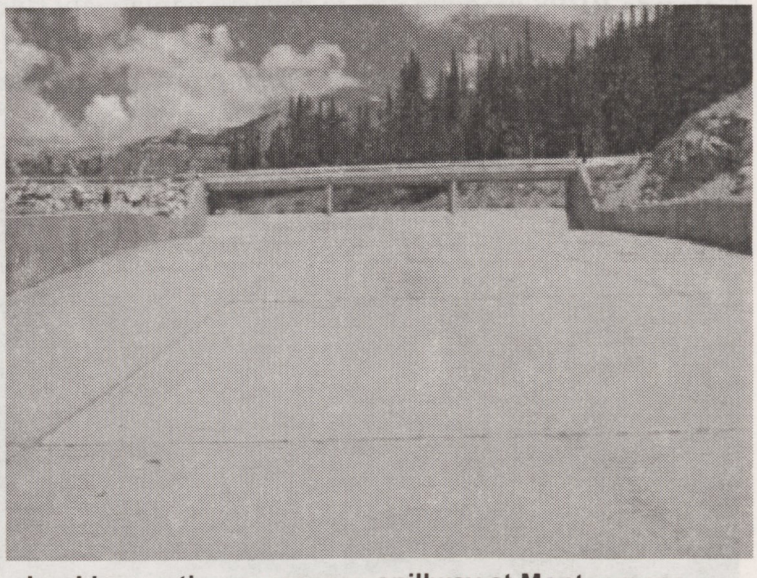
Once the Dam Safety Engineers become familiar with the RPBS tool, additional application of the Risk-Based methodologies, including increased implementation of Failure Modes and Consequence Evaluations (FMCE), will be pursued.

4.0 SPECIAL STUDIES

4.1 Extreme Precipitation Analysis Tools

The hydrologic evaluation of spillways on dams located above elevation 7,500 feet has been on hold for a number of years. The hold status is predicated by uncertainties in the existing tools and methodologies available to determine the Probable Maximum Precipitation (PMP) in high altitude watersheds in the state. Although long considered a factor, the real effects of terrain and 14,000-foot mountains on the tools used to predict and quantify extreme precipitation events has not been wholly understood or accounted for by the commonly available tools or methods, most of which are nearly 40 years old. It is believed that a more accurate estimate of the probable maximum precipitation in the mountainous area could save millions of dollars in the construction of spillways for dams.

Between 1997 and 2002, under the direction of the state and a selected technical review group, the Department of Atmospheric Science at Colorado State University (CSU) studied new methods of estimating extreme precipitation with a goal to develop concepts of how extreme precipitation varies with elevation in Colorado. One of the objectives of the study was to provide a more accurate portrayal of the maximum estimated precipitation in the mountainous areas. The draft final report was submitted by CSU on July 29, 2002, and the recommendations of the study indicated that additional research, data collection, and analyses were required in order to develop a better model to more accurately estimate extreme precipitation events within Colorado. The conclusions of the study were disappointing to the state and the technical review group in that the research group was unable to provide a tool or methodology that could estimate extreme precipitation within the mountainous regions of the state.



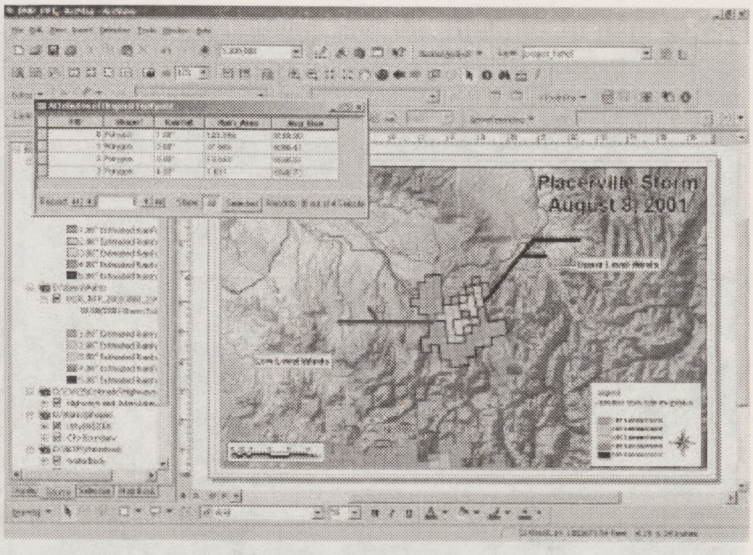
Looking up the emergency spillway at Montgomery Dam.

Between August 2002 and the winter of 2004-05, the technological limitations and potential alternatives to address the ongoing extreme precipitation concerns were discussed and debated with the Dam Safety Branch. An evaluation of approximately fifteen state-of-the-art "Site-Specific PMP Studies" performed in the past ten years was also performed. The site-specific PMP studies are not widely available due to their relatively high cost. Based on those discussions, meetings, and evaluations, a methodology was drafted to reduce the estimates of extreme precipitation as a function of elevation. This draft methodology became the basis for proposed revisions to the hydrology section of the Rules. As was previously discussed, the proposed

Rules were and presented at several public forums. During those forums, some discussion of the proposed PMP percentage reductions for elevation occurred, mostly among the hydrometerological community. The discussion was informative and mostly validated the methodology upon with the proposed PMP reductions were based.

As occurred with the geotechnical and concrete dam engineers in response to the public discussion or the proposed Rules, the meteorological community also came forward to present additional comments. In the summer of 2005, discussions began between the Dam Safety Branch and consulting hydrometerologists regarding the use of Geographic Information System (GIS) technology to solve the long-standing extreme precipitation dilemma. Based upon those discussions, in the fall of 2005, a proposal was developed to provide an Extreme Precipitation Analysis Tool (EPAT) for use in dam safety and rehabilitation studies within specific regions of the state.

The EPAT would be based upon a commonly available GIS software platform and utilize existing National Weather Service weather databases, as well as the Colorado extreme weather database developed as part of the previously mentioned CSU study. The EPAT tool will be designed to allow staff of the Dam Safety Branch to conduct such studies in-house and form the basis for evaluating the hydrologic adequacy of dams in the specified regions without an elevation limit. Additionally, the EPAT tool would make start-of-the-art hydro-meterological studies affordable and, therefore, available to many if not all the state of Colorado dam owners.



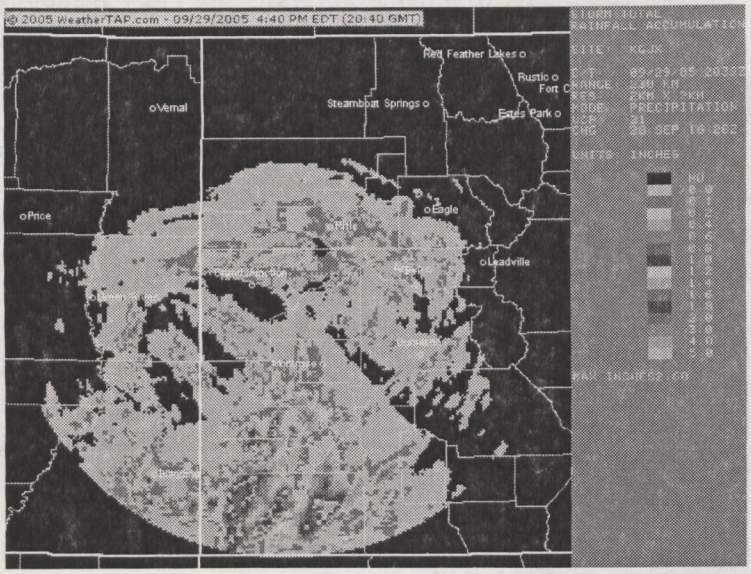
Typical screen from an ArcView based GIS analysis of an Extreme Precipitation event.

The EPAT proposal was accepted in the fall of 2005 and will be funded by the Dam Safety Branch NDSP grant and the Colorado Water Conservation Board (CWCB). The tool will be developed for various regions within the state starting on the western slope. The development of the first tool is expected to be delivered to the Dam Safety Branch for testing in the spring of 2006.

This is an exciting proposal to advance the state-of-the-practice of hydrology and hydrometeorology in the state of Colorado, and there is guarded optimism that this will solve a long-standing problem with the use of HMR based PMP as required by the Rules.

4.2 Hydrologic Basin Response Study

The determination of spillway adequacy is based upon the development of an Inflow Design Flood (IDF) for the watershed above a given dam. As was discussed in Section 4.1 above, the analysis of spillway adequacy for dams within much of the state has been on hold for some time due to questions regarding estimates of extreme precipitation. A second part of the development of an IDF has to do with how the watershed reacts to the extreme precipitation event. Many "Basin Response Factors" can effect how much precipitation (water) from a given magnitude event actually "runs off" and needs to be safely handled by the spillway and passed through the reservoir to prevent overtopping the dam. As with the methodologies used for estimating extreme precipitation, the methods of estimating basin response factors used in determining the IDF are based on past research and have not been updated in over 40 years. Additionally, in many cases the empirically based response factors are based on studies performed in other states, making their application within Colorado questionable.



Typical radar precipitation data file used by the Extreme Precipitation Analysis Tool (EPAT).

The problems associated with choosing appropriate basin response factors for Colorado watersheds have long been known within the Dam Safety Branch. As with the extreme precipitation dilemma, there are large cost implications associated with spillways in Colorado as a direct result of estimating basin response factors.

During the spring of 2005, efforts were begun to solve this problem and provide more accuracy in choosing basin response factors and determining IDF's. A nationally recognized consulting hydrologist was retained to study the problem of hydrologic basin response specifically in Colorado. The goals of the study were developed by the Dam Safety Branch and generally include investigation and documentation of the use of data and information available to estimate watershed parameters for use in IDF studies. The scope of the study also includes the development of guidelines and procedures that when used by engineers and hydrologists with appropriate training and relevant experience, will produce consistent and reasonable IDF hydrographs throughout the state.

The study is being performed under the direction and review of a select group of dam safety engineers with expertise in hydrology. The study has been ongoing since the summer of 2005 and the study schedule indicates Colorado specific basin response guidelines and procedures will be available for use in late 2006.

5.0 COORDINATION WITH NATIONAL DAM SAFETY PROGRAMS

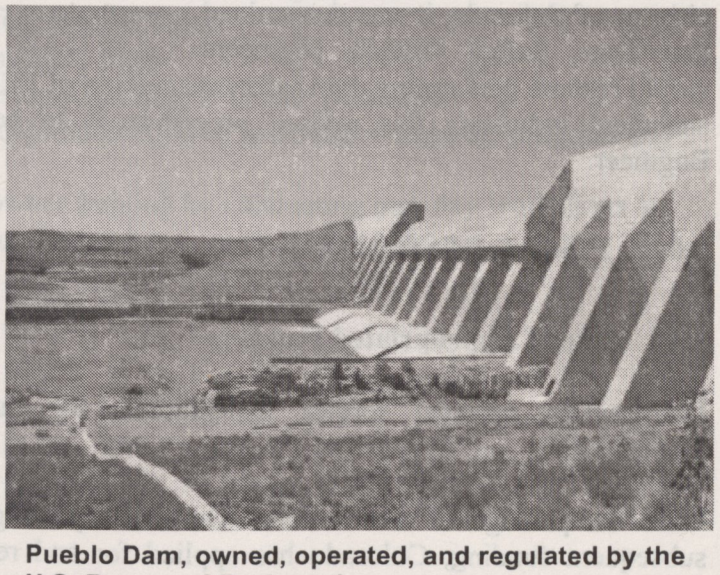
5.1 Association of State Dam Safety Officials

All of the dam safety engineers in the Dam Safety Branch are members of the Association of State Dam Safety Officials (ASDSO) and actively participate in its programs, presenting papers, serving on task groups and committees, and taking advantage of ASDSO-sponsored training opportunities. The purpose of ASDSO is to provide a forum for the exchange of ideas and experiences on dam safety issues, foster interstate cooperation, provide information and assistance to dam safety programs, provide representation of state interests before Congress and federal agencies for dam safety, and to improve the efficiency and effectiveness of state dam safety programs. Mr. Jack Byers, Deputy State Engineer, is the state's representative to the ASDSO, and was recently appointed to the National Dam Safety Review Board.

Procedures have been implemented to begin reporting incidents and the findings of dam safety inspections where orders have been issued to make modifications for safety reasons. Incidents are reported to the Center for the Performance of Dams at Stanford University, in Palo Alto, California. This is a national program that has been developed by ASDSO and the Federal Emergency Management Agency (FEMA) for the accumulation of data for the improvement of design and safety evaluations of dams nationwide.

5.2 Federal Dam Safety Programs

5.2.1 General - Routine inspections of federal dams by dam safety engineers have been curtailed in accordance with a legislative audit recommendation. The branch, however, will participate in the evaluation of the safety of some federal dams for special issues and performance problem evaluations, in accordance with the procedure for obtaining approval to participate in these inspections. Less than about ten hours were spent this fiscal year participating in these safety inspections at a cost of less than $450.



Pueblo Dam, owned, operated, and regulated by the U.S. Bureau of Reclamation.

5.2.2 Memoranda of Understanding - Memorandums of Understanding (MOU) have been executed with the U.S. Bureau of Reclamation (USBR), the U.S. Bureau of Land Management, and the Air Force Academy (AFA) relating to dam safety activities in Colorado. An MOU is also in development for the Fort Carson Army installation. The MOUs provide for the exchange of safety related information of dams under each agency's jurisdiction. An MOU is also being updated with the U.S. Forest Service, Rocky Mountain Region, to provide coordination of mutual responsibilities for dam safety and their

Travel Management Plan for the National Forests. This is necessary to provide access to private dams located within the forests. MOUs are being pursued with the other federal agencies such as the U.S. Army Corps of Engineers (USCOE) and the Federal Energy Regulatory Commission (FERC) to assure that the dams under their jurisdiction are being maintained in a safe condition and to coordinate activities and exchange of information and data.

5.2.3 Federal Energy Regulatory Commission – In the past, the Branch has performed safety inspections of dams that are also regulated by the Federal Energy Regulatory Commission (FERC). In accordance with an agreement (since a formal MOU was not completed) with them, they were to furnish copies of their reports for branch records. More recently, the branch had curtailed participation in FERC regulated dams in accordance with a state of Colorado internal audit. However, during a recent review of the agreement and procedures for administration of FERC regulated dams, the need for a change in the current policy was identified. It was determined that the Dam Safety Branch does not regularly receive copies of FERC safety inspection reports. Further, it was clarified that unlike USBR and USCOE dams, the FERC does not own the dams they regulate and, in most cases, the dams are owned by Colorado based entities. To ensure the safety of the citizens of Colorado, it was determined that Dam Safety Branch engineers would resume performing dam safety inspection of FERC regulated dams in Colorado. A policy statement indicating this revised procedure is to be developed and approved by the State Engineer.

Downstream slope of Rampart Dam, a 220 foot-tall earth dam.

6.0 FISCAL RESPONSIBILITY

6.1 Use of Appropriated Funds

Dam safety personal service expenditures for fiscal year 2004-05 were approximately $1,500,000.

With the passage of the National Dam Safety Program Act (NDSP), PL 104-303, and its subsequent funding, Colorado has applied for and received assistance grants each year since 1998. An additional grant was approved for 2005. These funds were used to provide advanced training to the Dam Safety Branch personnel in the fields of dam safety and risk analysis. Additional training is provided under the technical seminar provisions of the Act. The grant funds are also used to acquire emergency communication equipment, upgrade computers, and

purchase engineering computer software programs and other equipment. Future grants may be available each year under the Act, subject to appropriations.

6.2 Receipt of Funds Generated by Filing Fees

Fees collected by the State Engineer and deposited in the General Fund for dam safety amounted to $55,721.59 for filing plans and specifications during the period.

7.0 ENFORCEMENT ORDERS AND PROCEEDINGS

No enforcement orders on dam safety were issued during the period.

8.0 LEGISLATION

No legislation affecting dam safety was enacted during the period.

9.0 SUMMARY OF FY 2005-06 PROGRAM GOALS

In addition to yearly program goals of inspections and design reviews, the following are additional program goals for FY 2005-06:

1. Fully implement the modified Risk-Based Profiling System
2. Complete special studies to advance the state-of-the-practice of dam hydrology in Colorado
3. Review ad update current policy documents
4. Complete update and publish revised rules and regulations
5. Hire a permanent Dam Safety Branch chief
6. Update the long-range dam safety plan
7. Continue to provide professional training of branch personnel
8. Improve coordination and communication of personnel within the program and Division Offices
9. Continue to perform dam owner training by conducting one-day workshops at various locations throughout the state

APPENDIX A

DAM SAFETY BRANCH ORGANIZATION AND PERSONNEL

DAM SAFETY BRANCH PERSONNEL

NAME	LOCATION	GRADE	TITLE	RESPONSIBILITY
Jack Byers	Denver	PE IV	Deputy State Engineer	Oversight of Colorado Dam Safety Branch Program, ASDSO State Representative
Vacant	Denver	PE III	Chief, Dam Safety Branch	Oversight of Safety Evaluations of Existing Dams and Design Review and Construction Inspection Activities
Mark Haynes	Denver	PE II	Design Review/Const. Inspect. Engineer	Engineering review of design documents and construction inspection
Mike Cola	Greeley	PE II	Dam Safety Engineer	Safety Evaluations of existing dams in Water Division 1
Jim Dubler	Greeley	PE II	Dam Safety Engineer	Safety Evaluations of Existing Dams in Water Division 1
Greg Hammer	Greeley	PE II	Dam Safety Engineer	Safety Evaluations of Existing Dams in Water Division 1
Bill McCormick	Colorado Springs	PE II	Dam Safety Engineer	Safety Evaluations of Existing Dams in Water Divisions 1 and 2
Mike Graber	Pueblo	PE II	Dam Safety Engineer	Safety Evaluations of Existing Dams in Water Division 2
Dennis Miller	Durango	PE II	Dam Safety Engineer	Safety Evaluations of Existing Dams in Water Divisions 3 and 7
Jason Ward	Montrose	PE II	Dam Safety Engineer	Safety Evaluations of Existing Dams in Water Division 4
John G. Blair	Glenwood Springs	PE II	Dam Safety Engineer	Safety Evaluations of Existing Dams in Water Division 5
Garrett Jackson	Grand Junction	PE II	Dam Safety/Design Review Engineer	Safety Evaluations of Existing Dams in Water Divisions 4 and 5, and review of design documents on the Western Slope
John R. Blair	Steamboat Springs	PE II	Dam Safety Engineer	Safety Evaluations of Existing Dams in Water Division 6
Vacant	Denver	PE I	Dam Safety Engineer	Safety Evaluations of Existing Class 3 Dams in Water Division 1, and assistance to Denver Design Review Unit staff

APPENDIX B

DAM SAFETY ENGINEER
DAM SAFETY INSPECTION REPORT FORM

ENGINEERS INSPECTION REPORT

INSPECTOR:

OFFICE OF THE STATE ENGINEER - DIVISION OF WATER RESOURCES - DAM SAFETY BRANCH — 1313 SHERMAN STREET, ROOM 818, DENVER, CO 80203, (303) 866-3581

DAM NAME: T: R: S: COUNTY: DATE OF INSPECTION:

DAM ID: YRCompl: DAM HEIGHT(FT): SPILLWAY WIDTH(FT): PREVIOUS INSPECTION:

CLASS: DAM LENGTH(FT): SPILLWAY CAPACITY(CFS): CAPACITY(AF):

DIV: WD: CRESTWIDTH(FT): FREEBOARD (FT): SURFACE AREA(AC):

EPP: 8/5/2002 CRESTELEV(FT): DRAINAGE AREA (AC.): OUTLET INSPECTED:

CURRENT RESTRICTION

OWNER: CONTACT NAME:

ADDRESS: CONTACT PHONE:

INSPECTION PARTY:

REPRESENTING:

FIELD CONDITIONS OBSERVED

WATER LEVEL: BELOW DAM CREST _____ FT. Above Spillway _____ FT. GAGE ROD READING _____

GROUND MOISTURE CONDITION: DRY ☐ WET ☐ SNOWCOVER ☐ OTHER _____

DIRECTIONS: MARK AN X FOR CONDITIONS FOUND AND UNDERLINE WORDS THAT APPLY

Conditions Observed: GOOD | ACCEPTABLE | POOR

UPSTREAM SLOPE

PROBLEMS NOTED ☐ (0)NONE ☐ (1)RIPRAP - MISSING, SPARSE, DISPLACED, WEATHERED ☐ (2) WAVE EROSION - WITH SCARPS

☐ (3) CRACKS WITH DISPLACEMENT ☐ (4) SINKHOLE ☐ (5) APPEARS TOO STEEP ☐ (6) DEPRESSIONS OR BULGES ☐ (7) SLIDES

☐ (8) CONCRETE FACING - HOLES, CRACKS, DISPLACED, UNDERMINED ☐ (9) OTHER

CREST

PROBLEMS NOTED ☐ (10) NONE ☐ (11) RUTS OR PUDDLES ☐ (12) EROSION ☐ (13) CRACKS - WITH DISPLACEMENT ☐ (14) SINKHOLES

☐ (15) NOT WIDE ENOUGH ☐ (16) LOW AREA ☐ (17) MISALIGNMENT ☐ (18) IMPROPER SURFACE DRAINAGE ☐ (19) OTHER

DOWNSTREAM SLOPE

PROBLEMS NOTED ☐ (20) NONE ☐ (21) LIVESTOCK DAMAGE ☐ (22) EROSION OR GULLIES ☐ (23) CRACKS - WITH DISPLACEMENT ☐ (24) SINKHOLE

☐ (25) APPEARS TOO STEEP ☐ (26) DEPRESSIONS OR BULGES ☐ (27) SLIDE ☐ (28) SOFT AREAS ☐ (29) OTHER

SEEPAGE

PROBLEMS NOTED ☐ (30) NONE ☐ (31) SATURATED EMBANKMENT AREA ☐ (32) SEEPAGE EXITS ON EMBANKMENT

☐ (33) SEEPAGE EXITS AT POINT SOURCE ☐ (34) SEEPAGE AREA AT TOE ☐ (35) FLOW ADJACENT TO OUTLET ☐ (36) SEEPAGE INCREASED / MUDDY

DRAIN OUTFALLS SEEN ☐ No ☐ Yes Show location of drains on sketch and indicate ☐ (37) FLOW INCREASED / MUDDY ☐ (38) DRAIN DRY / OBSTRUCTED

☐ (39) OTHER

OUTLET

PROBLEMS NOTED ☐ (40) NONE ☐ (41) NO OUTLET FOUND ☐ (42) POOR OPERATING ACCESS ☐ (43) INOPERABLE

☐ (44) UPSTREAM OR DOWNSTREAM STRUCTURE DETERIORATED (45) OUTLET OPERATED DURING INSPECTION ☐ YES ☐ NO

INTERIOR INSPECTED ☐ (120) NO ☐ (121)YES ☐ (46) CONDUIT DETERIORATED OR COLLAPSED ☐ (47) JOINTS DISPLACED ☐ (48) VALVE LEAKAGE

☐ (49) OTHER

SPILLWAY

PROBLEMS NOTED ☐ (50) NONE ☐ (51) NO EMERGENCY SPILLWAY FOUND ☐ (52) EROSION WITH BACKCUTTING ☐ (53) CRACK - WITH DISPLACEMENT

☐ (54) APPEARS TO BE STRUCTURALLY INADEQUATE ☐ (55) APPEARS TOO SMALL ☐ (56) INADEQUATE FREEBOARD ☐ (57) FLOW OBSTRUCTED

☐ (58) CONCRETE DETERIORATED / UNDERMINED ☐ (59) OTHER

See Guidelines on Back of this Sheet

MONITORING

EXISTING INSTRUMENTATION FOUND ☐ (110) NONE ☐ (111) GAGE ROD ☐ (112) PIEZOMETERS ☐ (113) SEEPAGE WEIRS / FLUMES
☐ (114) SURVEY MONUMENTS ☐ (115) OTHER
MONITORING OF INSTRUMENTATION ☐ (116) NO ☐ (117) YES PERIODIC INSPECTIONS BY: ☐ (118) OWNER ☐ (119) ENGINEER

GOOD | ACCEPTABLE | POOR

MAINTENANCE AND REPAIR

PROBLEMS NOTED: ☐ (60 NONE ☐ (61) ACCESS ROAD NEEDS MAINTENANCE ☐ (62) CATTLE DAMAGE
☐ (63) BRUSH ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE ☐ (64) TREES ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE
☐ (65) RODENT ACTIVITY ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE ☐ (66) DETERIORATED CONCRETE - FACING, OUTLET SPILLWAY
☐ (67) GATE AND OPERATING MECHANISM NEED MAINTENANCE ☐ (68) OTHER

GOOD | ACCEPTABLE | POOR

OVERALL CONDITIONS

Based on this Safety Inspection and recent file review, the overall condition is determined to be:
☐ (71) SATISFACTORY ☐ (72) CONDITIONALLY SATISFACTORY ☐ (73) UNSATISFACTORY

The State Engineer, by providing this dam safety inspection report, does not assume responsibility for any unsafe condition of the subject dam. The sole responsibility for the safety of this dam rests with the reservoir owner or operator, who should take every step necessary to prevent damages caused by leakage or overflow of waters from the reservoir or floods resulting from a failure of the dam.

ITEMS REQUIRING ACTION BY OWNER TO IMPROVE THE SAFETY OF THE DAM

MAINTENANCE - MINOR REPAIR - MONITORING

☐ (80) PROVIDE ADDITIONAL RIPRAP:
☐ (81) LUBRICATE AND OPERATE OUTLET GATES THROUGH FULL CYCLE
☐ (82) CLEAR TREES AND/OR BRUSH FROM:
☐ (83) INITIATE RODENT CONTROL PROGRAM AND PROPERLY BACKFILL EXISTING HOLES:
☐ (84) GRADE CREST TO A UNIFORM ELEVATION WITH DRAINAGE TO THE UPSTREAM SLOPE:
☐ (85) PROVIDE SURFACE DRAINAGE FOR:
☐ (86) MONITOR:
☐ (87) DEVELOP AND SUBMIT AN EMERGENCY PREPAREDNESS PLAN:
☐ (88) OTHER
☐ (89) OTHER

ENGINEERING - EMPLOY AN ENGINEER EXPERIENCED IN DESIGN AND CONSTRUCTION OF DAMS TO: (Plans and Specifications must be approved by State Engineer prior to construction

☐ (90) PREPARE PLANS AND SPECIFICATIONS FOR REHABILITATION OF THE DAM:
☐ (91) PREPARE AS -BUILT DRAWINGS OF:
☐ (92) PERFORM A GEOTECHNICAL INVESTIGATION TO EVALUATE THE STABILITY OF THE DAM:
☐ (93) PERFORM A HYDROLOGIC STUDY TO DETERMINE REQUIRED SPILLWAY SIZE:
☐ (94) PREPARE PLANS AND SPECIFICATIONS FOR AN ADEQUATE SPILLWAY:
☐ (95) SET UP A MONITORING SYSTEM INCLUDING WORK SHEETS, REDUCED DATA AND GRAPHED RESULTS:
☐ (96) PERFORM AN INTERNAL INSPECTION OF THE OUTLET:
☐ (97) OTHER:
☐ (98) OTHER:
☐ (99) OTHER:

SAFE STORAGE LEVEL RECOMMENDED AS A RESULT OF THIS INSPECTION

☐ (101) FULL STORAGE
☐ (102) CONDITIONAL FULL STORAGE
☐ (103) RECOMMENDED RESTRICTION
☐ (104) CONTINUE EXISTING RESTRICTION

RESTRICTED LEVEL OFFICIAL ORDER TO FOLLOW →

FT. BELOW DAM CREST
FT. BELOW SPILLWAY CREST
FT. GAGE HEIGHT
NO STORAGE-MAINTAIN OUTLET FULLY OPEN

REASON FOR RESTRICTION

ACTIONS REQUIRED FOR CONDITIONAL FULL STORAGE OR CONTINUED STORAGE AT THE RESTRICTED LEVEL:

Engineer's Signature _____ INSPECTED BY
Owner's Signature _____ OWNER/OWNER'S REPRESENTATIVE DATE: / /

GUIDELINES FOR DETERMINING CONDITIONS

CONDITIONS OBSERVED - APPLIES TO UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, OUTLET, SPILLWAY

GOOD

In general, this part of the structure has a near new appearance, and conditions observed in this area do not appear to threaten the safety of the dam.

ACCEPTABLE

Although general cross-section is maintained, surfaces may be irregular, eroded, rutted, spalled, or otherwise not in new condition. Conditions in this area do not currently appear to threaten the safety of the dam.

POOR

Conditions observed in this area appear to threaten the safety of the dam.

CONDITIONS OBSERVED - APPLIES TO SEEPAGE

GOOD

No evidence of uncontrolled seepage. No unexplained increase in flows from designed drains. All seepage is clear. Seepage conditions do not appear to threaten the safety of the dam.

ACCEPTABLE

Some seepage exists at areas other than the drain outfalls, or other designed drains. No unexplained increase in seepage. All seepage is clear. Seepage conditions observed do not currently appear to threaten the safety of the dam.

POOR

Seepage conditions observed appear to threaten the safety of the dam. Examples:
1) Designed drain or seepage flows have increased without increase in reservoir level.
2) Drain or seepage flows contain sediment, i.e., muddy water or particles in jar samples.
3) Widespread seepage, concentrated seepage, or ponding appears to threaten the safety of the dam.

CONDITIONS OBSERVED - APPLIES TO MONITORING

GOOD

Monitoring includes movement surveys and leakage measurements for all dams, and piezometer readings for Class I dams. Instrumentation is in reliable, working condition. A plan for monitoring the instrumentation and analyzing results by the owner's engineer is in effect. Periodic inspections by owner's engineer.

ACCEPTABLE

Monitoring includes movement surveys and leakage measurements for Class I & II dams; leakage measurements for Class III dams. Instrumentation is in serviceable condition. A plan for monitoring instrumentation is in effect by owner. Periodic inspections by owner or representative. OR, NO MONITORING REQUIRED.

POOR

All instrumentation and monitoring described under "ACCEPTABLE" here for each class of dam, are not provided, or required periodic readings are not being made, or unexplained changes in readings are not reacted to by the owner.

CONDITIONS OBSERVED - APPLIES TO MAINTENANCE AND REPAIR

GOOD

Dam appears to receive effective on-going maintenance and repair, and only a few minor items may need to be addressed.

ACCEPTABLE

Dam appears to receive maintenance, but some maintenance items need to be addressed. No major repairs are requirecl

POOR

Dam does not appear to receive adequate maintenance. One or more items needing maintenance or repair has begun to threaten the safety of the dam.

OVERALL CONDITIONS

SATISFACTORY

The safety inspection indicates no conditions that appear to threaten the safety of the dam, and the dam is expected to perform satisfactorily under all design loading conditions. Most of the required monitoring is being performed.

CONDITIONALLY SATISFACTORY

The safety inspection indicates symptoms of structural distress (seepage, evidence of minor displacements, etc.), which, if conditions worsen, could lead to the failure of the dam. Essential monitoring, inspection, and maintenance must be performed as a requirement for continued full storage in the reservoir.

UNSATISFACTORY

The safety inspection indicates definite signs of structural distress (excessive seepage, cracks, slides, sinkholes, severe deterioration, etc.), which could lead to the failure of the dam if the reservoir is used to full capacity. The dam is judged unsafe for full storage of water.

SAFE STORAGE LEVEL

FULL STORAGE

Dam may be used to full capacity with no conditions attached.

CONDITIONAL FULL STORAGE

]am may be used to full storage if certain monitoring, maintenance, or operational conditions are met.

RESTRICTION

Dam may not be used to full capacity, but must be operated at some reduced level in the interest of public safety.

CLASSIFICATION OF DAMS

CLASS I

Class I - Loss of human life is expected in the event of failure of the dam, while the reservoir is at the high water line.

CLASS II

Class II - Significant damage to improved property is expected in the event of failure of the dam while the reservoir is at the high water line, but no loss of human life is expected.

CLASS III

Class III - Loss of human life is not expected, and damage to improved property is expected to be small, in the event of failure of the dam while the reservoir is at high water fine.

Class IV - No loss of life or damage to improved property, or loss of downstream resource is expected in the event of failure of the dam while the reservoir is at the high water line.

APPENDIX C

WATER COMMISSIONER
DAM INSPECTION REPORT FORM

WATER COMMISSIONER • DAM OBSERVATION REPORT • OFFICE OF THE STATE ENGINEER

DIVISION OF WATER RESOURCES • DAM SAFETY BRANCH — 1313 SHERMAN STREET, ROOM 818, DENVER, CO 80203, (303) 866-3681

FIELD CONDITIONS OBSERVED

WATER LEVEL: BELOW DAM CREST _____ FT., BELOW SPILLWAY _____ FT., GAGE ROD READING _____

GROUND MOISTURE CONDITION: DRY _____ WET _____ SNOWCOVER _____ OTHER _____

DIRECTIONS: MARK AN X FOR CONDITIONS FOUND AND UNDERLINE WORDS THAT APPLY.

UPSTEAM SLOPE

PROBLEMS NOTED: ☐ (0) NONE ☐ (1) RIPRAP - MISSING, SPARSE, DISPLACED, WEATHERED ☐ (2) WAVE EROSION-WITH SCARPS ☐ (3) CRACKSWITH DISPLACEMENT ☐ (4) SINKHOLE (5) APPEARS TO STEEP ☐ (6) DEPRESSIONS OR BULGES (7) SLIDES ☐ (8) CONCRETE FACING-HOLES, CRACKS, DISPLACED, UNDERMINED ☐ (9) OTHER _____

CREST

PROBLEMS NOTED: ☐ (10) NONE ☐ (11) RUTS OR PUDDLES ☐ (12) EROSION ☐ (13) CRACKS - WITH DISPLACEMENT ☐ (14) SINKHOLES ☐ (15) NOT WIDE ENOUGH ☐ (16) LOW AREA ☐ (17) MISALIGNMENT ☐ (18) IMPROPER SURFACE DRAINAGE ☐ (19) OTHER _____

DOWNSTREAM SLOPE

PROBLEMS NOTED: ☐ (20) NONE ☐ (21) LIVESTOCK DAMAGE ☐ (22) EROSION OR GULLIES ☐ (23) CRACKS - WITH DISPLACEMENT ☐ (24) SINKHOLE ☐ (25) APPEARS TOO STEEP ☐ (26) DEPRESSION OR BULGES ☐ (27) SLIDE ☐ (28) SOFT AREAS ☐ (29) OTHER _____

SEEPAGE

PROBLEMS NOTED: ☐ (30) NONE ☐ (31) SATURATED EMBANKMENT AREA ☐ (32) SEEPAGE EXITS ON EMBANKMENT ☐ (33) SEEPAGE EXITS AT POINT SOURCE ☐ (34) SEEPAGE AREA AT TOE ☐ (35) FLOW ADJACENT TO OUTLET ☐ (36) SEEPAGE INCREASED/MUDDY **DRAIN OUTPALL SEEN** ___ No ___ Yes ☐ (37) FLOW INCREASED/MUDDY (38) DRAIN DRY/OBSTRUCTED ☐ (39) OTHER _____

OUTLET

PROBLEMS NOTED: ☐ (40) NONE ☐ (41) NO OUTLET FOUND ☐ (42) POOR OPERATING ACCESS ☐ (43) INOPERABLE ☐ (44) UPSTREAM OR DOWNSTREAM STRUCTURE DETERIORATED (45) OUTLET OPERATED DURING INSPECTION? ☐ YES ☐ NO **INTERIOR INSPECTED** ☐ (120) NO ☐ (121) YES ☐ (46) CONDUIT DETERIORATED OR COLLAPSED ☐ (47) JOINTS DISPLACED ☐ (48) VALVE LEAKAGE ☐ (49) OTHER _____

SPILLWAY

PROBLEMS NOTED: ☐ (50) NONE ☐ (51) NO EMERGENCY SPILLWAY FOUND ☐ (52) EROSION-WITH BACKCUTTING ☐ (53) CRACK - WITH DISPLACEMENT ☐ (54) APPEARS TO BE STRUCTURALLY INADEQUATE ☐ (55) APPEARS TOO SMALL ☐ (56) INADEQUATE FREEBOARD ☐ (57) FLOW OBSTRUCTED ☐ (58) CONCRETE DETERIORATED/UNDERMINED ☐ (59) OTHER _____

MAINTENANCE

PROBLEMS NOTED: ☐ (60) NONE ☐ (61) ACCESS ROAD NEEDS MAINTENANCE ☐ (62) CATTLE DAMAGE ☐ (63) BRUSH ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE ☐ (64) TREES ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE ☐ (67) GATE AND OPERATING MECHANISM NEED MAINTENANCE ☐ (68) OTHER _____

See Guidelines on Back of this Sheet

Conditions Observed

	GOOD	ACCEPTABLE	POOR
UPSTREAM SLOPE			
CREST			
DOWNSTREAM SLOPE			
SEEPAGE			
OUTLET			
SPILLWAY			
MAINTENANCE			

DIRECTIONS: ENTER PROBLEM NUMBER ( ) THEN LOCATION DIMENSIONS, DEGREE,

LOCATION OF PROBLEMS & COMMENTS _____

MAINTENANCE – MINOR REPAIR – MONITORING – ACTION REQUIRED OF OWNER TO IMPROVE THE SAFETY OF THE DAM.

☐ (80) PROVIDE ADDITIONAL RIPRAP _____
☐ (81) LUBRICATE AND OPERATE OUTLET GATES THROUGH FULL CYCLE _____
☐ (82) CLEAR TREES AND/OR BRUSH FROM _____
☐ (83) INITIATE RODENT CONTROL PROGRAM AND PROPERLY BACKFILL EXISTING HOLES _____
☐ (84) GRADE CREST TO A UNIFORM ELEVATION WITH DRAINAGE TO THE UPSTREAM SLOPE _____
☐ (85) PROVIDE SURFACE DRAINAGE FOR _____
☐ (86) MONITOR _____
☐ (88) OTHER _____
☐ (89) OTHER _____

DAM REQUIRES INSPECTION BY A FIELD ENGINEER

The State Engineer, by providing this dam safety observation report, does not assume responsibility for any unsafe condition of the subject dam. The sole responsibility for the safety of the dam rests with the reservoir owner or operator, who should take every step necessary to prevent damages caused by leakage or overflow of waters from the reservoir or floods resulting from a failure of the dam.

_____
OBSERVATION BY WATER COMMISSIONER **DATE**

4/90 JTS

APPENDIX D

APPROVED PLANS
AND
SPECIFICATIONS LIST

APPROVED PLANS AND SPECIFICATIONS FOR NEW DAMS AND ALTERATIONS, ENLARGEMENTS, OR REPAIRS OF EXISTING DAMS					
NAME	DAMID	C-NO	CONST TYPE	APPROVAL	USE
MIDDLEMIST	010428	C-1850	MODIFICATION	11/8/2004	FIRE PROTECTION
GREAT WESTERN	020212	C-0857I	MODIFICATION	11/8/2004	DOMESTIC
TERRY LAKE	030326	C-1268D	REPAIR	11/19/2004	IRRIGATION
SPIRES BROADMOOR SOUTH	100458	C-1871	NEW	11/24/2004	
SPIRES BROADMOOR NORTH	100457	C-1872	NEW	11/24/2004	
BELLVUE WATER TREATMENT	030525	C-1820A	MODIFICATION	12/6/2004	
GREELEY LAKE WEST	030202	C-1528C	REPAIR	12/13/2004	IRRIGATION
MERIDIAN LAKE PARK #1	590113	C-1464B	MODIFICATION	12/17/2004	DOMESTIC
JONES	360121	C-1869	REPAIR	12/17/2004	IRRIGATION
POND 14	08___F	C-1856	NEW	12/17/2004	
MERIDIAN LAKE	590112	C-1874	MODIFICATION	12/17/2004	IRRIGATION
BOULDER - SOUTH DAM	060317	C-0666C	MODIFICATION	1/31/2005	DOMESTIC
DOUGLAS	030126	C-1034C	MODIFICATION	2/17/2005	IRRIGATION
FLOOD CONTROL BASIN NO 1	03___A	C-1863	NEW	2/17/2005	
HOLBROOK	170136	C-1677A	REPAIR	3/15/2005	IRRIGATION
ELKHEAD CREEK	440126	C-1339B	MODIFICATION	3/23/2005	FISH AND WILDLIFE
GOOSE PASTURE TARN	360105	C-1144E	REPAIR	3/30/2005	RECREATION
PROSPECT LAKE	100235	C-0682A	REPAIR	3/30/2005	RECREATION
SKAGWAY	120215	C-0257F	REPAIR	3/30/2005	RECREATION
NORTH POUDRE # 3	030238	C-0752D	REPAIR	3/30/2005	IRRIGATION
GREELEY LAKE WEST	030202	C-1528A	MODIFICATION	4/6/2005	IRRIGATION
LOVE RANCH EVAPORATION	43___A	C-1881	NEW	4/6/2005	
BULL CANAL (Main Reservoir)	020607	C-1573A	MODIFICATION	4/26/2005	IRRIGATION
CHIPMUNK	400202	C-0766A	REPAIR	5/3/2005	IRRIGATION
GREELEY LAKE WEST	030202	C-1528B	MODIFICATION	5/10/2005	IRRIGATION
BOYD LAKE	040105	C-1269A	MODIFICATION	5/24/2005	FISH AND WILDLIFE
LININGER LAKE	800109	C-1351A	MODIFICATION	5/24/2005	RECREATION
PALISADE CABIN	720223	C-0910C	MODIFICATION	5/24/2005	DOMESTIC
WINDSOR LAKE	030336	C-1637A	MODIFICATION	5/24/2005	IRRIGATION
ELEVEN MILE CANYON	230115	C-0862A	MODIFICATION	5/24/2005	DOMESTIC
CLOVER BASIN	050117	C-0048B	MODIFICATION	6/13/2005	IRRIGATION
SPINNEY MOUNTAIN	230304	C-1577A	MODIFICATION	6/13/2005	DOMESTIC
D.O.E. ROCKY FLATS C-2	025628	C-1546A	MODIFICATION	6/13/2005	OTHER
TIGERS	020644	C-1818B	MODIFICATION	6/23/2005	DOMESTIC
LOWER SACRAMENTO CK. #1	230313	C-1619A	MODIFICATION	6/23/2005	DOMESTIC
DURANGO TERMINAL	300102	C-0670B	MODIFICATION	7/25/2005	DOMESTIC
BEEBE GUN CLUB LAKE #1	020647	C-1884	REPAIR	7/25/2005	RECREATION
FOOTHILLS	050124	C-0066D	REPAIR	8/9/2005	IRRIGATION
JOHNSTOWN	040132	C-0652A	MODIFICATION	8/9/2005	DOMESTIC
COMANCHE	030121	C-0250F	REPAIR	8/18/2005	IRRIGATION
NORTH POUDRE # 1	030236	C-1606A	MODIFICATION	9/1/2005	IRRIGATION
BEAVER	400115	C-0830C	MODIFICATION	9/13/2005	IRRIGATION
COW CAMP	380229	C-1882	NEW	9/19/2005	
PINE BROOK	06___B	C-1878	NEW	9/22/2005	
HALLENBECK #2	420126	C-0402A	MODIFICATION	9/26/2005	DOMESTIC
HALLENBECK #1	420125	C-0356E	REPAIR	9/26/2005	DOMESTIC
CONSOLIDATED	380106	C-0103B	MODIFICATION	10/5/2005	IRRIGATION
HIGHWAY 93	07___E	C-1865	NEW	10/11/2005	
PREWITT	640108	C-0060B	MODIFICATION	10/11/2005	IRRIGATION
PINON LAKE	780111	C-1384A	REPAIR	10/17/2005	RECREATION
DRY CREEK	04___B	C-1885	NEW	10/17/2005	

APPENDIX E

RESERVOIR RESTRICTION LIST

STATE OF COLORADO --- DAM SAFETY BRANCH
LISTING OF DAMS UNDER STORAGE RESTRICTION ORDERS

FOR DIVISION: 1

DAMID	Haz. Class	Dam Name	Restricted Reservoir Level	Reason for Restriction	Gage Ht.	Action Date	Act. Type	Volume
010104	3	ADAMS & BUNKER #3	6.0 CREST	INADEQUATE FREEBOARD, SEEPAGE	0	5/22/1975	C	150
010115	2	BIJOU #2 DAM #1	GH 16 but not > GH 15 for > 30 days	scarping, seepage, no spillway	16	6/1/1993	C	2400
010132	3	J.B. COOKE	3 ft below top of headwall	provide minimum freeboard		5/6/1998	R	0
010138	3	DOVER	10.0 FT. CREST	POOR CONDITION		6/27/1996	I	60
010210	1	EMPIRE (OUTLET EMBANKMENT)	GH 29.0	lack of emergency spillway	29	3/7/1985	R	2779
010419	3	D.A. LORD #4	2.0 SPILLWAY	INADEQUATE SPILLWAY	0	9/19/1980	C	400
010505	2	PROSPECT	GH 35.5.	maintenance & monitoring issues	35.5	4/15/1981	R	588
010506	1	RIVERSIDE	GH 33.55 FT.	no spillway; 33.55 is max decree	33.5	5/9/1984	I	0
010612	3	NO NAME 1-1 #1	10 FT. CREST	SCOUR OF D/S SLOPE DUE TO FAILURE OF OUTLET		11/2/2000	I	100
010709	3	JOLLY JOHN	NO STORAGE	SCOUR HOLE FROM OUTLET	0	10/27/2000	I	297
010716	3	HOWARDS LAKE	3.0 FT. SPILLWAY	EROSION OF DAM AND CREST		6/3/1998	I	50
010723	2	BIJOU #2 DAM #2	GH 16 but not > GH 15 for > 30 days	scarping, seepage, no spillway	16	6/1/1993	C	2400
010724	2	BIJOU #2 DAM #3	GH 16 but not > GH 15 for > 30 days	scarping, seepage, no spillway	16	6/1/1993	C	2400
010725	2	BIJOU #2 DAM #4	GH 16 but not > GH 15 for > 30 days	scarping, seepage, no spillway	16	6/1/1993	C	2400
010726	1	EMPIRE (NW EMBANKMENT)	GH 29.0	lack of emergency spillway	29	3/7/1985	R	2779
010727	1	EMPIRE (McINTYRE DIKE)	GH 29.0	lack of emergency spillway	29	3/7/1985	R	2779
010728	1	EMPIRE (EAST EMBANKMENT)	GH 29.0	lack of emergency spillway	29	3/7/1985	R	2779
010729	3	EMPIRE (FREEBOARD DIKE)	GH 29.0	lack of emergency spillway	29	3/7/1985	R	2779
020109	3	BRIGHT VIEW #1	7.0 CREST	INOP. OUTLET, INADEQUATE FREEBOARD	0	9/30/1985	I	17
020113	3	CARLIN	5.0 CREST	NO SPILLWAY	0	7/29/1986	C	0
020115	3	LOWER CHURCH LAKE	3.0 FT CREST	INADEQUATE SPILLWAY		6/22/1999	I	0
020119	3	COLE	NO STORAGE	POOR CONDITION	0	6/30/1994	I	95
020123	N	EAST LAKE #1	NO STORAGE	INADEQUATE SPILLWAY, POOR CONDITION	0	3/19/1992	I	125
020237	3	MARSHALL	5 ft. below dam crest	Obstructed spillway, etc.		10/21/2002	I	10
020314	3	NORTH STAR	5.0 BELOW DAM CREST	SINKHOLE ON DOWNSTREAM SLOPE		2/11/2003	R	
020322	2	SIGNAL #1	5.0 CREST	CONCENTRATD SPG AREAS&QUESTNBLE COND OF OUTLET	0	6/21/1993	R	60
020327	2	RANKIN RESERVOIR	NO STORAGE	POOR CONDITION	0	7/12/1995	I	44
020333	3	THOMPSON	5.0 CREST	INADEQUATE FREEBOARD, GENERALLY POOR CONDITION	0	10/7/1987	R	30
020411	2	NISSEN #2	1.75 SPILLWAY	LACK OF FREEBOARD		9/11/1995	I	50
020606	3	MOWER	3 Feet below Lowest Point of Dam Crest	Inadequate Spillway and Freeboard		5/22/2002	I	8
020615	3	HAVANA STREET DAM	NO STORAGE	NO SPILLWAY	0	6/17/1987	C	0
030107	1	BLACK HOLLOW	4.2 FT. SPILLWAY	INADEQUATE SPILLWAY	31	10/22/1997	I	999
030108	3	BOX ELDER #2	3.0 FT. SPILLWAY	EXCESSIVE SEEPAGE	6.5	8/8/1989	I	49
030122	2	CURTIS LAKE	GH 10 FT.	CREST, SLOPE, EXT. SEEP. AREA BELOW D/S TOE	10	7/2/1985	I	397
030128	3	DRY CREEK	GH 11.5 FT.	OUTLET DETERIORATION,SEEPAGE, INAD SW	11.5	1/17/1996	R	150
030138	2	GRAY #3	NO STORAGE	SINKHOLE OVER OUTLET	0	5/27/1997	I	100

STATE OF COLORADO --- DAM SAFETY BRANCH
LISTING OF DAMS UNDER STORAGE RESTRICTION ORDERS

FOR DIVISION: 1

DAMID	Haz. Class	Dam Name	Restricted Reservoir Level	Reason for Restriction	Gage Ht.	Action Date	Act. Type	Volume
030214	3	LAW, JOHN	3.0 CREST	INADEQUATE SPILLWAY AND FREEBOARD	11	6/22/1987	C	45
030220	3	MATTINGLY	2.0 FT. SPILLWAY	EROSION/3-5 FT. SCARP ON U/S FACE		10/23/1997	I	99
030225	3	MOUNTAIN SUPPLY # 1	10 FT. CREST	POOR CONDITION	5	11/5/1997	I	500
030226	3	MOUNTAIN SUPPLY # 2	10 FT. CREST	POOR CONDITION	5	11/5/1997	I	300
030227	3	MOUNTAIN SUPPLY # 6	3.0 CREST	NO SPILLWAY		10/19/2000	C	120
030229	3	MOUNTAIN SUPPLY # 8	NO STORAGE	POOR CONDITION	0	10/3/1978	I	643
030236	2	NORTH POUDRE # 1	7.0 CREST	SEEP. @ HIGHER STGE. LEVELS/COND. OF UP SLOPE	9	10/17/1988	R	365
030301	2	NORTH POUDRE # 4	GH 17 FT.	POOR U/S FACE, GENERAL CONDITION	17	4/17/1984	R	562
030512	3	RIST CANYON	3.0 CREST	SEEPAGE, INADEQUATE SPILLWAY	0	4/19/1983	I	33
040123	2	FAIRPORT	6.0 SPILLWAY	POOR CONDITION	6	6/22/1987	R	363
040208	1	RIST - BENSON	Restricted to Below Gage Ht 10	Seepage at Toe and on Embankment	10	7/5/2005	I	160
040211	2	RYAN GULCH	GH 27.6	INADEQUATE SPILLWAY, LEAKAGE	27.6	2/12/1997	R	40
040213	2	SOUTH SIDE	8.0 CREST	DAM UNSAFE FOR ORIG. STOR. AMT.	8	7/7/1978	I	105
045234	3	IDE AND STARBIRD #1	3.0 CREST	POOR MN, ERODED U/S FACE, QUES. SPILLWAY	0	7/3/1985	I	0
050101	2	AKERS & TARR	7.0 CREST OCT. 1 - APRIL 1	SLIDE ON D/S SLOPE, SPGE. IN AREA OF ABAND OTL	0	3/23/1989	R	34
050132	3	HIGHLAND	3.0 BELOW TOP OF CONCRETE WALL AT OUTLET	NO SPILLWAY	0	11/26/1990	R	0
050206	3	KNOTH	NO STORAGE	NEVER COMPLETED DAM	0	12/24/1985	I	204
050212	3	LITTLE GEM	10.0 CREST	EROSION ON U/S SLOPE & CRST,TREES ON U/S SLOPE	0	10/11/1985	I	60
050301	3	STEELE BROTHERS #1	4.0 SPILLWAY	SAT. EMBKMT.;INOP. O'S.;INAD. FBD.;SPWY.REPAIR	0	12/1/1987	I	34
050302	3	STEELE BROTHERS #2	3.0 SPILLWAY	TOTAL REHABILITATION REQUIRED	0	11/23/1987	I	14
050304	3	SWEDE	5.0 CREST	EMBANKMENT SEEPAGE & INADEQUATE FREEBOARD	0	11/14/1986	I	75
050308	2	UNION	GH 28.0	spillway design based on GH=28.0	28	12/6/1977	C	0
060122	4	GREEN LAKE NO. 1	3.0 CREST	SEEPAGE, NO SPILLWAY	0	10/12/1984	I	30
060124	4	GREEN LAKE NO. 3	3.0 CREST	LEAKS, INADEQUATE SPILLWAY FREEBOARD	0	10/8/1984	I	60
060202	1	MCKAY LAKE - EAST DAM	GH 11 FT.	INAD. FREEBOARD, SEEPAGE	11	9/11/1995	I	90
060204	3	MESA	NO STORAGE	POOR COND		6/28/2000	I	100
060212	3	SECTION 19	4.0 CREST	NO SPILLWAY	0	7/24/1984	I	10
060306	3	VARSITY POND	1 FT. SPILLWAY	SEEPAGE/SPILLWAY		8/31/1999	I	1
060314	3	HODGSON-HARRIS	6.0 CREST	POOR CONDITION		11/14/1995	I	60
070126	2	DEWEY NO. 1	3.0 CREST(NW)	POOR CONDITION	0	11/19/1990	I	15
070201	1	KALCEVIC	11.0 CREST	ERODED UPSTREAM SLOPE	0	2/10/1983	I	43
070202	3	KELLY	3.0 CREST	NO SPILLWAY,	0	12/5/1986	I	0
075311	1	SMITH	1.0 SPILLWAY	SEEPAGE	0	1/26/2000	R	100
080101	3	ALLIS	15.0 CREST	SLOUGHING, SEEPAGE	0	8/25/1992	R	50
080105	3	BAIRD #1	7.0 CREST	SEVERE BEAVER ACTIVITY, PLUGGED OUTLET	0	1/8/1990	I	25
080110	4	CANTRILL	NO STORAGE	NO SPILLWAY, INOPERABLE OUTLET	0	10/22/1987	I	37
080306	3	WAKEMAN	NO STORAGE	SPILLWAY EROSION		10/17/1994	I	110
080321	4	QUICK	NO STORAGE	NO SPILLWAY, INOPERABLE OUTLET	0	10/22/1987	I	64
080327	1	SKEEL	2.0 FT. SPILLWAY	POOR CONDITION		4/2/1997	R	10
080422	3	RAINBOW FALLS #5	9.0 CREST	INADEQUATE SPILLWAY	0	9/11/1985	I	25
080424	3	GERLITS	NO STORAGE	DAM PARTIALLY BREACHED DUE TO OVERTOPPING.	0	11/13/1984	I	10
090102	2	BEERS SISTERS LAKE	5' BELOW DAM CREST	INADEQUATE SPILLWAY		1/8/1999	I	15
090115	2	HARRIMAN	GH 19 FT.	EXCESSIVE SEEPAGE	19	11/12/1992	R	300
090138	4	HAYSTACK #1	NO STORAGE	SPILLWAY UNDERMINED	0	5/8/1987	I	3

STATE OF COLORADO --- DAM SAFETY BRANCH
LISTING OF DAMS UNDER STORAGE RESTRICTION ORDERS

FOR DIVISION: 1

DAMID	Haz. Class	Dam Name	Restricted Reservoir Level	Reason for Restriction	Gage Ht.	Action Date	Act. Type	Volume
090204	1	WILLOW SPRINGS #1	1.0 SPILLWAY	EROSION OF US FACE	13.5	9/14/2000	R	10
230102	1	ANTERO	GH 18 FT.	STAB. BERM CONST. & NEW INSTR. MONITORING	18	2/4/1986	R	5100
230104	3	BAYOU SALADO	One-Foot Below Spillway Crest	Unsatisfactory & Unsafe Condition of Spillway		8/29/2002	I	26
230126	2	LAKE GEORGE	7' Below the Dam Crest (2' below spillway)	Cracking on Downstream Slope		9/23/2004	I	60
230308	3	MOUNTAIN	4.0 CREST	INSUFFICIENT FREEBOARD, SEEPAGE AT TOE	0	11/6/1985	I	3
230310	3	STOCKING POND	NO STORAGE	INADEQUATE SPILLWAY	0	6/13/1988	I	10
230311	3	SUN	5.0 CREST	SEEPAGE-RESTRICT O 8' BELOW CREST	0	12/31/1984	R	6
230312	3	WIND	5.5 CREST	SATURATED D/S SLOPE	0	9/20/1985	C	3
480101	3	JOHNSON	4.0 CREST(3.0 CREST IRR. SEASON)	EROS. ON U/S FACE, IMPROPER FB., SEEP/D/S TOE	0	7/18/1994	C	68
640104	1	JULESBURG #4	GH 24 FT. FOR 90 DAYS, THEN GH 23 FT.	CONDITION OF OUTLET, EXCESSIVE SEEPAGE	24	5/2/1995	R	6964
640108	1	PREWITT	GH 26.5 FT.	NO SPWY & EXCESSIVE SEEPAGE	26.5	8/23/1990	I	2531
650121	3	DUCK	4.0 SPILLWAY	NARROW CREST, STEEP SLOPES	0	3/23/1987	I	15
650123	3	HANSHAW	5.0 CREST	seepage, slide, overall poor	0	7/7/1987	I	12

VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION FOR DIVISION 1 46996 AF TOTAL NUMBER OF DAMS AFFECTED: 93 DAMS

STATE OF COLORADO --- DAM SAFETY BRANCH
LISTING OF DAMS UNDER STORAGE RESTRICTION ORDERS

FOR DIVISION: 2

DAMID	Haz. Class	Dam Name	Restricted Reservoir Level	Reason for Restriction	Gage Ht.	Action Date	Act. Type	Volume
100131	3	GARDEN OF THE GODS GOLF COURSE	3.0 CREST	NO SPILLWAY	0	5/31/1988	I	0
100205	3	KEETON LAKE	10.O FT. SPILLWAY	EROSION OF SPILLWAY, LEAKAGE, PIPING	0	8/8/1997	I	10
100215	N	MODERN WOODMEN OF AMER. #2	NO STORAGE	INADEQUATE SPILLWAY, POOR REPAIR	0	8/12/1983	R	85
100235	2	PROSPECT LAKE	3.5 CREST	NO SPWY., OTLT OPERABILITY QUESTIONABLE	0	5/31/1988	I	0
100309	3	VALLEY NO. 1	15.0 CREST	INOPERABLE OUTLET & BLOCKED SPILLWAY	0	12/27/1984	I	50
100402	2	VALLEY NO. 2	NO STORAGE	INOPERABLE OUTLET, OBSTRUCTED SPILLWAY	0	9/21/2000	C	185
110106	3	EVANS GULCH	3.0 CREST	INSUFFICIENT FREEBOARD	0	2/2/1985	R	2
120126	3	JORDAN #1	12 Feet Below Emergency Spillway Crest	Deterioration &Joint Offsets in Spillway Riser		10/26/2005	I	18
120136	3	PARK CENTER L & W #2	8.8 CREST	SLIDE ON DOWNSTREAM SLOPE	0	1/4/1989	R	11
120202	3	PARK CENTER L & W #10	GH 7 FT.	EXTENSIVE CRACKING ON THE CREST	7	10/2/1974	I	48
150116	3	OCCHIATO #1	10 FEET CREST	SLIDE		9/16/1999	I	3
160108	1	CUCHARAS #5	GH 100 FT.	POOR OVERALL CON. EMBKMT. HISTY. MVMNT.	100	7/21/1988	R	33000
160135	4	CLARK #1	8.0 CREST	ERODED UPSTREAM SLOPE	0	2/16/1994	R	80
170118	3	CUDAHY #1	5.0 FT. BELOW DAM CREST	INADEQUATE FREEBOARD AND INOPERABLE OUTLET		7/15/1985	I	900
170217	3	SWINK #1	5.0 CREST	IN DISREPAIR, ABANDONED	0	4/24/1986	I	500
170218	3	SWINK #2	5.0 CREST	IN DISREPAIR, ABANDONED	0	4/24/1986	I	600
170219	3	SWINK #5	5.0 CREST	IN DISREPAIR, ABANDONED	0	4/24/1986	I	750
170220	3	SWINK #6	5.0 CREST	IN DISREPAIR, ABANDONED	0	4/24/1986	I	650
170222	3	TIMPAS #3	10.0 CREST	IN DISREPAIR, ABANDONED	0	4/21/1986	I	500
180206	2	APISHAPA	22.0 CREST	SPILLWAY, OUTLET SILTED IN	0	2/18/1994	I	260
180207	3	SEVEN LAKES	7.0 CREST	DILAPIDATED CONDITION OF DAM	0	5/6/1987	I	1200
670236	1	TWO BUTTES	GH 20 FT.	HYDRAULICALLY INADEQUATE SPILWAY	20	1/24/1983	I	31465

VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION FOR DIVISION 2 70317 AF TOTAL NUMBER OF DAMS AFFECTED: 22 DAMS

STATE OF COLORADO --- DAM SAFETY BRANCH
LISTING OF DAMS UNDER STORAGE RESTRICTION ORDERS

FOR DIVISION: 3

DAMID	Haz. Class	Dam Name	Restricted Reservoir Level	Reason for Restriction	Gage Ht.	Action Date	Act. Type	Volume
200105	3	BRISTOL HEAD #1	ZERO STORAGE	INOPERABLE OUTLET/POOR GENERAL CONDITION	0	8/6/2002	I	121
200110	1	CONTINENTAL	GH 64.5	LEAKAGE	64.5	8/1/1995	R	7679
210102	1	TERRACE	7.0 SPILLWAY	DETERIORATED SPILLWAY	117	7/18/1984	I	2000
220103	2	TRUJILLO MEADOWS	1 foot below spillway crest	Excessive Seepage	23.6	8/25/2004	I	69
240101	3	EASTDALE #1	1.3 feet below spillway crest	Erosion of upstream slope	23	7/1/2004	I	420
260101	3	SAGUACHE	Zero storage	General neglect, inoperable U/S gate	0	6/28/2004	I	450

VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION FOR DIVISION 3 10739 AF TOTAL NUMBER OF DAMS AFFECTED: 6 DAMS

STATE OF COLORADO --- DAM SAFETY BRANCH
LISTING OF DAMS UNDER STORAGE RESTRICTION ORDERS

FOR DIVISION: 4

DAMID	Haz. Class	Dam Name	Restricted Reservoir Level	Reason for Restriction	Gage Ht.	Action Date	Act. Type	Volume
400103	3	ARCH SLOUGH	DAM WAS ABANDONED,BUT CAN STILL HOLD WATER	POOR CONDITION	0	12/12/1985	I	66
400212	3	CYPHER #1	4.0 BELOW EMERGENCY SPILLWAY CREST	REPAIRS NOT COMPLETED		1/14/2003	R	8
400228	3	ELLA	7-Feet Below Dam Crest	Inadequate Spillway & Overtopping Damage		9/20/2005	I	30
400306	2	GRANBY #12	GH 17 FT.	D/S FACE SLIDE DUE TO SEEPAGE	17	10/15/1987	R	0
400318	1	HOTEL LAKE	NO STORAGE	WEAKENED CONDITIONS!	0	1/14/2002	I	549
400330	3	KNOX	FULL STORAGE FROM 4/1 TO 8/15 IF MONITORED	EXCESSIVE SEEPAGE AT TOE AND ON EMBANKMENT	17	1/8/1988	R	0
400405	3	LONE STAR #1	30.0 CREST	CRACKS ON CREST, UNAPPROVED PLANS, POOR CONSTR	0	7/31/1996	R	0
400411	3	MILITARY PARK		PIPING	10	9/7/2000	I	150
400413	2	MONUMENT	10.0 SPILLWAY, FILL/MONITORING PLAN IN PLACE	CRACKS ON DAM AND LEFT ABUTMENT SLIDE	33.5	4/29/1993	I	175
400419	3	OASIS	3 FEET BELOW NORMAL WATER SURFACE	UNCONTROLLED SEEPAGE		9/30/2003	I	40
400434	3	PITCAIRNE #1	5.5 FT. SPILLWAY	BEAVER DENS ON US FACE		8/2/2000	I	50
400508	3	RYAN	ZERO STORAGE	POOR CONDITION OF OUTLET WORKS		11/9/2004	I	60
400522	3	TODD	10.0 CREST	6' ELEVATION DIFF ALONG CREST WITH NO SPLLWAY	0	10/19/1984	I	112
400524	3	TRIO	8.0 SPILLWAY	SLIDE ON DOWNSTREAM SLOPE	14	1/11/1989	I	75
400601	3	HARRY WHITE #2	5.0 CREST	POOR OUTLET VALVE,LACK OF FREEBOARD,MAINTENANC	0	8/9/1991	I	30
400619	3	LONE STAR #2	10.0 CREST	CONSTRUCTION WITHOUT APPROVED PLANS & SPECS	0	6/2/1988	C	0
400705	3	WEBSTER #1	NO STORAGE	POORLY CONSTRUCTED	0	5/6/1987	C	15
400707	3	WEBSTER #3	NO STORAGE	POORLY CONSTRUCTED	0	5/6/1987	C	15
410201	3	COFFEY RESERVOIR	NO STORAGE	GENERAL POOR CONDITION,CONST. WO/APP. PLANS	0	7/21/1988	C	90
410202	3	MOCK #1	9.0 CREST(AFTER 60 DAYS FULL)	BUILT WITHOUT APPROVED PLANS & SEEPAGE	0	4/26/1989	R	0
420116	2	FRUITA #1	20 FT. CREST	SLIDE ON DOWNSTREAM SLOPE		8/12/1998	I	100
420120	2	GRAND MESA #1	8 FT. SPILLWAY	OUTLET WORKS FAILURE	12	12/21/2000	I	300
420123	3	GRAND MESA #9	3.4 FT SPILLWAY	OUTLET WORKS PROBLEMS	8	12/21/2000	I	100
420135	3	REEDER	8.0 CREST	SEEP. ON D/S SURFACE,NUMEROUS LARGE TREES	0	8/26/1985	R	96
590113	2	MERIDIAN LAKE PARK #1	2.0 SPILLWAY (PRIN SPWY LOWERED)	SEVERE EROSION OF THE EMERGENCY SPILLWAY	0	6/4/1987	I	10
600105	3	BLUE LAKE #1	5.0 FEET SPILLWAY	POOR CONDITION		11/21/2001	I	100
600118	3	PAXTON	2.5 SPILLWAY	SEEPAGE	0	8/8/1988	R	100
600126	3	CUSHMAN	6.0 CREST	OUTLET-INOP. SPWY-INAD. EMB. SEEPS	0	7/29/1975	I	36
600127	1	PRIEST	3.0 CREST	INSUFFICIENT FREEBOARD	0	9/16/1985	I	25
620122	3	FISH CREEK #1	zero storage	stability, seepage, outlet control	0	9/11/2003	I	85
630103	3	BURG	ZERO STORAGE	DAMAGED OUTLET CONTROLS		9/30/2003	I	91

VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION FOR DIVISION 4 2508 AF TOTAL NUMBER OF DAMS AFFECTED: 31 DAMS

STATE OF COLORADO --- DAM SAFETY BRANCH
LISTING OF DAMS UNDER STORAGE RESTRICTION ORDERS

FOR DIVISION: 5

DAMID	Haz. Class	Dam Name	Restricted Reservoir Level	Reason for Restriction	Gage Ht.	Action Date	Act. Type	Volume
370116	3	G G LOWER	4.0 CREST	INADEQ FRBD., STABILITY OF DOWNSTREAMSLOPE	0	12/14/1992	R	7
370205	4	FORIER #3	NO STORAGE	ILLEGAL DAM /INADEQUATE SPILLWAY	0	11/9/1995	I	3
380204	3	CHRISTENSON	Zero Storage	Sloughing of Downstream Slope	0	7/6/2005	I	11
380212	2	FLANNERY	1.0 FT SPILLWAY	SPILLWAY EROSION		9/17/2001	I	20
380217	2	CHRISTINE LAKE	3.5 FT CREST	NO SPILLWAY		5/4/2001	I	10
380219	1	POLARIS	5' BELOW DAM CREST	INADEQUATE SPILLWAY AND FREEBOARD	16	5/31/2005	I	271
450123	1	ALSBURY	5.5' BELOW SPILLWAY, 10.5' BELOW CREST	EXCESSIVE SEEPAGE	9055	6/7/2004	I	100
450126	3	RAGLE RESERVOIR NO. 1	ZERO STORAGE	ILLEGALLY AND POORLY BUILT	0	4/15/2005	I	1
500113 0	2	MATHESON	FULL STOR IN SPRING. DRAIN TO GH 30 BY 9/1	MONITORING DEVISE INSTALLED	30	10/30/2002	R	
500126	3	MILK CREEK	15.0 CREST (AUG 1 THRU MAY 1)	EXCESSIVE LEAKAGE	0	5/10/1991	R	56
510114	2	LITTLE KING RANCH	10.0 SPILLWAY	EXCESSIVE SEEPAGE	41	3/7/1978	C	439
510124	2	SCHOLL	SEASONAL GH 18 IN SPRING GH 10 BY JULY 1			3/30/2004	R	212
510129	N	ROCK CREEK	NO STORAGE	DAM BREACHED BY OWNER BUT WANTS TO REPAIR	0	6/28/1989	C	66
530119	3	KELLY	5.0 CREST	SPILLWAY EROSION	0	9/20/1985	C	54
530125 537	3	NEWTON GULCH	ZERO STORAGE FOR WINTER & 13.5' GH OTHER TIME	NEW SINKHOLE ON EMBANKMENT	13.5	8/18/2005	R	
530129	3	STERNER	RELAX 5/1-8/15, 3.0 SPILLWAY	UNCONTROLLED LEAKAGE		8/2/1995	R	71
720115	1	BULL CREEK #4	3 FEET BELOW EMERGENCY SPILLWAY CREST	POOR CONDITION OF OUTLET AND DAM, SEEPAGE		8/18/2005	I	71
720117	3	CARPENTER	NO STORAGE	PIPING HOLE		8/23/1994	I	39
720126	3	CURRIER #2	1.0' BELOW SPILLWAY	SLIDE ON HILL ABOVE SPILLWAY IMPROVEMENTS MADE		6/9/2005	R	17
720136	3	HAWXHURST	9 feet below crest/6 feet below spillway	Hole in dam		9/9/2003	I	120
720304	3	LONG SLOUGH	Zero Storage	Piping along outlet works conduit		9/9/2003	I	219

VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION FOR DIVISION 5 2324 AF TOTAL NUMBER OF DAMS AFFECTED: 21 DAMS

STATE OF COLORADO --- DAM SAFETY BRANCH
LISTING OF DAMS UNDER STORAGE RESTRICTION ORDERS

FOR DIVISION: 6

DAMID	Haz. Class	Dam Name	Restricted Reservoir Level	Reason for Restriction	Gage Ht.	Action Date	Act. Type	Volume
430205	3	BAXTER	5.0 FT. SPILLWAY	SEEPAGE, EROSION OF U/S FACE		11/13/1997	I	30
430212	3	WILSON #3	3.0 SPILLWAY	INOPERABLE OUTLET, INAD SPWY	3	9/30/1989	I	10
440106	3	BISKUP	5.0 SPILLWAY	DILAPIDATED CONDITION	0	8/19/1987	C	55
440120	3	DRESCHER	8.0 SPILLWAY	SEEPAGE & INSTABILITY	8	8/1/1988	R	159
440124	3	ELLGEN #2	Full Storage	New outlet pipe. Recommend restriction lifted.		2/16/1999	R	
440213	3	FLATTOP	5.0 FT CREST MAIN DAM	BREACHED, BEAVER DAMS, FREEBOARD		8/2/1999	I	50
560105	3	HAUNTED SPRING	Zero Storage	Uncontrolled seepage/piping		9/9/2003	I	8
560107	3	BASSETT #2	5-FEET BELOW SPILLWAY CREST	ILLEGAL DAM, POOR CONDITION		10/21/2002	R	25
570114	3	LAKE EMRICH	15.0 CREST	SLIDES ON DOWNSTREAM SLOPE	0	8/30/1988	C	330
580303	N	LOWER SPRING CREEK	Dam Breached.	Approval of breach construction.	0	12/16/2003	R	0

VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION FOR DIVISION 6 667 AF TOTAL NUMBER OF DAMS AFFECTED: 10 DAMS

STATE OF COLORADO --- DAM SAFETY BRANCH
LISTING OF DAMS UNDER STORAGE RESTRICTION ORDERS

FOR DIVISION: 7

DAMID	Haz. Class	Dam Name	Restricted Reservoir Level	Reason for Restriction	Gage Ht.	Action Date	Act. Type	Volume
300144	3	UPPER RAILROAD	5 Feet below Dam Crest	Inadequate Spillway& Unstable Downstream Slope		9/8/2005	I	4
340106	3	HURST	NO STORAGE	OUTLET FAILURE	0	3/29/1999	I	35
340119	3	J. O. SPENCER	NO STORAGE	INOPERABLE OUTLET	0	5/8/2000	I	16
340203	1	SUMMIT - MAIN DAM	NOT TO EXCEED 1.1' BELOW SPILL FOR > 3 WEEKS	EXCESSIVE SEEPAGE	23.6	6/3/1998	R	400
340205	1	SUMMIT - SOUTH DAM	NOT TO EXCEED 1.1' BELOW SPILL FOR > 3 WEEKS	EXCESSIVE SEEPAGE	23.6	6/3/1998	R	400
780111	2	PINON LAKE	3 FEET SPILLWAY	POOR CONDITION OF OUTLET		7/27/2001	I	86

VOLUME OF STORAGE WATER LOST DUE TO RESTRICTION FOR DIVISION 7 941 AF TOTAL NUMBER OF DAMS AFFECTED: 6 DAMS

Cover Photo: Denver Water's Cheesman Dam is shown on the cover of this report. It is significant in that 2005 was the 100-year anniversary of the construction of the dam. At 221 feet tall, this cyclopean-masonry, constant-radius arch dam was the largest of its kind in the world when completed in 1905. The photo looks north across the arch from the right abutment and was taken by dam safety engineer Bill McCormick during the 2005 annual safety inspection.