STATE ENGINEER'S FIFTH ANNUAL REPORT TO THE GENERAL ASSEMBLY ON DAM SAFETY FOR F. Y. 87-88

November 1, 1988

OFFICE OF THE STATE ENGINEER
DIVISION OF WATER RESOURCES

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October 19, 1988

The Honorable Roy Romer
Governor, State of Colorado
State Capitol Building
Denver, Colorado

The Honorable Ted Strickland
President of the Senate
Colorado State Senate
Denver, Colorado

The Honorable Bev Bledsoe
Speaker of the House
Colorado House of Representatives
Denver, Colorado

Gentlemen:

Pursuant to Section 37-87-114.4, C.R.S. 1973 (1987 Supp.), I am pleased to transmit the enclosed report describing the activities of the State Engineer with respect to dam safety in Colorado for fiscal year 1987-1988.

Colorado's dam safety program has matured as a result of resources made available by the General Assembly and as a result of increased awareness by dam owners of their responsibilities. This awareness has been gained by informing the owner through public meetings and seminars on dam safety issues.

I still believe our dam safety program can be improved by continued education of dam owners and the public, additional staffing (2.0 FTE), additional funds ($5,000) for on-going training of our professional staff, and additional funds ($30,000) for rental of "All-Terrain Vehicles" and a helicopter for efficient access to remote areas as described in detail in the report.

I have also taken steps to decentralize the dam inspection program by moving field engineers from Denver to Glenwood Springs, Montrose, and Durango. This will permit inspections at less cost and will enhance the program.

If you have any questions or would like additional information, please feel free to call upon me at any time.

Sincerely,

Jeris A. Danielson
State Engineer

JAD/AEP:jad/0227I

Enclosure (a/s)

cc: Senate Majority Leader Jeffrey M. Wells
Senate Minority Leader Ray E. Peterson
House Majority Leader Chris Paulson
House Minority Leader Ruth Wright
Senator Tilman Bishop, Chairman
Senate Agriculture Committee
Representative Scott McInnis, Chairman
House Agriculture Committee
Senator Robert DeNier, Vice-Chairman
Joint Budget Committee
Senator Mike Bird, Joint Budget Committee
Senator James Rizzuto, Joint Budget Committee
Representative Elwood Gillis, Chairman
Joint Budget Committee
Representative Vickie Armstrong, Joint Budget Committee
Representative Richard R. Bond, Joint Budget Committee

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STATE ENGINEER'S FIFTH ANNUAL REPORT TO THE GENERAL ASSEMBLY ON DAM SAFETY FOR FY 87-88

INTRODUCTION

Statutory Provisions

Colorado's Dam Safety Program is administered by the State Engineer in accordance with Title 37, Article 87, of C.R.S. (1973) (1987 Supp.), and the Livestock Water Tank Act, Title 35, Article 49 of C.R.S. (1973), as amended. Rules and Regulations for filing plans and specifications for the construction of reservoir dams, and standard specifications for Livestock Water Tanks and Erosion Control Dams, establish the procedures and requirements of the State Engineer for administration of these statutes.

This report is submitted in compliance with Section 37-87-114.4, C.R.S. (1987 Supp.) concerning the activities of the State Engineer and the Division of Water Resources relating to Sections 37-87-105 to 37-87-114, C.R.S. (1973) (1987 Supp.).

Organization

Implementation of the dam safety program is done by the State Engineer through the Dam Safety Branch.

The branch is organized into three units, two being field engineering units (FEU), and the other, a design review and construction inspection unit (DRCIU). Each unit is led by a Supervising Water Resource Engineer. (See Appendix A for tables and charts of the personnel and organization of the branch.)

The Field Engineering Units' principal duties are to conduct Safety Evaluations of Existing Dams (SEED),[1] design review and construction inspection of repairs,[2] and investigation of complaints on the safety of dams.[3] They investigate the construction of dams in violation of Section 37-87-105(1) and (4), C.R.S., (1973) (1987 Supp.), assist the Department of Health in the inspection of tailing dams, and conduct training on the inspection of dams for division personnel, dam owners, interested agencies, engineers, and the public. They also do other related work as assigned.

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[1] Per Section 37-87-107, C.R.S. (1973) (1987 Supp.)
[2] Per Section 37-87-105(4), C.R.S. (1973) (1987 Supp.)
[3] Per Section 37-87-109, C.R.S. (1973)

The Design Review and Construction Inspection Unit's principal duties are to review the plans and specifications for the construction, alteration, modification, repair, and enlargement of reservoirs or dams in accordance with Section 37-87-105, C.R.S. (1973) (1987 Supp.) (this involves a comprehensive engineering review of the plans and specifications to assure that a safe design has been developed), and to inspect the construction of the work. It processes the Livestock Water Tank and Erosion Control Dam applications per Section 35-49-101 through 116, C.R.S. (1973) and Section 37-87-122, C.R.S. (1973). The Unit assists the Department of Health in the technical evaluation of tailing impoundments through a "Memorandum of Understanding," and participates in the State's "Joint Review Process" with the Department of Natural Resources. They also do other related work as assigned.

Goals and Objectives of the Program

The primary goal of the State Engineer with respect to dam safety is to provide maximum public safety against dam failures within the resources of his office. Towards this goal, the resources are directed at the safety inspection of each high and moderate hazard nonfederal dam and reservoir on an annual basis, and the safety inspection of each low hazard nonfederal dam and reservoir on a five-year basis. The program concentrates on "jurisdictional" dams and reservoirs as defined in Section 37-87-105 C.R.S. (1973) (1987 Supp.) which are greater than 10 feet high at the spillway, or greater than 20 acres in surface area at the high water line, or greater than 100 acre-feet in capacity at the high water line.

Safety inspections are made of U.S. Bureau of Reclamation and U.S. Corps of Engineers dams on a cooperative basis, their safety inspections being carried out in accordance with the "Federal Guidelines for Dam Safety." Arrangements are made with other federal agencies for the safety inspection of their dams by the Bureau of Reclamation, the Corps of Engineers, their own forces, consulting engineers, or by the State Engineer. When other than State Engineer personnel conduct the safety inspections, the agencies submit the findings/recommendations and follow-up to the State Engineer in order to assure the safety of these dams. A memorandum of understanding has been formulated with the Bureau of Reclamation relating to dam safety activities in Colorado. It provides for the exchange of safety-related information of dams under each agencies jurisdiction.

A related objective is the inspection of construction for compliance with approved plans, and to assure that plans are adequate for the site conditions. Inspections are made of the foundation, outlet works, spillways, and final construction as a minimum. Interim inspections are made as necessary.

An adjunct to the inspection objectives, but an important element of the dam safety program, is the goal to have each owner of high hazard dams prepare an Emergency Preparedness Plan to combat any incident which would jeopardize the safety of the dams, and to give warning to appropriate emergency preparedness agencies/officials so they may mobilize their plans for mitigating the consequences of dam-break flooding.

The following Table 1 shows the ownership of jurisdictional dams in Colorado by owner; and Table 2 shows the distribution of dams in the state by Water Division and hazard rating.

TABLE 1

JURISDICTIONAL[1] DAM OWNERSHIP STATUS
IN COLORADO

HAZARD RATING	TYPE OF OWNER FEDERAL	STATE	OTHER GOVT.	PRIVATE	TOTAL
HIGH (Class I)	38	12	77	127	254
MODERATE (Class II)	11	22	74	210	317
LOW (Class III)	52	32	134	954	1,172
TOTAL	101	66	285	1,291	1,743

[1]Greater than ten feet high to spillway, or 20 acres in surface area at the high-water line, or 100 acre-feet in capacity at the high-water line.

H = High Hazard = 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.

M = Moderate Hazard = 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.

L = Low Hazard = 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 the high-water line.

Table 2

DISTRIBUTION OF DAMS BY IRRIGATION DIVISION/HAZARD

DIVISION	NONFEDERAL			FEDERAL			TOTAL		
	H	M	L	H	M	L	H	M	L
1	113	128	446	13	6	18	126	134	464
2	32	50	201	5	3	8	37	53	209
3	9	15	37	1	0	5	10	15	42
4	21	39	166	8	0	7	29	39	173
5	21	41	120	7	1	9	28	42	129
6	10	15	105	0	1	4	10	16	109
7	10	18	45	4	0	1	14	18	46
	216	306	1,120	38	11	52	254	317	1,172
TOTALS			1,642			101			1,743

H = High Hazard = Class I - loss of human life is expected in the event of failure of the dam, while the reservoir is at the the high water line.

M = Moderate Hazard = 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.

L = Low Hazard = 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 the high water line.

APPROVAL OF PLANS AND SPECIFICATIONS FOR CONSTRUCTION OF DAMS AND RESERVOIRS

During FY 87-88, the State Engineer received plans for eight new dams, and 52 plans for alteration, modification, repair, or enlargement. Sixteen change orders to previously approved plans were also reviewed and all were approved within the time frame. Eighteen separate hydrology/hazard studies were also received for determination of the inflow design flood for spillway designs or hazard classifications. Estimated cost of construction for the submitted plans was $5,267,041. Four thousand one hundred and eighty dollars ($4,180.00) was collected for the examination and filing of the submitted plans.

Forty-two sets of plans and specifications were approved by the State Engineer for construction during FY 87-88. (See Appendix B for lists of dams which were approved by Water Division/District, and use.) In order to expedite the approval of repair plans for dams, the State Engineer has modified the approval process for these type of plans by delaying the filing requirements until the end of construction and approving the work by letter. This enables the owners to repair their dams sooner by shortening the review time. Since these types of repairs are usually simple procedures, they do not require the same detail as plans for new dams.

Three special studies associated with dams were also performed, including geotechnical reports, feasibility reports, subdivision plans, and requests from the Department of Health, and Division of Mined Land Reclamation.

Upon completion of construction, the owner's engineer submits copies of the "AS-CONSTRUCTED" plans, showing the 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 of and the "AS-CONSTRUCTED" plans serve as the public record as provided by the statutes.

Section 37-87-114.5, C.R.S. (1987 Supp.) exempts certain structures from the State Engineer's approval. They are, structures not designed or operated for the purpose of storing water, mill tailing impoundments permitted under Article 32 or 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, C.R.S., siltation structures permitted under Article 33 of Title 34, C.R.S. (Coal Mines), and structures which store water only below the natural surface of the ground.

In order to prevent administrative problems arising from the construction of small dams which do not fall under the jurisdiction of the State Engineer's review and approval, Section 37-87-125, C.R.S. (1987 Supp.) requires that a notice of intent to construct an impoundment must be submitted to the State Engineer prior to beginning construction. The State Engineer has developed a

form for submitting the notice, which is directed to the Division Engineer of the Division that the impoundment is located in for processing. The notification also serves to address any dam safety issues which are evident.

SAFETY INSPECTIONS AND CONSTRUCTION OBSERVATION

Scheduling

Jurisdictional dams identified for inspection in accordance with the objectives of the State Engineer are assigned to the field engineers on a geographic and hazard related basis. The field engineers each schedule the inspection of approximately 85 separate dams each "inspection season," which begins about April 1 and ends about November 1. Subsequent follow-up and problem solving results in additional inspections each year. Within the planned schedules are the inclusion of all the high and moderate hazard dams, and approximately one-fifth of the low ones. Inspection of Federal dams are integrated with these schedules. In addition, the State Engineer has executed a memorandum of understanding with the Regional Forester, Rocky Mountain Region, USDA Forest Service, concerning the statutory obligations each has in regard to the administration and safety of dams on National Forest lands in Colorado. The memorandum of understanding provides for the exchange of information, assuring access to dams (e.g. wilderness areas), scheduling of the inspection of Forest Service dams, and the joint review for approval of plans and specifications. The two field engineering units, therefore, collectively conduct about 900 safety inspections on an "inspection season" basis, which is equivalent to a fiscal year in the amount planned.

In order to track potential problems which could develop at low hazard dams between their five-year engineered inspections, the Division's Water Commissioners are assigned lists of low hazard dams to observe and to fill out a report. The report is submitted to the branch for review, and a copy is furnished to the owner for their information and to implement any recommendations for maintenance and repair. A copy of the WATER COMMISSIONER DAM OBSERVATION REPORT is in Appendix C.

Scope

A safety inspection involves more than just a visit to the dam. The site visit is preceded by a review of the file and history of performance, and coordination with the owner, division staff, and other interested parties so they may take part in the inspection. (The statute specifies that a safety inspection include the review of previous inspection reports and drawings, site inspection of the dam, spillways, outlet facilities, seepage control and measurement system, and permanent monument or monitoring installations.)

A safety inspection also includes an evaluation of the adequacy of the spillway to pass the appropriate sized flood for the dam's size and hazard class, to make an evaluation of the dam's hazard classification and whether it has been affected, and to assess the several emergency preparedness plans for the dams.

The findings of the inspection are documented on a report form which rates the conditions observed of the several components of the dam and reservoir. The overall conditions are rated as satisfactory, conditionally satisfactory, or unsatisfactory (unsafe) for full storage, and a recommendation is made on the safe storage level. The report also enumerates the several repair and maintenance items which the owner must attend to, and specifies the several engineering and monitoring requirements necessary to assure the safety of the dam. (A copy of the ENGINEERS INSPECTION REPORT is in Appendix D.

An invoice for the cost of the inspection is also prepared in accordance with the provisions of the statutes, the payment being due within 30 days of receipt by the owner.

If the safety inspection finds that the overall conditions are unsafe, an order is written by the State Engineer restricting the storage in the reservoir to a safe level. If the findings are conditionally satisfactory, full storage is recommended contingent upon appropriate monitoring provisions being provided by the owner. Restriction orders are accompanied by orders to rehabilitate the dam to make it safe for full storage, or to breach the dam.

Orders to repair or maintain the dam usually require the reinspection of the dam in order to verify that the work has been done in a workmanlike manner. Reinspections normally occur to assure follow-up of the State Engineer's orders, or by request from the owner.

In the event the owner fails to comply with an order to make a dam safe, a breach order is issued to remove the hazard created by the dam and reservoir. This subject will be covered in more detail later in this report under RESULTS OF SAFETY INSPECTIONS and ENFORCEMENT ORDERS AND PROCEEDINGS, where the Attorney General is requested to commence proceedings against owners refusing to obey the written orders of the State Engineer.

Number of Inspections

During FY 87-88, a total of 996 safety inspections were conducted (and 70 construction inspections) for a total of 1066. This included 265 safety inspections of high hazard dams, 229 safety inspections of moderate hazard dams, and 402 safety inspections of low hazard dams (including Federal dams). The objective of inspecting all high and moderate hazard dams on an annual basis is an "inspection season" objective versus a fiscal year one. This objective was reached for "inspection season" 1987 and is expected for 1988, in spite of the loss of one FTE that was eliminated by the legislature for FY 88-89.

Results of Safety Inspections

The 996 safety inspections resulted in the issuance of 42 restriction orders due to unsafe conditions during FY 87-88. Fifty-seven former restrictions were removed, and 29 revised.

As of June 30, 1988, there were a total of 279 restriction orders in effect. The following tables show the cause for restrictions by category and hazard class in Table 3, and by category and Irrigation Division in Table 4.

TABLE 3

CAUSE FOR RESTRICTION BY CATEGORY/HAZARD[1]

HAZARD	CATEGORY A		B		C		D		TOTAL	
HIGH	11	(-8)[2]	3	(-40)	12	(+20)	5	(0)	31	(-3)
MODERATE	20	(-13)	32	(+3)	13	(-13)	10	(-9)	75	(-6)
LOW	68	(+6)	69	(+8)	21	(-16)	15	(-17)	173	(+1)
TOTAL	99	(0)	104	(+4)	46	(-8)	30	(-12)	279[3]	(-1)

TABLE 4

CAUSE FOR RESTRICTIONS BY CATEGORY/IRRIGATION DIVISION[1]

DIVISION	CATEGORY A	B	C	D	TOTAL	NO. OF NONFEDERAL DAMS
1	43	45	17	15	120	687
2	15	18	3	6	42	283
3	5	1	1	0	7	61
4	11	12	10	4	37	226
5	16	15	12	1	44	182
6	9	5	2	2	19	130
7	3	4	1	2	10	73
TOTAL	99	104	46	30	279[3]	1,642

A - Inadequate Spillway/Freeboard
B - Structural Problem (Deteriorated appurtenances, cracking, erosion, scarps, sinkholes, deteriorated riprap, etc.
C - Leakage/Piping Conditions
D - Stability (Slides, saturated slopes)

[1] In effect as of June 30, 1988
[2] (%) change from FY 86-87
[3] All nonfederal dams

The approximate amount of storage lost due to restrictions is 132,628 acre-feet. The number of restrictions has reduced slightly, reflecting the repairs the owners are making to their dams, or breaching. A list of the storage restrictions by name, former water district, amount of restriction, date, reason, hazard rating, and approximate storage lost is contained in Appendix E.

The greatest problems causing the unsafe conditions according to the tables are inadequate spillway capacity-insufficient freeboard (freeboard is the vertical distance between the bottom of the spillway and the crest of the dam), and structural deficiencies. As a single category, inadequate spillway capacity represents almost half of these deficiencies; it being judged by hydrologic standards related to a dam's "hazard" to the floodplain. The State Engineer's hydrologic requirements for spillway flood capacity range from the 100-year flood to the Probable Maximum Flood (PMF); any spillway capacity less than the PMF requiring demonstration that the overtopping failure of the dam will be insignificant on the floodplain. The number of leakage and piping problems increased again, especially for high hazard dams; the moderate and lows decreasing. There were significant decreases in other categories, however, such as inadequate spillways for high and moderate hazard dams, structural problems with high hazard dams, and stability problems with moderate and low hazard dams.

With inadequate spillways identified as a frequent deficiency concerning the safety of dams in Colorado, a large number of orders issued by the State Engineer to dam owners is the need to repair and enlarge spillways. For "inspection season" 1988, all dams are still being evaluated for hydrologic adequacy in accordance with the following policy: All dams must pass a 100-year flood with one foot of residual freeboard. For high and moderate hazard dams that cannot do this, the dam is restricted to a level that can handle the 100-year event, and an order issued to upgrade the spillway (to the PMF, if needed). For low hazard dams that cannot pass the 50-year flood, the dam is restricted to handle the 50-year event, and an order issued to upgrade the spillway (to at least the 100-year event). If a low hazard dam will pass the 50-year event but not the 100-year event, an order is issued to upgrade the spillway to the 100-year event. In each case, the owner has the alternative to partially or fully breach the dam. These policies will be applied until the revised rules and regulations are promulgated, upon which the hydrologic requirements will be enforced.

In cases where the restriction orders cannot be enforced during flooding due to inadequate outlet capacity, and the owner has not complied with the orders to rehabilitate the dam, orders are issued to partially breach the dam by cutting the spillway down to the restricted level. The work must be done under the supervision of a registered professional engineer, and the spillway must be able to pass the 100-year flood.

In the event the owner does not comply with any of the above orders, another order is issued to completely breach the dam. The breach must be of sufficient width to pass abnormal flood flows without surcharging the reservoir basin, by passing the 100-year event at less than five feet of depth.

Following is a list of dams which were breached during the fiscal year 87-88:

NAME	COUNTY	DIV/DIST	DESCRIPTION
Joe Vento	El Paso	2/10	To 7 ft below dam crest.
Bergen #5	Jefferson	1/9	To 10 ft below dam crest.
Citizens	Mesa	4/41	To 7 ft below dam crest.
Pear	Boulder	1/5	Totally removed.
Sandbeach	Boulder	1/5	Totally removed.
Flickinger	Saguache	3/26	To 9.3 ft. below dam crest.
Brewer	Adams	1/2	Totally breached.
Williams-McCreery	Morgan	1/1	To 15 ft. above outlet.

USE OF APPROPRIATED FUNDS

The Legislature, for FY 87-88, budgeted $836,559 for dam safety personal services. The Division of Water Resources allocated $42,250 for both operating costs and for travel and subsistence to the Dam Safety Branch.

Dam Safety personal services expenditures for the fiscal year were $823,827. Total operating and travel and subsistence expenditures were $39,912. (No capital expenditures were made during the fiscal year.) In order to more effectively and efficiently administer the program, the State Engineer has transferred three field engineers to the division offices in Glenwood Springs, Montrose, and Durango. The engineer in Durango also supports the program in the Alamosa division office. Besides realizing a savings in travel costs to administer the program in these areas, another benefit being achieved is availability to the dam owners to assist them with the maintenance and repair of their dams.

RECEIPTS GENERATED FOR COSTS OF INSPECTION AND FILING OF PLANS

Fees collected by the State Engineer for dam safety were $67,536.30 for safety inspections and construction observation, and $4,180.34 for filing plans and specifications. Invoices totaling $66,556.49 were issued for safety inspections during the period.

RULES AND REGULATIONS

No regulations were promulgated during the fiscal year. Existing rules and regulations promulgated in 1967 were in force. With the passage of HB-1052 (1984), and HB 1186 (1986), preparation of revised regulations is nearly complete. Due to the concern about the hydrologic requirements for spillways, resulting from criticisms of the National Weather Service's Hydrometeorological Report No. 55, which is a basis for the criteria, they were delayed. An Attorney General's opinion on the proposed criteria was also

needed before they could be completed. Upon completion of the final draft of regulations, public meetings were held in Delta, Alamosa, and Denver to receive input on the proposed rules. The proposed fiscal impact statement was filed with the Office of Regulatory Reform, and the notice of the hearing on the rule making was published in the Colorado Register. A prehearing conference was held on March 25, 1988, and the hearings were held from April 13 to 18, 1988. Substantial revisions were made to the rules based upon testimony from the hearings. The revisions were transmitted to the parties to the hearings on August 1, 1988, with final comments due by August 15, 1988. Several additional revisions were made, and the rules were adopted on August 26, 1988. They were published in the September 10, 1988, issue of the Colorado Register, and became effective on September 30, 1988.

The new regulations have reduced the size requirements for spillways by relating them to the dam's size and hazard class (lesser requirements for smaller dams). The cost for determining spillway adequacy should be less in most cases, and the cost of the spillways themselves should be less, without jeopardizing the public safety.

In order to safe guard life, health, and property, the design and construction of dams must be done by professional engineers who are certified to practice in accordance with the laws regulating the practice of professional engineering. The regulations require the use of engineers for the design and construction of dams where they constitute a significant hazard to life and property; the requirements for assuring safe design and construction, however, vary with the size and hazard class of the dam. For very low hazard dams, the dam owners will be able to repair their dams themselves, with assistance from the State Engineer.

The regulations also provide for the safety inspection of dams by the owner's engineer, where it is more expedient and beneficial to the owner. The manner in which fees are collected for safety inspections of dams was revised to lessen the daily charge to owners of dams who have more than one of their dams inspected the same day.

ENFORCEMENT ORDERS AND PROCEEDINGS

During the fiscal year, the State Engineer was involved in enforcement proceedings under Section 37-87-114 , C.R.S. (1973) (1986 Supp.). Following is a brief description of each case.

1. Flickinger Reservoir Dam, Saguache County

Flickinger Dam is located on Ford Creek in the southwest quarter of Section 2, Township 45N, Range 6E, New Mexico P.M., in the vicinity of Saguache, Colorado. It is a 20-foot high, 15.5 acre-foot, low hazard dam.

While inspecting other dams in the area during 1980, it was discovered that this dam was constructed without having been approved by the State Engineer. On November 12, 1980, the State Engineer issued a restriction order to the owner, providing for a safe storage level 17 feet below the crest of the dam. The owner was ordered to retain the services of an engineer to conduct a hydrologic analysis of the drainage area and design a spillway for the dam which would handle a 100-year flood; to investigate the geotechnical properties of the embankment and analyze the stability of the dam; and to ascertain the integrity of the outlet works; and other administrative data such as capacity tables. The restriction remained in effect until 1986, when the outlet become plugged (under suspicious circumstances) and the reservoir filled to the spillway. No engineering analysis had been done as requested. In September of 1986, the State Engineer issued another order to the owner to either: breach the dam; rehabilitate the dam in accordance with the previous order; or reduce the height of the dam to nonjurisdictional size.

In March of 1987, the State Engineer learned that the owner was being foreclosed, and had filed for bankruptcy. A mortgage company intended taking control of the property. On May 1, 1987, the State Engineer issued another order to breach the dam at the spillway to a nonjurisdictional height and to unplug the outlet, with a due date of May 22, 1987, to notify him when the work would be done. After the due date passed without any response from the owner, the State Engineer requested the assistance of the Attorney General on June 8, 1987, to file an action in the District Court of Saguache County, pursuant to Section 37-87-114, C.R.S. (1973) (1986 Supp.), to have the court enforce the order. The complaint was filed on June 29, 1987, Case No. 87 CV 78.

Plans were submitted to open the outlet and modify the dam by lowering the spillway about nine feet. The plan was approved, and the work completed by April 19, 1988. The case was dismissed in the District Court on August 16, 1988.

2. Brewer Reservoir Dam, Adams County

Brewer Dam is located in the vicinity of Colorado Boulevard and East 104th Avenue, within the city limits of Thornton. It is a 20-foot high, 36 acre-foot, low hazard dam. On September 26, 1985, the State Engineer issued a zero storage restriction order due to the unsafe conditions at the dam, and the increased hazard conditions resulting from development downstream. The owner was directed to prepare plans for the rehabilitation of the dam, or have it breached. During July of 1986, large rainstorms in the area filled the reservoir to the point where Thornton city officials became concerned about the safety and an emergency response plan to patrol the dam by Thornton police was implemented. The owner subsequently began work to pump the reservoir down to the restricted level, but apparently due to poor communications with the contractor, many delays occurred. On August 27, 1986, the State Engineer issued an order to have the spillway enlarged by September 30, 1986, in order to protect the public safety during large rainstorms. Because the owner failed to comply with the order by the due date, the State Engineer requested the Attorney General on November 12, 1986, to initiate legal proceedings to have the order enforced. The Attorney General filed a complaint for

Preliminary and Permanent Injunction in District Court of Adams County on November 25, 1986, Case No. 86 CV 2742. The owner's attorney subsequently prepared a plan for breach of the dam, and upon approval by the State Engineer, proceeded to breach the dam, after a small delay, on July 15, 1987. The case was dismissed on October 14, 1987.

3. Douglas (Charles) Frost Dam, Park County

The Charles Frost dams are located in the Roland Valley Subdivision, adjacent to U.S. 285, about five miles east of Bailey in Park County.

The Frost dams are three of several "nonjurisdictional" dams less than 10 feet high which the Board of County Commissioners of Park County requested assistance to require spillways for in 1983 due to drainage problems caused by the dams. Upon complaint filed by the Attorney General for the State Engineer in the Division One Water Court, the judge ordered the owner on August 2, 1985, case no. 85CW40, to construct spillways and other provisions in accordance with plans approved by the State Engineer by August 30, 1985. In 1986, when the State Engineer was able to check the structures, it was determined that the dams were not in conformance with the court order. A hearing was requested and scheduled for January 22, 1987, in the Water Court of Water Division No. 1, where an order was issued for the water referee to determine whether the owner's dams were in reasonable compliance with the original order of August 2, 1985.

The referee conducted an inspection of the dams on June 15, 1987, and issued his findings on September 3, 1987. The referee found that the dams were not in compliance. Another meeting was held with the owner, his engineer, and attorney on November 24, 1987, where they were given directions on the repairs and modifications necessary to bring the dams into compliance. On December 21, 1987, we were notified that the work was completed and the case was closed on January 22, 1988.

EMERGENCY PREPAREDNESS PLANS

During the National Dam Safety Program's inspection and Phase I findings/ recommendations on high hazard dams, the preparation and maintenance of plans to combat incidents at dams, and to give warning to the floodplain area downstream, became a common recommendation of the reviewing professional engineers. At the conclusion of the National Dam Safety Program in 1981, the State Engineer requested that all owners of high hazard dams prepare emergency preparedness plans and provided a guideline for them to follow.

As of June 30, 1988, a total of 131 plans for high hazard dams have been filed with the State Engineer, out of the 254 Federal and nonfederal high hazard dams on file. Of the 131, twenty-eight are for Federal dams, primarily of the Bureau of Reclamation. In addition, plans have been submitted for thirty-four moderate hazard dams (three Federal), and twenty-two low hazard dams (one Federal). During FY 88-89, the State Engineer plans to return comments on submitted EPP's to the owners for updating and to request the balance of the high hazard dam owners and the moderate hazard dam owners to prepare plans, and file them with the State Engineer in accordance with the regulations. The owners will also be requested to coordinate with the Division of Disaster Emergency Services and local disaster coordinators.

DAM SAFETY DATA BASE MANAGEMENT SYSTEM

During FY 87-88, the Dam Safety Branch continued to enter data and make corrections to the data base, primarily being done by the several field engineers and a secretary. The FOCUS data base management software was acquired and installed in late June, 1986. It is being tested to learn its features and capabilities. Part of the data base (VS-300) was transferred to a dBase III format in the branches personal computer in order to prepare reports and print the headings for our inspection forms.

EFFECTIVENESS OF PROGRAM

As expressed by the goals and objectives of the State Engineer, the program's effectiveness can be measured by the prevention of dam failures. No failures occurred during the period of the report. Another example of the effectiveness of the dam safety program is shown in the tables of causes for restriction and the restriction list in the appendix. The identification of the unsafe conditions at the several dams and reservoirs and the subsequent restrictions to safe storage levels, prevented inevitable failures of these structures and the costly consequences thereof. The enforcement of the State Engineer's orders also plays a role in assuring the effectiveness of the program. The combination of the State Engineer's safety inspections, restrictions to safe storage, follow-up inspections, Emergency Preparedness Plans, and programs to make the dam owners more knowledgeable about the safe operation and maintenance of their dams through the State Engineer's "Dam Safety Manual," makes Colorado's Dam Safety Program one of the most effective in the United States.

In order to make dam owners aware of the value of designing, constructing, and maintaining safe dams, the State Engineer's office sponsored a dam safety workshop in Delta, Colorado, on April 5, 1988. About one-hundred participants received valuable information from engineers and dam owners in the safe design of dams and their appurtenances, and the safe operation and maintenance of their dams. The State Engineer's office also sponsored a training session on Risk Based Assessment of the Repair of Dams for Engineers in the Denver Area.

LEGISLATION

House Bill 1356 (Long Bill) removed one FTE from the branch, as well as the operating funds for three FTE. Footnotes to the bill requested that dam inspection efforts give priority to high and moderate hazard dams, and requiring that two supervisor level positions (in the branch) work half-time as dam inspectors.

The full impact of this has not been realized yet, but for fiscal year 87-88 it is expected that we will meet our inspection objectives as outlined previously. The loss of the operating funds, however, will place a severe strain on our ability to accomplish our objectives for inspection year 1989.

RECOMMENDED LEGISLATION

Program Funding

Increased funding is recommended for several areas of the dam safety program in order to maintain and improve it. One area is increased full time employees (FTE); one FTE for the Design Review Unit; and another FTE for the Dam Safety Branch's data base management system. Due to increased emphasis on safety inspections, one of the FTE's allocated to the Design Review Unit has been transferred back to the Field Engineering Units. However, the Design Review Unit has been assigned the responsibility to inspect the construction of the plans which they review. Another FTE is needed in Design Review in order to maintain the 180 day review time limit, and to assure quality design review.

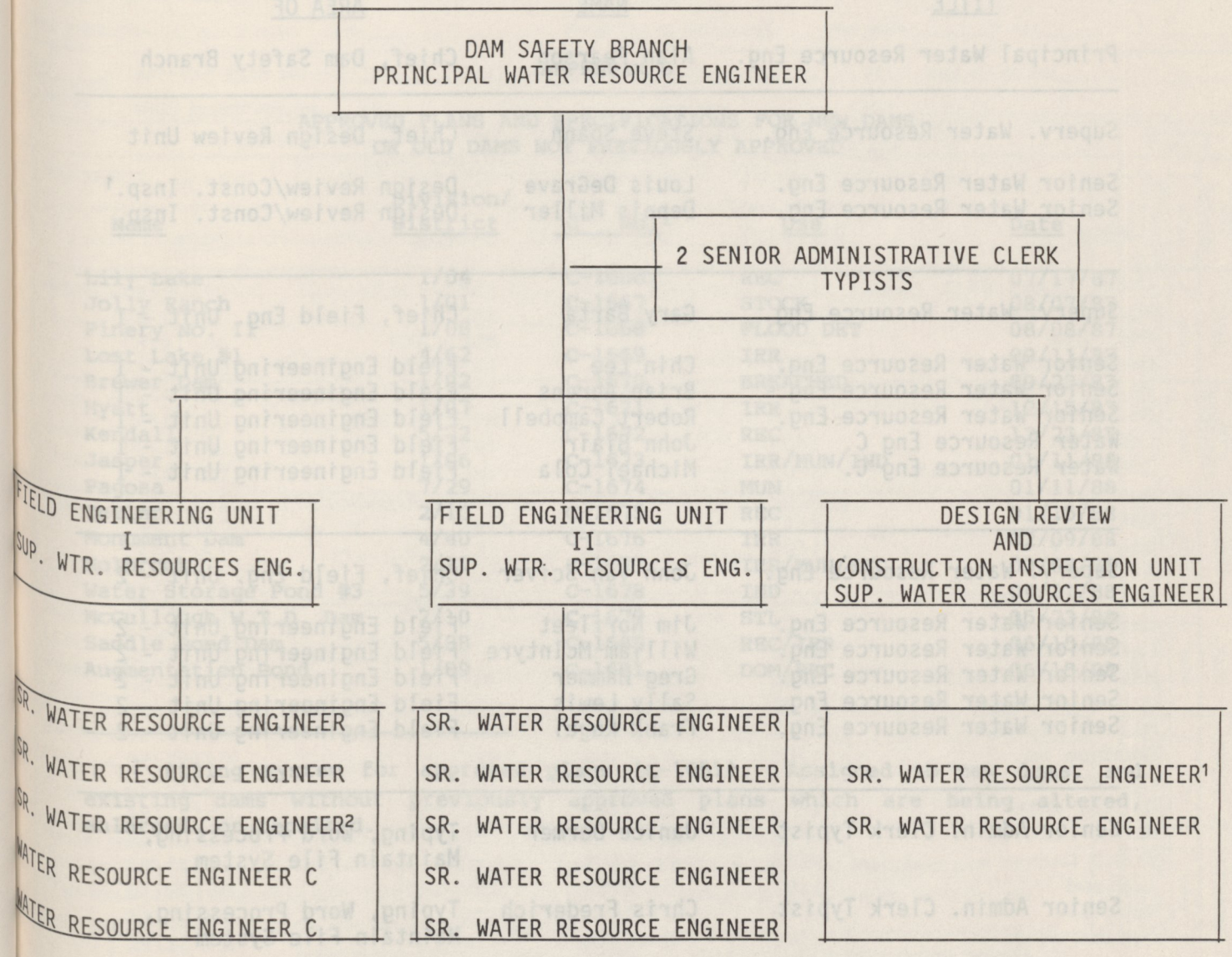
With the transfer of the dams data base to the DNR WANG VS-300 computer (and the intent to place as much relevant data as possible into the system), in order to produce comprehensive management and report data, there is a need for an FTE to support the data base, the branch, and to achieve its objectives.

Rapid changes occur in the field of dam safety engineering and related disciplines. New designs of dams (and rehabilitation of dams) are utilizing new material whose behavior and properties are unknown to the staff, and several conferences are held throughout the country with the object of sharing knowledge and experience in the field of dam safety. It is proposed to establish a training plan to send our dam safety engineers to these training programs in order to maintain a knowledge of the state-of-the-art of dam safety. The estimated first year's cost for such a program would be about $5,000.

Another area is the rental of "All-Terrain Vehicles (ATV)" and helicopters to allow fast and efficient access to many dams in remote areas. It is proposed to reserve about one-fourth of the helicopter time for emergency use. Estimated first year's cost for this program is $30,000.

APPENDIX A

PERSONNEL
DAM SAFETY BRANCH



[1] Field engineer position being used for design review and construction inspection:

[2] Position deleted in FY88-89

APPENDIX A
PERSONNEL
DAM SAFETY BRANCH

TITLE	NAME	AREA OF
Principal Water Resource Eng.	Alan Pearson	Chief, Dam Safety Branch
Superv. Water Resource Eng.	Steve Spann	Chief, Design Review Unit
Senior Water Resource Eng.	Louis DeGrave	Design Review/Const. Insp.[1]
Senior Water Resource Eng.	Dennis Miller	Design Review/Const. Insp.
Superv. Water Resource Eng.	Gary Barta	Chief, Field Eng. Unit - 1
Senior Water Resource Eng.	Chin Lee	Field Engineering Unit - 1
Senior Water Resource Eng.[2]	Brian Ahrens	Field Engineering Unit - 1
Senior Water Resource Eng.	Robert Campbell	Field Engineering Unit - 1
Water Resource Eng C.	John Blair	Field Engineering Unit - 1
Water Resource Eng C.	Michael Cola	Field Engineering Unit - 1
Superv. Water Resource Eng.	John Van Sciver	Chief, Field Eng. Unit - 2
Senior Water Resource Eng.	Jim Norfleet	Field Engineering Unit - 2
Senior Water Resource Eng.	William McIntyre	Field Engineering Unit - 2
Senior Water Resource Eng.	Greg Hammer	Field Engineering Unit - 2
Senior Water Resource Eng.	Sally Lewis	Field Engineering Unit - 2
Senior Water Resource Eng.	Frank Kugel	Field Engineering Unit - 2
Senior Admin. Clerk Typist	Janice Dermer	Typing, Word Processing, Maintain File System
Senior Admin. Clerk Typist	Chris Frederich	Typing, Word Processing, Maintain File System

[1]Field Engineer position being used for Design Review and Construction Inspection.

[2]Position deleted in FY88-89

APPENDIX B

APPROVED PLANS AND SPECIFICATIONS FOR NEW DAMS
OR OLD DAMS NOT PREVIOUSLY APPROVED

Name	Division/ District	"C" No.[1]	Use	Date
Lily Lake	1/04	C-1666	REC	07/17/87
Jolly Ranch	1/01	C-1667	STOCK	08/07/87
Pinery No. 11	1/08	C-1668	FLOOD DET	08/08/87
Lost Lake #1	4/62	C-1669	IRR	09/11/87
Brewer Dam	1/02	C-1670	BREACHED	09/23/87
Hyatt	1/07	C-1671	IRR	12/15/87
Kendall	5/72	C-1672	REC	12/23/87
Jasper	1/06	C-1673	IRR/MUN/IND	01/11/88
Pagosa	7/29	C-1674	MUN	01/11/88
Teller	2/10	C-1675	REC	01/15/88
Monument Dam	4/40	C-1676	IRR	02/09/88
Holbrook	2/17	C-1677	IRR/MUN/REC	03/08/88
Water Storage Pond #3	5/39	C-1678	IND	04/21/88
McCullough W.T.D. Dam	2/10	C-1679	STL	05/23/88
Saddle Pond Dam	5/38	C-1680	REC/IRR	06/15/88
Augmentation Pond	1/09	C-1681	DOM/REC	06/15/88

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1 Filing system for approved plans (C-1651). Assigned to new dams, and existing dams without previously approved plans which are being altered, enlarged, or repaired.

LHD:ict:7402I

APPENDIX B (continued)

APPROVED PLANS AND SPECIFICATIONS FOR ALTERATIONS
ENLARGEMENTS, OR REPAIR OF EXISTING DAMS

Name	Division/ District	"C" No.[2]	Use	Date
Chief Creek #4	1/65	C- 771E	FSH	08/06/87
Horse Creek	2/17	C-1329A	IRR	08/03/87
Pear Dam	1/05		BREACHED	08/14/87
Sand Beach Dam	1/05		BREACHED	08/14/87
Polly A. Dean	1/07	C- 538A	IRR/MUN/REC/FSH	08/17/87
Beckwith	2/15	C- 63A	MUN/IRR/REC	08/14/87
Lower Chinns	1/07	C- 281A	IRR/MUN	10/15/87
Johnston Reservoir	1/08	C-1397A	IRR/REC	10/19/87
Gurley	4/60	C- 460C	REC/IRR/MUN/FSH	11/30/87
Lake Henry	2/17	C- 555B	IRR	12/07/87
Signal #1	1/02	C-1650A	IRR/MUN	12/15/87
Albion	1/06	C- 36A	MUN	12/30/87
Buffalo Creek	1/23	C-1539A	AUG/REC	12/28/87
Cattail Pond	1/04	C-1475A	IRR	01/15/88
Lake Brennand	4/40	C- 287B	MUN/FSH/REC/IRR	01/26/88
Marston Reservoir	1/09	C- 970B	MUN/REC	02/03/88
Johnston Dam	7/30	C-1565A	REC	02/23/88
Milton Seaman	1/03	C- 385B	IRR/MUN	02/23/88
Goodhue No. 1	1/06	C- 318A	REC	04/01/88
Cotter Tailings	2/12	C-1526A	IND	04/18/88
Milton Lake	1/02	C-1471A	IRR/MUN	05/23/88
Bauer Lake #1	7/34	C- 368B	IRR	05/23/88
Trout Lake	4/60	C- 675B	HYDRO/REC	05/27/88
Ireland	1/01	C- 425B	IRR/REC	05/23/88
West #1	4/40	C- 545A	IRR	05/31/88
Cucaharas #5	2/16	C-1021B	IRR	04/21/88

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[2] Filing system for approved plans (C-1008A). Letters denote revisions to previously approved plans.

NOTE: Includes AS-CONSTRUCTED plans which were prepared after sketch plans or emergency actions were completed.

LHD:ict:7402I

APPENDIX C

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

DAM NAME _____ W. DIV. _____ W. DIST. _____ DATE OF INSPECTION ___/___/___

DAM ID _____ FILE NO. C- _____ FOREST I.D. _____ DATE OF LAST INSPECTION ___/___/___

OWNER NAME _____ OWNER PHONE _____

ADDRESS _____ ZIP CODE _____

CONTACT NAME _____ CONTACT PHONE _____

CLASS _____ CAPACITY _____ AF SURFACE AREA _____ AC. HEIGHT _____ FT. CREST LENGTH _____ FT CREST WIDTH _____ FT

CURRENT RESTRICTION ☐ (NO) ☐ (YES) LEVEL _____ EPP ON FILE ☐ (NO) ☐ (YES) SPWY WIDTH _____ FT. FBD _____ FT. Z _____

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.

		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 _____	☐	☐	☐	UPSTREAM SLOPE
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 _____	☐	☐	☐	CREST
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 _____	☐	☐	☐	DOWNSTREAM SLOPE
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 ☐ (37) FLOW INCREASED/MUDDY ☐ (38) DRAIN DRY/OBSTRUCTED ☐ (39) OTHER _____	☐	☐	☐	SEEPAGE
OUTLET	**PROBLEMS NOTED:** ☐ (40) NONE ☐ (41) NO OUTLET FOUND ☐ (42) POOR OPERATING ACCESS ☐ (43) INOPERABLE ☐ (44) UPSTREAM OR DOWNSTREAM STRUCTURE DETERIORATED ☐ (45) OUTLET NOT OPERATED DURING INSPECTION **INTERIOR INSPECTED** ☐ (120) NO ☐ (121) YES ☐ (46) CONDUIT DETERIORATED OR COLLAPSED ☐ (47) JOINTS DISPLACED ☐ (48) VALVE LEAKAGE ☐ (49) OTHER _____	☐	☐	☐	OUTLET
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 _____	☐	☐	☐	SPILLWAY
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 ☐ (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 _____		ACCEPTABLE	POOR	MAINTENANCE

See Guidelines on Back of this Sheet

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

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 ☐ ☐ **FIELD DIMENSIONS SHOWN ON BACK**

OBSERVATION BY WATER COMMISSIONER _____ **DATE**

The State Engineer, by providing this dam safety observation report, does not assume responsibility for the safety of this 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.

3/86 JTS

APPENDIX D

ENGINEERS INSPECTION REPORT

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 _____ W. DIV. _____ W. DIST. _____ DATE OF INSPECTION ___/___/___

DAM ID _____ FILE NO. C- _____ FOREST I.D. _____ DATE OF LAST INSPECTION ___/___/___

OWNER NAME _____ OWNER PHONE _____

ADDRESS _____ ZIP CODE _____

CONTACT NAME _____ CONTACT PHONE _____

CLASS _____ CAPACITY _____ AF SURFACE AREA _____ AC. HEIGHT _____ FT. CREST LENGTH _____ FT CREST WIDTH _____ FT.

CURRENT RESTRICTION ☐ (NO) ☐ (YES) LEVEL _____ EPP ON FILE ☐ (NO) ☐ (YES) SPWY WIDTH _____ FT. FBD. _____ FT. Z _____

INSPECTION PARTY REPRESENTING _____ _____ _____

DIRECTIONS: MARK AN X FOR CONDITIONS FOUND **AND** UNDERLINE WORDS THAT APPLY. GIVE LOCATION AND EXTENT WITH NUMBER REFERENCE I.E. (25) ALL ALONG SLOPE, OR SHOW IT ON SKETCH.

FIELD CONDITIONS OBSERVED

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

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

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 _____
Comments: _____

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) INADEQUATE SURFACE DRAINAGE
☐ (19) OTHER _____
Comments: _____

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 _____
Comments: _____

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 ☐ (37) FLOW INCREASED/MUDDY ☐ (38) DRAIN DRY/OBSTRUCTED
☐ (39) OTHER _____ Show location of drains on sketch and indicate amount and quality of discharge.
Comments: _____

OUTLET

PROBLEMS NOTED: ☐ (40) NONE ☐ (41) NO OUTLET FOUND ☐ (42) POOR OPERATING ACCESS ☐ (43) INOPERABLE
☐ (44)UPSTREAM OR DOWNSTREAM STRUCTURE DETERIORATED ☐ (45) OUTLET NOT OPERATED DURING INSPECTION
INTERIOR INSPECTED ☐ (120) NO ☐ (121) YES ☐ (46) CONDUIT DETERIORATED OR COLLAPSED ☐ (47) JOINTS DISPLACED ☐ (48) VALVE LEAKAGE
☐ (49) OTHER _____
Comments: _____

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 _____
Comments: _____

See Guidelines on Back of this Sheet

Conditions Observed	GOOD	ACCEPTABLE	POOR
UPSTREAM SLOPE			
CREST			
DOWNSTREAM SLOPE			
SEEPAGE			
OUTLET			
SPILLWAY			

DC185a-85

DAM NAME: _____ DAM I.D.: _____ DATE ___/___/___

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
Comments: _____

GOOD ☐ ACCEPTABLE ☐ POOR ☐ **MONITORING**

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 _____
Comments: _____

GOOD ☐ ACCEPTABLE ☐ POOR ☐ **MAINTENANCE AND REPAIRS**

OVERALL CONDITIONS

REMARKS: _____

Based on this Safety Inspection and recent file review, the overall condition is determined to be:

☐ 71 SATISFACTORY ☐ 72 CONDITIONALLY SATISFACTORY ☐ 73 UNSATISFACTORY

OVERALL CONDITIONS

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 & Specification must be approved by State Engineer prior to construction.)

☐ (90) PREPARE PLANS AND SPECIFICATIONS FOR THE 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 → RESTRICTED LEVEL OFFICIAL ORDER TO FOLLOW

- _____ FT. BELOW DAMS 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: ___/___/___

DC-22-2649a-86

APPENDIX E

DAM SAFETY BRANCH
CURRENT RESTRICTIONS[1]

JUNE 30, 1988

DIVISION ONE

NAME	DIST.	AMOUNT	DATE	REASON	HAZARD	APPROX. STG. LOST ACRE-FEET
A-20	2	5' below crest	11/27/85	Poor overall condition	M	30
Adams & Bunker #3	1	6' below crest	5/22/75	Inadequate freeboard, high seepage	L	150
Adrian Pond	4	8' below crest	12/3/86	No spillway	L	18
Akers & Tarr	5	7' below crest	2/17/83	Sloughing on downstream slope	M	95
Allis	8	11.5' below crest	5/03/85	Spillway prone to erosion	M	80
Angel Lake	3	8' below crest	2/21/78	Poor condition	L	309
Antero	23	G.H. 18.0	2/04/86	Stab. berm const. & new instrumen. monitoring	H	5,100
Badding/Croke 12 West	7	11' below embankment crest	12/30/83	Lack of maint. & repair; no serv. spwy.; no invest. of seepage situation, no EPP	H	751
Beaver Brook #2	7	3' below crest	8/26/85	Inadequate spwy., maint.	H	2
Beaver Brook #3	7	4' below spillway	6/11/87	Low area in crest, inadequate spwy.	M	
Beaver Brook #3A	7	15' below crest	9/17/85	Seepage high on embankment	H	48
Beaver Park	5	5' below spillway	11/8/84	Inadequate spillway	H	570
Bergen #2	9	10' below crest	4/30/84	Cracks in crest; inadequate spillway	H	209
**Bergen West	09	30 acre-feet	05/10/88	Piping of dam	M	
Bijou #2	1	G.H. 15 ft.	5/16/83	Erosion on upstream slope	M	470
Bluebird	5	No storage	11/21/74	Poor condition	M	966
Box Elder #3	3	5' below outlet	10/10/84	No emergency spillway	L	150
Bright View #1	2	7' below crest	9/30/85	Inoperable outlet, inadequate frbd.	L	17
Camp Shoshoni	6	3' below crest	6/12/87	Inadequate freeboard	L	4
Cantrill	8	G.H. 0.0	10/22/87	No spillway, inoperable outlet	L	64
Carlin	2	5' below crest	3/21/86	No spillway	L	0
Carmody	9	3' below crest	4/30/84	No spillway	M	0
Chambers	3	No storage above gage 45' more than 30 days	11/22/78	Excessive seepage over gage 45	H	0
Clarks Lake	3	G.H. 5 ft.	4/23/84	Poor condition	M	338
						9,371.0

[1]Total Storage Lost - 132,628.50

*Restrictions imposed this month
**Restrictions removed this month (date)
+Revised existing restrictions

Division One (cont.)

NAME	DIST.	AMOUNT	DATE	REASON	HAZARD	APPROX. STG. LOST ACRE-FEET
Clennon	5	6' below crest	7/11/85	Eroded and scarped u/s slope and eroded crest.	M	25
Comanche	3	G.H. 25	7/24/87	Sand boils in outlet discharge channel & inadequate spillway	H	340
Cooke	1	5' below crest	3/20/74	Deteriorated conditions	L	75
Croke #12 East	7	4' below emerg. spillway	6/01/84	Leakage from outlet pipe, sinkholes & depressions above outlet pipe	M	44
Crystal	5	5' below crest at outlet	4/17/85	Excessive seep. erosion of u/s slope, no spwy., brush, trees, and slough areas on d/s slope	M	50
Curtis	3	G.H. 10'	7/2/85	Irr. narrow crst, eroded unprotected u/s slope, exten. seep. area below d/s toe.	M	173
D. A. Lord #4	1	7' below crest	2/10/76	Inadequate spillway - seepage	L	450
Davis	5	3' below crest	10/21/87	Inadequate freeboard	L	40
Davis 1, 2, 3	80	10' below crest	9/13/84	Inadequate emergency spillways	L	10
Derby	2	14.5' below crest	2/5/85	Inadequate Spillway	M	400
Dixon Canyon	3	6' below crest	4/13/84	Erosion of u/s slope, sliding of d/s slope, lack of maintenance	M	195
Dry Creek	3	6' below crest	3/27/84	Outlet deter., u/s face erosion seep. d/s slope cracking	L	125
Duck	65	4' below spillway	3/23/87	Narrow crest, steep slopes	L	15
Eaton Law	3	6' below crest	1/3/77	Questionable condition of outlet	M	200
Elder	3	8.5' below crest	10/20/81	Inadequate spillway	H	264
Empire	1	No storage above G.H. 29.0	7/9/84	Excess seepage and no spillway	H	6,000
Erie	6	3.0' below crest	06/02/86	Insufficient freeboard	M	29
Fairport	4	6' below spillway	6/22/87	Poor condition	L	30
Florissant	23	No storage	5/21/73	Spillway failed; dam breached	L	20
Foothills	5	G.H. 41.0 ft.	5/20/86	Excessive leakage	H	450
Geist/aka/B-22	3	5' below crest	1/27/84	Erosion, seep., inad. spwy. no acceptable outlet	L	57.5
Gerlits	8	No storage	11/13/84	Dam partially breached due to overtopping	L	10
Gray #3	3	2' below spillway	3/11/83	Severe erosion u/s slope	M	200
Green Lake #1	6	13.5' below crest	10/12/84	Seepage, no spillway	L	30
Green Lake #3	6	3' below crest	10/8/84	Leaks, inadequate spwy. freeboard	L	60
Hanshaw	65	5' below crest	7/7/87	Seepage, slide	L	20
						9,312.5

Division One (cont.)

NAME	DIST.	AMOUNT	DATE	REASON	HAZARD	APPROX. STG. LOST ACRE-FEET
Havana Street	2	No storage	1/2/87	No spillway	L	75
Haystack #1	9	No storage	5/8/87	Spillway undermined	L	3
Henry	2	No storage	1/2/87	Piping into outlet, no spillway	L	100
Highland	5	4' below crest	3/7/77	Inadequate freeboard	L	90
Hoder	8	4' below spillway	9/14/87	Inadequate spillway with backcutting, seepage	L	20
Hourglass	3	9.5' below crest	10/27/75	Excessive seepage	H	259
Hyatt	7	8' below crest	5/8/84	Seepage d/s of toe and continual pressure on outlet pipe	M	360
Idaho Springs	7	9' below crest	7/9/84	Freeboard, leakage, depression spot	M	59
Ide & Starbird #1	5	3' below crest	7/3/85	Poor maintenance, eroded u/s face questionable spillway	M	
Jasper	6	Zero storage	1/8/88	Inadequate spillway; leakage	H	376
John Law	3	3' below crest	6/27/86	Inadequate freeboard & spillway	L	20
Johnson/aka Hohnholtz #3	48	5' below crest	7/24/86	Erosion on u/s face, lack of proper freeboard, seepage along d/s toe.	L	88
Julesburg	64	G.H. 23.0	6/13/88	Seepge at toe dam #2	H	6000
Kalcevic	7	11' below crest	2/10/83	Sloughing on upstream slope	H	69
Kelly	7	3' below crest	12/5/86	No spwy, inad. outlet construction	L	30
Knoth	5	Zero storage	12/24/85	Never completed dam	L	204
Lake Loveland	4	8.0' below crest	6/27/85	Deteriorated outlet, no spillway	H	1,000
Lambert	8	8' below crest	7/10/84	Large slide, abandoned outlet	L	50
Leyden	7	8' below crest	5/29/74	Inadequate spillway, unstable embankment	M	207
Lilly Lake	4	3.5' below crest	10/9/85	Spillway too small	M	5
Little Gem	5	10' below crest	10/11/85	Erosion on u/s slope & crest & trees on u/s slope	L	60
Louisville #1	6	5.5' below crest	6/28/85	Excessive seepage This is a seasonal restriction between the months of 10/1 & 4/30	M	
Lower Chinns	7	7' below crest	11/13/84	Excessive seepage in vicinity of outlet	L	14
Lower Cochran	9	4.5' below crest	5/22/86	Poor condition of upstream slope	L	2
Lower Long Lake	7	5' below crest	6/21/85	Poor condition of upstream face and crest, no spillway	M	52
McLain	23	3' below crest	7/7/87	Slip on upstream slope	L	6
Magnusun #1	23	8' below crest	12/4/85	Provide adequate freeboard	L	18
						9,167.0

Division One (cont.)

NAME	DIST.	AMOUNT	DATE	REASON	HAZARD	APPROX. STG. LOST ACRE-FEET
Mountain	23	4' below crest	11/06/85	Insufficient freebd., seepage @ toe	L	3
Mountain Supply #8	3	No storage	10/3/78	Poor condition	L	643
North Poudre #1	3	7' below crest	5/2/84	Poor u/s slope, decaying tree stumps, deteriorated riprap	M	106
North Poudre #2	3	G.H. 18 ft.	5/15/84	Concentrated seep, questions concerning abandoned outlet	H	985
North Poudre #4	3	G.H. 17 ft.	4/25/84	Poor u/s face, general condition	M	265
North Poudre #5	3	5.5' below spillway	12/12/78	Seepage instability	H	2,375
North Poudre #6	3	G.H. 9 ft.	1/21/83	Inadequate spillway, outlet, riprap	H	4,567
North Poudre #17	3	15' below crest after repaired	7/15/83	Poor condition, outlet	M	600
Oberon #1 (Lower) aka/ Hays Lake	7	No storage	6/8/85	Inadequate spwy., inoperable & disintegrating outlets.	M	54
Ohio Lake	2	5' below crest	5/14/84	Erosion on u/s slope, rodent activity, lack of maintenance	M	0
Park Creek #2	3	8' below crest	10/3/84	Generally poor condition, seepage	M	10
Pear	5	No storage	11/21/74	Poor condition	L	420
Pennock Creek/aka/ Twin Lakes	3	Zero storage	1/22/86	Deteriorated outlet, etc.	M	278
Peterson	3	12.6' below principal spillway	8/16/82	Excessive uplift at toe	H	246
Polly Deane	9	6.5' below crest	4/30/84	Erosion of upstream slope, poor general condition	M	57
Prospect	1	G.H. 35.5 ft.	4/15/80	Post-failure monitor; cracking on d/s slope	M	720
Quick	8	G.H. 0.0	10/22/87	No spillway, inoperable outlet	L	37
Rainbow Falls #5	8	9' below crest	9/11/85	Inadequate spillway	L	25
Richards	2	6' below crest	12/22/83	Erosion, narrow crest, seepage, plugged outlet, etc.	L	140
Rist Canyon	3	3' below crest	4/19/83	Poor condition	L	30
Rist George	4	Gage 10.8	7/18/85	Dilapidated condition, no spwy.	M	200
Riverside	1	G.H. 33.55 ft.	5/9/84	Prevent overfilling of reservoir	H	0
Rockwell Dam	4	8' below crest	6/8/72	Poor riprap, no access to outlet control	L	62
Ryan Gulch	4	8' below crest	2/15/78	Inadequate spillway and leakage	M	217
Sandbeach	5	No storage	2/7/83	Poor condition	M	297
Section 19 Res.	6	4' below crest	7/24/84	No spillway	N	10
Signal #1	2	10' below crest	5/25/84	Concentrated seepage areas and questionable condition of outlet	L	100
Southside	4	8' below crest	7/7/78	Inadequate spillway	M	144
						12,591.0

Division One (cont.)

NAME	DIST.	AMOUNT	DATE	REASON	HAZARD	APPROX. STG. LOST ACRE-FEET
Steele Bros. #1	5	4' below spillway	12/1/87	Sat. embankment; inoperable outlets; unknown cond. of n. outlet & adj. seep.; inad. frbd.; lack of erosion protection in spillway	L	34
Steele Bros. #2	5	3' below spillway	11/23/87	Total rehabilitation required	L	14
Storm	2	5' below crest	11/7/84	Inadequate cross-section, low areas on crest, service spwy. blocked	L	10
*Stocking Pond	23	Zero Storage	6/13/88	Inadequate spillway	L	10
Sun Lake	23	5' below crest	6/20/83	Provide adequate freeboard	L	1
Swede	5	5' below crest	11/14/86	Embankment seepage & inadequate freeboard	L	75
Thompson	2	5' below crest	10/7/87	Inadequate freeboard, generally poor condition	L	30
Tony White	8	10' below crest	5/18/84	Dam breached through spillway	L	112
Tucker Lake	7	6' below crest	6/12/78	Inadequate spillway	H	70
Wadley #1	2	8.0 below crest	6/13/85	Poor condition of dam	L	50
Wadley #2	2	7.0 below crest	6/17/85	Poor condition of dam	L	140
**Wakeman	8	7' below crest	11/23/87	Inadequate spillway	L	45
Waterpoint	2	No storage	6/19/86	Poor condition of spillway	L	10
*W. Cherry Crk #11	8	No storage	6/29/88	Illegal storage in flood control structure.	L	
Williams-McCreery	1	No storage	3/6/75	Questionable foundation & embnkmnt.	H	16,000
Wind	23	5.5' below crest		Saturated downstream slope	L	3
Woodland Park	8	20' below crest	4/21/83	Poor condition/inadequate spillway	H	40
*Worster	3	61 feet	6/22/88	Temporary filling to GH 65 not to exceed 60 days from date of this letter.	M	531
						17,175.0
				Division One Total		57,616.5

DAM SAFETY BRANCH
CURRENT RESTRICTIONS

JUNE 30, 1988

DIVISION TWO

NAME	DIST.	AMOUNT	DATE	REASON	HAZARD	APPROX. STG. LOST ACRE-FEET
Browning & Reese #1	17	Zero storage	12/28/87	Generally poor condition; inoperable outlet	L	383
Browning & Reese #2	17	Zero storage	12/28/87	Generally poor condition; inoperable outlet	L	100
Calahan	10	8' below crest	12/6/84	Saturated downstream slope	L	180
Cripple Creek #3	12	6' below crest	6/27/83	Inadequate spillway	L	112
Cudahy #1	17	5' below crest	7/15/85	Outlet disrepair	L	900
Cucharas #5	16	85' below crest	3/25/88	Damage to u/s face which would permit undesirable damage	H	49
Evans Gulch	11	3' below crest	9/14/84	Insufficient freeboard	L	2
Evans Gulch #2	11	1.5' below spillway	9/14/84	Insufficient freeboard	M	39
Gagliardi, Mike	19	Zero storage	10/21/87	Large animal holes in u/s slope	L	75
*Garden of the Gods	10	3'crest	5/31/88	No spillway	L	
Holita	16	3' below crest	6/2/77	Inadequate freeboard, slip on d/s slope	L	189
Horse Creek & Black Draw	17	5' below crest	4/24/86	In disrepair, abandoned	L	112
Lake Chipita	10	5' below crest	3/11/83	Provide adequate freeboard	L	5
Lake Henry	17	7.0' below crest	7/15/87	Seepage on east dam	M	2,659
Lolita #3	17	5' below crest	8/12/85	Inoperable outlet, uneven crest	L	700
Martin Lake	16	5' below crest	2/18/83	Inadequate spillway, poor condition of outlet	H	412
Mill Lake	16	9' below crest	2/16/83	Inadequate spillway, poor condition	L	40
Modern Woodmen of America #2	10	No storage	8/12/83	Spillway obstructed	L	18
Monument	10	3' below spillway	4/23/85	Unsat. Spillway condition	M	150
Mount Pisgah	12	5.2' below spillway	6/6/85	Inadequate spillway capacity	M	586
Nee-Noshe	67	Gage 22.5 with special requirements to allow storage to 23.5	1/17/83	No spillway	M	7,392
Orlando #2	16	G.H. 22.5 ft.	7/24/84	Cracks on downstream slope	L	750
Park Center L&W#2	12	No storage	9/26/85	Slide on downstream slope	L	15
Park Center #10	12	6' below crest	1/5/74	Severe cracking	L	12
						14,880.0

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**Restrictions removed this month (date)
+Revised existing restrictions

Division Two (cont.)

NAME	DIST.	AMOUNT	DATE	REASON	HAZARD	APPROX. STG. LOST ACRE-FEET
Prospect Lake	10	3 1/2' crest	05/31/88	No spillway,outlet operability questionable	L	0
Queen	67	7' below crest	2/20/87	U/S slope erosion; inadq. riprap	M	500
Rainbow Lake	11	5.0/8.0' below crest	12/23/87	Inadequate spillway	L	0
Seven Lakes	19	7' below crest	5/6/87	Dilapidated cond. of dam	L	1,200
Sharps Orchard	16	7' below crest	5/1/72	Badly eroded upstream slope	L	20
Silver Spruce #7	12	4' below crest	1/18/85	Seepage and slide	L	6
Swink #1	17	5' below crest	4/24/86	In disrepair, abandoned	L	500
Swink #2	17	5' below crest	4/24/86	In disrepair, abandoned	L	600
Swink #5	17	5' below crest	4/24/86	In disrepair, abandoned	L	750
Swink #6 (aka - Powell)	17	5' below crest	4/24/86	In disrepair, abandoned	L	650
Timpas #3	17	10' below crest	4/21/86	In disrepair, abandoned	L	500
Two Buttes	67	35' below crest	1/24/83	Inadequate spillway	H	22,200
Valley #1	10	15' below crest	12/27/84	Poor condition and blocked spillway	L	50
Valley #2	10	40' below crest	12/27/84	Inoperable outlet, poor condition	L	150
Victor #2	12	8' below crest	6/22/84	Extensive cracking along embankment	M	17
Wahatoya	16	5' below crest	5/12/75	Excess seepage, cracks	H	52
+Walsenburg Wtr. System	16	13'	6/22/88	Extensive seepage along the toe saturated foundation, and potential instability.	M	67
Wilson	12	3' below spillway	8/24/87	Structural cracks, spillway	M	120
						27,382.0
				Division Two Total		42,262.0

DAM SAFETY BRANCH
CURRENT RESTRICTIONS

JUNE 30, 1988

DIVISION THREE

NAME	DIST.	AMOUNT	DATE	REASON	HAZARD	APPROX. STG. LOST ACRE-FEET
Bristol Head #2 (Upper)	20	6.0 feet below lowest point of dam crest	4/20/87	Erosion damage, etc.	M	
Eastdale #1	24	G.H. 18 (12' below crest) 11/1 - 7/31 G.H. 15 (15' below crest) 8/1 - 10/31	08/21/87	Upstream slope erosion, seepage	L	1,700
**Flickinger	26	17' below crest	11/12/80	Inadequate spwy., poor construction	L	30
Forbes Park	35	2.5' spillway	7/19/85	Inadequate spillway	L	45
Lost Lake #2	20	3.5' below crest	8/14/87	Cracking, inadequate freeboard, rusted outlet	L	80
Mountain Home	35	G.H. 87.5'	9/16/82	Inadequate spillway	H	15,000
Terrace	21	7' below spillway	7/18/84	Inadequate spillway	H	2,000
						18,855.0
				Division Three Total		18,855.0

*Restrictions imposed this month
**Restrictions removed this month (date)
+Revised existing restrictions

DAM SAFETY BRANCH
CURRENT RESTRICTIONS

JUNE 30, 1988

DIVISION FOUR

NAME	DIST.	AMOUNT	DATE	REASON	HAZARD	APPROX. STG. LOST ACRE-FEET
Alta #1	60	5' below crest	8/18/76	Inadequate spillway	L	20
Alta #3	60	5' below crest	9/16/85	Provide sufficient freeboard	L	10
Arch Slough	40	G.H. 0.0	12/12/85	Poor condition, reservoir abandoned	L	66
Beaver	40	10' below spillway	7/7/87	Excessive seepage	H	300
Brockman #2	40	5' below spwy	7/11/86	Saturation/instability	L	20
Casto	63	12' below crest	4/6/84	Rodent holes, abandoned outlet, thin crest	M	477
Citizens	41	2' below spwy	9/29/86	Inadequate freeboard and general poor maintenance	L	30
Coffey	41	Zero storage	10/22/85	Poor condition & excessive seepage	L	35
Craig #1	63	3' below spillway	05/1/86	Seepage ponding at toe and brush obscuring upstream slope	M	95
Cushman Lake	60	6' below crest	7/29/75	Provide sufficient freeboard	L	6
Doughty	40	5' below spillway	11/10/86	Seepage adjacent to outlet	L	21
Duvall #1	73	16' below crest	5/22/85	Poor condition, no outlet	L	15
Fullmoon	68	3' below crest	11/27/85	Maintain minimum freeboard	L	
Gobbo #3	42	16' below crest	11/7/86	Slide on d/s slope	M	100
Granby #11	40	4' below spillway	10/15/87	Seepage	M	72
Granby #12	40	G.H. 17	10/15/87	Seepage	M	98
Grand Mesa No. 1	42	3' below crest	1/27/88	Inadequate freeboard	L	48
Hale	40	5' below crest	9/17/85	Sinkholes	L	15
Holy Terror	40	6' below crest	11/10/86	Inadequate spwy., spwy. erosion & debris, seepage, narrow crest	L	67
Knox	40	G.H. 17.0	1/8/88	Seepage on embankment revision until 8/15/87	L	135
						1,630.0

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**Restrictions removed this month (date)
+Revised existing restrictions

Division Four (cont.)

NAME	DIST.	AMOUNT	DATE	REASON	HAZARD	APPROX. STG. LOST ACRE-FEET
Little Giant #1	40	6' crest, 10.5' GH	6/6/88	Poor outlet, inadequate spillway.	L	
Lone Cabin	40	3' below spillway	9/11/84	Slide on downstream slope	L	40
Lone Star #1	40	10' below crest	4/12/85	Constructed without approved plans and specifications	L	
**Lone Star #3	40	4' below crest of spillway	4/12/85	Constructed without approved plans and specifications	L	
Meridian Lake Park #1	59	2' below spillway	6/4/87	Severe erosion of the spillway	L	10
Mock #1	41	9' below crest	9/20/82	Poor condition	L	20
+Monument	40	5' below spillway	6/6/88	Cracks in left abutment	M	100
Norwood Pond	60	5' below crest	1/5/83	Seepage high up on d/s slope	L	4
Oasis	40	3' below crest	11/9/84	Lack of freeboard, poor outlet	L	21
Paxton	60	5' below spwy	8/6/86	Seepage	L	400
Priest Lake	60	3' below crest	9/16/85	Insufficient freeboard	L	25
Reeder	42	8' below crest	8/14/85	Insufficient freeboard Seepage, trees	L	96
Todd	40	10' below crest	10/19/84	6' elevation difference along crest with no spillway	L	112
Trout Lake	60	12' below crest	7/7/87	Sandboils	H	530
Waterbug	40	6' below spillway	11/10/86	Poor condition, slip on u/s slope, d/s outlet valve	L	65
Weir & Johnson	40	Zero storage	12/4/87	Failed outlet	M	630
Womack #3	40	4' below crest	9/14/84	Inadequate cross-section	L	23
						2,076.0
				Division Four Total		3,706.0

DAM SAFETY BRANCH
CURRENT RESTRICTIONS

JUNE 30, 1988

DIVISION FIVE

NAME	DIST.	AMOUNT	DATE	REASON	HAZARD	APPROX. STG. LOST ACRE-FEET
Battlement #2	45	Zero storage	11/5/85	Damaged outlet	L	70
Big Beaver	72	10' below crest	11/17/87	Sinkholes in right embankment	L	96
Bull Basin #1	72	10' below crest	11/23/87	Spillway flows impinge on embankment toe	L	80
Bull Creek #3	72	Zero Storage Maintain Outlet Fully Open	11/23/87	Sinkhole on u/s slope	L	59
Carpenter	72	G.H. zero	11/7/86	Sinkhole, seepage	L	34
Coon Creek #1	72	8' below spillway	9/24/87	Inadequate spillway	M	475
Coon Creek #2	72	Zero Storage Maintain Outlet Fully Open	11/23/87	Sinkhole on u/s slope, excessive seepage	M	225
Coon Creek #3	72	5' below crest	9/29/87	Outlet deteriorated	L	30
Coon Creek #4	72	No storage	9/16/86	Poor Condition	L	9
Cottonwood #2	72	3' below spwy.	10/17/85	Inadequate spwy., ext. seepage	M	50
Currier #2	72	Zero Storage	10/16/87	Land slides into spillway	L	222
Dale	51	15.5' below crest	7/6/87	Outlet distress, sloughing at outlet	L	
Dale #2	51	5' below crest	7/5/85	Insufficient freeboard	L	15
Dawson/aka/Lambert	72	3' below crest	10/17/85	Inadequate spwy., poor condition	L	70
Fruita Settling Basin #2	72	Zero storage	11/23/87	Poor condition	L	38
G. G. Lower	37	No storage	2/14/86	Inadequate freeboard	L	37
G. G. Upper	37	No storage	2/14/86	Inadequate frbd. & questionable stability of d/s slope	L	30
Harris	39	6' below spwy.	11/27/85	Undersized spillway	M	50
Jones	52	5' below p. spwy.	10/23/85	Outlet disrepair, seepage on embmnt.	M	35
Kelly Dam	53	5' below crest	11/21/84	Insufficient freeboard	L	100
Langholen	51	4' below spwy.	6/28/85	Inadequate spillway	L	60
						1,785.0

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Division Five (cont.)

NAME	DIST.	AMOUNT	DATE	REASON	HAZARD	APPROX. STG. LOST ACRE-FEET
Leon Lake	72	G.H. 18.5	9/18/87	Sinkhole and leakages	H	
Little King Ranch	51	10' below spillway gage-height 41.0	4/16/73	Excessive leakage	M	180
Mesa Creek #4	72	G.H. 10.0 or 5' below spwy. crest	1/18/83	Instability of d/s slope and seepage	M	324
Michaelson	72	G.H. 0.0	10/21/87		L	88
Milk Creek	50	20' below crest or 15' below spillway	09/16/87	Excessive seepage on embankment	L	60
Muddy Gulch	72	No storage	6/2/86	Inad. s/w, seepage, poor condition	L	5
Newton Gulch	53	20' below crest	7/3/75	Abutment piping failure	L	400
Noeker	37	5' below crest	10/10/84	Badger holes down into crest	L	65
Parkerson	72	No storage	9/24/87	Improper construction	L	10
Parsons	50	Zero strg.	11/28/86	Inadequate spwy. sagging crest, abutment slides at spwy.	L	27
Pheney	51	5' below crest	7/18/86	No spillway, extensive seepage	L	100
Rapid Creek #1	72	6' below crest	9/12/86	Poor condition & seepage	M	400
Rapid Creek #2	72	6' below crest	9/11/86	Poor condition & inoperable outlet	M	147
Rifle Valley	39	5' below crest	2/14/77	No spillway, outlet, inoperable	M	49
Rock Creek	51	15' below crest	1/22/79	Inadequate spillway, poor embnkmnt.	L	125
Ruby Lee	72	No storage	6/25/85	Inadequate spillway, poor condition	L	367
Rudolph	50	Zero storage	9/16/87	Failed outlet	L	70
Scholl	51	22' below crest	6/30/86	Sinkholes in abutment	L	250
**Schorn Fish Pond	72	No storage	9/14/82	Poor condition	L	7
Sylvan	51	5' below crest	9/30/85	Insufficient freeboard	M	130
Upper Highline	72	10' below spwy.	8/22/85	Seepage of dissolved solids	M	1,860
Welsh	37	8' below crest	5/17/78	Poor condition	L	36
Willow Creek	37	5' below crest	09/29/87	Inadequate spillway	L	7
Y-T Reservoir	72	6' below crest	9/24/87	Extensive historic seepage, inadequate spillway	L	40
						4,747.0
				Division Five Total		6,532.0

DAM SAFETY BRANCH
CURRENT RESTRICTIONS

JUNE 30, 1988

DIVISION SIX

NAME	DIST.	AMOUNT	DATE	REASON	HAZARD	APPROX. STG. LOST ACRE-FEET
Anderson	44	6' below crest	6/06/86	Blocked spillway	L	60
Bar-Bee	58	1' below spillway	11/17/87	Spillway erosion	L	6
Basin	57	13' below crest	9/17/85	Dam is breached	L	200
Biskup Dam	44	5' below spwy	6/27/86	Inadequate spillway, slide, poor condition	L	45
Bunker	44	5' below crest	11/15/85	Poor condition, no spillway	L	60
Clayton	47	5' below spwy	7/23/86	Seepage on d/s face	L	60
D D & E Wise	44	5' below spwy	11/27/85	Poor outlet condition	M	200
Drescher	44	1' below spillway	9/22/87	Cracks in crest and spillway backcutting	L	30
Ellgen #2	44	No storage	5/30/86	Poor outlet condition	L	60
Elk Lake	54	5' below crest	9/12/85	Spillway obstructed, poor maint.	M	40
Fait	58	Zero storage	10/1/87	Illegal dam	L	4
Gill	44	10 below crest	10/20/86	Seepage high on embankment	L	60
Lake Emrich	57	15' below crest	5/6/87	Slide on d/s face	L	250
Lake Gloria	43	5' below crest	12/29/87	Illegal dam w/o plans & specs.; inad. frbd.; questionable spwy.	L	7
Mystic #2	58	10' below crest	11/16/87	Severe cracking of embankment	L	5
Nofstger	57	3' below spillway	12/16/87	Spillway too small	L	40
Nofstger-Zeigler	57	5' below crest	6/18/85	No spillway, poor condition	L	40
Overman	58	No storage	11/18/87	Hole in d/s slope	L	50
Pole Mountain	47	No storage	3/30/83	Slide, upstream slope	M	1,905
						3,122.0
				Division Six Total		3,122.0

*Restrictions imposed this month
**Restrictions removed this month (date)
+Revised existing restrictions

DAM SAFETY BRANCH
CURRENT RESTRICTIONS

JUNE 30, 1988

DIVISION SEVEN

NAME	DIST.	AMOUNT	DATE	REASON	HAZARD	APPROX. STG. LOST ACRE-FEET
Bauer #1	34	3' below spwy for 45 days or 5' below spwy	8/27/84	Saturation high on embankment	M	144
Belmear	69	7' below crest	7/17/84	Backcutting of spillway, concentrated leakage, questionable outlet	M	168
Big Pine	71	2' below spillway	8/12/85	Steepness of d/s slope around outlet and seepage and sloughing from abutment left of outlet	M	70
Caballo Lake	31	2' below spillway	7/29/86	Leakage along outlet; inadequate spillway	L	8
Charles Lemon	30	G.H. 8.5	3/7/86	Poor condition - restriction is to top of principle spwy. pipe	L	15
Coppinger #1	34	3' below crest	1/27/84	Inadequate freeboard, inoperable outlet, rodent activity	L	12
Coppinger #2	34	3' below crest	8/85	Inadequate freeboard	L	5
Highland Mary	30	11' below crest	9/12/85	Inoperable outlet, partially breached condition of dam	L	60
J. O. Spencer	34	5' below spillway		Poor condition	L	13
Short	30	No storage. Outlet full open.	11/13/86	Inadequate spwy.; erosion on u/s face; current rest. results in about 3 AF of dead storage below invert of outlet	L	40
						535.0
				Division Seven Total		535.0

*Restrictions imposed this month
**Restrictions removed this month (date)
+Revised existing restrictions