

STATE OF RHODE ISLAND

2002

Annual Report to the Governor
on the Activities of the

DAM SAFETY PROGRAM



Valley Falls Dam (Number 63), Central Falls & Cumberland

Department of Environmental Management

Prepared by the Office of Compliance and Inspection

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HISTORY OF RHODE ISLAND'S DAM SAFETY PROGRAM

The Rhode Island dam inspection and inventory program had its inception in 1883, and was under the authority and responsibility of the Commissioner of Dams and Reservoirs. At that time, there were 86 dams included in the inventory records; today, there are 528 inventoried dams.

DAM CLASSIFICATIONS

All of the inventoried dams are classified by size and hazard ratings. The size classification provides a relative description of small, medium or large, based on the storage capacity and height of the impounded water. The hazard classification relates to the potential for harm if the dam fails and does not relate to the current condition of the dam. The hazard classifications are defined as follows:

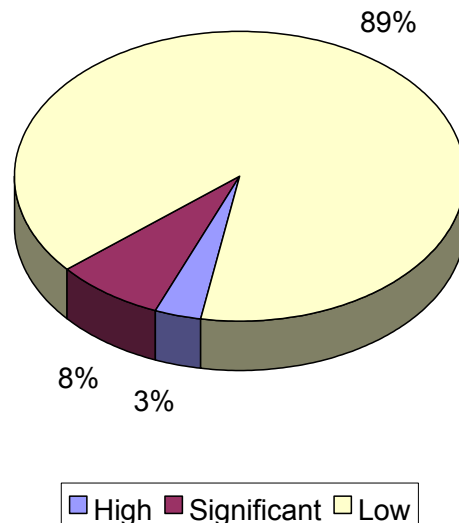
High Hazard – Failure of the dam would most probably result in the loss of more than a few lives and extensive property damage.

Significant Hazard – Failure of the dam could possibly result in the loss of life and appreciable property damage.

Low Hazard – Failure of the dam would result in no apparent loss of life and only minimal or no property damage.

There are 17 high hazard dams, 41 significant hazard dams and 470 low hazard dams. Attached is a list of the inventoried dams, sorted by town and river.

Hazard Classifications
(Percent of Registered Dams)



Most of these hazard classifications were assigned in the late 1970's and early 1980's. However, due to additional development throughout the state, including those areas downstream of dams, some of the classifications are no longer accurate. As indicated in the "Activities in 2002 - Grants" section of this report, the Department of Environmental Management (DEM) has utilized a Federal Emergency Management Agency (FEMA) grant to obtain engineering services to update the hazard classification of certain dams.

STATUTES

As set forth in Rhode Island General Laws, Chapters 46-18 and 46-19, a dam owner has the responsibility for the safe operation of his/her dam, and is liable for the consequences of accidents or failures of the dam. In general, a dam owner is required to use "reasonable care" in the operation and maintenance of a dam. This responsibility includes the proper operation, maintenance, repair and rehabilitation of a dam, which are essential elements in preventing a dam failure.

The criteria governing the administration and enforcement of Rhode Island's Dam Safety Program are contained in the General Laws of Rhode Island, Chapter 46-19. DEM has the responsibility to cause to be inspected dams to determine their condition, to review and approve plans for construction or substantial alteration of a dam and to order the owner to make repairs or to take other necessary action to make the dam safe.

GOVERNOR'S TASK FORCE ON DAM SAFETY AND MAINTENANCE

In May 2000, Governor Almond issued Executive Order 00-6, *Creation of Dam Safety and Maintenance Task Force*. The Task Force was charged with developing recommendations for a comprehensive program of monitoring, maintenance and repairs that will enhance upkeep and safety of the dams in the State.

The Task Force, co-chaired by the Directors of DEM and of the RI Emergency Management Agency (RIEMA), was comprised of representatives of the RI Budget Office, the RI Clean Water Finance Agency, the Natural Resources Conservation Service, Public Works Directors for three Rhode Island municipalities, five dam associations, two dam owners, and four members of the General Assembly (not all General Assembly members were officially appointed to the Task Force).

The Task Force convened for 12 two hour sessions over a six month period, and finalized their recommendations in a report dated January 2001. The recommendations included legislative, regulatory, administrative and policy proposals designed to protect public safety, create an efficient approach to dam repairs and ensure a timely response should a community be threatened by a dam failure.

Although the proposed legislation developed by the Task Force was not enacted, DEM has identified a number of recommendations that can be implemented by regulations. In 2002, DEM began drafting regulations to incorporate those Task Force's recommendations that can be implemented within the framework of the existing statute, and expects to promulgate them in 2003.

PROFESSIONAL ASSOCIATIONS

Rhode Island has been a member of the Association of State Dam Safety Officials (ASDSO) since its inception in Denver, Colorado in 1984. ASDSO membership consists of state representatives along with corporate and individual members representing dam owners and professional engineering firms. ASDSO was formed to serve these initial functions:

- Improve efficiency and effectiveness of state dam safety programs;
- Foster public awareness;
- Facilitate inter-organizational, intergovernmental and interstate cooperation;
- Assist the dam safety community and provide a forum for the exchange of information;
- Provide representation of dam safety interests before state legislatures and before Congress; and
- Manage the association effectively through internal policies and procedures.

ASDSO has helped to improve dam safety in Rhode Island mainly through its sponsorship of regional dam safety workshops and its national annual conferences. In addition, various grants have provided funds for the purchase of computers, camera and video equipment and various types of field equipment to aid in the inspection and inventory of dams. These grant programs have also been supported, in part, by FEMA.

INSPECTION PROGRAM

Each dam's hazard classification determines the frequency of inspection. The higher the classification, the more frequently the inspection is conducted. A dam of any classification is also inspected upon request by the owner, a town/city official, or a person owning or representing property liable to damage from the dam in the event of failure.

The inspections performed by DEM are visual inspections and are conducted under a general inspection format based on guidelines established in 1976 by the United States Army Corps of Engineers (ACOE) for the National Program for the Inspection of (Non-Federal) Dams.

As part of each visual inspection, the condition of the major components of the dam are subjectively rated as *good*, *fair* or *poor*. The major components of a dam are the embankment, the spillway and the low level outlet. *Good* is defined as meeting minimum guidelines, where no irregularities are observed and the component appears to be maintained properly. *Fair* indicates a component which requires maintenance that has not led to the need for structural repairs (e.g., missing mortar in a masonry wall that has not yet caused displacement of the masonry units). *Poor* indicates a component that has deteriorated beyond a maintenance issue and requires major repair; the component no longer functions as it was originally intended (e.g., an inoperable low level outlet, a permanently blocked outlet, or an earthen embankment with extensive, deep rooted vegetation). A component rated as poor typically requires an engineering evaluation and extensive work to return it to proper order.

Following a visual inspection, a dam inspection report is prepared, identifying specific deficiencies and, when warranted, recommending corrective measures. A copy of the report is forwarded to the owner, with the expectation that the deficiencies will be corrected. However, unless DEM has determined that a dam is unsafe, DEM can only recommend corrective measures, rather than require them. If a dam is determined to be unsafe, then DEM may order corrective actions.

ACTIVITIES IN 2002

INSPECTIONS

In 2002, 63 dams were inspected by DEM. Information relating to the numbers and dams inspected follows:

DEM Owned Dam Inspections

The Dam Safety Program, in conjunction with DEM's Division of Planning and Development¹, inspected all the DEM owned dams in an effort to determine and prioritize those that require repair. Ownership of four of the dams, 63 (Valley Falls), 143 (Pawtuxet Lower), 294 (Ten Mile Reservation) and 297 (Long), are in question and will be researched by legal staff.



Dam Number 63 (Valley Falls), Central Falls & Cumberland

¹ The Division of Planning and Development is responsible for coordinating repair of DEM owned dams, when such repairs are too extensive to be performed by in-house personnel.

The 51 DEM owned dams and their conditions are listed below.

Dam No.	Dam Name	City/Town	Hazard	Embankment	Spillway	Low Level Outlet
17	Burlingame Lower	Glocester	Low	Fair	Poor	NA
18	Burlingame Upper	Glocester	Significant	Fair	Good	Good
19	Sweet's Mill	Glocester	Low	Poor	Poor	NA
42	Round Top	Burrillville	Low	Fair	Good	Poor
63	Valley Falls	C. Falls/Cumberland	Significant	NA	Good	Poor
100	Goldfish	Lincoln	Low	Poor	Poor	NA
102	Olney	Lincoln	High	Good	Good	Unknown
108	Stillwater	Smithfield	High	Poor	Poor	Fair
143	Pawtuxet Lower	Warwick	Low	NA	Good	NA
166	Curran Upper	Cranston	Significant	Poor	Poor	Poor
198	Curran Lower	Cranston	Significant	Poor	Poor	Poor
210	Old Mill #1	West Greenwich	Low	Fair	Good	Good
214	Breakheart	Exeter	Low	Fair	Poor	Fair
216	Wyoming Upper	Hopkinton/Richmond	Significant	Good to Fair	Fair	Poor
220	Barberville Mill	Exeter	Low	Fair	Fair	NA
221	Browning Mill	Exeter	Low	Fair to Poor	Fair	Good
222	Moscow	Hopkinton	Low	Fair to Poor	Fair	Poor
245	Hope Valley Mill	Hopkinton/Richmond	Low	NA	Fair	NA
287	Long	Hopkinton	Low	Fair	Good	Good
294	Ten Mile Reservation	Pawtucket	Low	NA	Fair	Poor
340	Meshanticut Park	Cranston	Low	Fair	Good	NA
347	Young's	Foster	Low	Fair	Fair to Poor	NA
403	Greenwich Bleachery	East Greenwich	Significant	Poor	Poor	Poor
423	Burlingame	Charlestown	Low	Fair to Poor	Unknown	Good
444	Silver Spring	North Kingstown	Low	Fair	Fair	NA
454	Woody Hill	Westerly	Low	Fair	Poor	NA
457	Clausen Farm	Charlestown	Low	Good to Fair	Good	Good
469	Frosty Hollow	Exeter	Low	Good	Good	NA
474	Simmons	Little Compton	Low	Fair	Good	Good
476	Carolina Trout	Richmond	Low	Good	Unknown	NA
496	Buck Hill	Burrillville	Low	Good	Fair	Good
499	Durfee Hill #2	Glocester	Low	Good to Fair	Fair	NA
501	Little Round Top	Burrillville	Low	Good to Fair	Unknown	Unknown
512	Black Hut	Burrillville	Low	Good	Good	NA
521	Wildlife Marsh	South Kingstown	Low	Good to Fair	Good to Fair	NA
531	Great Swamp	South Kingstown	Low	Fair	Fair	Good
551	Potowomut	North Kingstown	Low	Fair	Good	Good
566	Bowdish	Glocester	High	Good	Good	Good
601	Durfee Hill Upper	Glocester	Low	Good to Fair	Fair	Good to Fair
602	Durfee Hill Lower	Glocester	Low	Fair	Poor	NA
603	Barberville Lower	Exeter	Low	Fair	Fair	Unknown
604	Richardson Marsh	Burrillville	Low	Fair	Unknown	Unknown
605	Old Mill #1 Upper	West Greenwich	Low	NA	Good	NA
606	Carbuncle	Coventry	Low	Fair	Poor	NA
607	L. Woods Circulation	Lincoln	Low	NA	Fair	NA
609	Simmons #2	Little Compton	Low	Fair	Good	NA
610	Simmons #3	Little Compton	Low	Fair	Good	NA
611	Simmons #4	Little Compton	Low	Fair	Good	NA
612	Simmons #5	Little Compton	Low	Fair	Fair	NA
613	Simmons #6	Little Compton	Low	Fair	Good	NA
614	Simmons #7	Little Compton	Low	Fair	Good	NA

NA feature not present at this dam
 Unknown feature present but not visible for inspection

A report was completed for each dam indicating its current condition and any repairs needed - repairs that can be performed by DEM personnel and those that require hiring of outside engineers and contractors.

In 2003, DEM is scheduled to undertake general maintenance and repair at the five highest priority dams - 166 (Curran Upper), 198 (Curran Lower), 108 (Stillwater), 216 (Wyoming Upper) and 18 (Burlingame Upper).



Dam Number 42 (Round Top), Burrillville

The following dams were also inspected, originally under the assumption that they were DEM owned. However, further investigation revealed that they were not owned by DEM, as indicated below.

Dam No.	Dam Name	City/Town	Hazard	Embankment	Spillway	Low Level Outlet
183	Tarbox	West Greenwich	Low	Fair	Good	Poor
184	Carr	West Greenwich	Low	Poor	Fair	Poor
227	Ashville	Hopkinton	Low	Fair	Good to Fair	Good to Fair
229	Blue	Hopkinton	Low	Poor	Good to Fair	Unknown
281	Capwell	West Greenwich	Low	Fair to Poor	Fair to Poor	Fair to Poor
550	Hamilton	North Kingstown	Low	Fair	Good	Poor

Dam numbers 183 (Tarbox), 184 (Carr) and 281 (Capwell) are owned by the Rhode Island Water Resources Board; however, DEM has provided assistance in management and maintenance of the dams.



Dam Number 281 (Capwell) West Greenwich

Dam number 227 (Ashville) is believed to be owned by the Town of Hopkinton. Canonchet Road is on the crest of the dam and DEM owns much of the land below and surrounding the pond and maintains a boat ramp at one end of the dam.

Dam number 229 (Blue) is owned by the Ashville Corporation. Most of the land below and surrounding the pond is owned by DEM. During the inspection, the pond was about 2 to 2.5 feet below normal elevation, at least in part due to substantial leakage that could be heard. The area of leakage could not be observed due to excessive vegetation in the area, however it was believed to be in the area of a former gated outlet.

Dam number 550 (Hamilton). In the early 1990's, DEM constructed a fish ladder adjacent to the spillway, under an agreement with the dam owner, the Hamilton Web Company.

Requested Inspections

State law requires DEM to inspect any dam following a request by the owner or some other interested party that could receive harm by the failure of the dam. The following dams were inspected based on such requests:

Dam No.	Dam Name	City/Town	Hazard	Embankment	Spillway	Low Level Outlet
133	Allendale	North Providence	Low	Fair	Good	Good
168	Oak Swamp	Johnston	Low	Fair to Poor	Fair	Poor
177	Tiogue	Coventry	Low	Fair	Poor	Good
240	Yorker Mill	Exeter	Low	Fair to Poor	Good	Poor
296	Old Forge Mill	North Kingstown	Low	NA	Fair to Poor	Good
401	Lake Washington	Gloicester	Low	Fair to Poor	Good	Good

Dam number 133 (Allendale) had breached in the spillway about a decade ago. The spillway, low level outlet and portions of the embankment were reconstructed in 2002 in accordance with the Environmental Protection Agency's Superfund Program. Reconstruction of the dam allowed the water in the pond to be raised, which thereby provided a temporary cap over contaminated sediment in the pond. The Dam Safety Program was requested to review the Post Removal Site Control Plan, which discussed routine maintenance, inspection and operation of the dam. An inspection was performed in conjunction with the review.

Dam number 168 (Oak Swamp) was inspected by DEM based on notification by the town of Johnston's consultant, who observed a 6 to 12 inch diameter seepage hole in the earthen embankment, passing a flow of about 30 to 50 gallons per minute. The dam is owned by the town, which quickly plugged the hole and stopped the leakage. Temporary erosion protection was later placed on the area and the town advised DEM that a consultant would be retained to provide further investigation and repair.

Dam number 177 (Tiogue), has been an ongoing concern to DEM since 1999. Following Hurricane Floyd, a neighborhood association's call about the safety of the dam prompted a DEM inspection to determine if the dam, which is owned and operated by three separate parties, was safe. In July 2000, DEM determined that the condition of the spillway was inadequate and the dam was unsafe, and issued an informal enforcement action requiring the spillway be returned to its original condition.

The investigation continued through 2001. An engineer retained by one of the responsible parties stated that in order for the spillway to be returned to its original condition, the area downstream of the spillway would have to be modified to safely accommodate the flow.

In 2002, due to lack of progress, DEM filed a complaint in Superior Court asking the court to order repair of the spillway. The parties are attempting to negotiate a resolution to this matter.

Dam number 240 (Yorker Mill) was originally inspected in May 2000, following a request by one of the owners, whose business is located immediately downstream of the embankment in a former mill building. The owner noted an increase in seepage through a portion of the earthen embankment. In November 2000, the owner retained an engineer who recommended that the impoundment be immediately lowered. In 2001, the owners installed siphons to lower the impoundment and constructed a new concrete spillway. In 2002, the spillway was inspected and the seepage was not present. In addition, the owners were planning to repair the upstream face of the embankment by adding fill and stone erosion protection.

Dam number 296 (Old Forge Mill) is a privately owned dam located adjacent to the Forge Road bridge, that was being reconstructed by the Department of Transportation. In conjunction with the bridge work, a chute was to be constructed in the spillway of the dam, to assist with fish migration. Following lowering of the impounded water, the Dam Safety Program, along with other State agencies, were requested to inspect the spillway. Much of the spillway had pockets of displaced stone. An agreement was reached regarding the amount of work that needed to be completed to construct the chute.



Dam Number 296 (Old Forge Mill), North Kingstown

Dam number 401 (Lake Washington) was inspected following a request by a member of a neighborhood association. The dam is well maintained except for the embankments, which contained excessive vegetation including large trees.

High Hazard Dam Inspections

In 2001, fifteen high hazard dams were inspected. Seven of the reports for these inspections were completed and mailed to the owners in 2001; the remainder were completed and mailed in 2002.

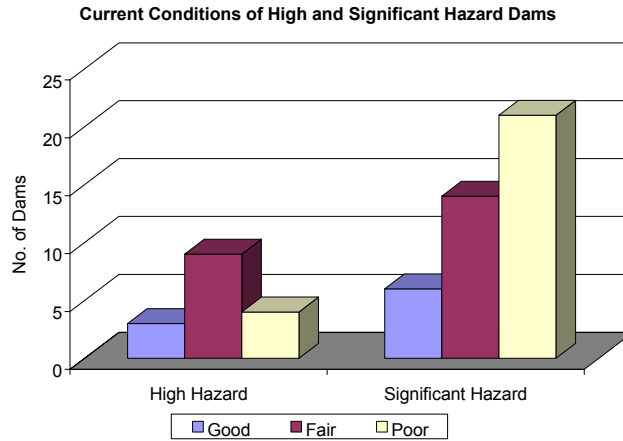
Dam numbers 108 (Stillwater) and 566 (Bowdish) were not inspected in 2001 since each were in the process of major construction and the owner (DEM) was aware of their respective condition. These two dams, as well as dam number 102 (Olney), were inspected in 2002. They are all owned by DEM and their conditions are listed in the *DEM Owned Dam Inspections* section above.

Significant Hazard Dam Inspections

Six significant hazard dams were inspected. They are all owned by DEM and their conditions are listed in the *DEM Owned Dam Inspections* section above.

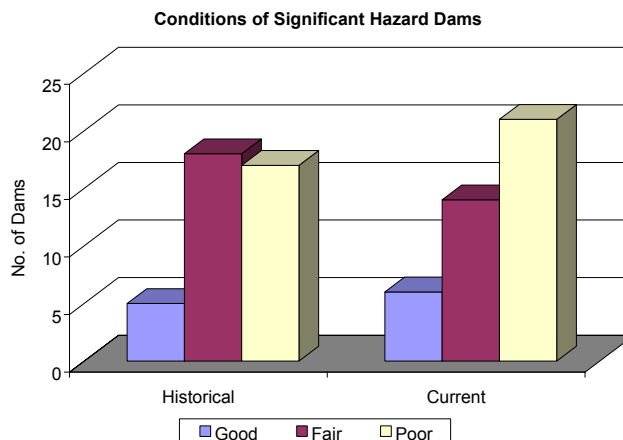
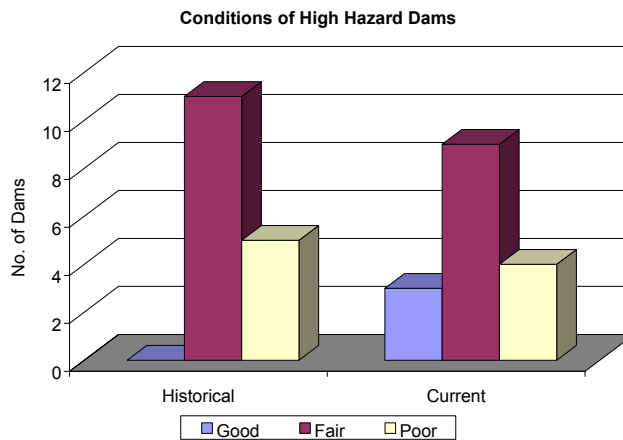
CURRENT CONDITIONS OF HIGH AND SIGNIFICANT HAZARD DAMS

A summary chart of the current conditions of the high and significant hazard dams follows. This summary is based on inspections conducted prior to year 2002.



It is abundantly clear that the majority of the high and significant hazard dams, both public and private, are in need of maintenance and repair to return them to good condition. The 2001 Dam Safety Task Force Final Report clearly addresses this potentially disastrous situation.

DEM has reviewed historical inspection reports for high and significant hazard dams. The majority of the historical data was taken from the last 20 years. These conditions, compared to current conditions, are summarized in the following two charts:



The charts illustrate general trends of improving conditions of the high hazard dams and deteriorating conditions for the significant hazard dams. Keep in mind that some of the significant hazard dams will likely be reclassified as high hazard dams through DEM's ongoing classification assessment.

GRANTS

In 2000, DEM applied for a FEMA grant to support the efforts of the Dam Safety Program, and was awarded \$45,327. The grant was amended in 2001 with an additional \$55,624 and again in 2002 with an additional \$45,327 for a total grant of \$144,278.

During 2002, a contract for \$55,143 was awarded to an engineering consultant to provide hazard classification assessments for 68 dams. The final report is being prepared and is expected to be submitted in February 2003. We expect this report will be of significant interest to particular dam owners and municipalities.

Also in 2002, the process was initiated to purchase aerial photographs of the state and a new hybrid (gasoline/electric) vehicle for use by DEM's dam safety staff. These items will be used to improve DEM's ability to identify, classify and inspect all dams in the state.

DEM OWNED DAM REPAIRS

DEM continued to move forward under its Capital Development Projects program, undertaking the engineering evaluation, design and reconstruction at the following DEM owned dams:

Dam No.	Dam Name	City/Town	Hazard
108	Stillwater	Smithfield	High
566	Bowdish	Glocester	High

In 2000, DEM awarded a construction contract in the amount of \$852,043 for repairs to dam number 566 (Bowdish). Repairs included reconstruction of the earthen embankment and reinforcing it to withstand overtopping, constructing a new concrete spillway, replacing the low level outlet structure and related piping and providing an access road to the dam for maintenance purposes. Repairs were completed during 2002.

In 1999, DEM retained engineering services to perform an evaluation of dam number 108 (Stillwater). In May 2001, a \$250,000 contract was awarded for the design of repairs to the dam. The design was approximately 90% complete in 2002.

PROGRAM SHORTCOMINGS

STAFFING

Currently, the Dam Safety Program has a staff of 1.1 full time equivalents, consisting of one full time engineer/inspector and 0.1 administrative/clerical. To successfully meet the requirements of the current statute, DEM estimates one additional full time engineer/inspector is necessary.

FINANCIAL ASSISTANCE

The Governor's Dam Safety and Maintenance Task Force concluded that repairs to bring all Rhode Island dams up to current safety standards could average as much as \$800,000 per dam. Unfortunately, the state is not able to offer any financial assistance for these repairs. In many cases, the costs are so overwhelming that even if the state were to offer a repair loan, the owner could not afford to repay it. Creative financial assistance will be a key element for improving the condition of dams in the state.

INSPECTION LIMITATIONS

By law, DEM is required to cause to be inspected all the dams in the state. However, the visual inspections performed by the Dam Safety Program do not involve full engineering analyses of the structural integrity of dams. DEM does not have the staff nor the financial resources to ensure that such inspections are completed. Its authority to require a dam owner to undertake such inspections was

challenged during the debate on the 2001 Task Force legislative proposal. Although a visual inspection can provide indicators of underlying problems, an engineering analysis is needed to fully assess the condition of the dam.

REGULATIONS / TECHNICAL GUIDANCE DOCUMENTS

DEM has not promulgated dam safety regulations, nor does it have technical guidance documents for distribution to all dam owners. Both of these documents would help the regulated community and consultants understand what is expected of a dam owner. As noted previously, DEM has been developing comprehensive regulations to address recommendations of the Governor's Task Force on Dam Safety and Maintenance.

This completes the activities performed in 2002. For further information on the Dam Safety Program please contact David Chopy at 222-1360.