

**STATE OF NEW HAMPSHIRE
DEPARTMENT OF ENVIRONMENTAL SERVICES
STATE-OWNED DAMS**

**PERFORMANCE AUDIT REPORT
OCTOBER 2015**



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To The Fiscal Committee Of The General Court:

We conducted a performance audit of Department of Environmental Services State-owned dams to address the recommendation made to you by the joint Legislative Performance Audit and Oversight Committee. We conducted this audit in accordance with generally accepted government auditing standards. Those standards require we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions. The evidence we obtained provides a reasonable basis for our findings and conclusions based on our audit objective.

The purpose of the audit was to determine whether the Department of Environmental Services efficiently and effectively managed State-owned dams during State fiscal years 2014 and 2015.

Office of Legislative Budget Assistant

Office Of Legislative Budget Assistant

October 2015

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ABBREVIATIONS

DES	Department Of Environmental Services
DRED	Department Of Resources And Economic Development
DOT	Department Of Transportation
EAP	Emergency Action Plan
F&G	New Hampshire Fish And Game Department
FTE	Full-Time Equivalent
PE	Professional Engineer
RSA	Revised Statute Annotated
SFY	State Fiscal Year
UNH	University Of New Hampshire
USSD	United States Society On Dams
WBS	Work Breakdown Structure

**STATE OF NEW HAMPSHIRE
DEPARTMENT OF ENVIRONMENTAL SERVICES
STATE-OWNED DAMS**

EXECUTIVE SUMMARY

The Department of Environmental Services (DES) Dam Bureau was generally effective in operating State-owned dams under its stewardship. We primarily reviewed the work of two of the three sections within the Dam Bureau as their work pertained to State-owned dams – the Engineering and Construction Section and the Operations and Maintenance Section. Although we found qualified and knowledgeable personnel within the Dam Bureau, we also found opportunities for improved management practices.

We found the DES Engineering and Construction Section may be more efficient and effective if it utilized a project management approach to managing its reconstruction projects. Major construction projects, typically costing hundreds of thousands of dollars, were managed by the Design Engineer with little oversight, project documentation, and no detailed project schedule. In addition, we found reconstruction projects were built without any formal prospective analyses to determine whether it would be more cost effective to use in-house construction forces or contract the work out. Instead, the Dam Bureau used reported project costs of similar projects completed by private contractors compared with its own costs for finished projects. Contracting may enable the Dam Bureau to move some of its dams in disrepair off the list of backlogged reconstruction projects. Decisions should be made on a project by project basis only after considering the full-cost and all direct and indirect costs and benefits of performing the work in-house.

We also found safety inspections of State-owned dams were not always performed as frequently as required by administrative rules, and some written reports were not completed. In the Operations and Maintenance Section, we found long-standing maintenance deficiencies identified by safety inspections, such as brush and tree clearing from State-owned dams, that had gone unresolved for long periods of time. Some required Emergency Action Plans (EAPs) were found to be out-of-date or untested. Both EAPs and Operations and Maintenance Plans for State-owned dams needed periodic review. The Dam Bureau may be able to act more timely on deficiencies such as these by contracting for services when resources permit rather than relying on its own staff.

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**STATE OF NEW HAMPSHIRE
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RECOMMENDATION SUMMARY

Observation Number	Page	Legislative Action Required?	Recommendations	Agency Response
1	11	No	Use formal project management approach, establish a project management plan, and utilize plan for evaluating performance on the project.	Concur
2	12	No	Monitor and document dam construction and reconstruction progress.	Concur
3	13	No	Ensure plans and specifications are reviewed.	Concur
4	14	No	Perform formal cost-benefit analyses for reconstruction projects.	Concur
5	16	No	Retain all dam documents in a central location and consider standard file contents.	Concur
6	17	No	Ensure deficiencies at State-owned dams are resolved in a timely manner, seek easements where necessary, prioritize deficiencies, and consider contracting out some tasks.	Concur
7	20	No	Develop policies and procedures to ensure Operations and Maintenance Plans are documented, updated, and periodically reviewed.	Concur
8	21	No	Develop policies and procedures for updating, testing, and reviewing Emergency Action Plans and assign responsibility.	Concur
9	23	No	Perform periodic inventories, report consumable materials, and improve on-site storage.	Concur
10	24	No	Promulgate administrative rules for Dam Maintenance Revolving Loan Fund and begin making loans available.	Concur
11	25	No	Complete required inspections and document results for State-owned dams.	Concur
12	26	No	Develop and implement a password policy for automated gate controls.	Concur

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**STATE OF NEW HAMPSHIRE
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STATE-OWNED DAMS**

BACKGROUND

In 1937, the Legislature declared there was a need to conserve and control water in streams, rivers, lakes, and ponds. The Department of Environmental Services (DES) is responsible for inspecting all hazardous dams in the State, and operating and maintaining dams owned by the DES and the New Hampshire Fish and Game Department (F&G). The DES Dam Bureau regulates the safety of all dams located in New Hampshire, and is responsible for the maintenance, repair, construction, reconstruction, and removal of all State-owned dams. The Dam Bureau also uses State-owned dams for which it is responsible to regulate water levels of lakes, ponds, streams, and rivers to meet the needs of the State of New Hampshire, as well as to lessen flood damage, enhance public safety, and improve the recreational facilities within the State. In addition, the Dam Bureau oversees hydro-energy production at State-owned dams.

RSA 482:2, II(a) defines a dam as “any artificial barrier, including appurtenant works, which impounds or diverts water and which has a height of 6 feet or more, or is located at the outlet of a great pond.” Artificial barriers which impound liquid industrial or commercial wastes, septage, or sewage, regardless of height or storage capacity, are also considered dams. However, roadway culverts which do not normally impound water and storm water detention basins are not normally considered dams under RSA 482.

The DES classifies dams according to their potential threat to life and property in the event of damage to their structural integrity or failure and has four classifications: high hazard, significant hazard, low hazard, and non-menace. Table 1 defines each of the four hazard classifications.

Table 1

Dam Hazard Classifications

High Hazard Structure
A dam located and of a size that failure or misoperation would result in probable loss of human life as a result of: 1) water levels and velocities causing the structural failure of foundations of a residential, commercial, or industrial structure occupied under normal conditions; 2) water levels rising above the first floor elevation of a habitable residential, commercial, or industrial structure which is occupied under normal conditions when the rise due to dam failure is greater than one foot; 3) structural damage to an interstate highway which could render the roadway impassable or otherwise interrupt public safety services; or 4) release of a quantity and concentration of hazardous waste materials.
Significant Hazard Structure
A dam located and of a size that failure or misoperation of the dam would result in any of the following: 1) no probable loss of life; 2) major economic loss to structures or property; 3) structural damage to a Class I or II road which could render the road impassible or otherwise interrupt public safety services; 4) major environmental or public health losses, including damage to a public water system which will take longer than 48 hours to repair, the release of liquid industrial, agricultural, or commercial wastes, septage, sewage, or contaminated sediments of the storage capacity is two acre-feet or more; or damage to an environmentally-sensitive site that does not meet the definition of reversible environmental losses.

Low Hazard Structure
A dam located and of a size that failure or misoperation would result in any of the following: 1) no probable loss of life; 2) low economic loss; 3) structural damage to a town, city, or private road accessing property other than the dam owner's which could render the road impassible or otherwise interrupt public safety services; 4) the release of liquid industrial, agricultural, or commercial wastes, septage, or contaminated sediment if the storage capacity is less than two acre-feet and is located more than 350 feet from a water body or water course; or 5) reversible environmental losses to environmentally-sensitive sites.
Non-Menace Structure
A dam that is not a menace because it is in a location and of a size that failure or misoperation of the dam would not result in probable loss of life or loss to property, provided the dam is: 1) less than six feet in height if it has a storage capacity greater than 50 acre-feet; or 2) less than 25 feet in height if it has a storage capacity of 15 to 50 acre-feet.
Source: Administrative Rules Env-Wr 101.21, 101.39, 101.25, and 101.28.

As of May 4, 2015, the DES oversaw 2,646 active dams in the various hazard classifications. Table 2 shows the number of dams in each classification by ownership. There were 51 State-owned high hazard dams, 38 significant hazard dams, 94 low hazard dams, 72 non-menace dams, and 21 other structures below six feet in height, which were exempt from dam safety and inspection requirements because they do not meet the definition of a dam. Nevertheless, these 21 structures were maintained by the State but were not classified as of May 4, 2015. Table 3 shows the hazard classification of State-owned dams by agencies such as the Department of Resources and Economic Development (DRED), Department of Transportation (DOT), and the University System of New Hampshire (UNH).

Table 2

Dams By Ownership And Classification Type						
Hazard Classification	Private	Utility	Municipal	Federal	State	Total
High Hazard	36	6	39	12	51	144
Significant Hazard	53	0	66	0	38	157
Low Hazard	312	3	109	10	94	528
Non-Menace	1,556	3	144	11	72	1,786
Exempt	0	0	0	0	21	21
Unknown ¹	7	0	3	0	0	10
Total	1,964	12	361	33	276	2,646

Note:

¹Unknown means no hazard classification assigned in the DES dams database.

Source: LBA analysis of DES dams database as of May 2015.

The DES inspects all dams in the State according to their hazard classification. Dams classified as high hazard are required to be inspected every two years, while significant hazard dams are

inspected every four years, and low hazard and applicable non-menace dams are inspected every six years.

Table 3

Hazard Classification	State-Owned Dams By Classification						Glenclyff	Veteran's	Total
	DES	F&G	DRED	DOT	UNH	Home	Home		
High Hazard	42	5	2	1	1	0	0	51	
Significant Hazard	23	7	3	4	1	0	0	38	
Low Hazard	40	41	9	4	0	0	0	94	
Non-Menace	5	34	14	13	2	2	2	72	
Exempt	1	12	3	4	1	0	0	21	
Total	111	99	31	26	5	2	2	276	

Source: LBA analysis of DES dams database as of May 2015.

In addition to classifying dams according to their hazard potential, the Dam Bureau also assigned a condition rating to each dam following inspection by DES inspection personnel. Condition ratings range from “Unsatisfactory” to “Poor,” “Fair,” and “Satisfactory.” “Unsatisfactory” indicates the current condition of the dam requires immediate action to lower or drain the reservoir to reduce or eliminate the potential for a dam failure. A rating of “Poor” indicates the dam has multiple maintenance deficiencies that are considered significant or that affect the safe operation of the dam, some of which may be structural and need further evaluation or the dam has significant seepage/leakage that has not been investigated or appears to have a relationship to some structural component of the dam. Dams are rated as “Fair” if they have deficiencies beyond minor ones allowable for “Satisfactory” dams, but these deficiencies are non-structural and do not affect the safe operation of the dam, the dam can pass its design event without overtopping, or the dam has seepage/leakage issues that are not deemed an immediate threat to the stability of the dam. Dams rated “Satisfactory” have no deficiencies beyond minor maintenance items such as minor brush growth; small eroded bare areas; small areas of non-structural deterioration to concrete, metal, or timber components; debris in the outlets; and the dam has no known structural issues. A dam may still be considered “Satisfactory” if there is seepage/leakage as long as it has been longstanding, previously evaluated, and deemed static and has some DES-approved formal remedy or monitoring program in place. As of May 2015, one low hazard F&G dam was rated as unsatisfactory, while 29 State-owned dams were rated as poor, including 17 that were classified as high hazard dams. Fourteen dams had not yet been rated on their condition.

Table 4 shows the estimated cost of repairing or reconstructing all 37 State-owned dams on the repair/reconstruction list as of May 2015. In total, nearly \$23.3 million in repairs are needed for all 37 State-owned dams. The DES owns the majority of the dams for a total of \$18.3 million. Repairs or reconstruction of high hazard dams is estimated at \$15.2 million.

Table 4

Total Estimated Cost Of Repair Or Reconstruction By Hazard Class And Agency

Hazard Class	DES	DRED	F&G	Total	Total Count
High	\$ 14,025,000	\$ 250,000	\$ 950,000	\$ 15,225,000	20
Significant	750,000	0	200,000	950,000	3
Low	3,575,000	350,000	2,725,000	6,650,000	12
Non-Menace	0	0	450,000	450,000	2
Total	\$ 18,350,000	\$ 600,000	\$ 4,325,000	\$ 23,275,000	37

Source: LBA analysis of unaudited DES information.

Organization And Staffing

The Dam Bureau was staffed by 38 full-time equivalent (FTE) positions as of April 2015. The organization chart shown in Figure 1 shows the Dam Bureau consisted of three sections: the Operations and Maintenance Section, the Engineering and Construction Section, and the Dam Safety and Inspections Section.

Operations and Maintenance

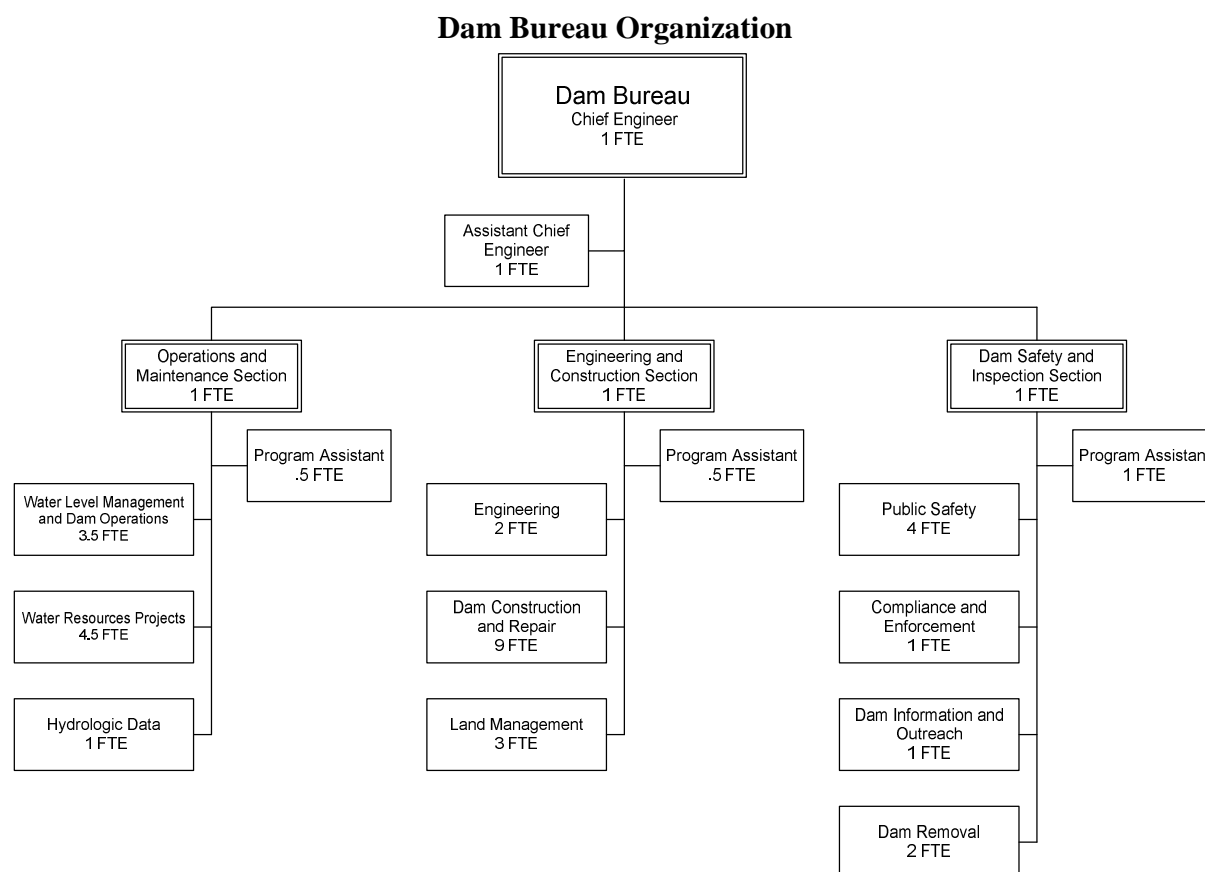
The Operations and Maintenance Section was responsible for operating and maintaining dams owned by the DES and F&G located throughout the State as well as monitoring hydrologic data. This section was also responsible for monitoring lake water levels and seasonal fill/drawdowns in lakes controlled by State-owned dams. The Operations and Maintenance Section had 10.5 FTE positions as of April 2015. Three and one-half dam operator positions were responsible for operating and maintaining a majority of the DES and F&G-owned dams located throughout the State, travelling to each dam to check water levels and dam condition, removing debris, performing light maintenance such as mowing grass, and minor repairs. Of the 10.5 FTE positions, 4.5 FTE positions were permanently stationed at the dams on Lake Winnepesaukee and the Connecticut River and served dams nearby those regions.

Engineering and Construction

The Engineering and Construction Section was responsible for dam engineering, reconstruction and major repairs. During construction or reconstruction, an engineer from this section was required to be on-site. The nine-person construction and repair crew was headquartered at Sewalls Falls Park in Concord and typically worked as two crews at different sites, but also came together on occasion to work on a single project. The crew worked year-round. This section was also responsible for surveying required for dam projects and managing over 10,000 acres of land

associated with the DES-owned dams located throughout the State. The Engineering and Construction Section had 15.5 FTEs as of April 2015.

Figure 1



Source: LBA analysis of Dam Bureau organizational chart as of April 2015.

Dam Safety and Inspections

The Dam Safety and Inspections Section was responsible for inspecting all hazardous dams in the State, enforcing compliance with State laws and dam administrative rules, and also provided public information regarding dams and their potential removal. Inspectors also checked on the non-menace dams to determine their condition and whether the classification had changed due to development below the dams. The Dam Safety and Inspections Section had 10 FTEs as of April 2015.

Revenues And Expenditures

Dam Bureau revenues increased by almost \$330,000 between State fiscal years (SFY) 2013 and 2015. Agency income from application fees and annual registrations increased by \$8,381, private local funds increased over the same period by approximately \$202,000, while federal funds increased by almost \$119,000 (Table 5). Private local funds were largely water user fees received from downstream hydropower operators for storage and release of water in the Winnepesaukee, Connecticut-Coos, Mascoma, Sugar, Squam, and Newfound Projects at rates which increase the efficiency of their hydropower operations. The private local funds also included fees for licensing State-owned waterfront property to owners of abutting property at the Winnepesaukee, Connecticut-Coos, Mascoma, and Piscataquog Projects.

Table 5**Dam Bureau Revenues
SFYs 2013 – 2014**

Class	2013	2014	2015
Agency Income	\$2,519,610	\$2,673,486	\$2,527,991
Private Local Funds	122,253	706,415	323,971
Federal Funds	151,416	137,496	270,049
Transfers from DOT	62,643	63,205	63,903
Total	\$2,855,922	\$3,580,602	3,185,914

Source: LBA analysis of Statements of Appropriations.

Table 6 shows expenditures increased slightly from \$4.8 million in SFY 2013 to \$5.2 million in SFY 2015, primarily due to increased contract work and federal grant expenditures. Personnel and benefits, and current expenses remained virtually flat for each year at approximately \$2.6 million, and \$0.5 million, respectively.

Table 6**Dam Bureau Expenditures
SFYs 2013 – 2014**

Class	2013	2014	2015
Personnel & Benefits	\$2,646,457	\$2,693,716	\$2,692,693
Current Expenses	504,725	524,894	506,669
Debt Service	414,466	428,602	412,644
Equipment	384,452	403,920	181,414
Contracts	292,080	513,901	729,245
Dam Projects	393,784	384,529	325,678
Transfers to Other State Agencies	179,060	249,559	231,256
Maintenance	12,995	37,139	37,373
Federal Grants	0	148,711	124,111
Total	\$4,828,019	\$5,384,971	\$5,241,083

Source: LBA analysis of Statements of Appropriations.

**STATE OF NEW HAMPSHIRE
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REPAIRS AND RECONSTRUCTION

Unlike dam safety programs in most states, New Hampshire’s Dam Bureau had an Engineering and Construction Section which performed engineering, major repairs, removals, and reconstruction of State-owned dams. The United States Society On Dams (USSD) published “*Dam Construction Project Management Guidelines*” which outlined common project management practices in dam construction. Although much of the Engineering and Construction Section’s work was project-based, the section’s management practices did not reflect current common practices in project management. The observations that follow address project management weaknesses. We also recommend formal cost-benefit analysis to assist decision making in reconstructing dams with in-house staff or contracting, and centralized file storage.

Observation No. 1

Project Management Approach Needed

The Department of Environmental Services (DES) Dam Bureau’s construction/reconstruction project management practices did not align with common project management principles. We reviewed seven dam projects completed in State fiscal years (SFY) 2013 and 2014. None of the seven project files contained a project management plan, a project cost estimate, or a project schedule. A master schedule was maintained by the Engineering and Construction Section Administrator that showed the estimated start date, duration, and end date of all upcoming projects through September 2019, but did not break down each project into discrete phases. Although a high-level project task list was appended to the plans and specifications, a work breakdown structure (WBS) was not found for any of the projects.

The USSD recommended dam construction and reconstruction projects contain a project management plan, a WBS, cost estimates, and a complete project schedule including milestones. According to the USSD, a project management plan “sets forth the plans, organization and systems that those responsible for managing the project will use.” Project management plans should address: 1) a project description, 2) roles and responsibilities of project managers and their team members, 3) qualifications of team members, 4) a consulting review board, 5) a project schedule, 6) a project cost estimate and cash flow, 7) project financing, 8) real estate, 9) environmental issues, 10) safety, 11) security, 12) cultural resources, 13) local community participation, and 14) an Emergency Action Plan. The USSD states a WBS organizes the work to be completed, assigns responsibility for the work, and provides a basis for dividing the project “into segments that can be planned, tracked, and reported on.” In addition, a cost estimate is crucial for successful project monitoring and should be developed and updated regularly throughout the project. Schedules should also be utilized to control work, monitor task completion, and identify variances.

The Dam Bureau had historically taken a less formal approach to project management when using its own workforce. Without sufficient planning documents, project oversight is difficult and projects may incur unnecessary costs and deviate from expected completion dates. For these

reasons the Dam Bureau required contractors performing design and evaluation work to use project plans and schedules.

Recommendation:

We recommend DES management use a formal project management approach for its construction and reconstruction projects. Each project should establish a project management plan which describes the project, a complete time schedule including milestones, and a reliable project cost estimate. Once drafted and approved, the project should be managed with these parameters in mind and should be the basis for evaluating performance on the project.

Auditee Response:

Concur. Implementation underway. The report cites the Dam Construction and Project Management Guidelines prepared by the U.S. Society on Dams in recommending practices for managing the reconstruction projects of state-owned dams. While that document was written to provide guidance for the management of major dam construction projects, some of the practices recommended in the report, including the development of a project management plan, a detailed project schedule and a cost estimate are appropriate for the dam reconstruction projects performed by the DES Dam Bureau, and will be developed for future projects, at a level of detail and effort commensurate with the scope and complexity of each project, beginning with the Mendums Pond Dam Reconstruction Project in Barrington, for which construction is scheduled to begin in November 2015.

Observation No. 2

Adequate Project Monitoring Needed

We reviewed seven dam reconstruction projects completed in SFY 2013 and 2014 and found insufficient project monitoring and oversight documentation. One of the seven projects did not contain any project status reports. Although project engineers typically prepared status reports, including personnel on site, equipment, and major tasks completed, we found no evidence the reports were reviewed by the project engineer's direct supervisor or any other person in an administrative capacity. While Dam Bureau managers met every two weeks to discuss project progress we found no documentation of those meetings. Furthermore, we found project engineers did not receive expenditure reports until after projects were completed, making it difficult for the project manager to keep apprised of actual costs versus budget.

According to the USSD, project monitoring is used to detect adverse cost and scheduling trends by monitoring the progress of the project. Project monitoring consists of regular project reporting and project meetings. Each month the project manager should report on the activities completed during the prior month. "The report [should] accurately address the actual progress of the project versus the planned schedule and analyze cost variances. A short narrative should be prepared that fully describes the work accomplished during the reporting period and all problems that required solution. Changes in the project schedule should also be identified, as well as a summary of

actual costs and potential cost overruns.” Project meetings should be periodically held and documented to discuss the project progress, schedule, costs, and design issues.

Historically, the Dam Bureau had not formally monitored the progress of its projects. Without sufficient project monitoring, projects may incur unnecessary costs and deviate from expected completion dates.

Recommendation:

We recommend DES management effectively monitor and document dam construction and reconstruction progress and ensure management at all levels are aware of the progress of each project.

Auditee Response:

Concur. Implementation underway. Currently, the Dam Bureau Administrator monitors the progress of projects through direct conversations with the Engineering and Construction Section Administrator, the project engineers and the Construction Superintendent. This process allows the Dam Bureau Administrator to timely resolve problems that could impact the project schedule and costs, and approve changes in scope to address unanticipated conditions encountered during construction. However, more formal project monitoring through supervisory review of the daily project status reports and specific monthly project meetings between the project engineers and Dam Bureau management, where the schedule and expenditures are documented, are needed to ensure that budgets and milestones are met. The Dam Bureau commits to implementing this recommendation, starting with the ongoing Seaver Reservoir Reconstruction Project in Harrisville.

Observation No. 3

Plans And Specifications Review Needed

The Dam Bureau employed two Professional Engineers (PE) as Design Engineers to design dams for construction, reconstruction, or repairs. The Engineering and Construction Section Administrator oversaw the two Design Engineers, but did not review their plans and specifications. Instead, plans and specifications were reviewed solely by PEs within the Dam Safety and Inspection Section. The Dam Safety and Inspection PEs performed a safety review related to the section’s permitting function, intended to ensure structures were designed and built in accordance with accepted engineering safety practices and standards, but they also checked calculations traditionally performed by a supervisory engineer.

The supplemental job description for the Engineering and Construction Section Administrator states the position “[m]anages a staff of engineers, surveyors and construction crews to ensure adequate and appropriate engineering designs, project planning and budgeting, project management and construction of dams as part of a State-wide reconstruction and capital improvement program for State-owned dams.” The USSD echoes this need for oversight by suggesting use of a Consulting Review Board. The purpose of the Board is to review design

validity and oversee construction to ensure the dam “is constructed in accordance with the approved design.”

Dam Bureau management stated the Engineering and Construction Section Administrator position had been vacant for over a year and in that time quality review practices for plans and specifications changed. Without the section chief’s review, proposed plans and specifications may not receive the value added by supervisory review. Supervisory review could ensure construction plans are correct, catch errors, and reduce changes needed during construction that may not be caught during the safety review performed by the Dam Safety and Inspection Section.

Recommendation:

We recommend DES management ensure plans and specifications are reviewed by the Engineering and Construction Section Administrator prior to project approval and construction.

Auditee Response:

Concur. Implementation underway. Design concepts are reviewed by Dam Bureau management, but a detailed check of every calculation has not been performed on recent projects. The Dam Bureau agrees that a detailed review is necessary to detect possible errors, and the Bureau commits to immediately implementing a process whereby the plans, specifications and all calculations are checked by either the Administrator of the Engineering and Construction Section, the Dam Bureau Administrator or other project engineers.

Observation No. 4

Formal Cost-Benefit Analyses Should Be Performed

While management reported cost savings in performing services in-house rather than contracting, formal cost-benefit analyses were not completed. Management provided documentation for a cost-comparison of in-house service projects to non-State contracted projects; however, we found the analysis to be informal. Additionally, although the Construction and Engineering Section rented equipment for the increasing demand of large projects, no analysis was performed to determine whether purchasing or leasing would be in the best interest of the State.

There was no statewide requirement in statute, rule, or policy and procedure to justify in writing a service contract’s need, or to conduct a cost-benefit analysis. However, periodically identifying in-house services, and exploring the feasibility of contracting each service being delivered to determine the most effective delivery method, can reduce the cost of government, inspire public confidence, and improve public service quality. Formal analytical processes help ensure alternatives are considered, permit external review, create informed decision-making, as well as foster comprehensiveness, transparency, and consistency within and among decisions. Such processes permit a determination as to which course of action is in the organization’s best interest.

Formal processes require calculating the full-cost of in-house and contracted services. Full-cost factors include all direct and applicable indirect costs, whether they are qualitative or quantitative. Benefits are also qualitative and quantitative and include improved efficiency, effectiveness, timeliness, reliability, and security. Additionally, analyses consider risk, public and political sensitivity, and legal issues. Poorly managed public procurement can result in inefficient State-owned dam engineering and construction and may raise the price the DES pays for goods and services.

Recommendation:

We recommend DES management periodically perform formal cost-benefit analyses to ensure State resources are being used in the most cost-effective manner.

Auditee Response:

Concur. Implementation continuing. Currently, management of the Dam Bureau informally assesses the alternatives of using in-house forces and equipment or contracting to ensure that its reconstruction projects are performed with the highest quality and at the least cost to the State of New Hampshire. The use of in-house forces is often cost-effective to the state for the following reasons:

- *Flexibility in scheduling projects;*
- *Ability to quickly adjust to unexpected conditions at project sites;*
- *Avoidance of costs associated with procuring and administering engineering consultant and construction contracts for an average of five projects per year; and*
- *Enhanced emergency response capabilities.*

However, the expertise of the Dam Bureau Construction Crew is in reinforced concrete and earth embankment construction. For work beyond these areas of expertise, the Dam Bureau has contracted with contractors for various services including pile driving, blasting, sealing of outlet pipes, and underwater gate installation. The Dam Bureau also rents outside equipment, instead of using in-house equipment, when the increased capacity of the outside equipment will result in lower overall project costs, as was the case in the Bureau's two most recent projects, Jones Brook Dam in New Durham and Seaver Reservoir in Harrisville.

The Dam Bureau will continue to evaluate the cost effectiveness of using in-house forces or contractors and rental equipment for each project to ensure that the project is constructed in the shortest time and at the lowest cost. As part of the project management plan to be prepared for each project, as discussed in the response to Observation No. 1, the Dam Bureau will determine whether all or parts of each project should be contracted out, and will document the basis of that determination in the project management plan.

Observation No. 5

Dam Files Should Be Centrally Located

During our file review of projects completed during SFYs 2013 and 2014, documents were not available in a central location. For example, dam safety files were located in a file room while documents concerning reconstruction or repair projects were located with individual Design Engineers that oversaw the project. According to the USSD, as-built drawings, manuals, and design documentation should be archived and a final construction report should be written and should contain “all the formal documentation generated throughout the life of the project.”

The Dam Bureau had no policy or procedure that required the Design Engineers to turn over documentation of the projects they oversaw or standard file contents. Without a central location for file storage, timely access is difficult.

Recommendation:

We recommend DES management develop and implement policies and procedures to fully document and retain all project documents in a central location. DES management may also wish to consider a policy describing required documents and standard file organization.

Auditee Response:

Concur. Implementation to be completed by Spring 2016. As observed, not all the files on each state-owned dam are stored in one location. The files for the dam reconstruction projects are often stored separately from the Dam Safety files. It would be preferable to store them all in one location. However, as with many of the other DES Bureaus, storage of hard copies is becoming a problem because of limited physical space, and, as a result, the Dam Bureau has been electronically storing many of the files on recent construction projects. These files include the daily status reports, photographs of the construction projects, and the final construction reports. But like the hard copy files, these files are stored in various subdirectories on the Dam Bureau’s directory on DES’s new server, instead of in one subdirectory. In addition, the recent migration of these files from the old server to DES’s new server has resulted in further dispersion of these files, which caused difficulties in finding the cost estimates of completed projects for this audit. The Dam Bureau agrees that the both the electronic and hard copy files on state-owned dams should be centrally located or easily retrievable by Dam Bureau staff and outside interests, and commits to having a centralized file system in place by December 31, 2016.

**STATE OF NEW HAMPSHIRE
DEPARTMENT OF ENVIRONMENTAL SERVICES
STATE-OWNED DAMS**

OPERATIONS AND MAINTENANCE

When the Dam Safety and Inspection Section inspected State-owned dams and identified deficiencies, they sent a Memorandum of Deficiency to the Engineering and Construction Section. The Engineering and Construction Section then added the deficiencies to a Master Deficiency List, which was also utilized by the Operations and Maintenance Section. We found some deficiencies had gone for long periods without resolution, including the need to update Operations and Maintenance Plans and Emergency Action Plans (EAP). We also found a need for better safeguards over State assets, the need for administrative rules for the Dam Maintenance Revolving Loan Fund, completion of inspections of State-owned dams, and a policy to address the need for strong passwords at State-owned dams with gates that can be operated remotely.

Observation No. 6

Dam Deficiencies Should Be Resolved

The Department of Environmental Services (DES) Dam Bureau kept a list of backlogged dam maintenance and repairs needed for State-owned dams. Deficiencies ranged from minor maintenance, such as brush or debris removal to major repairs or reconstruction.

Nearly 60 percent of the 232 deficiencies with a due date listed on the Master Deficiency List were past due as of June 2015. Approximately 15 percent of the past due items were for updating and testing the EAPs. Another 14.6 percent required completion of the dam’s Operations and Maintenance Plan. Altogether, 11.7 percent of the past due deficient items were removing trees or brush. Five past due items (3.6 percent) on the Master Deficiency List required redesign and reconstruction of the dam. Table 7 shows the past due task areas requiring attention.

Table 7

Task Types Past Due

Task	Percent
Update/test EAPs	15.3
Complete Operations and Maintenance Plan	14.6
Remove trees/brush	11.7
Loam and seed	6.6
Perform or update hydrology and hydraulic studies	6.6
Survey	3.6
Fill sinkholes/burrows	3.6
Redesign and reconstruct dam	3.6
Regrade slope/embankment/abutment/crest	3.6
All other tasks	30.8
Source: LBA analysis of Master Deficiency List as of June 2015.	

The oldest items on the list had a due date of July 1, 2009 for Northwood Lake dam in Epsom (remove debris from downstream side of dike) and York Pond dam in Berlin (remove trees and brush from crest and slopes). These stemmed from inspection reports received in March 2009 and April 2009, respectively. Table 8 shows the number of past due tasks remaining on the Master Deficiency List as of June 2015 and the State fiscal year (SFY) they were due.

Table 8

Number Of Items Past Due By Fiscal Year

SFY Due	Number of Items Past Due
2010	20
2011	20
2012	16
2013	17
2014	6
2015	58
Total	137

Source: Analysis of Master Deficiency List as of June 2015.

According to State statute, owners were required to maintain and repair their dams to keep them from disrepair. Owners were expected to resolve deficiencies by the due date imposed in the deficiency notice.

The Operations and Maintenance Section was responsible for regular maintenance and minor repairs at each of the 210 DES and New Hampshire Fish and Game Department (F&G) dams using its staff of 10.5 Full-Time Equivalent (FTE) positions as of April 2015. Three and one-half dam operator positions were responsible for operating and maintaining a majority of the DES and F&G-owned dams located throughout the State, travelling to each dam to check water levels and dam condition, removing debris, performing light maintenance such as mowing grass, and performing minor repairs. Four and one-half FTE positions were permanently stationed at the dams on Lake Winnepesaukee and the Connecticut River and served dams nearby those regions. Dam Bureau management reported staff went to some dams every couple of weeks, but smaller dams may only be visited every month or two. Once a year they performed site visits for cutting brush, clearing beaver dam debris, or checking for seepage. A Dam Bureau manager stated he tried to check the Master Deficiency List, but there were more than he was able to track and also noted difficulty maintaining a spreadsheet of deficiencies.

The Engineering and Construction Section had six full-time Construction Technicians, two full-time Foremen (one vacant), and a full-time Superintendent as of June 2015. This section was responsible for major repairs and reconstruction of dams. Recently, the Construction Technicians spent most of their time on major reconstruction projects. Dam Bureau management reported

minor projects were deferred because of the greater need to complete major projects in poor condition that posed a greater risk to public safety.

Dam Bureau management stated trees and brush were sometimes difficult to remedy because they needed permission or an easement from dam abutters to cut trees and brush on the abutters' property.

EAP updates fell behind due to staffing changes. The Assistant Chief Engineer had taken on the task of ensuring they were completed and a contract was reportedly forthcoming for a private consulting firm to update sections of some EAPs.

Without timely action, deferred maintenance may result in higher costs at a later date due to more severe problems developing. By not addressing deficiencies within the required timeframe, the Dam Bureau may not comply with its own statutes and rules and was also setting a poor example for private dam owners.

Recommendations:

We recommend DES management take steps to ensure known deficiencies at State-owned dams are resolved in a timely manner. Possible actions the DES could take include:

- **utilizing its operations budget to contract out tree and brush removal, loam placement, and seeding;**
- **updating EAPs; and**
- **completing hydrologic and hydraulic studies.**

We also recommend DES management seek necessary easements to cut trees and brush to comply with administrative rules.

Once the backlogged items are resolved, the Operations and Maintenance Section should ensure future tasks on the Master Deficiency List be prioritized given its other work requirements and assigned or contracted as required. The Engineering and Construction Section should also consider contracting some of its major repair and reconstruction projects to ensure they are addressed timely. Senior Dam Bureau management should oversee the completion of tasks on the Master Deficiency List to ensure progress is made.

Auditee Response:

Concur. Implementation underway but funding limited. As shown in Table 7, nearly 30 percent of the deficiencies concern Operation and Maintenance Plans and Emergency Action Plans. These will be addressed in responses to Observations Nos. 7 and 8.

The budget for Dam Maintenance is limited. In the past, this activity was funded from the revenue received from the leasing of 11 state-owned dams for hydropower generation. Under the terms of the leases, the State Dam Maintenance Fund received a percentage of the revenue from the sales of hydropower at the sites. However, Public Service of New Hampshire bought out the

above-market power purchase agreements that they had with several of these leaseholders, and, as a result, the revenue to the State Dam Maintenance Fund was reduced by 70% and could no longer fund this activity. Since the FY14-15 Budget, this activity has been funded out of the General Fund.

To improve its performance in correcting deficiencies, the Dam Bureau has been implementing many of the recommendations provided in the report. Using state contracts, the Dam Bureau has contracted for tree removal at state-owned dam sites and has retained the services of a hydro-seeding contractor to improve the vegetative cover on state-owned dams. In addition, the Dam Bureau has recently acquired a mini-excavator, which the Dam Operators are using to fill sinkholes and regrade dam crests and embankments, as necessary. The Dam Bureau is also in the process of procuring equipment to seal cracks in the concrete of state-owned dams. The Dam Bureau is committed to addressing all of the observed deficiencies, and is placing a priority on those that pose the greatest threat to the integrity of a dam.

Observation No. 7

Operations And Maintenance Plans Should Be Updated

We reviewed the Master Deficiency List and found 86 percent of the 37 recommendations to update Operations and Maintenance Plans had not been addressed or exceeded their due date as of June 2015. Only five of the recommendations had a future date to complete the task. Although outdated, all State-owned dams had an Operations and Maintenance Plan and the format and contents of the Operations and Maintenance Plans were generally in compliance with administrative rule as well as available to operators. Operators also attested the plans were comprehensive enough to allow another person, who might be unfamiliar with the specific dam, to operate and maintain the structure if needed.

Administrative rules stipulated Operations and Maintenance Plans must be updated as necessary. To be effective, an Operations and Maintenance Plan must be reviewed and updated. Best practice recommends annually reviewing plans. Updates should be performed if there are: 1) personnel changes, such as when key staff members change positions, leave, or are added; 2) modifications made to the dam, its appurtenances, or the mechanical and electrical systems; 3) changed requirements for operating the reservoir due to changed conditions upstream or downstream of the dam; or 4) operations and maintenance-related findings from a dam safety inspection.

An Operations and Maintenance Plan is important since it can help ensure: 1) tasks are performed based on an established schedule, routine monitoring, or inspection; 2) approved procedures will be followed; 3) new operating personnel will be trained to follow approved procedures; and 4) authorized personnel can operate the dam and reservoir during emergencies when regular operating personnel may not be available.

Updates were generally performed after a reconstruction project was completed, and if needed following an inspection; however, there was no policy or procedure to periodically review plans or ensure updates were completed as necessary. It is important to keep the plan up-to-date

because an out-of-date plan does not serve its intended purpose and may escalate to a public safety issue.

Recommendation:

We recommend DES management develop policies and procedures to ensure updates are documented and addressed timely as well as begin periodically reviewing Operations and Maintenance Plans for State-owned dams.

Auditee Response:

Concur. Plans will be updated as needed. All state-owned dams currently have Operation and Maintenance Plans, and the plans are current regarding the operation and maintenance procedures and schedules to be implemented at each dam, which is the primary purpose of the plans. They may be identified as deficient if, for example, the 100-year flood discharge identified in the plan does not agree with the number in the Dam Bureau's database, or if a physical dimension such as the spillway width is not consistent with that dimension as shown in the database. In such instances, there may not be a mistake in the Plan, but instead a mistake in the database. While it is important that these two sources of information are consistent and correct, these inconsistencies are not public safety issues and the plans can still serve all the important purposes described in the report until such inconsistencies are identified and the information can be corrected in a plan or the database.

Observation No. 8

Emergency Action Plan Policies And Procedures Needed

Several State-owned dams had outdated EAPs, were not in compliance with administrative rules regarding the frequency of notification testing, as well as performing annual reviews, and lacked a formal procedure for distributing revisions or updates to required EAP holders.

An EAP is a written document delineating a prescribed sequence of actions to be taken by a dam owner to minimize loss of life and property damage, as well as inform the authorities and others downstream of an impending or actual sudden release of water caused by an accident to, or failure of, the dam. Statute required the owner develop an EAP for any dam in which its failure may threaten life or property, specifically, high hazard and significant hazard dams. A low hazard dam may substitute the Operations and Maintenance Plan for the EAP.

EAPs were available for applicable State-owned dams; and the format and contents generally complied with administrative rule. Several Dam Bureau personnel stated inundation maps and notification charts were outdated. Our file review, as confirmed by Dam Bureau management, demonstrated most recent revisions to the EAPs were minimal, and did not include inundation maps and/or comprehensively address the notification charts. Multiple Memorandums of Deficiency and tasks within the Dam Bureau's Master Deficiency List cited the need to update EAPs. An EAP requires continual review, updates, and distribution in order to remain effective.

Notification testing and reviews of the EAPs were not being performed in accordance with administrative rules. Owners of high hazard and significant hazard dams were required to test their notification charts every two and four years, respectively. Our review of the dam database revealed three of 87 applicable State-owned dams complied with testing requirements. Of these dams, two performed an annual review of the EAP within calendar year 2014. Federal guidance recommends annual testing of the notification flowchart to maintain accurate emergency contacts.

Per statute and administrative rule, revisions and updates must be distributed to DES identified appropriate entities. The Dam Bureau's informal process did not ensure all copies were changed and sent to the appropriate entities. Further, representatives of several entities required to have a copy of the EAP stated they stored EAPs and filed updates as they were received, but did not maintain records of when or what updates occurred. In addition to written policy to continually review, revise, and redistribute the EAP, an effective EAP should include distribution lists, as well as a record of reviews and revisions.

Dam Bureau personnel stated a former staff member had been responsible for maintaining the EAPs; however, following her departure, it was not being formally addressed. The responsibility subsequently was informally taken on by the Assistant Chief Engineer. The Assistant Chief Engineer reported trying to address needed updates in addition to his regular workload; therefore, a majority of the EAPs remained outdated, untested, and/or not annually reviewed. Without policies and procedures to ensure periodic maintenance, EAPs, will be outdated and ineffective thus potentially risking property damage and human casualties.

Recommendations:

We recommend DES management create policies and procedures for updating, distributing, testing, and annual review of EAPs for State-owned dams. DES management should also formally assign responsibility for EAPs.

Auditee Response:

Concur. Testing procedures and schedules will be established by December 31, 2015, and updates completed by December 31, 2016. Dam Bureau data indicate that the Emergency Action Plans (EAPs) for 60 of the 73 dams for which the Dam Bureau is responsible have been updated sometime in the past 6 years, and that the contacts in notification flow charts have been reviewed and updated for all the EAPs in the past two years. In addition, the Dam Bureau has been working on improving the distribution of its EAPs by creating electronic files of them and distributing them electronically. Also, the Dam Bureau is currently working with the State's Office of Homeland Security and Emergency Management to further improve the availability of EAPs to the state's emergency responders by a creating a library of them in the State's WebEOC Emergency Response Communications System. While dam failure computer modeling and inundation mapping have improved since some of the inundation maps were developed, the maps included in most of the plans still serve the purpose of identifying the areas that need to be evacuated during dam failure.

However, the Dam Bureau recognizes that the testing of the EAPs on state-owned dams has lagged, and has not met the Bureau's own standards, and will commit to developing a process by the end of the calendar year to ensure that the EAPs are tested in accordance with the schedule established for their hazard classification, and that all outdated plans are updated by December 31, 2016.

Observation No. 9

Need Better Internal Control Of State Assets

The Dam Bureau maintenance facility was utilized by the Operations and Maintenance Section as well as the Engineering and Construction Section to store equipment, materials, and perform minor tasks on-site such as building stop logs or concrete forms for dams. While the DES regularly performed inventory of the equipment stored at the maintenance facility, materials were not part of the inventory. We found over \$119,000 of State assets stored for several years at the facility awaiting installation at three dam sites. We also found an additional \$110,000 worth of consumable building materials such as lumber, rebar, steel, and concrete block were stored on-site in a manner exposing the materials to the elements for lengths of time that may lead to deterioration, eventually rendering them useless.

An internal control system provides reasonable assurance regarding prevention or prompt detection and correction of unauthorized acquisition, use, or disposition of an entity's assets. Documentation is a necessary part of an effective internal control system. Further, established physical controls to secure and safeguard vulnerable assets include security for and limited access to assets as well as performing inventories periodically to count and compare such assets to control records. Ongoing monitoring through regular management activities such as comparisons and reconciliations can increase objectivity and efficiency.

Although the facility had an alarm system, signage, fencing, and locks to deter trespassers and protect equipment and materials from theft, the integrity and usability of the materials could not be safeguarded with existing storage conditions allowing seasonal exposure to the elements. Additionally, the DES did not and could not annually report consumable materials to the Bureau of Financial Reporting as required in the *Department of Administrative Services Annual Closing Review Manual of Procedures 2400* without a recorded inventory. By not performing inventories and maintaining effective storage conditions, the DES could not sufficiently track the cost of materials, account for, nor utilize State assets efficiently thereby risking waste.

Recommendation:

We recommend DES management perform periodic inventories of materials, report consumable materials to the Bureau of Financial Reporting as required, and improve storage of on-site materials.

Auditee Response:

Concur. Implementation of Asset Control Process by December 31, 2015. The Dam Bureau is currently developing plans for a Capital Budget Request to construct a new, safer and more suitable Dam Maintenance Facility at another location, but will work this fall to have materials stored in a covered space for as long as the facility is at its current location. In addition, the Dam Bureau will also consult with the Department of Transportation regarding its inventory control processes and will adopt and adapt them for use by the Dam Bureau, as applicable.

Observation No. 10

Administrative Rules Should Be Written For Dam Maintenance Revolving Loan Fund

The DES did not establish rules for the Dam Maintenance Revolving Loan Fund as required by RSA 482:55-a. The Dam Maintenance Revolving Loan Fund was established as a non-lapsing fund in 2008 and expanded in 2013 to provide low interest loans to fund the maintenance, repair, removal, or improvement of any dams excluding State-owned dams. State law stipulated:

The department shall establish rules for the fund including the application process, criteria for award, the procedure for making loans, the interest rate to be applied, the maximum loan amount, the time frame for repayment, actions to be taken in the event of a default on a loan, and oversight of the administration of the fund.

As of July 2015, the reported balance of the loan fund was \$76,278 which accrued from collecting fines assessed against dam owners. Although the fund could be utilized when it reached a balance of \$25,000, which was met in SFY 2010, no loans were made. The fund was not limited to support the full cost of a single project and no minimum loan amount was set in statute. Nonetheless, the DES management stated administrative rules had not been written because the fund balance would not cover the total costs of a typical dam project. Without written administrative rules, the Dam Maintenance Revolving Loan Fund could not serve its intended purpose as an additional funding resource to non-State dam owners.

Recommendation:

We recommend DES management promulgate administrative rules per statute and begin making loans available.

Auditee Response:

Concur. Rules to be established by December 2016. The Dam Bureau agrees that the statute authorizing the fund requires DES to establish rules once the balance in the fund exceeds \$25,000. That threshold has been exceeded. The Dam Bureau commits to establishing the rules by December 2016, but expects that the current fund balance of \$76,278 will be insufficient to administer loans for dam reconstruction.

Observation No. 11

Dam Safety Should Meet Inspection Requirements And Complete Written Reports

We found inspections for State-owned dams were not met within the State-specified cycle. As of May 2015, there were a total of 183 State-owned dams classified as hazardous. Of these hazardous dams, 57 or 31 percent did not receive the most recent required inspection. We also reviewed 35 applicable dam files and found eight or 23 percent did not contain written inspection reports for the most current inspection.

Per RSA 482:12, it was the duty of the DES to inspect with competent engineers all dams in the State which may be a menace to the public safety. Administrative rules required inspections to occur every two years for high hazard structures, four years for significant hazard structures, and six years for low hazard structures. Although national guidelines recommended more frequent inspections, the intervals required for DES were generally aligned with the national average of other dam safety inspection programs for high hazard and significant hazard dams.

If the inspection indicated maintenance or repair was required, the DES was to notify the owner in writing of necessary repairs and request they be undertaken within a specified time period. Following a State-owned dam inspection, the Dam Bureau issued either a Memorandum of Deficiency, which set a timetable for the owner to address the repairs, or Notice of Inspection, which required minor issues be addressed before the subsequent routine inspection.

An effective inspection program is essential for identifying problems and providing safe maintenance of a dam. Inspection activities provide the basis for dam inventories, evaluation of downstream hazards and hazard potential classification, correlation of approved construction plans with actual construction, safety evaluation of existing dams, as well as emergency response planning and execution. Written documentation of all inspections is necessary for detailing all visual observations, recommendations, and are critical in assessing legal liability. Also, written documentation is important because inspectors relied on documentation from the previous inspections to perform subsequent inspections.

With only one of the four available inspector positions filled at times during the audit period, management reported staffing issues hindered the Dam Bureau's ability to complete required inspections and written reports. Potential risk to human life and property could not be reduced without consistent inspections and documentation verifying the structural integrity of the dam.

Recommendation(s):

We recommend DES management complete required inspections and document all results of inspections performed on State-owned dams.

Auditee Response:

Concur. Requirements will be met during the 2015 Inspection Cycle. The report notes that during much of the audit period, three of the four Dam Safety Engineer positions in the Dam

Safety and Inspection Section were vacant. As a result, during this period the scheduled inspections had to be triaged, and, to provide the greatest protection to human life and property, the Dam Bureau Administrator made the inspection of private and municipally owned dams a higher priority than the inspection of state-owned dams. This priority was based on the fact that the state-owned dams are regularly visited by dam operators, who have been formally trained in dam safety and inspection, and who regularly report issues of concern regarding the safety of the dams they operate. Also, during this staffing shortage, an engineer from the Engineering and Construction Section, who formerly worked in Dam Safety and Inspection Section, inspected some of the state-owned dams. With the recent hiring of two Dam Safety Engineers, the Dam Bureau will complete the inspections of state-owned dams scheduled for 2015. The fourth Dam Safety Engineer position currently remains vacant due to a funding shortage.

Observation No. 12

Password Policy For Automated Gate Controls Needed

The DES Dam Bureau did not have a minimum password strength policy. Until July 2015, Mascoma Lake dam and Milton Three Ponds dam gates could be raised and lowered remotely through a dial-up telephone connection. Typically the connection was initiated from a personal computer located at Dam Bureau headquarters, but could be hacked by any computer user knowing the telephone number, user name, and password. The Dam Bureau used a single character as a password for accessing these two systems, which was how the systems were configured when the contractor set them up. In July 2015, the two systems were permanently removed from the sites until a newer system could replace them. The newer system planned for these two sites, which was in place at Newfound Lake, will be connected to the DES network and protected using a firewall. However, a strong password policy was still needed.

The Federal Information System Controls Audit Manual states users should be appropriately identified and authenticated. AC-2.1.6 states passwords should contain alphanumeric and special characters, sufficiently long (e.g. at least eight characters in length), and changed periodically (e.g. every 30 to 90 days).

Without a policy requiring strong passwords, the Dam Bureau risks implementation of weak passwords which may lead to unauthorized control of dam gates.

Recommendation:

We recommend DES management develop and implement a strong password policy aligned with current best practices for its automated gate controls.

Auditee Response:

Concur. Implementation underway. The Dam Bureau is currently in the process of upgrading remote control systems for Mascoma Lake Dam in Lebanon and Milton 3-Ponds Dam in Milton. In addition, a new control system has been installed at Newfound Lake Dam in Bristol. The original control systems for Mascoma Lake Dam and Milton 3-Ponds Dam operated via a dial-

up connection and a weak username/password entry as indicated in the audit report. These original systems were removed during the summer.

The new control systems for all three sites now operate via a regular internet (DSL) connection, and provide firewall protection and a direct VPN tunnel connection to the DES network. In order to connect to these control systems, a user must first have DES network credentials and access to a DES computer. The DES credentials follow a rigid IT industry standard for password strength and a 90-day change schedule. In addition, the new control systems have an “HMI” level username and password option, which prevents users from using the human-machine interface (HMI) without first logging in.

DES will implement a strong-password policy, consistent with current cybersecurity standards, for future automated gate control systems.

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**STATE OF NEW HAMPSHIRE
DEPARTMENT OF ENVIRONMENTAL SERVICES
STATE-OWNED DAMS**

**APPENDIX A
OBJECTIVES, SCOPE, AND METHODOLOGY**

Objectives And Scope

In April 2015, the Fiscal Committee of the General Court approved a joint Legislative Performance Audit and Oversight Committee recommendation to conduct a performance audit of the Department of Environmental Services (DES) Dam Bureau. Our entrance conference with the DES management was in April 2015. Our audit sought to answer the following question:

Did the Department of Environmental Services efficiently and effectively manage State-owned dams during State fiscal years 2014 and 2015?

This audit had two primary foci: 1) the efficiency and effectiveness of the DES Dam Bureau operating and maintaining State-owned dams, and 2) the efficiency and effectiveness of the DES Dam Bureau repairing and reconstructing State-owned dams.

Methodology

To gain an understanding of operations and legal requirements, management, the internal control environment, and procedures for management of State-owned dams, we performed the following steps:

- Reviewed relevant State laws and administrative rules, the Dam Bureau's organization charts, policy documents, financial statements, inventories, data, job descriptions, timesheets, memorandums of agreement, grant awards, and website.
- Reviewed similar audits from the federal government and other states, relevant news articles, state dam safety program performance summaries, State infrastructure report cards, and a State peer review report.
- Reviewed industry standards, national dam safety and dam construction guidelines, recommended practices for dam operations and maintenance programs, procedures for performing cost-benefit analyses, and internal control standards.
- Inquired with other State entities required to maintain Emergency Actions Plans of State-owned dams.
- Interviewed personnel within the Operations and Maintenance, Engineering and Construction, and Dam Safety and Inspection Sections, as well as DES management and other staff.
- Observed operations and maintenance tasks, construction practices, and a routine inspection at a State-owned dam.
- Visited the Sewalls Falls maintenance facility to gain an understanding of additional maintenance tasks as well as storage and security procedures for State assets and materials.
- Assessed information technology access controls of automated State-owned dams.

Data Reliability

We assessed the reliability of the DES Dam Bureau database as part of our file review and determined we could rely on the information for audit purposes.

Review Of Dam Files

We reviewed a random sample of 42 State-owned dam files to determine whether: 1) inspections occurred as required and corresponding reports were generated; 2) Operations and Maintenance Plans were current and complete; and 3) required Emergency Action Plans were accessible, current, and formatted correctly. The files were checked for Memorandums of Deficiency, statutory compliance with inspection frequency, Operations and Maintenance Plan formatting, and if applicable, construction documentation, as well as completeness of Emergency Action Plans, testing, and annual review. Because we used a non-statistical sample, results cannot be projected to the entire population of dam files.

Dam Reconstruction Project Files

To evaluate the project management of State-owned dam reconstruction, we reviewed seven projects costing over \$100,000 completed within State fiscal years 2013 and 2014. Because of a lag in project closeout, projects finished in 2015 were not examined because documentation had not yet been completed. We evaluated these files to determine whether project management practices were utilized. We examined the files looking for project-related documentation that illustrated compliance with best practices in project management.

**STATE OF NEW HAMPSHIRE
DEPARTMENT OF ENVIRONMENTAL SERVICES
STATE-OWNED DAMS**

**APPENDIX B
AGENCY RESPONSE TO AUDIT**



The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES



Thomas S. Burack, Commissioner

September 24, 2015

Stephen C. Smith, MS, CPA
Director of Audits
Legislative Budget Assistant – Audit Division
107 North Main Street
State House, Room 102
Concord, NH 03301-4906

**RE: State of New Hampshire Department of Environmental Services State-Owned Dams
Performance Audit Report, October 2015**

Dear Mr. Smith:

Thank you for the opportunity to comment on the “Department of Environmental Services State-Owned Dams Performance Audit Report, October 2015” written by the Legislative Budget Assistant’s Audit Division (LBA-Audit Division).

The Department of Environmental Services (DES) sincerely appreciates the excellent work of the LBA-Audit Division. John Clinch and Paige Lorenz of the LBA-Audit Division Team are to be commended for the professionalism and thoroughness that is reflected in the quality of the Audit Report. DES concurs with the final audit findings, and is committed to implementing the recommendations contained in the report to improve the operation, maintenance, repair and reconstruction of state-owned dams.

As part of the audit, the LBA-Audit Division Team visited the Dam Bureau Dam Maintenance Facility at Sewalls Falls. The LBA-Audit Division Team noted that materials could not be safeguarded because of the limited storage at the facility. However, the lack of suitable storage is only one of the problems at the facility. The facility is a former hydroelectric station constructed in the late 1800’s by the Concord Electric Company on the Merrimack River in Concord. The buildings are in poor condition, may pose hazards to those who work in them, and are unsuitable for storage of much of the Dam Bureau’s equipment and material. The site is in the floodplain or floodway and no additional buildings can be built on the site. For these reasons, DES will be requesting funds in the FY 18-19 Capital Budget to construct a new, safer and more suitable Dam Maintenance Facility at another location.

Thank you, again, for your consideration. If you have questions concerning our response to the Audit Report, please contact me at 271-2958 or thomas.burack@des.nh.gov.

Sincerely,

A handwritten signature in black ink that reads "Thomas S. Burack".

Thomas S. Burack
Commissioner

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