



# Oregon

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## Water Resources Department

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### MEMORANDUM

TO: Water Resources Commission

FROM: Keith Mills, Acting State Engineer and Dam Safety Program Manager

SUBJECT: Agenda Item M, November 21, 2014  
Water Resources Commission Meeting

#### **Dam Safety Program Overview**

#### **I. Introduction**

Oregon's Dam Safety Program is currently developing rules for the Commission's consideration and action in 2015. Oregon has a good dam safety record; however, in recent years, we have learned more about the potential seismic vulnerabilities of Oregon's infrastructure, and there have been several incidents related to inadequate spillways. The revisions to the dam safety rules will assist engineers and dam owners in continuing the state's good safety record. This report will describe the dam safety program in general, as well as provide information on the process underway to develop rules.

#### **II. Background**

Oregon Revised Statutes (ORS) 540.340 to 540.400 authorize and direct the Oregon Water Resources Department to take actions related to the design, construction, inspection, and safety of dams. Dams that are at least ten-feet high and store three million gallons (9.2 acre feet) of water or more are subject to Oregon's dam safety statutes.

The dam safety program staff undertake a number of activities to ensure that dams are safe in Oregon, such as reviewing and approving designs, drawings, and specifications of dams; inspecting dams and evaluating safety conditions; determining hazard ratings; and coordinating enforcement actions. An overview of the dam safety program's activities is provided in more detail below.

The Dam Safety Section has one dam safety engineer and one engineering intern. Dam safety inspections are also performed by watermasters and assistant watermasters, with one of the watermasters serving as the dam safety coordinator for Eastern Oregon.

### III. Discussion

**Reviewing and Approving Designs, Drawings, and Specifications of Dams.** All dams that store water require a water right permit from the Department. There are two different permitting processes for constructing a dam in Oregon. Dams that are under ten feet in height or that store less than 9.2 acre feet of water, undergo an “Alternate Reservoir Application” process and receive an expedited review. An engineering review for these very small reservoirs is not required.

All other dams are required to have a dam safety evaluation of dam designs prepared by an Oregon registered professional engineer. Before construction can begin, Oregon’s dam safety engineer must review and approve the designs, plans and specifications. The dam safety engineer also reviews and approves designs, drawings, and specifications for the modification of non-federal dams that meet the size requirements.

**Inspecting Dams.** During dam safety inspections, staff evaluate the condition of the embankment and reservoir, the safety of the spillway, the conduit through the dam, and access and security issues. Prior to conducting an inspection, staff obtain permission from the landowner. If necessary, the Department does have authority to seek a search warrant for inspections of significant and high-hazard dams. Most owners, however, provide access and frequently join staff during inspections.

After the on-site inspection is completed, a letter is drafted and sent to landowner detailing any safety issues. If the dam is unsafe and the owner does not take immediate action, the Department initiates enforcement actions.

**Number of Dams in Oregon by Jurisdiction & Hazard Rating**

	Federal Inspected	State Inspected	Totals
High	69	68	137
Significant	29	145	174
Low	187	723	910
Totals	285	936	1221

Federal agencies like the U.S. Army Corps of Engineers, Bureau of Reclamation, and Federal Energy Regulatory Commission have their own dam safety programs and conduct safety inspections of dams under their jurisdiction.

**Determining Hazard Ratings.** As with almost all states, all statutory dams in Oregon are rated by *hazard*. Dam hazard is based on what could happen if the dam fails, not on the condition of a dam.

There are three hazard ratings:

- High hazard – a dam failure will likely cause loss of life
- Significant hazard – a dam failure will likely cause extensive property damage with loss of life unlikely
- Low hazard – a dam failure is unlikely to do extensive damage to other property and loss of life is unlikely.

Dam safety standards are more stringent for high hazard dams, requiring more frequent inspections, and the development of an emergency action plan. There are currently 68 non-Federal dams in Oregon rated as high hazard.

One important function of the dam safety program is to evaluate existing dams for the correct hazard rating using “dam breach inundation analysis,” a fairly complex hydraulic analysis. The Department has made dam breach inundation analysis for hazard reclassification a priority. Over the past two years, the number of state regulated high hazard dams in Oregon has increased from 61 to 68 based on formal dam breach inundation analyses.

**Evaluating Safety Conditions.** The Department evaluates the safety of each dam, based on field inspections, and categorizes each one as satisfactory, fair, poor, and unsatisfactory. At the beginning of 2014, of the 68 state regulated high-hazard dams, twenty-six were in satisfactory condition, twenty-four were in fair condition, eleven were in poor condition, and seven were in unsatisfactory condition. As of October 2014, there are 29 dams in satisfactory condition, 24 dams in fair condition, ten dams in poor condition, and five in unsatisfactory condition. These improvements in dam safety conditions were due to repairs made to the dams after the Department conducted dam safety inspections, and determined that the owners needed to take actions to address the condition of the dams as described below.

**Conducting Enforcement Actions.** When staff determine that a dam is unsafe, action is taken. There are a number of dams where rehabilitation or removal of the dam is under analysis or being implemented now. In most cases, staff can work with owners to ensure that they voluntarily take timely actions to address the issue. When owners do not agree with the Department’s determination that a dam is unsafe, the statutes provide a specific process for enforcement of dam safety standards. This process allows the owner to contest the findings of the Department.

**Developing Emergency Action Plans.** In Oregon, money from FEMA grants is used to help dam owners create Emergency Action Plans (EAP) for existing dams. Rules require EAPs for all new high hazard rated dams, to be completed at owners’ expense. An EAP helps identify situations where a dam failure might occur, and spells out actions that could save the dam and hasten evacuations. Approximately 75 percent of state-regulated high hazard dams have, or are in the process of developing, EAP’s. The Department strongly encourages owners of existing dams to complete emergency action plans (EAP) for all remaining high hazard dams in Oregon.

**Assisting with Engineering Analysis.** As resources permit, the Department assists owners of public dams with engineering analysis, particularly for critical municipal water supply dams in locations most susceptible to very large earthquakes. We are currently working with owners of several coastal municipal water supply dams to complete seismic analyses of the dams. If necessary, the Department will work with owners to ensure these dams meet seismic safety standards.

**Coordinating with Emergency Managers.** The Dam Safety Program coordinates with local and state emergency managers on planning for emergencies, such as a dam failure, drought, floods, or earthquakes. We are also the liaison in the event of an emergency at a Federal dam.

**Training.** Staff have attended training and conferences organized by the Association of Dam Safety Officials (ASDSO) and will hold a State Dam Safety Conference for owners, engineers, and scientists in early 2015.

**Funding.** Funding for the Dam Safety Program totals more than \$600,000 per biennium. Funding is received from three major sources: a dam safety fee, a grant from FEMA, and the General Fund.

1. *Dam safety fee established by the Oregon Legislature in 2009 (approx. \$263K);*

The 2009 Oregon Legislature enacted Senate Bill 788, which authorizes the Oregon Water Resources Department to charge annual fees for dams to support the state dam safety program. The fee for each dam is based on the hazard rating as follows:

- \$85 per year for low hazard dams (these dams are inspected every 5-6 years);
- \$170 per year for significant hazard dams (inspected every 2-3 years);
- \$575 per year for high hazard dams (inspected every year).

2. *Dam safety grant from FEMA (almost \$218K); and*

The Federal Emergency Management Agency actively supports state dam safety programs with grants in order to:

- Reduce the likelihood of dam failures – The grants help the Department to continue to conduct dam safety inspections on schedule and communicate necessary maintenance, analysis, operations, or repair deficiencies to the dam owner.
- Reduce the potential consequences resulting from dam failure – To achieve this, the Department has committed to working with dam owners to complete emergency action plans.
- Promote public awareness of the benefits and risks related to dams – This helps Oregon support dam owner efforts to analyze dams, identify needs for rehabilitation, and disseminate information.
- Promote research and training for State dam safety and other professionals.

3. *The General Fund (approx. \$144K).*

**Upcoming Rulemaking.** The Department has identified a number of improvements that can be made to the dam safety rules to more clearly describe the Department's dam safety functions. The proposed rule changes will primarily focus on dam design and construction. The proposed rules are intended to clarify for dam owners and engineers the elements that should be submitted to the department to ensure timely approval of designs for new and modified dams. The proposed rule changes will focus on:

- Simple instructions so that owners and engineers know what is required to build and maintain a safe dam;
- Specific design objectives for engineers, including the design elements that will be required for dam safety;
- Standards for seismic stability and spillway capacity based on the dam's hazard rating; and
- Specific criteria for inundation analysis, so the Department can objectively and accurately classify the hazard rating of each dam.

In developing the draft rules, the Department convened a Rules Advisory Committee, comprised of public and private dam owners, consultants and engineers. The Department also held a public hearing on September 29, 2014 and accepted public comment on the draft rules from September 1 to October 3, 2014. The Department is currently incorporating public comment into a set of proposed rules, which it plans to bring to the Commission for adoption early in 2015.

#### **IV. Conclusion**

Oregon has a good dam safety record; however, the Department is always looking for opportunities to improve the program. Staff have identified an opportunity to revise the dam safety rules in order to provide clearer direction for engineers and dam owners. The Department will bring these rules forward for consideration at the next Commission meeting.

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