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## MEMORANDUM

TO: Water Resources Commission

FROM: Keith Mills, State Engineer for Water Resources *KAM*  
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SUBJECT: Agenda Item C, March 15, 2018  
Water Resources Commission Meeting

### **Dam Safety Program Overview**

#### **I. Introduction**

The Commission and Department strive to maintain a good dam safety record to protect people and property. This report will describe the dam safety program in general and discuss the dam safety recommendations in the 2017 Integrated Water Resources Strategy (IWRS).

#### **II. Background**

A majority of Oregon's dams were constructed decades ago, with some more than 100 years old. In recent years, we have learned more about the potential seismic vulnerabilities of Oregon's infrastructure. There have been several incidents related to floods and inadequate spillways around the United States. While the original focus of Oregon's dam safety program was the review and approval of designs for new dams, the dam safety program now focuses on evaluating the condition of existing dams through regular inspections and providing feedback to owners regarding needed safety improvements.

The State Engineer for Water Resources oversees the dam safety program along with one staff engineer. Oregon Revised Statutes (ORS) 540.340 to 540.400 authorize actions related to the design, construction, inspection, and general safety of dams. These laws apply to dams that are at least ten-feet high and store three million gallons (9.2 acre feet) of water. Staff undertake a number of activities to improve dam safety including: inspecting dams; communicating with the dam owner; evaluating proposed designs; determining hazard ratings; coordination on emergency action plans; and, if necessary, proceeding to enforcement.

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.

### III. Discussion

Most of the authorizing statutes were adopted in 1929, with no major technical safety changes since that time. The Commission updated the dam safety rules in 2015 based on existing authorities. Since then, it has become evident that there is a need for the Department to propose legislation to modernize the dam safety statutes. An overview of the dam safety program’s activities follows, along with an identification of particular areas where the agency sees a need to address its current authorities.

*Hazard Rating:*

Evaluating hazard and risk are key elements of the dam safety program. Hazard refers to the consequence of a dam failure. Failure of a high hazard dam would likely cause fatalities. Failure of a significant hazard dam is unlikely to cause fatalities but would likely result in major property damage. A low hazard dam poses little risk to people and limited risk to property. Determination of hazard rating requires detailed inundation analysis through hydraulic modelling. With current staff, the program emphasis is on dams that are, or have the potential to be, rated as high-hazard.

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

	Federal Inspected	State Inspected	Totals
High	69	75	144
Significant	29	147	176
Low	187	747	934
Totals	285	969	1254

From OWRD dam safety database June 2017 for the Integrated Water Resources Strategy update

*Inspecting Dams, Conditions Ratings, and Enforcement:* Dam safety inspections evaluate: the condition of the embankment and reservoir; the safety of the spillway; the soundness of the conduit through the dam; the presence of leakage or seepage; and access and security. Inspections can screen for, but are generally unable to confirm, conditions related to seismic or extreme flood risk. Prior to conducting an inspection, staff obtain permission from the landowner. After the on-site inspection is completed, a letter is drafted and sent to the landowner detailing any safety issues. If the dam is demonstrably unsafe and the owner does not take immediate action, the Department initiates enforcement actions.

The condition of high hazard dams are evaluated and ranked using four classifications (the lower the condition, the higher the potential safety risk): satisfactory, fair, poor, and unsatisfactory. The condition analysis of each high hazard dam is updated after its formal inspection. Some states consider all dams in unsatisfactory condition as unsafe unless there is a significant restriction in the volume of water storage allowed at that dam, while other states require monitoring of dams in less than satisfactory condition. Oregon does not have similar criteria. There are currently six Oregon high hazard dams in unsatisfactory condition.

Most commonly inspections find potential safety deficiencies, which are inadequacies in construction and design, or lack of repair that make the dam more vulnerable to failure over time. In most cases the safety deficiency is related to a possible vulnerability in an earthquake or

extreme storm, long-term internal erosion, or loss of water control through a conduit or spillway. Existing resources are usually insufficient to allow the Department to conduct more in depth evaluations of safety deficiencies. The Department has resources to identify obvious external deficiencies. Determination of hydraulic and seismic deficiencies, often require more resources than dam safety program staffing allows.

On a rare occasion, inspections find a dam at imminent risk of failure. There is currently no statutory authority to act in an emergency unless a notice and a formal hearing before an administrative law judge has been completed.

*Monitoring:* Remote monitoring can detect a potential problem before there is harm to people and property. The most important information includes the current water level in the reservoir and any change in seepage flow through the dam. A few dam owners collect and analyze this information, as it allows them to improve the performance and safety of their dams. The Department is not authorized to require monitoring on high hazard dams, even those in poor or unsatisfactory condition, unless it is part of the enforcement required after a formal administrative hearing.

*Emergency Action Plans (EAP):* A proper EAP allows the dam owner to identify situations where a dam failure might occur, and spells out actions that could save the dam, communicate to emergency officials, and hasten evacuations. Over 75 percent of state- regulated high hazard dams have EAPs. The 2017 Legislature passed a bill requiring owners or operators of high-hazard dams to develop an emergency action plan and file it with the Water Resources Department, Office of Emergency Management, and the local county emergency agency no later than January 1, 2019.

*Designs for new dams:* All dams that store water require a water right permit from the Department. Dams that are ten feet in height and storing over 9.2 acre feet of water are required to have a dam safety evaluation of designs and analyses that are prepared by an Oregon registered professional engineer. There is currently no fee for design review, so this is funded by the dam safety fee on other owners and by the small amount of General Fund dedicated to dam safety. Before construction can begin, the state engineer for water resources must review and approve the designs, analysis and supporting documentation. In March of 2015, the Commission approved new rules mostly to provide standards for engineers to use in the design of new dams. The new rules for high hazard dams require that new dams are designed for the most extreme floods and earthquakes. The Department's authority for review and approval of major dam modifications or safe removal of dams is unclear in current statute.

*Recommendations of the Integrated Water Resources Strategy (IWRS):* A number of reviews of the dam safety program have occurred over the last few years. The Federal Emergency Management Agency and Association of State Dam Safety Officials provide model dam safety authorities to establish best practices across the states and protect the public from dam failures. Consistent with the Model Dam Safety authorities and the peer review, the Department has identified a number of areas where modifications to the dam safety statutes are very important for the protection of people and property. Based both on internal and independent reviews of the

dam safety program, the following recommendations were included in the 2017 IWRS Recommended Action 7.C:

- Modernize state laws to improve the safety and resiliency of Oregon dams
- Authorize resources to determine if dams have safety deficiencies; evaluate and retrofit dams to meet new seismic standards
- Authorize emergency actions and encourage cooperative actions to improve the safety of dams
- Properly decommission dams at the end of their useful life
- Coordinate interagency emergency responses regarding dam inspection, communication, and evacuation
- Define the legal responsibilities of a dam owner
- Authorize a requirement for remote monitoring on deficient high hazard dams
- Dam owners should prepare and implement an Emergency Action Plan for all existing dams rated high hazard
- Authorize a fee for review of plans and specifications
- Dedicate grant and loan resources for rehabilitation of deficient dams

#### **IV. Conclusion**

Federal funding for the dam safety program requires that states make progress on ensuring sufficient authority and resources to minimize the risk to people and property from dam-related floods. Oregon has a fairly good dam safety record; however, there is increased understanding of the age and condition of Oregon's dams, as well as of the potential for a major earthquake or flood to occur. These new understandings and the need to be able to provide more immediate action in the event of an emergency suggest that revisions to the dam safety statutes are needed. During Agenda Item E, staff will provide an overview of the Department's 2019 legislative concept that is under development.

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