

STATE OF CALIFORNIA  
CALIFORNIA NATURAL RESOURCES AGENCY  
DEPARTMENT OF WATER RESOURCES  
DIVISION OF SAFETY OF DAMS

## INSPECTION OF DAM AND RESERVOIR IN CERTIFIED STATUS

Name of Dam Phoenix Lake Dam No. 33-3 County Marin  
 Type of Dam Earth Type of Spillway Concrete weir and chute  
 Water is 0.16 feet above the spillway crest and 15.2 15.04 feet below the dam crest.  
 Weather Conditions Sunny and warm  
 Contacts Made Lucy Croy, Kristin Arnold, and Jonathan Fouche (Marin Municipal Water District)  
 Reason for Inspection Annual Inspection

### Important Observations, Recommendations or Actions Taken

Tules growing along the upstream waterline and in the spillway approach need to be removed (photos 2 & 3).

As requested in the previous inspection report, emerging vegetation was removed from the downstream right groin and rock was added to both lower downstream groins, preventing additional erosion (photo 4).

Per the California Water Code, outlet controls used in emergency drawdown need to be cycled annually by the owner.

### Conclusions

From the known information and visual inspection, the dam, reservoir, and the appurtenances are judged safe for continued use.

### Observations and Comments

<u>Dam</u>	<p>The visible portion of the upstream and downstream faces, the crest, and the abutments are in satisfactory condition with no indication of surficial distress or instability.</p> <p>Vegetation control is generally satisfactory, and the downstream face is covered in low lying grass and other low ground cover that provide protection against erosion without hindering inspection and monitoring for seepage and other defects; however, tules growing along the upstream waterline need to be removed (photo 2). As requested in the previous inspection report, emerging vegetation was removed from the downstream right groin and rock was added to both lower downstream groins, preventing additional erosion (photo 4).</p> <p>Rodent control is satisfactory, and only minor indications of rodent activity were observed.</p>
<u>Spillway</u>	<p>The spillway control section and exit channel are clear and unobstructed. Tules and cattails that were removed are beginning to emerge again and will require annual maintenance to keep the spillway entrance clear (photo 3).</p> <p>A crack within the spillway is presently being monitored using electronic extensometers, which were recalibrated in late 2015. Additional inexpensive crack movement indicators were installed across the crack in April 2018. Since the recalibration, the displacement of the crack does not appear to have changed significantly.</p> <p>Vegetation growing below the spillway crack indicates that water flowing through the spillway is leaking through the crack. The owner should continue to monitor the crack and report any indication of potentially adverse displacements to DSOD immediately.</p>
<u>Outlet</u>	<p>None of the controls were cycled during this inspection but were fully cycled in the presence of DSOD during the March 13, 2019 inspection and found to be in good operating condition. Per the</p>

Photos taken? Yes  No  *MM* 4/30/2020 Inspected by Michelle Lockhart  
 cc for Owner/Book *LS* 4/30/2020 Date of Inspection April 15, 2020  
 Date of Report April 29 2020

**INSPECTION OF DAM AND RESERVOIR IN CERTIFIED STATUS**

Name of Dam Phoenix Lake Dam No. 33.3  
 Date of Inspection April 15, 2020

**Observations and Comments**

owner's log, the outlets were not cycled when inspected on September 10, 2019. California Water Code mandates that critical outlet controls be cycled annually by the owner and in the presence of DSOD every three years.

Seepage The downstream face and groins were dry and free of any indication of seepage.

Instr. Instrumentation consists of the following:

- Ten (10) operable piezometers designated 5-1, 5-2, 6-1, 6-2, 7, 7A, B-3, B-4, B-5, and B-6, installed to monitor the phreatic surface within the embankment. Piezometers are monitored monthly.
- Three (3) crest survey monuments (M-3, M-4 and M-5) installed to monitor settlement and horizontal displacement of the crest.
- Two (2) crack meters installed to monitor vertical and horizontal displacement of a crack within the raised portion of the concrete spillway chute.

The latest instrumentation data was received from the owner on July 31, 2019.

Piezometer data covers the period between July 2009 and July 2019. Piezometer 6-1, located at the center of the crest, has gone dry and is no longer measured. The owner should check the piezometer periodically to ensure it is still dry. All piezometers trend with the reservoir water surface elevation except for P7, which remains at a constant elevation of approximately 117 ft. For the period reviewed, all piezometers follow historic patterns, and no long-term indication of a change of the phreatic surface within the embankment is indicated.

Settlement data covers the period between January 1982 and January 2020. The measured maximum total settlement is 0.346 feet (4.2") for monument M-5, located at the right abutment of the crest, on November 12, 2015. Monuments M-3 and M-4, both in the middle of the crest, show maximum total settlements of 1" and 2", respectively. The latest readings continue to show less total settlement than the November 2015 readings.

Alignment readings have trended overall to a shift in the downstream direction, with a maximum of -0.284 at M-5, located at the right abutment of the crest, on January 1, 2017. To date there are no obvious physical indications of significant displacement, settlement, or other signs of potentially hazardous mass movement.

Spillway crack data covers the period between January 2016 and September 2019, with a gap in data between December 2018 and February 2019 due to data handling error. Crack monitors indicate horizontal displacements are cyclical and range from 45.5 mm displacement in warmer temperatures and 49 mm displacement in cooler temperatures. The vertical displacements are also somewhat cyclical but more sporadic and range from 19.5 mm displacement in warmer temperatures and 20.75 mm displacement in cooler temperatures.

The dam appears to be performing satisfactorily, and no additional instrumentation is believed necessary at this time. Careful and consistent monitoring of the spillway crack is imperative, and any indication of potentially adverse displacements must be reported to DSOD immediately.

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Photo 1: View of the downstream face as seen from the right abutment.



Photo 2: View of the upstream face as seen from the right abutment. Tules along the waterline (circled) need to be removed.

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Photo 3: Tules and the circled tree in the spillway approach need to be removed.



Photo 4: Additional rock was placed in the groins of the lower portion of the downstream face.