

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 Soulajule Dam No. 33-9 County Marin  
 Type of Dam ERTH Type of Spillway Concrete weir and chute  
 Water is 6 feet below the spillway crest and 18 feet below the dam crest.  
 Weather Conditions Clear and mild  
 Contacts Made Lucy Croy, Conner Pollard, and Carl Sanders during the inspection  
 Reason for Inspection Periodic Evaluation

**Important Observations, Recommendations or Actions Taken**

Overall care and maintenance of the dam and appurtenances continues to improve, and vegetation control is now excellent.

Primary access to the dam when the spillway is flowing has been improved by placing course gravel armor on the alternate access road located along the right side of the dam. Access is now satisfactory.

The owner was draining the spillway flip bucket in preparation for a detailed evaluation of the spillway by AECOM. I asked Ms. Croy to forward a copy of AECOM's spillway report to DSOD.

**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 portions of the upstream face, crest, downstream face, and abutments are in satisfactory condition, with no indication of surficial distress or instability. The upstream riprap armor remains in satisfactory condition and continues to provide reasonably adequate protection against wave action.</p> <p>Overall care and maintenance of the dam and appurtenances continues to improve, and vegetation control is now excellent. The embankment is covered with ankle tall grass and other low ground cover that protect against erosion without hindering access for inspection and monitoring for seepage and other defects.</p> <p>Rodent control remains satisfactory and only minor indications of burrowing are evident along portions of the crest.</p>
<u>Spillway</u>	<p>The approach, control section, and exit channel were open and clear; a polyethylene log boom was in place several hundred feet upstream of the dam. Due to safety concerns, the spillway could not be entered for close examination, but no significant flaws were noted from our safe viewing locations. The owner has contracted with AECOM to perform a detailed evaluation of the concrete spillway. I asked Ms. Croy to forward a copy of AECOM's spillway report to DSOD.</p> <p>The current design storm, prepared in 1978, is for a 10,000-year return period producing 15,223 cfs (~814 cfs / sq mi) from the 18.7 square mile drainage area. The spillway capacity is ~17,300 cfs which is greater than the peak inflow. Total freeboard is 12 feet and the residual freeboard for the design storm is 3.3 feet. Freeboard is satisfactory.</p>
<u>Outlet</u>	<p>Five 36-inch diameter butterfly valves mounted on the inclined inlet structure provide upstream control for the fully encased outlet. The five mechanically operated valves are located at elevations</p>

Photos taken? Yes  No   
 cc for Owner/Book

Inspected by J. Lowe  
 Date of Inspection 13 February 2018  
 Date of Report 16 February 2018

# INSPECTION OF DAM AND RESERVOIR IN CERTIFIED STATUS

Name of Dam Soulajule Dam No. 33-9

Date of Inspection 13 February 2018

## Observations and Comments

323.0', 305.5', 228.0', 270.5', and 253.0'. Downstream control is provided by a pair of butterfly valves arrayed in series; a 36-inch butterfly valve within a concrete vault, followed by a recently installed 48-inch butterfly valve buried between the vault and outlet energy dissipater discharge. The outlet is normally pressurized.

All of the outlet controls were fully cycled during and immediately following this inspection. All controls functioned well.

Seepage No evidence of seepage was observed through the downstream face, groins, or abutments.

The seepage monitoring weir is located next to the right side of the outlet energy dissipating structure. Estimated flow was approximately 8 gpm, which remains within historical values. Clear seepage measured at the monitoring weir correlates closely to rainfall; in the absence of rainfall seepage drops to essentially zero.

Instr. Instrumentation consists of the following:

- Twenty-one (21) survey monuments. Survey monuments were installed to measure post construction settlement and to monitor settlement and lateral displacement of the embankment crest and downstream face following significant seismic events. Surveys are performed approximately every five years.
- Nineteen (19) piezometers. Piezometers were installed to monitor post construction pore water pressure and to monitor the phreatic surface within the embankment. Piezometers are read monthly.
- One (1) 90-degree V-notch weir. The weir was installed to measure seepage from the toe drain and is monitored monthly.

The latest instrumentation data was received from the owner on 21 June 2017.

Survey data covers the reporting period between January 1980 and March 2017. Settlement data shows that the dam continues to settle over time, though along a significantly flattening settlement slope. The maximum differential settlement, and the maximum total settlement since the start of the reviewed data period, remains 0.465 feet (5.6 inches) for monument M-16 on 8 October 2015. Settlement at all locations is significantly less than camber, and camber at monument M-16 is 25 inches.

Alignment readings are presented and are quite steady up until 1991, after which they make a pronounced shift in the upstream direction beginning in 1992. The upstream shift continues through to the 2015 readings, with maximum total displacements of almost 2 inches between 1991 and 2015. New survey instruments were introduced in December of 2005 and August of 2015, and the change of instruments, reading and reporting errors, or a change in anchor monument locations are several plausible explanations for the deviations. To date there are no obvious physical indications of significant displacement, settlement, or other signs of potentially hazardous mass movement, and several years of consistent data will be required before any meaningful trends can be ascertained from instrumentation readings.

Piezometers are distributed along the crest, along a bench near the mid elevation of the downstream embankment, on the upstream face, and along the downstream toe and groin. Design elevations for the piezometers are:

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Piezometer Number	Depth to Bottom of Piezometer	Design Tip Elevation	Comments
P-1	141.33	204.66	Left crest.
P-1A	116.38	229.45	Left crest.
P-1B	46.17	299.83	Left crest.
P-2	135.83	210.75	Center crest.
P-2A	156.33	190.10	Center crest.
P-2B	66.00	280.57	Center crest.
P-3	90.46	255.36	Right crest.
P-3A	98.33	246.89	Right crest.
P-3B	45.08	300.38	Right crest.
P-4	86.75	249.50	Upper center downstream embankment.
P-5	78.29	231.55	Left drainage bench. Critical elevation 250'.
P-6	88.74	224.49	Center drainage bench. Critical elevation 250'.
P-6A	116.76	196.39	Center drainage bench. Critical elevation 250'.
P-7	75.79	237.41	Right drainage bench. Critical elevation 250'.
P-8	59.85	252.71	Far right drainage bench. Critical elevation 250'.
P-9	28.57	222.58	Left downstream toe. Critical elevation 250'.
P-10	43.56	207.56	Center downstream toe. Critical elevation 250'.
P-11	38.28	218.71	Right downstream groin. Critical elevation 250'.
P-12	28.07	313.07	Upper center upstream embankment.

Piezometer data covers the period between January 2007 and March 2017. Measured piezometer water surface elevations remain relatively constant over the period reviewed, and all piezometers remain below the critical elevation indicated in the Embankment Dam Stability Analysis, Soulajule Dam, 33-9, dated 28 February 1978.

The seepage measurement weir is located on the right side of the outlet energy dissipater, and is designed to measure seepage from the toe drain. Data for the period January 2007 through March 2017 was reviewed prior to this inspection. Normal peak seepage of up to 70 gpm or more quickly falls to near zero following the termination of winter storms. Seepage reported was consistent with historical values and appears to be highly related to rainfall.

The owner's conclusions from their June 2017 submittal were that, "The Soulajule Dam piezometer readings are consistent with historic readings. The weir readings vary due to clogging and flooding. The weirs are now cleaned every six months as part of a preventative maintenance program. Soulajule Dam is trending toward stabilization: settlement of -0.47 ft (maximum) and alignment of +0.18 ft (upstream direction; maximum)". Based on the data submitted I agree with the owner's conclusions. The dam appears to be performing satisfactorily, and no additional instrumentation is believed necessary at this time.

### Other

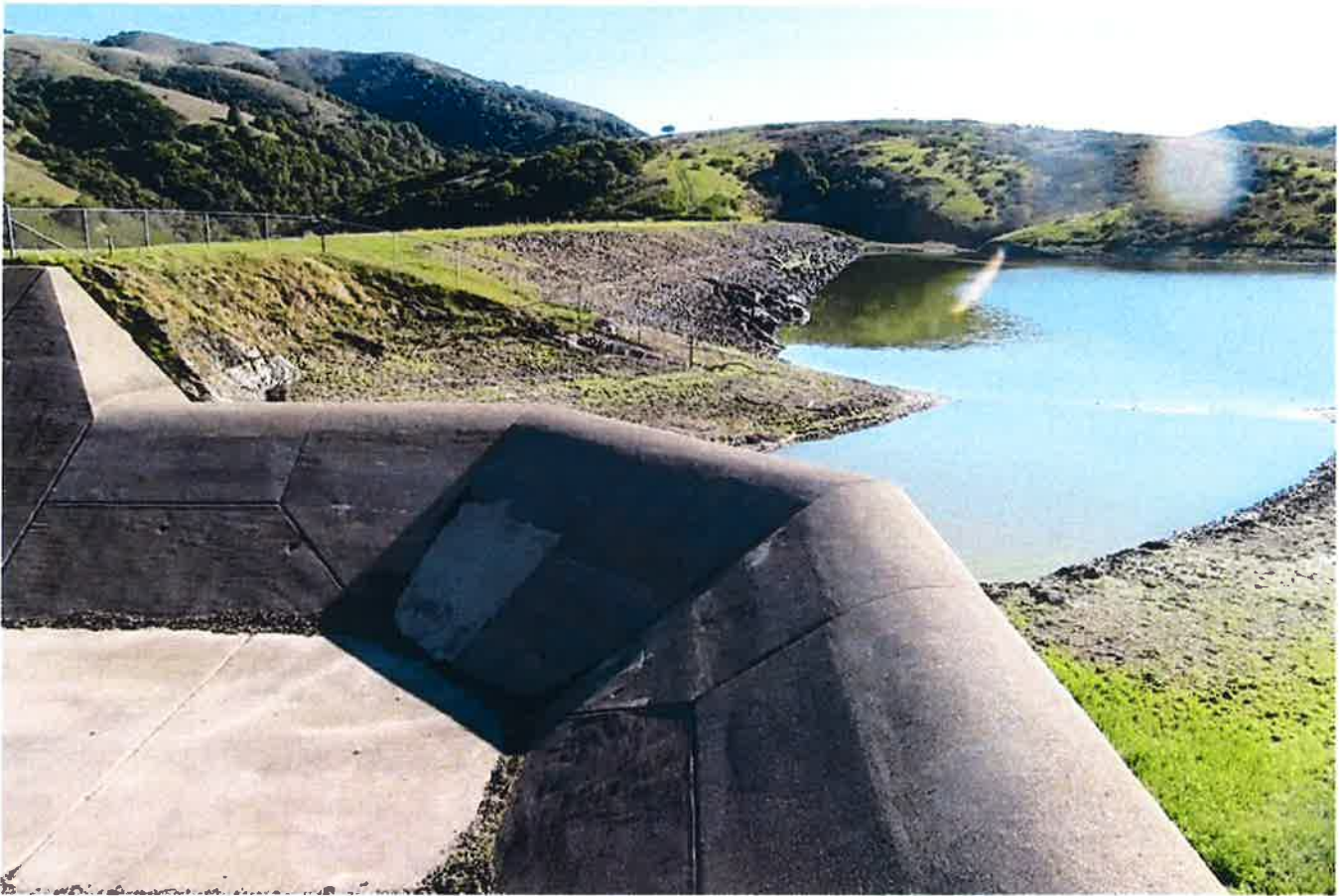
Primary access to the dam when the spillway is flowing has been improved by placing course gravel armor on the alternate access road located along the right side of the dam. Access is now satisfactory.



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The upstream face as viewed from the spillway entrance, above, and as viewed from the upstream outlet control valves, below.





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The downstream face as viewed from the right spillway abutment, above, and as viewed from the alternative access road along the right side of the dam, below. Vegetation control is excellent.





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Clear seepage measured at the monitoring weir correlates closely to rainfall; in the absence of rainfall seepage drops to essentially zero. Flow at the time of the inspection was approximately 8 gpm.