

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 Alpine Dam No. 33 County Marin
 Type of Dam GRAV Type of Spillway Eight siphons
 Water is 0.1 feet above the spillway crest and 7.9 feet below the dam crest.
 Weather Conditions Clear and mild
 Contacts Made Alex Anaya and Ronnie Chasteen during the inspection
 Reason for Inspection Periodic evaluation, including that of the dam internal galleries and outlet tower

Important Observations, Recommendations or Actions Taken

Vegetation control is generally satisfactory, but woody and tall non-woody vegetation that has been accumulating along both downstream groins should be removed before the next annual inspection.

The dam galleries were not entered during this inspection, and were last inspected in June of 2013. The owner should make arrangements to allow for inspection of the galleries during the next periodic inspection.

I asked Mr. Anaya to have vegetation cleared from within 25-feet of the right and left downstream groins.

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. Minor cracks and offsets appear unchanged from that reported in previous inspection reports.</p> <p>Vegetation control is generally satisfactory, but woody and tall non-woody vegetation that has been accumulating along both downstream groins should be removed before the next annual inspection.</p>
<u>Galleries</u>	<p>The galleries are considered a confined space requiring qualified and trained personnel for access and inspection, and were not entered during this inspection; the galleries were inspected by David Borger on July 28, 2009, and by Jim Lowe on June 26, 2013. The galleries should be inspected during the next periodic inspection.</p>
<u>Spillway</u>	<p>The spillway approach, siphon entrances, and siphon discharges were open and clear. A polyethylene log boom was in place several dozen yards upstream of the dam.</p> <p>Total freeboard is 8 feet and the residual freeboard for the design storm is 2.3 feet. Freeboard is satisfactory.</p>
<u>Outlet</u>	<p>The 125-foot tall dry outlet tower has inlets at five different elevations. The upper most inlet at elevation 626' is controlled with a 24-inch slide gate mounted outside of the tower; the remaining four inlets at elevations 595', 567.5', 540', and 530.75' are controlled with externally mounted 18-inch slide gates. Each of the five slide gate valves outside of the tower has an equivalent sized downstream control gate valve within the dry portion of the tower.</p> <p>The upper four outlet tower inlets manifold into a single 30-inch concrete-encased steel pipe within</p>

Inspected by J. Lowe *13 Apr 2016*
 Date of Inspection 12 April 2016 *15 Apr*
 Date of Report 13 April 2016 *4/18/16*

Photos taken? Yes No
 cc for Owner/Book

FEB 4/18/16

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Observations and Comments

the tower, from whence the outlet pipe passes beneath the dam for conveyance to facilities downstream; the outlet is normally pressurized. The lowest 18-inch tower inlet feeds a separate "scour pipe" which discharges at the downstream spillway apron of the dam.

Both the upper most and lowest downstream control can be operated from the upper most fully-grated floor level within the outlet tower. The lowest downstream control is equipped with a vertical actuator rod which extends from the valve to a large hand wheel at the upper most level; the upper most valve is located at the upper level. The three intermediate valves are accessible from narrow walkways adjacent to each of the three valves.

Only those upstream and downstream outlet controls accessible from outside of the outlet tower (exterior valves) were cycled during this inspection; all exterior valves were partially cycled were found to be in satisfactory working order. All upstream and downstream controls that remain operable, including those within the outlet tower, were fully cycled during either the February 26, 2015, or April 30, 2015 inspections.

Seepage Consistent with previous inspections there was minor seepage from the right abutment, and from several of the internal gallery drains. The owner has reported that seepage rates decrease significantly when the reservoir level drops more than 22.5 feet below spillway elevation.

There is no designated collection point or weir for estimating and apportioning seepage from the left galleries and left abutment. In the past, the total seepage from the left side of the dam has been visually estimated as it flows over and around the left downstream toe. With the reservoir high flows from the left side of the dam have been in the 5 gpm range, as they were during this inspection.

Seepage from the right galleries and right abutment is collected and measured at two locations designated the "Upper" and "Lower" leaks, respectively. The total cumulative seepage from the right side of the dam was on the order of 20 gpm or so cumulative flow, with the majority of that coming from gallery No. 5.

Seepage from both sides of the dam was clear and remains within historic levels.

Instr. Instrumentation consists of four (4) piezometers, and two (2) seepage measurement locations.

The latest instrumentation data was received from the owner on December 16, 2015.

Piezometer data for the reporting period from January 2006 through July 2015 was reviewed. All four piezometers were constructed in 1985 from holes drilled for geophysical testing, and are designed to measure uplift pressures at the dam foundation. The design uplift pressure assumed in the December 1982 Safety Review Report (SRR) equals 100% of the reservoir head at the upstream edge, reducing (linearly) to zero at the downstream toe.

Piezometers P1 and P4 are located along the downstream half of the dam crest, near the right and left abutments, respectively. Piezometer P2 is located several feet to the right of the right spillway wall just above the mid elevation of the dam; piezometer P3 is located near the left abutment just below the mid elevation of the dam. Piezometer P3 has recently been retrofitted with a vibrating wire piezometer.

The average elevation of piezometers P1, P3, and P4 remain relatively steady within the reporting period, neither raising nor lowering significantly over the ten year period.

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Piezometer P2 showed a gradual rise in average elevation from about 555' to about 570' between January 2001 and January 2009, after which the elevation spiked relatively quickly, reaching 605' by October 2009. The elevation stayed around 605' until April 2010, when it dropped rapidly to just under 540' in May of 2010, after the piezometer borehole was flushed with high pressure water. The average elevation has remained around the 540' elevation since the flushing.

Pore pressures measured within piezometers P2 and P3 remain below the design pressures assumed in the 1982 SSR. Pore pressures measured within Piezometers P1 and P4, however, are close to, and have at times been above, the design uplift values, though not within the data period reviewed for this report. Periodic cleaning of the piezometers is a sound practice and it will be interesting to see if future reports show a more stable trend in readings.

Seepage data for the reporting period from January 2006 through July 2015 was reviewed. Seepage data is reported for the "upper" and "lower" leaks, both of which are on the right side of the dam through the dam concrete. Seepage from the upper leak generally averages about 3 or 4 gallons per minute (gpm), with an occasional spike up to 6 or 7 gpm, and one spike up to 12 gpm in December 2010. Seepage from the lower leak averages about 15 gpm, with highs of up to 40 gpm coincident with full reservoir water elevations. All monitored seepage is clear, and average seepage rates for both leak locations haven't changed within the data period reviewed.

Settlement and alignment data for the reporting period from September 1, 2014 through November 20, 2015 was reviewed. Maximum reported settlement and alignment deviation are 0.17" and -0.65", respectively, which are probably within the range of instrumentation error.

Based on the data submitted the dam appears to be performing satisfactorily, and no additional instrumentation is believed necessary at this time.

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The upstream face as viewed from the left abutment. The reservoir water surface elevation is 0.1 feet above the spillway crest.



The downstream face as viewed from the left abutment.

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Vegetation control is generally satisfactory, but woody and tall non-woody vegetation that has been accumulating along both downstream groins (circled) should be removed before the next annual inspection. The left groin is shown in the photograph above, the right groin in the photograph below.

