# Nevada Irrigation District

## 2021 Dam Safety Activities Report

Nevada Irrigation District (NID) owns and operates 15 dams under the jurisdiction of the California Division of Safety of Dams (DSOD). All of these dams, except two, are also under the jurisdiction of the Federal Energy Regulatory Commission (FERC). These regulatory agencies enforce their respective comprehensive dam safety programs on their jurisdictional dams. The Hydroelectric Department is the District's lead in ensuring the safety of the jurisdictional dams, with support from the Engineering, Water Operations, and Water Maintenance Departments. In addition to satisfying the regulatory requirements, the Hydroelectric Department engages in additional activities that support on-going improvements to the dam safety program. The following summarizes the dam safety activities performed by the District in 2021:

1. **Inspections and Monitoring**
   In addition to the District's regular weekly and monthly inspections (as conditions permit) of the dams, DSOD and FERC performed their annual inspections in August 2021. The 5-year FERC Part 12D Independent Consultant (IC) Dam Safety Inspections took place concurrently with the annual inspections. During the times of year when access roads are not passable by a highway vehicle, the upper-division dams are inspected remotely using a helicopter or, when conditions permit, using equipment designed for over snow travel. The District prepared and submitted to FERC and DSOD the annual Dam Safety Surveillance Monitoring Reports (DSSMR), which details dam safety findings, issues, maintenance activities, inspection records, and instrumentation readings then provides an evaluation of safety performance of the dams.

2. **Evaluations and Assessments**
   a. Combie Dam Protection Against Scour Under Probable Maximum Flood (PMF) – In response to DSOD requirements, the District conducted the Alternatives Analyses and Conceptual Design for protection against scour in the abutment groins during PMF flows. The final report has been completed and submitted to DSOD and FERC for review and approval prior to further efforts on the project. The District plans to start the design phase of the project in 2024.

   b. Scotts Flat Spillway Upgrades – During development of the alternatives to upgrade the spillway to meet regulatory requirements, it was found that the spillway chute and the existing lower plunge pool cannot safely pass the PMF flow. Their modifications are necessary. A physical hydraulic modeling study to analyze the effects of the flow and to modify the spillway was performed in 2021. The modeling developed conceptual improvements of the upper plunge pool and the spillway chute and walls, and addition of a flip bucket structure upstream of the lower plunge pool. The spillway upgrade alternatives study report will be completed in 2022. The District will then propose the selected alternative, sloped or vertical chute walls, to DSOD and FERC for concurrence before the next phase design.

   c. Dam Seismic Stabilities – Driven by the recommendations from the Part 12D Independent Consultant Dam Safety Inspections, NID conducted a blanket seismic stability re-evaluation

of all of the 13 major dams. In 2017, the District completed Phase 1 - Site-Specific Seismic Hazard Analyses and Design Ground Motions. FERC provided comments including 1) adding Bowman Lake fault as a potential seismic source, and 2) performing field seismic wave velocity measurements. The District has completed the wave velocity measurements, has evaluated the Bowman Lake fault using the probabilistic seismic hazard analyses, and plans to submit the updated report to FERC by December 2022.

Based on the 2017 results of Phase 1, Phase 2 covers the seismic stability updates. The update analyses for the two large arch dams, Combie and Bowman South, were completed in 2019 and 2020, respectively. The screening-level analyses for the 10 embankment dams (3 concrete-faced rockfill dams, 4 zoned-earth-rockfill dams, and 3 earth dams) were also completed in 2020. All of the embankment dams appear to be seismically stable, with the exception of Rollins Dam which requires a more detailed analysis. The Rollins Dam requires additional evaluation to characterize the dam foundation for liquefaction potential. The District plans to conduct a tabletop study and site reconnaissance for Rollins Dam foundation in 2022 to project the extent and liquefaction potential of the alluvium under the dam.

In 2022, the District plans to analyze the seismic stability of Milton Diversion Main Dam and South Dam (both are arch dams) using the seismic hazards and design ground motions to be updated later in 2022.

d. Sawmill Dam Spillway – The District has completed a spillway crest structure stability evaluation (for sloped slab, buttress wall, and retaining wall), as recommended in the 2017 Part 12D IC Inspections report. In November 2020, non-destructive testing of in-place concrete using a Schmidt Hammer was performed. The structural stability analysis, completed in 2021, concluded that the existing spillway structure has sufficient structural capacities to resist their loading.

e. Scotts Flat Penstock Seismic Analysis Update – The District has conducted assessment of the seismic stability of the 36" Scotts Flat outlet pipe in the outlet tunnel in the right abutment. The report is expected to be completed in 2022.

f. Jackson Meadows Spillway Crest Structure Stabilities and Radial Gates Safety – To address the recommendations from the 2017 Part 12D IC Inspection, the District has completed in 2021 two separate assessments: 1) seismic stabilities of the spill crest structure, and 2) the safety of the steel radial gates under various loading conditions. Both subjects are concluded to be stable and safe.

**3. Emergency Action Plans (EAPs) and Annual Seminar**

NID prepared a full reprint of the EAP in 2020 based on Cal OES requested changes and comments. On September 16, 2021 NID held virtually the Annual Emergency Action Plan Outreach Seminar for emergency responders and plan holders. The outreach seminar focus was to review the Projects, EAP components, notification processes, inundation maps, emergency protocols, communication, and coordination. The seminar was attended by 34 individuals from 17 organizations, including NID. Due to the number of additional changes to the EAP requested

by Cal OES, the District's EAP has again been comprehensively updated and new plan sets will be distributed to FERC, Cal OES, and all plan holders upon approval by Cal OES.

**4. Dam Safety Training**

The annual dam safety training was provided as a self-guided training including a pdf presentation, videos, reading material, references and a quiz. The training course covered case histories, potential failure modes and instrumentation, dam safety inspections, and additional reference material. The annual dam safety training is mandatory for selected staff members.

**5. Other Improvements and Activities**

In 2021, the District completed the following:

a. Texas Creek Flume Spillway Footing Foundation Protection – During a regular inspection of the waterway in 2020, it was found that the bedrock under the shotcrete footing had eroded and progressed to the point it had undermined the shotcrete covering. The District prepared a foundation protection design package in 2021, which consists of an anchored and reinforced shotcrete slab around the footing and in the spill area. The construction was completed in December 2021.

b. Bowman North Concrete Plinth Slab Repair – In December 2020, during a regular dam inspection while the reservoir was lowered to approximately Elevation 5518 feet, an operator found a major spall of concrete at the left groin of the dam. The finding was reported to the San Francisco Regional Office on December 14, 2020, per 18 CFR 12.10(a). The District designed a repair, obtained FERC approval, and completed the construction in 2021. The construction report was submitted to FERC in February 2022.

c. French Dam Upgrades – The District completed the construction of French Dam Upgrades, which included 1) repair of concrete spalls at the upstream face, 2) strengthening the spillway rock-piled training wall, and 3) addition of a flow measurement weir downstream of the dam. The design was approved by FERC in June 2021, and the construction was completed in December 2021. The construction report was submitted to FERC in February 2022.

d. Bowman North and Bowman South Dams Photogrammetry - The District's Survey Department performed photogrammetric mapping and drone video inspections of the upstream faces of the dams in 2021. The information will be used for future mapping of damage of the concrete lining slabs and joints.

e. Underwater ROV Inspection of Main Dam Plunge Pool – The Hydroelectric Department used a wired remote underwater drone to inspect the dam toe area within the plunge pool. Minor gaps between the shotcrete and underlying bedrock were observed during the inspection, and no significant defect was found, so no action is recommended at this time. The next inspection will be performed in 2026, and a diver's underwater inspection is recommended.

f. Full Cycling of Drain Valves and Radial Gates. Staff completed all of the exercises of drain valves and spillway radial gates to satisfy the requirements of DSOD and FERC.

## 6. Summary of Significant Modifications and Studies (>$100,000) Completed in 2021

| Dam | Component | Summary of Work |
|---|---|---|
| French Dam | Upgrades | The upgrades consisted of 3 items: 1) repair of concrete spalls at the upstream face, 2) strengthening the spillway rock-piled training wall, and 3) addition of a flow measurement weir downstream of the dam. The construction was completed in 2021. |
| Texas Creek Flume Spillway | Footing Foundation Protection | The foundation protection consists of an anchored and reinforced shotcrete slab around the footing and in the spill area. The construction was completed in December 2021. |
| 5-year FERC Part 12D IC Dam Safety Inspections | Regulatory Compliance | The District completed the 5-year Independent Consultants' inspections and potential failure mode analysis for 12 of the 13 FERC jurisdiction dams. The final reports have been completed and submitted to FERC in 2022. |
| Scotts Flat | Spillway Upgrades Alternatives and Physical Hydraulic Modeling Study | The spillway chute and the lower plunge pool cannot safely pass the PMF flows, and a physical modeling study has been conducted to generate optimal modifications of the spillway. The modeling study along with upgrade alternative development will be completed in 2022. |
| Combie Dam | Alternative Development for Protection against Scour under PMF flows | Preliminary findings suggest preventing spilling at the abutments by adding parapet walls at the abutment sections to keep the PMF flow within the existing spillway. Armoring of the spill channel is necessary to protect the dam against scouring from the flows. Three alternatives have been identified and the option of adding post-tension anchors appears to be most favorable. The design of the upgrades is scheduled to being in 2024. |