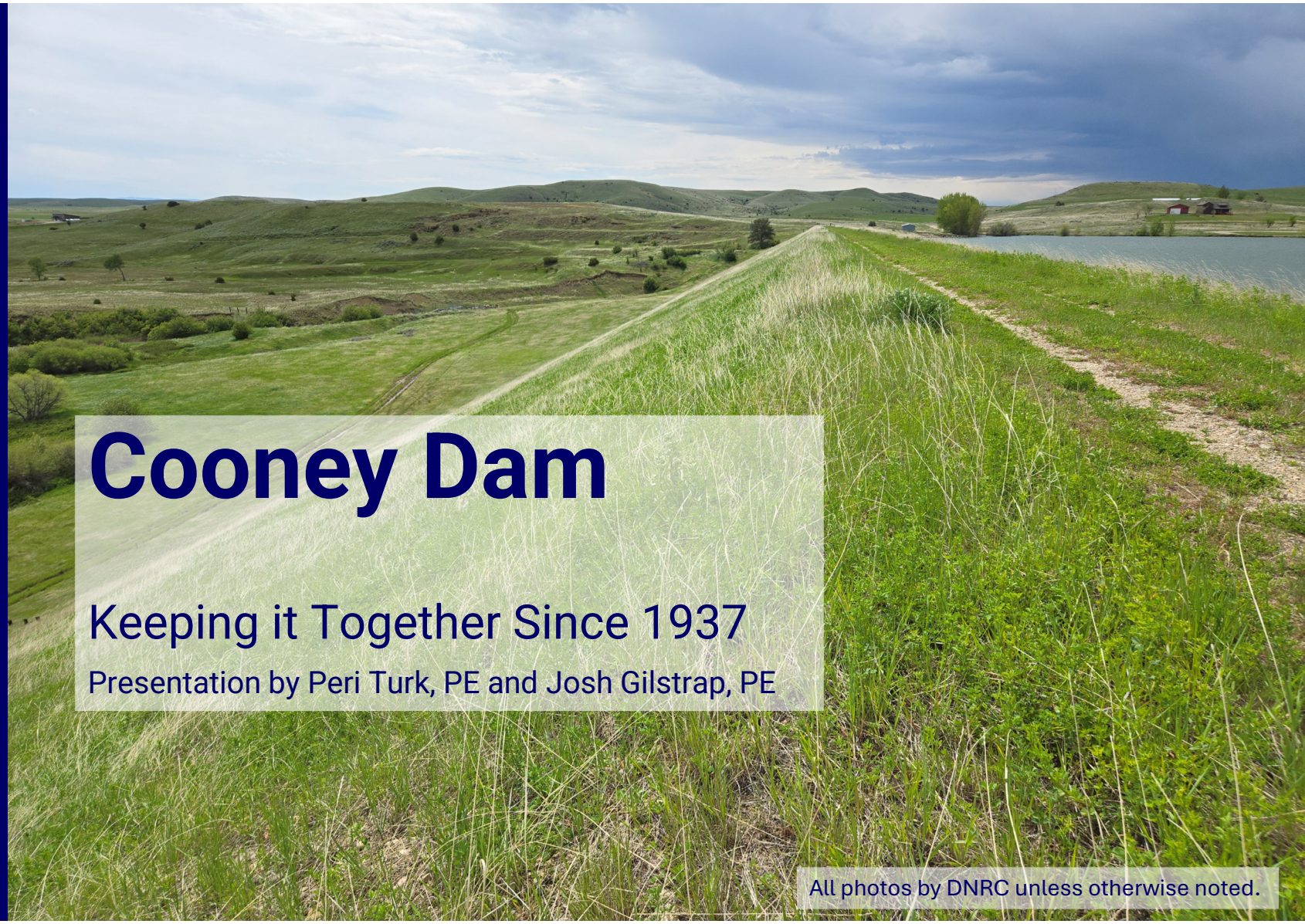


Cooney Dam

Keeping it Together Since 1937

Presentation by Peri Turk, PE and Josh Gilstrap, PE

All photos by DNRC unless otherwise noted.

Brief Outline

- What is a 5-Year Evaluation?
- 5-Year Evaluation for Cooney
  - Regulatory Framework
  - Document Review
  - Site Visits
  - Report
- Conclusions
  - Engineer's Recommendations
  - Lessons Learned

What is a 5-Year Evaluation

- Required to Renew an Operating Permit through Montana (MT) Dam Safety Program.
  - In-depth visual inspection and evaluation of a high-hazard dam.
  - Does the dam still meet MT dam safety standards?
  - Required every 5 years by a licensed engineer.





What is a 5-Year Evaluation?

- Includes:
  - Prep: review of previous reports and available data on design, construction, operation, and maintenance.
  - Visual Inspection: note condition of dam, appurtenances, downstream area, and other areas affected by structure.
  - Safety Evaluation:
    - Hydrologic and hydraulic capabilities;
    - Structural stability;
    - Condition of dam from visual inspection as well as additional historical information;
    - Analysis of instrumentation data;
    - Evaluation of operation and maintenance;
    - Evaluation of emergency action plan and procedures;
    - And much more!!!!

5-Year Evaluation for Cooney

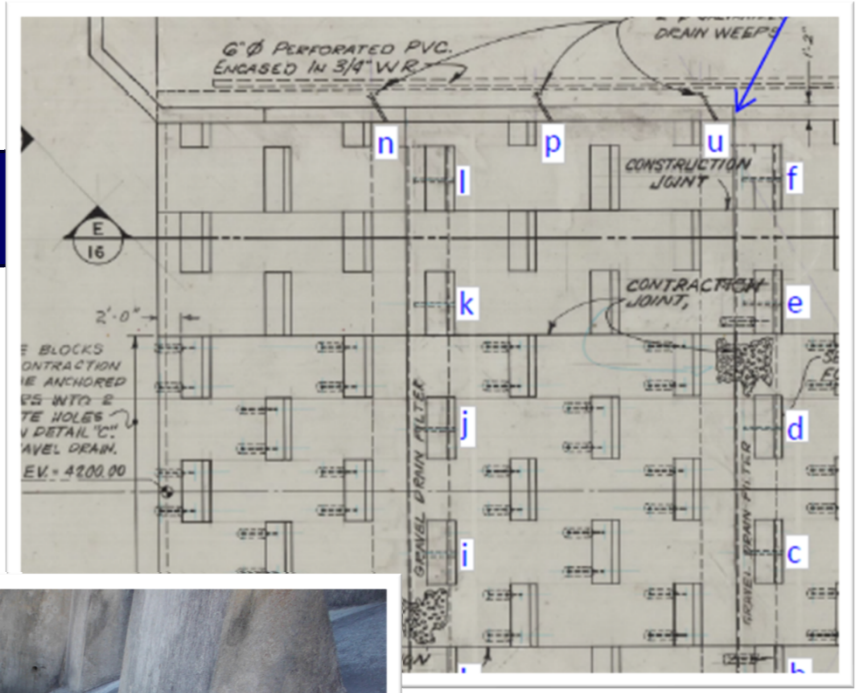
Regulatory Framework

Dam Safety Act

- ARM 36.14 and MCA 85-15-213
  - A high-hazard dam must be inspected at least once every 5 years to ensure the continued safe operation of the high-hazard dam
  - MT DNRC dam safety program (DSP) administers the Dam Safety Act
- All state water projects bureau (SWP) high-hazard dams are subject to the Dam Safety Act
  - Inspection and evaluation info submitted to DNRC DSP for operation permit renewal

Document Review

- Review of annual owners' inspection, operation and maintenance manual, and previous 5-year inspections.
  - Designs or historic memos.
- Document review is necessary to:
  - Contextualize current conditions; and
  - Minimize duplication of effort.





Dam Overview



Site Visits

- March 19, 2025. First site visit: visual inspection of dam crest, embankments, abutments, and spillway.
  - Included in-depth inventory of joint offsets of lower spillway drop structure.
- Oct. 28, 2025. Second site visit: visual inspection of dam crest, embankments, abutments, spillway, gate tower, and conduit.



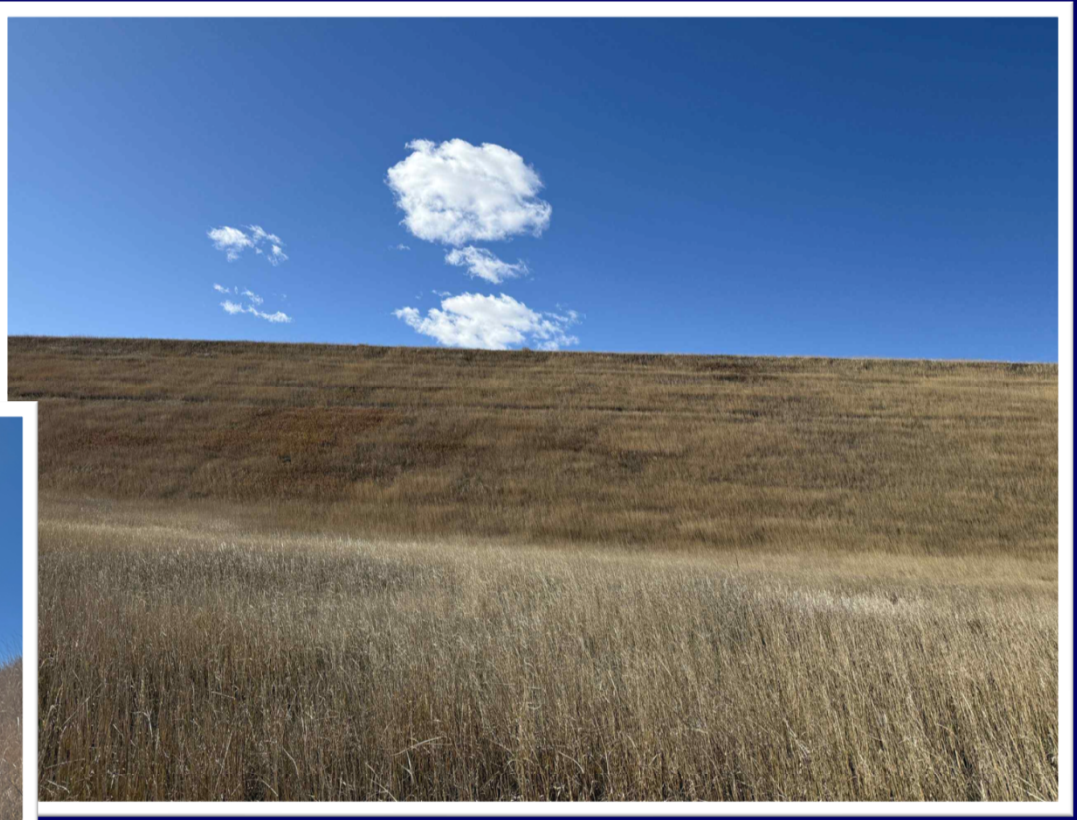


Upstream Embankment





Downstream Embankment





Gate Tower





Gate Operators





Conduit/Operating and Guard Gate







Spillway Approach and Fuse Plug





Spillway Upper and Lower Drop Structures





Final Report

1. Background Information
2. Hydrologic Adequacy
3. Spillway Condition and Adequacy
4. Low-level Outlet Condition and Adequacy
5. Embankment
6. Seepage
7. Instrumentation
8. Operation, Maintenance, and Inspection Procedures
9. Recommendations

Appendix A- 2019 Operating Permit Approval

Appendix B- Annual Inspection Report

Appendix C- Statement of Owners Intent

Conclusions

Engineer's Recommendations

There were eight general recommendations.

1. Update breach analysis using the Top of Dam breach methodology. Update inundation mapping with new breach analysis information.

2. Complete a loss of life (LOL) analysis to determine if Cooney Dam needs to pass the Probable Maximum Flood (PMF).

3. Complete hydraulic modeling to understand what flows could have enough erosive force to impact the downstream toe of the dam and access road with the current configuration of the dam.

4. Investigate the structural adequacy of the lower baffle drop structure.

5. Update seismic and static stability analyses to incorporate updated seismic information using current methodologies.

6. The vitrified clay tile (VCT) drain in the right abutment requires further investigation to understand extent of the condition of the drain.

7. Further review of piezometer 306P is necessary to understand cause behind the anomalous readings.

8. Complete the high priority items outlined in the 2025 Annual Owner Inspection within the noted amount of time.

General Recommendation #2

Complete a loss of life (LOL) analysis to determine if Cooney Dam needs to pass the Probable Maximum Flood (PMF).

- In MT, the LOL is used to determine the amount of water the spillway needs to be able to convey.
- There is no LOL for Cooney since it conveys the calculated PMF of record, the most rigorous design storm.
- There are two hydraulic analyses that result in differing values for the peak spillway outflow.
- SWP needs to know what the Cooney spillway needs to convey using MT guidance.

Table from Cooney 5-Year Engineer's Evaluation Report

Table 4 – Design Flood

Flood Event	Peak Reservoir Inflow (cfs)	Peak Spillway Outflow (cfs)	Maximum Reservoir Stage (ft)	Freeboard[a] (ft)
100-year (HKM 1981)	6,010	4,365	4,253.6	12.9
500-year (HKM 1981)	9,390	5,225	4,254.6	11.9
PMF – 24-hr (HKM 1981)	55,339	52,000	4,263.0	3.5
PMF – 6-hr local storm (DNRC 1991)[b]	28,548	24,735	4,257.12	9.38
PMF – 24-hr general storm (DNRC 1991)[b]	85,099	78,951	4,266.08	0.42
PMF – 72-hr general storm (DNRC 1991)[b]	84,750	78,620	4,266.03	0.47

Notes:

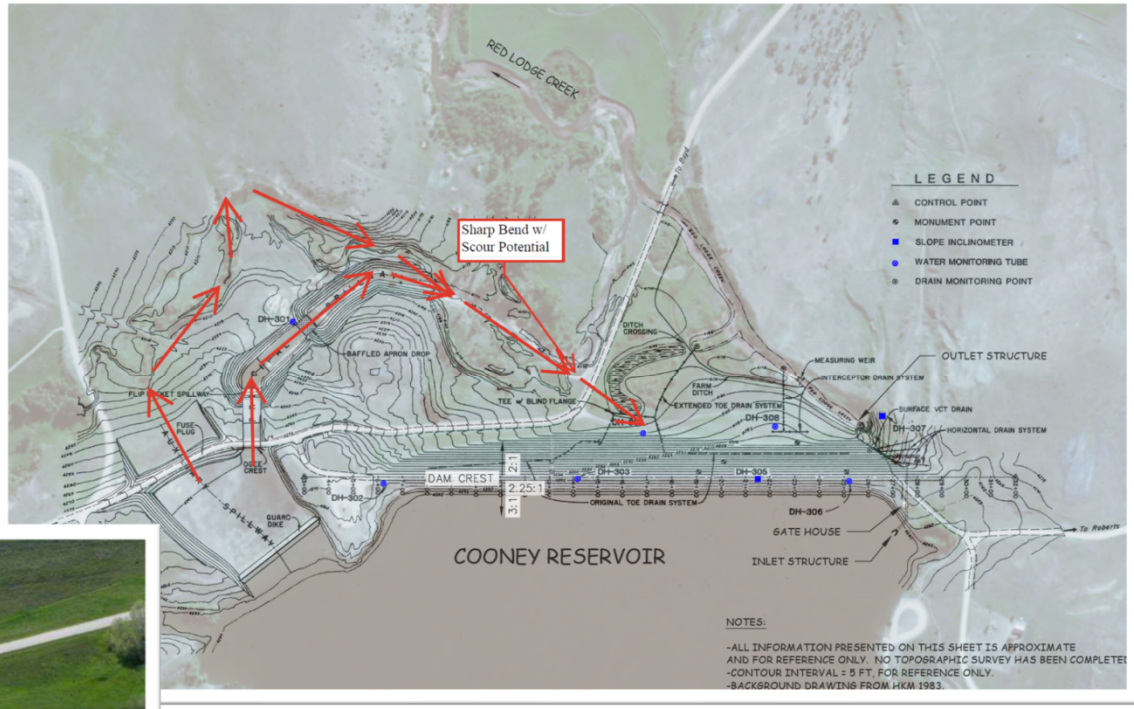
a Freeboard using minimum dam crest elevation of 4,266.5 ft (HKM 1982 As-built Sheet 4).

b DNRC, 1991. Revised PMP and PMF Estimates for Cooney Dam.

Primary spillway capacity- 5,300 cfs
Fuse plug capacity- 52,000 cfs
Total capacity- 57,300 cfs

General Recommendation #3

Complete hydraulic modeling to understand what flows could have enough erosive force to impact the downstream toe of the dam and access road with the current configuration of the dam.



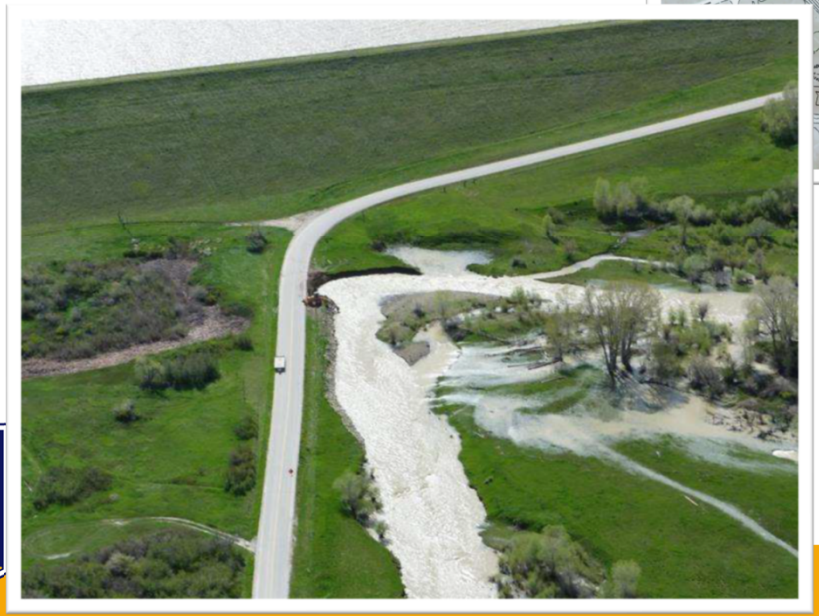


Figure (above): General site plan map with flow path overlay.

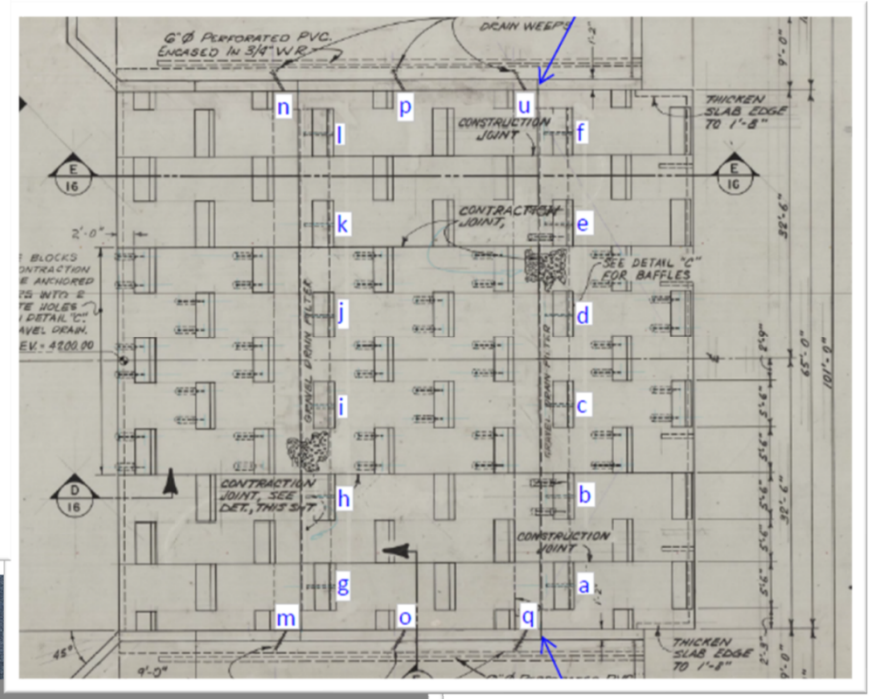
Figure (to left): May 2011 flooding at the bend in the spillway channel. Peak spillway discharge estimated at 3,738 cfs.

General Recommendation #4

Investigate the structural adequacy of the lower baffle drop structure.

- Only baffles in center section of chute floor were anchored during construction.
- Current condition of spillway drains is unknown and based on document review, performance of the spillway structure hinges on performance of the drains.







General Recommendation #6

The VCT drain in the right abutment requires further investigation to understand extent of the condition of the drain.

- Drain located in right abutment intended for seepage control.
- Seepage discovered in May 2023.
- Culprit- VCT drain filled with roots and organic matter.
- Cleaned out 100 ft up the drain and joint displacements were noted.



Photo 1 Seep first observed above right abutment drain on May 12, 2023.



Photo 9 Root, debris, and sludge buildup observed at PVC elbow, July 25, 2023.



Photo 13 Sewer jetting in process.



Photo 16 View up first two sections of clay pipe after jetting. Note offset of joints and visible gravel in pipe invert and at second joint.

Lessons Learned

- Plan your site visit before you get on site especially for large dams like Cooney.
  - Assign team roles and tasks.
- Schedule your site visit with the 90-day due date in mind.
  - Cooney 5-Year Evaluation Report was my Christmas present.
- Associated with document review - think about what documentation you need from the site visit.
- On that note, do a moderately thorough document review before your site visit.
- As my first 5-Year Evaluation, I learned quickly about calibration of making definitive statements.
  - My statements needed to be evidence/analysis based.
  - It's ok to not have expertise in a particular area and to say you don't know.

Document Review (Ideally)

- Before first site visit:
  - Annual owner inspections from the last few years;
  - Previous 5-Year inspection;
  - Operation and Maintenance Manual (O&M); and
  - Historical documents to contextualize known conditions.
- Before second site visit:
  - Emergency Action Plan (EAP); and
  - All other documents that can be found;





Photo 2B. Connection of lower end of operating lever to disc (butterfly) valve. Valve is almost closed position. Note reinforcining side plates on valve lever gussets and bronze spacer washer between left side of operating lever and left valve lever gussets. The set screws locking the pin in position can also be seen.

Questions?

