ENGINEER'S INSPECTION REPORT

INSPECTOR: BCM

OFFICE OF THE STATE ENGINEER - DIVISION OF WATER RESOURCES - DAM SAFETY BRANCH 1313 SHERMAN STREET, ROOM 818, DENVER, CO 80203, (303) 866-3581

DAM NAME:	BRISTLECONE	T: 110S	R: 0670W	S: 27	COUNTY: EL PASO			DATE OF INSPECTION:	4/8/2025
DAM ID:	100403	YRCompl: 1986	DAM HEIGHT(FT):	72.0	SPILLWAY WIDTH(FT):	100.0		PREVIOUS INSPECTION:	5/9/2023
CLASS:	Significant hazard		DAM LENGTH(FT):	1500.0	SPILLWAY CAPACITY(CFS):	113000.0		NORMAL STORAGE (AF):	1200.0
DIV:	2	WD: 10	CRESTWIDTH(FT):	30.0	FREEBOARD (FT):	20.0		SURFACE AREA(AC):	65.0
EAP:	12/28/2023		CRESTELEV(FT):	6905.0	DRAINAGE AREA (AC.):	13069.0		OUTLET INSPECTED:	2/20/2015

CURRENT RESTRICTION: -- NONE --

OWNER:	FOREST LAKES METRO DISTRICT (ANN NICHOLS)	OWNER REP.:	ANN NICHOLS
ADDRESS:	2 NORTH CASCADE AVENUE	CONTACT NAME:	Douglas E. Schwenke
	COLORADO SPRINGS CO 80903-	CONTACT PHONE:	(719) 227-0072

INSPECTION PARTY :	Brian McCormick, DSB	Larry Stiltner	Doug Schwenke
REPRESENTING :		FLMD	RESPEC

FIELD CONDITIONS OBSERVED

WATER LEVEL: BELOW DAM CREST _____ FT. Above Spillway 0 FT. GAGE ROD READING 41.0

GROUND MOISTURE CONDITION: [x] DRY [ ] WET [ ] SNOWCOVER OTHER 60°F, Partly Cloudy

DIRECTIONS: MARK AN X FOR CONDITIONS FOUND AND UNDERLINE WORDS THAT APPLY

UPSTREAM SLOPE

PROBLEMS NOTED: [x] (0)NONE [ ] (1)RIPRAP - MISSING, SPARSE, DISPLACED, WEATHERED [ ] (2) WAVE EROSION - WITH SCARPS

[ ] (3) CRACKS WITH DISPLACEMENT [ ] (4) SINKHOLE [ ] (5) APPEARS TOO STEEP [ ] (6) DEPRESSIONS OR BULGES [ ] (7) SLIDES

[ ] (8) CONCRETE FACING - HOLES, CRACKS, DISPLACED, UNDERMINED [ ] (9) OTHER

The upstream face is inclined at 3:1 and surfaced with a layer of well graded, durable granite riprap. The upstream face appears even with no signs of settlement or instability. Riprap is mounded on the upstream face to protect the gate operator stem. Some light brush is present on the face but does not yet affect observation.

The area at the left end, between the embankment and the spillway approach channel, is not protected with riprap and erosion of the sandstone bedrock has occurred. This area appears similar to the previous inspection in 2023 and is not currently a dam safety concern. This area should continue to be observed following periods of high water level and/or high wind events.

CONDITIONS OBSERVED: [ ] Good [X] Acceptable [ ] Poor

CREST

PROBLEMS NOTED: [x] (10) NONE [ ] (11) RUTS OR PUDDLES [ ] (12) EROSION [ ] (13) CRACKS - WITH DISPLACEMENT [ ] (14) SINKHOLES

[ ] (15) NOT WIDE ENOUGH [ ] (16) LOW AREA [ ] (17) MISALIGNMENT [ ] (18) IMPROPER SURFACE DRAINAGE [ ] (19) OTHER

The dam crest appears level with a cross slope upstream and is surfaced in granular material. Camber from original construction is visible. No signs of settlement, instability, or cracking were observed. No dam safety concerns were noted for the dam crest.

CONDITIONS OBSERVED: [ ] Good [X] Acceptable [ ] Poor

DOWNSTREAM SLOPE

PROBLEMS NOTED: [x] (20) NONE [ ] (21) LIVESTOCK DAMAGE [ ] (22) EROSION OR GULLIES [ ] (23) CRACKS - WITH DISPLACEMENT [ ] (24) SINKHOLE

[ ] (25) APPEARS TOO STEEP [ ] (26) DEPRESSIONS OR BULGES [ ] (27) SLIDE [ ] (28) SOFT AREAS [ ] (29) OTHER

The downstream slope is inclined at ~2.5:1 and surfaced in a good coverage of grasses. Minor rodent burrowing and game trails were observed on the downstream face however these have not led to erosion or a level of concern. The concrete drain pans in the groins are in acceptable condition with no erosion or undermining observed.

The replacement of a section of concrete drain pan in the left groin with riprap (c. 2011) was an effective repair and remains in good condition. No dam safety concerns were observed for the downstream face.

CONDITIONS OBSERVED: [ ] Good [X] Acceptable [ ] Poor

SEEPAGE

PROBLEMS NOTED: ☑ (30) NONE ☐ (31) SATURATED EMBANKMENT AREA ☐ (32) SEEPAGE EXITS ON EMBANKMENT
☐ (33) SEEPAGE EXITS AT POINT SOURCE ☐ (34) SEEPAGE AREA AT TOE ☐ (35) FLOW ADJACENT TO OUTLET ☐ (36) SEEPAGE INCREASED / MUDDY
DRAIN OUTFALLS SEEN ☐ No ☑ Yes Show location of drains on sketch and indicate amount and quality of discharge. ☐ (37) FLOW INCREASED / MUDDY ☑ (38) DRAIN DRY / OBSTRUCTED
☐ (39) OTHER

Seepage was observed at the following locations, generally consistent with previous inspections at similar reservoir level. Drain laterals are numbered from left to right in this report.

Drain lateral 1, daylighting into the concrete ditch, mid left groin, was dry at this inspection.

Drain lateral 2, measured at the concrete box and v-notch was flowing at ~ 7/8" depth. Based on the original construction plans, this lateral appears to drain the low point of the drainage blanket and as such would be expected to carry the most flow.

Drain lateral 3 (daylighting left of the outlet), was wet but not flowing at a measurable rate.

Drain lateral 4 (daylighting right of the outlet), was flowing at a low rate, <0.1gpm.

No areas of seepage were observed on the downstream slope, toe, or groins. No adverse seepage was observed at this inspection.

Actions:
Consider cleaning of drain laterals by low pressure flushing.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

OUTLET

PROBLEMS NOTED: ☑ (40) NONE ☐ (41) NO OUTLET FOUND ☐ (42) POOR OPERATING ACCESS ☐ (43) INOPERABLE
☐ (44) UPSTREAM OR DOWNSTREAM STRUCTURE DETERIORATED (45) OUTLET OPERATED DURING INSPECTION ☐ YES ☑ NO
INTERIOR INSPECTED ☑ (120) NO ☐ (121)YES ☐ (46) CONDUIT DETERIORATED OR COLLAPSED ☐ (47) JOINTS DISPLACED ☐ (48) VALVE LEAKAGE
☐ (49) OTHER

Description:
The outlet is a 30" steel lined concrete pipe laid in a concrete cradle. There is no filter diaphragm and the outlet was constructed with concrete collars through the dam core. Control is from an upstream slide gate with a manual operator located on the dam crest. The gate has historically had operability issues associated with a bent stem (likely caused by overclosure) and was repaired in 2003 with 10" travel reported following the repair. No air vent is present for this upstream gate.

Observations:
The outlet was not exercised at this inspection. Minor leakage was observed at the downstream end of the outlet conduit (photo 39).

Outlet exercise was performed in 2024 and opened the gate 8-10" producing a flow of ~55cfs, adequate to meet drawdown requirements. Total available travel of the gate is unknown.

The outlet conduit was last internally inspected in 2015 and is due for reinspection by the end of 2025. This inspection should include a full cycling of the upstream outlet gate. Based on construction drawings, the intake structure appears to contain a secondary stoplog gate structure. Inspection should verify upstream intake structure configuration and source of leakage.

Actions:
1) Cycle gate through full range of travel, minimum annually.

2) Internally inspect outlet by CCTV by end of 2025.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

SPILLWAY

PROBLEMS NOTED: ☑ (50) NONE ☐ (51) NO EMERGENCY SPILLWAY FOUND ☐ (52) EROSION WITH BACKCUTTING ☐ (53) CRACK - WITH DISPLACEMENT
☐ (54) APPEARS TO BE STRUCTURALLY INADEQUATE ☐ (55) APPEARS TOO SMALL ☐ (56) INADEQUATE FREEBOARD ☐ (57) FLOW OBSTRUCTED
☐ (58) CONCRETE DETERIORATED / UNDERMINED ☐ (59) OTHER

The spillway is located on the left abutment with 100' wide service section and an additional 366' of weir width emergency section for a total width of 466'. Spillway capacity is on the order of 113k cfs for the ~20mi^2 basin and is considered hydrologically adequate.

Minor voids were observed in the grouted riprap apron on the downstream side of the spillway sill consistent with recent inspections.

Sandy material excavated from the approach to the transfer structure was stockpiled in the spillway approach channel (photo 2). While this material does not have a significant effect on capacity, it should be removed or graded to beneath the level of the sill as a best practice.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

MONITORING

EXISTING INSTRUMENTATION FOUND ☐ (110) NONE ☑ (111) GAGE ROD ☑ (112) PIEZOMETERS ☑ (113) SEEPAGE WEIRS / FLUMES
☑ (114) SURVEY MONUMENTS ☐ (115) OTHER

MONITORING OF INSTRUMENTATION ☐ (116) NO ☑ (117) YES PERIODIC INSPECTIONS BY: ☑ (118) OWNER ☐ (119) ENGINEER

The dam is comprehensively instrumented with a gage rod, piezometers, a v-notch weir on drain lateral 2, and survey monuments. The Owner uses a portable v-notch weir for measurements of the other drain laterals.

The Owner's monitoring report was provided prior to this inspection. This report indicates that the dam is behaving consistenly with historical performance and no dam safety concerns were evidenced by review of the monitoring data. Piezometer levels and drain flows are both trending slightly downward. Continued observation is important. Drain cleaning by low pressure flushing should be considered.

Survey of crest deformation monuments performed in May 2024 shows negligible settlement.

The dam is regularly observed by the Owner.

Actions:
1) Continue monitoring at current frequency including preparation of annual monitoring report by Owner's Engineer.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

MAINTENANCE AND REPAIRS

PROBLEMS NOTED: ☐ (60 NONE ☐ (61) ACCESS ROAD NEEDS MAINTENANCE ☐ (62) LIVESTOCK DAMAGE
☑ (63) BRUSH ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE ☐ (64) TREES ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE
☑ (65) RODENT ACTIVITY ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE ☐ (66) DETERIORATED CONCRETE - FACING, OUTLET, SPILLWAY
☐ (67) GATE AND OPERATING MECHANISM NEED MAINTENANCE ☐ (68) OTHER

The dam is well maintained and no maintenance related dam safety concerns were observed during this inspection. Light brush was observed on the upstream face and is recommended for removal. Some minor rodent activity was observed on the downstream face.

Actions:
1) Continue to manage brush on the upstream face.

2) Compact rodent burrows on downstream face and consider formal rodent control program if hazing by collapsing burrows is ineffective.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

Go to next page for Overall Conditions and Items Requiring Actions

OVERALL CONDITIONS

Overall, Bristlecone Dam remains in satisfactory condition for full storage.

The EAP was revised in December 2023 and the EAP and inundation mapping are considered up to date. Development downstream, particularly between the dam and north boundary of USAFA could affect hazard classification. Continued awareness of development in this area is warranted.

Based on this Safety Inspection and recent file review, the overall condition is determined to be:

☑ (71) SATISFACTORY ☐ (72) CONDITIONALLY SATISFACTORY ☐ (73) UNSATISFACTORY

ITEMS REQUIRING ACTION BY OWNER TO IMPROVE THE SAFETY OF THE DAM

MAINTENANCE - ORDINARY REPAIR - MONITORING

☐ LUBRICATE AND OPERATE OUTLET GATES THROUGH FULL CYCLE

4/8/2025 - **Minimum annually**

☐ MONITOR

4/8/2025 - **REFERENCE MONITORING SECTION OF REPORT**

☐ OTHER

4/8/2025 - **REFERENCE MAINTENANCE SECTION OF REPORT**

ENGINEERING - EMPLOY AN ENGINEER EXPERIENCED IN DESIGN AND CONSTRUCTION OF DAMS TO

☐ PERFORM AN INTERNAL INSPECTION OF THE OUTLET

4/8/2025 - **Due in 2025.**

The State Engineer, by providing this dam safety inspection report, does not assume responsibility for any unsafe condition of the subject dam. The sole responsibility for the safety of this dam rests with the reservoir owner or operator, who should take every step necessary to prevent damages caused by leakage or overflow of waters from the reservoir or floods resulting from a failure of the dam.

SAFE STORAGE LEVEL: RECOMMENDED AS A RESULT OF THIS INSPECTION

☑ (101) FULL STORAGE
☐ (102) CONDITIONAL FULL STORAGE
☐ (103) RECOMMENDED RESTRICTION
☐ (104) CONTINUE EXISTING RESTRICTION

→ { _____ FT. BELOW DAM CREST
_____ FT. BELOW SPILLWAY CREST
_____ FT. GAGE HEIGHT
☐ NO STORAGE-MAINTAIN OUTLET FULLY OPEN

REASON FOR RESTRICTION

ACTIONS REQUIRED FOR CONDITIONAL FULL STORAGE OR CONTINUED STORAGE AT THE RESTRICTED LEVEL:

Engineer's Signature: Brian G McCormick — INSPECTED BY
Owner's Signature: _____ OWNER/OWNER'S REPRESENTATIVE
DATE: ____/____/____

GUIDELINES FOR DETERMINING CONDITIONS

CONDITIONS OBSERVED - APPLIES TO UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, OUTLET, SPILLWAY

GOOD
In general, this part of the structure has a near new appearance, and conditions observed in this area do not appear to threaten the safety of the dam.

ACCEPTABLE
Although general cross-section is maintained, surfaces may be irregular, eroded, rutted, spalled, or otherwise not in new condition. Conditions in this area do not currently appear to threaten the safety of the dam.

POOR
Conditions observed in this area appear to threaten the safety of the dam.

CONDITIONS OBSERVED - APPLIES TO SEEPAGE

GOOD
No evidence of uncontrolled seepage. No unexplained increase in flows from designed drains. All seepage is clear. Seepage conditions do not appear to threaten the safety of the dam.

ACCEPTABLE
Some seepage exists at areas other than the drain outfalls, or other designed drains. No unexplained increase in seepage. All seepage is clear. Seepage conditions observed do not currently appear to threaten the safety of the dam.

POOR
Seepage conditions observed appear to threaten the safety of the dam. Examples:
1) Designed drain or seepage flows have increased without increase in reservoir level.
2) Drain or seepage flows contain sediment, i.e., muddy water or particles in jar samples.
3) Widespread seepage, concentrated seepage, or ponding appears to threaten the safety of the dam.

CONDITIONS OBSERVED - APPLIES TO MONITORING

GOOD
Monitoring includes movement surveys and leakage measurements for all dams, and piezometer readings for High hazard dams. Instrumentation is in reliable, working condition. A plan for monitoring the instrumentation and analyzing results by the owner's engineer is in effect. Periodic inspections by owner's engineer.

ACCEPTABLE
Monitoring includes movement surveys and leakage measurements for High and Significant hazard dams; leakage measurements for Low hazard dams. Instrumentation is in serviceable condition. A plan for monitoring instrumentation is in effect by owner. Periodic inspections by owner or representative. OR, NO MONITORING REQUIRED.

POOR
All instrumentation and monitoring described under "ACCEPTABLE" here for each class of dam, are not provided, or required periodic readings are not being made, or unexplained changes in readings are not reacted to by the owner.

CONDITIONS OBSERVED - APPLIES TO MAINTENANCE AND REPAIR

GOOD
Dam appears to receive effective on-going maintenance and repair, and only a few minor items may need to be addressed.

ACCEPTABLE
Dam appears to receive maintenance, but some maintenance items need to be addressed. No major repairs are requirecl

POOR
Dam does not appear to receive adequate maintenance. One or more items needing maintenance or repair has begun to threaten the safety of the dam.

OVERALL CONDITIONS

SATISFACTORY
The safety inspection indicates no conditions that appear to threaten the safety of the dam, and the dam is expected to perform satisfactorily under all design loading conditions. Most of the required monitoring is being performed.

CONDITIONALLY SATISFACTORY
The safety inspection indicates symptoms of structural distress (seepage, evidence of minor displacements, etc.), which, if conditions worsen, could lead to the failure of the dam. Essential monitoring, inspection, and maintenance must be performed as a requirement for continued full storage in the reservoir.

UNSATISFACTORY
The safety inspection indicates definite signs of structural distress (excessive seepage, cracks, slides, sinkholes, severe deterioration, etc.), which could lead to the failure of the dam if the reservoir is used to full capacity. The dam is judged unsafe for full storage of water.

SAFE STORAGE LEVEL

FULL STORAGE
Dam may be used to full capacity with no conditions attached.

CONDITIONAL FULL STORAGE
Dam may be used to full storage if certain monitoring, maintenance, or operational conditions are met.

RESTRICTION
Dam may not be used to full capacity, but must be operated at some reduced level in the interest of public safety.

HAZARD CLASSIFICATION OF DAMS

High hazard
Loss of human life is expected in the event of failure of the dam, while the reservoir is at the high water line.

Significant hazard
Significant damage to improved property is expected in the event of failure of the dam while the reservoir is at the high water line, but no loss of human life is expected.

Low hazard
Loss of human life is not expected, and damage to improved property is expected to be small, in the event of failure of the dam while the reservoir is at high water fine.

NPH hazard - No loss of life or damage to improved property, or loss of downstream resource is expected in the event of failure of the dam while the reservoir is at the high water line.

COLORADO
Division of Water Resources
Department of Natural Resources

Dam Safety

DAM PHOTOGRAPHS

PROJECT INFORMATION			
Dam Name:	Bristlecone	Inspector:	Brian McCormick
DAMID:	100403	Date:	04.08.2025
Dam Owner:	Forest Lakes Metro District	Contact:	Ann Nichols

CONDITIONS	
Reservoir:	At spillway crest (GH 41.0)
Weather:	Partly cloudy, 60°F

NOTES

1. Photos from biennial safety inspection. Append to 08APR2025 EIR

PHOTOGRAPHS



1. Spillway from left side

PHOTOGRAPHS



2. Spillway crest from left side



3. Spillway channel, looking downstream from left side

PHOTOGRAPHS



4. Dam crest from right end



5. Downstream face of dam from right abutment

PHOTOGRAPHS

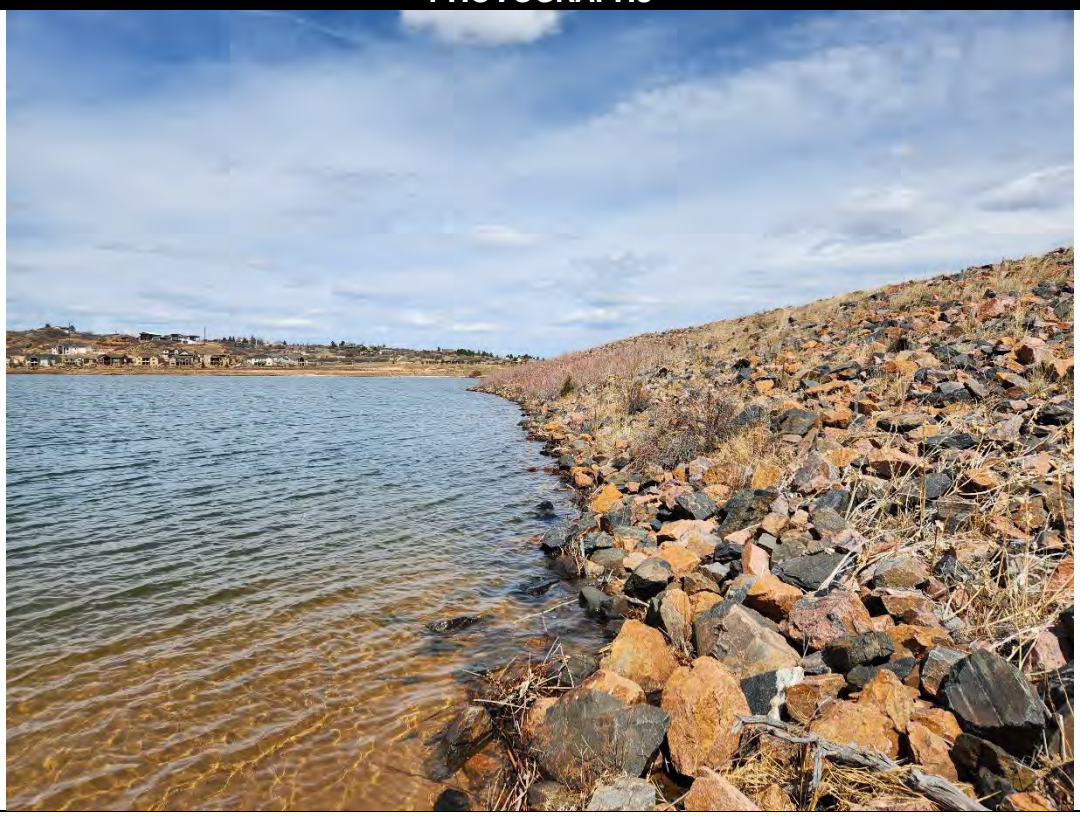


6. Staff gage in upstream right groin



7. Water level at staff gage, redtop stake marks 41.0

PHOTOGRAPHS



8. Upstream face at waterline from right end of dam



9. Upstream crest edge from near right end of dam

PHOTOGRAPHS



10. Typical crest instrumentation (piezometer pair and survey point) right of outlet



11. Looking downstream from crest, generally in line with outlet conduit

PHOTOGRAPHS



12. Outlet operator. No air vent provided for upstream sluice gate



13. Looking left from outlet operator, upstream crest edge

PHOTOGRAPHS



14. Upstream crest edge, looking right from outlet operator



15. Downstream crest edge, looking left from outlet

PHOTOGRAPHS



16. Minor rodent burrowing observed on crest



17. Burrow collapsed by boot heel

PHOTOGRAPHS



18. Downstream crest edge, looking right from near left end of dam



19. Upstream face at waterline, looking right from left end of dam

PHOTOGRAPHS



20. Shoreline erosion in sandstone bedrock, natural ground between embankment and spillway



21. Right side spillway approach channel

PHOTOGRAPHS



22. Spillway crest from right end



23. Center portion of spillway crest and reservoir level

PHOTOGRAPHS



24. Spillway channel, looking downstream from crest



25. Left side of downstream face, from left abutment

PHOTOGRAPHS



26. Upper left groin and downstream face



27. Paved ditch in left groin

PHOTOGRAPHS



28. Drain 1 outlet, dry



29. Downstream face, looking right from left groin, mid slope

PHOTOGRAPHS



30. Elk tracks on downstream face, game trail visible mid slope



31. Paved ditch area repaired with riprap, mid left groin

PHOTOGRAPHS



32. Drain 2 outlet and measuring weir



33. Weir depth 7/8” on drain outlet 2

PHOTOGRAPHS



34. Outlet stilling basin



35. Drain 3 left of outlet, dripping

PHOTOGRAPHS



36. Drain 3 detail



37. Drain 3 interior

PHOTOGRAPHS



38. Drain 4, right of outlet, dripping



39. Outlet conduit, minor leakage prior to operation

PHOTOGRAPHS



40. Measuring flume downstream of outlet stilling basin



41. Paved ditch in right groin, looking downstream