COLORADO
Division of Water Resources
Department of Natural Resources

Dam Safety

September 25, 2017

David Kuntz, DVM
Overland Ditch & Reservoir Company
28444 Redlands Mesa Road
Hotchkiss, CO 81419
dpkdvm1@aol.com

VIA EMAIL

When replying, please refer to:
OVERLAND #1 DAM, DAMID 400422
Water Division 4, Water District 40

SUBJECT: Engineer's Inspection Report

Dear Dr. Kuntz,

On August 7, 2017, our office inspected Overland #1 Dam in accordance with Section 37-87-107 of the Colorado Revised Statutes that assigns the State Engineer responsibility to determine the amount of water which is safe to impound in the reservoirs of all dams in the state of Colorado. Enclosed is a copy of the Engineer's Inspection Report for your use and reference. Please sign the signature block on page 3 to acknowledge your receipt of report and return a copy to the Division 4 office via mail or email.

Conditions observed during the dam safety inspection resulted in an overall rating of Conditionally Satisfactory with a recommended safe storage level of *Conditional Full Storage*, indicating that the dam may be used to full capacity provided certain conditions are met. Specifically, the maintenance, repair, and/or monitoring items listed on page 3 of the inspection report are actions required to improve the safety of the dam.

If you have any questions concerning this inspection report or any other dam safety related matters, please do not hesitate to contact me in the Montrose office at (970) 249-6622.

Sincerely,

Jason Ward, PhD,PE
Dam Safety Engineer

Enc: Engineer's Inspection Report
ec: Bill McCormick, Chief, Colorado Dam Safety
Doug Christner, District 40 Water Commissioner

ENGINEER'S INSPECTION REPORT

INSPECTOR: JPW

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:	OVERLAND #1			T: 110S	R: 0920W	S: 23	COUNTY: DELTA	DATE OF INSPECTION:	8/7/2017
DAM ID:	400422	YRCompl:	1987	DAM HEIGHT(FT):	60.0	SPILLWAY WIDTH(FT):	75.0	PREVIOUS INSPECTION:	7/27/2016
CLASS:	High hazard			DAM LENGTH(FT):	3200.0	SPILLWAY CAPACITY(CFS):	4367.0	NORMAL STORAGE (AF):	5828.0
DIV:	4	WD:	40	CRESTWIDTH(FT):	20.0	FREEBOARD (FT):	6.0	SURFACE AREA(AC):	252.0
EAP:	8/4/2012			CRESTELEV(FT):	9897.0	DRAINAGE AREA (AC.):	6200.0	OUTLET INSPECTED:	9/4/2009

CURRENT RESTRICTION: -- NONE --

OWNER:	OVERLAND DITCH & RESERVOIR COMPANY	OWNER REP.:	DAVID KUNTZ
ADDRESS:	28444 REDLANDS MESA RD.	CONTACT NAME:	DAVID KUNTZ
	HOTCHKISS CO 81419-0000	CONTACT PHONE:	(970) 640-7851X

INSPECTION PARTY :	Jason Ward ; Luke R., Doug C.	David Kuntz, Robert S., Andy K.	Bruce Marvin
REPRESENTING :	Dam Safety ; Water Comm.	Overland Ditch and Reservoir Co.	Western Engineers

FIELD CONDITIONS OBSERVED

WATER LEVEL: BELOW DAM CREST 24 FT. Below Spillway 18 FT. GAGE ROD READING 24.0

GROUND MOISTURE CONDITION: ☐ DRY ☑ WET ☐ SNOWCOVER OTHER rain during insp.

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

UPSTREAM SLOPE

PROBLEMS NOTED: ☐ (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

Main Dam: Generally complete riprap coverage along main portion of embankment. No signs of erosion, rock displacement, or instability. Slope and riprap have good uniform appearance.
(1) Riprap sparse between main portion and spillway. Small amount of high waterline erosion, but no signs of instability.

Auxiliary Dam:
(1) Riprap is sparsely placed and has gap-graded appearance (large boulders with small rock and voids). (2) However, wave erosion appears limited to high waterline where rock has been replaced periodically over the years to curb wave action. Condition acceptable and does not appear to have worsened in recent years. Sparse rock below approximately mid-height with slight beaching periodically. Overall slope is judged acceptable.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

CREST

PROBLEMS NOTED: ☐ (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

Main Dam: (11) Recent heavy rain revealed moderately-sized potholes on crest of main dam, particularly around the outlet controls manhole. Dam crest elevation, width, and alignment all appear uniform through main section of dam. However, (11) extensive rutting begins at right end of Main dam and extends along right wing dike of dam. Uncertain how elevation is affected along this portion. POOR rating for this section only.

Auxiliary Dam:
Gate open during inspection with clear evidence of recent vehicular traffic. No apparent damage at this time, but closure of access has proven successful in the past to prevent rutting and damage to crest. Owner is encouraged to lock gate and prevent access.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☒ Poor

DOWNSTREAM SLOPE

PROBLEMS NOTED: ☐ (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

Main Dam:
(22) Minor erosion locally along right downstream slope in buttress area. Erosion gullies identified several years ago have either been repaired or self-healed.
(21) Clear evidence of livestock activity on the dam in the form of hoof damage and light but well established trails. No significant damage found.
Slope appears stable and uniform.

Auxiliary Dam:
Historic line of bulges along downstream slope at approximately 1/3 height. Otherwise, slope is uniform. Vegetation varies from uniform grass coverage along lower half to areas of bare ground along upper half. Uncertain of reason, but does not appear to be a slope stability or safety concern at this time.

CONDITIONS OBSERVED: ☐ Good ☒ 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

Main Dam: Several areas along toe of dam with distinct line beyond which dense lush grass grows. Ground is wet, but likely due to recent rains. However, distinct change of vegetation likely influenced by subsurface water. Few areas with change in vegetation on slope, but no clear evidence of embankment seepage found.

Auxiliary Dam:
Clear evidence of historic seepage along right toe of the dam, but only damp ground from recent rain during inspection.
Standing and flowing water starts at head of historic outlet channel starting 100-ft below toe of current dam. Unknown history of this channel and does not appear to be a safety concern at this time, but should be periodically monitored for changes.

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

Outlet discharging and only limited inspection of outlet works components. Testimony from Owner and Water Commissioner indicate no known or observed problems with the outlet works.

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

Spillway floor drain recently excavated and cleaned of debris just beyond stilling basin. New grate installed at drain entrance.
Weep holes in spillway walls partially blocked with muck, but appear effective.
All concrete and steel structures appear in acceptable condition.
Downstream channel with access road crossing is eroded with significant puddles. Access concern only and not a spillway safety problem.

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 Drain outfalls

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

(112) Piezometer conditions vary and are to be evaluated by Owner's engineer within next year. Markers placed by Owner since last inspection have helped in identifying locations.

(111) Gage rod reportedly broken at lower reservoir level. Continual problem due to ice damage and owner advised to consider more permanent ice-resistant alternative such as a concrete stem wall (Please note that plans and specifications for this structure must be approved by the State Engineer prior to construction).

(117)(119) Owner's engineer present during inspection to discuss details of instrumentation inventory and long-term monitoring program. Commitment by owner and engineer to have reporting completed during winter 2017/18 with implementation by spring 2018.

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 Grade crest to uniform elevation and repair rutting along right wing dike.

Most maintenance items identified in last years inspection report have either been completed or are ongoing.

Clear evidence of large brush removal, but several localized brush and small pines found on the embankment and should be removed. This applies to both the Main and Auxiliary dams.

U.S. Forest Service contacted by Owner for grading of dam crest and import of material for rutted section along right wing dike of Main dam.

(61) Repair spillway channel access road crossing as needed to ensure reasonable vehicular access to dam for operation, maintenance, and emergencies.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

Go to next page for Overall Conditions and Items Requiring Actions

ENGINEER'S INSPECTION REPORT

DATE. 8/7/2017

DAM NAME: OVERLAND #1

DAM I.D.: 400422

OVERALL CONDITIONS

The main concern for this dam is providing an inventory and condition assessment of the existing piezometers and drains. The Owner showed diligence by inviting their engineer to the inspection. It was agreed that a report will be completed winter 2017/18 with implementation of a long-term monitoring program in spring 2018.

The maintenance items listed below should be completed to improve the safety of the dam. Priority must be given to item (95) with implementation of a long-term monitoring plan by the beginning of water year 2018.

In addition, emphasis is need to complete item (82) grading of the dam crest. While not an immediate safety concern at this time, the condition of the dam crest is worsening and impeding safe and efficient access to the Auxiliary dam. Also, access across the Auxiliary dam is no longer restricted and could be a long-term maintenance issuer if allowed to continue. Consideration should be given to locking gate and or signage to restrict access.

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

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 safety of the dam rests with the owner, who should take every necessary step to prevent damages caused by leakage or overflow of waters from the reservoir or floods resulting from a failure of the dam.

MAINTENANCE - MINOR REPAIR - MONITORING

- ☐ (80) PROVIDE ADDITIONAL RIPRAP:
- ☑ (81) LUBRICATE AND OPERATE OUTLET GATES THROUGH FULL CYCLE: **annually to ensure proper working order.**
- ☑ (82) CLEAR TREES AND/OR BRUSH FROM: **All embankment surfaces.**
- ☐ (83) INITIATE RODENT CONTROL PROGRAM AND PROPERLY BACKFILL EXISTING HOLES:
- ☑ (84) GRADE CREST TO A UNIFORM ELEVATION WITH DRAINAGE TO THE UPSTREAM SLOPE: **Along main dam crest and far right wing dam.**
- ☐ (85) PROVIDE SURFACE DRAINAGE FOR:
- ☑ (86) MONITOR: **Continue seepage and piezometer monitoring. See item (95) below.**
- ☐ (87) DEVELOP AND SUBMIT AN EMERGENCY ACTION PLAN:
- ☑ (88) OTHER **Repair spillway channel access road crossing to provide reasonable access for dam operation, maintenance, and safety purposes.**
- ☐ (89) OTHER

ENGINEERING - EMPLOY AN ENGINEER EXPERIENCED IN DESIGN AND CONSTRUCTION OF DAMS TO: (Plans and Specifications must be approved by State Engineer prior to construction.

- ☐ (90) PREPARE PLANS AND SPECIFICATIONS FOR REHABILITATION OF THE DAM:
- ☐ (91) PREPARE AS -BUILT DRAWINGS OF:
- ☐ (92) PERFORM A GEOTECHNICAL INVESTIGATION TO EVALUATE THE STABILITY OF THE DAM:
- ☐ (93) PERFORM A HYDROLOGIC STUDY TO DETERMINE REQUIRED SPILLWAY SIZE:
- ☐ (94) PREPARE PLANS AND SPECIFICATIONS FOR AN ADEQUATE SPILLWAY:
- ☑ (95) SET UP A MONITORING SYSTEM INCLUDING WORK SHEETS, REDUCED DATA AND GRAPHED RESULTS: **Inventory and evaluate all instrumentation with preparation of long-term monitoring plan.**
- ☐ (96) PERFORM AN INTERNAL INSPECTION OF THE OUTLET:
- ☐ (97) OTHER:
- ☐ (98) OTHER:
- ☐ (99) OTHER:

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~~

Complete all maintenance, monitoring, and engineering items listed above.

Engineer's Signature _____ 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.

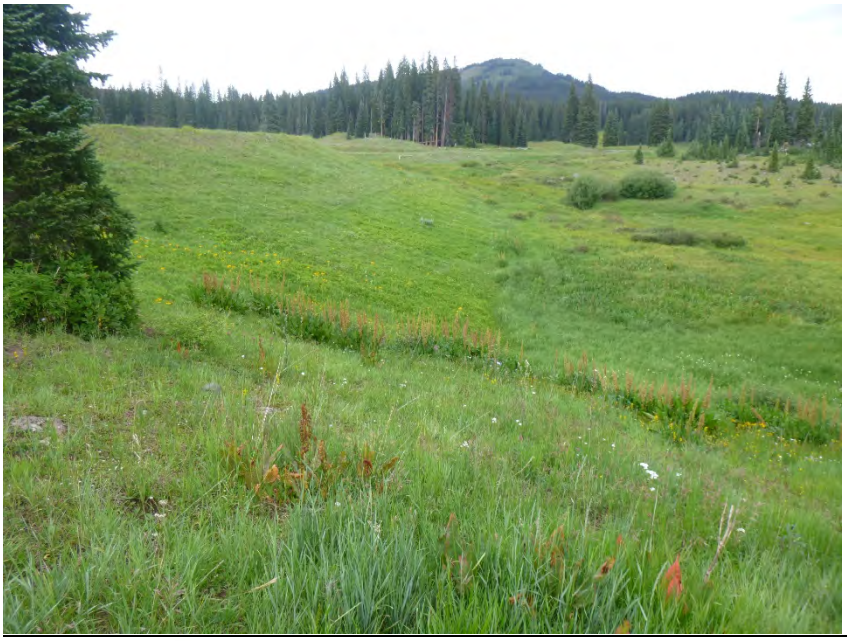
HAZARD CLASSIFICATION OF DAMS

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.

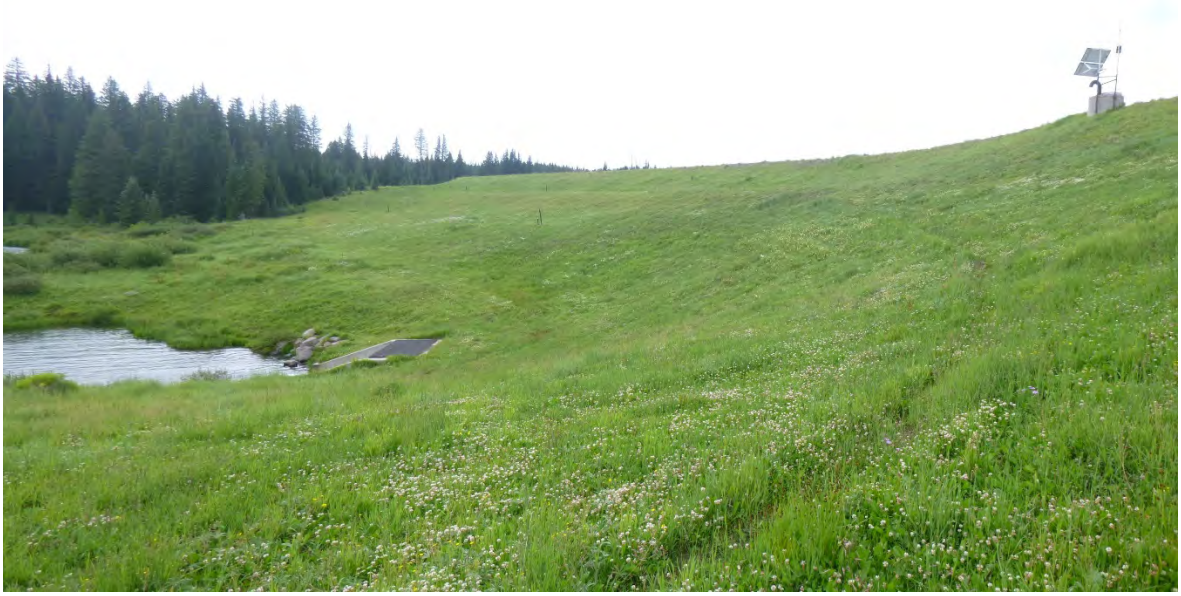
Significant hazard
Significant damage to improved property is expected in the event of failure of the dam while the reservoir is at the high water line, but no loss of human life is expected.

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.

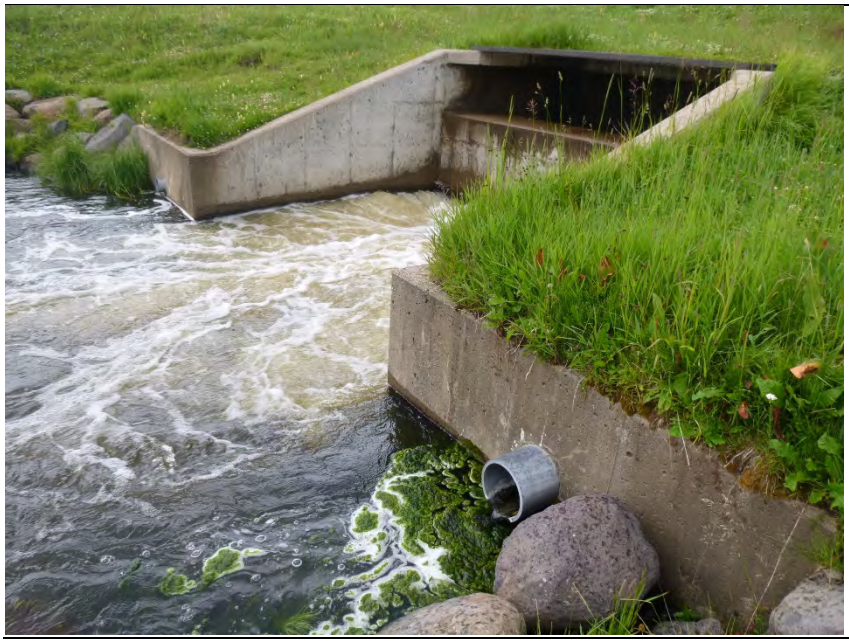
NPH hazard - No loss of life or damage to improved property, or loss of downstream resource is expected in the event of failure of the dam while the reservoir is at the high water line.



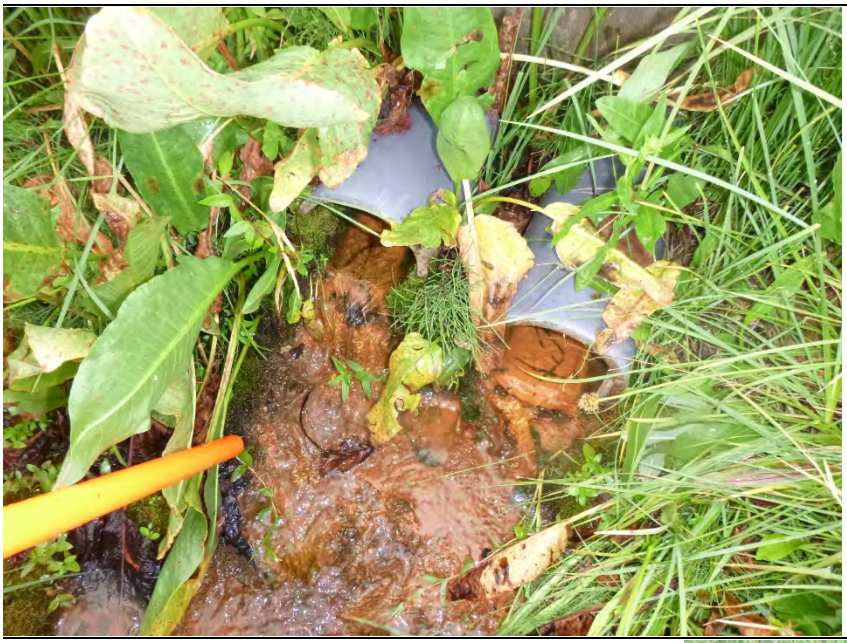
View along downstream slope of saddle dam between Main dam and Spillway.



View along downstream slope of Main dam.

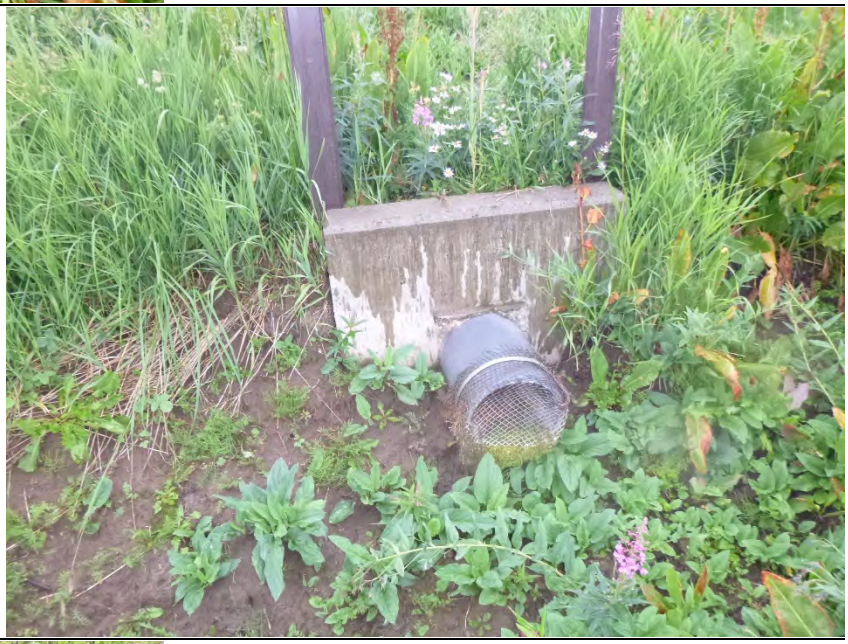


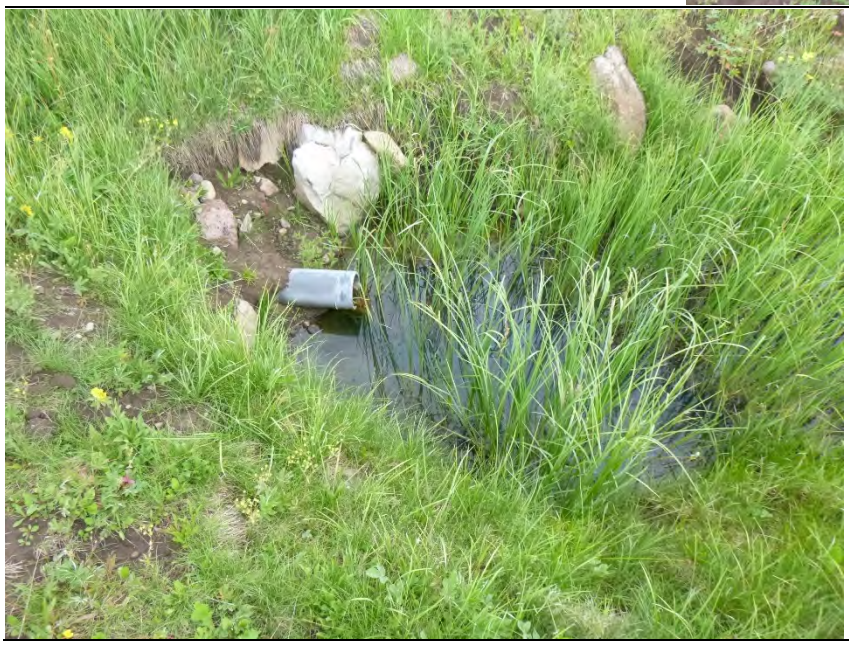
Downstream baffled outlet structure. Drain outfalls partially or fully submerged at this outlet discharge flow.



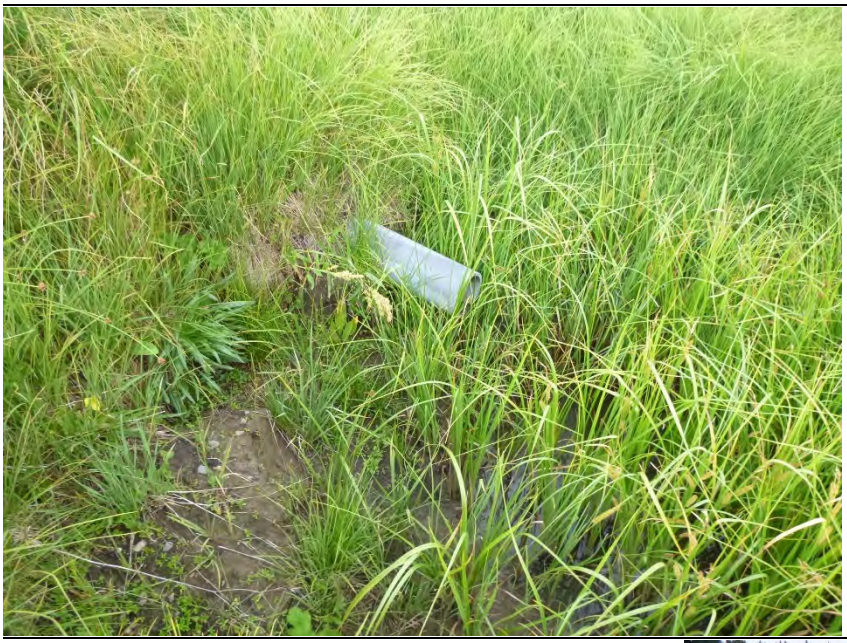
Toe Buttress drain outfalls (for Drain B, per C-576C).

Buttress drain ‘A’ outfall.



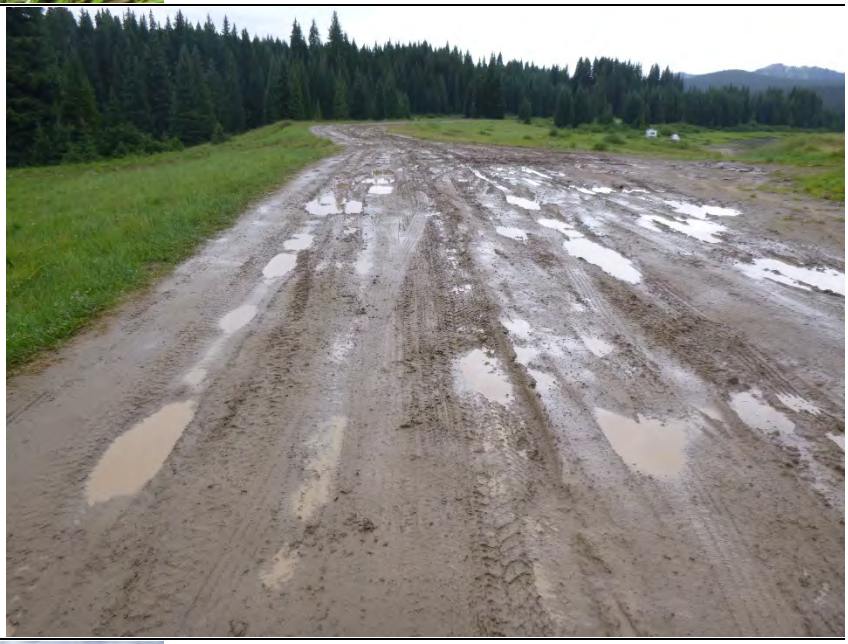


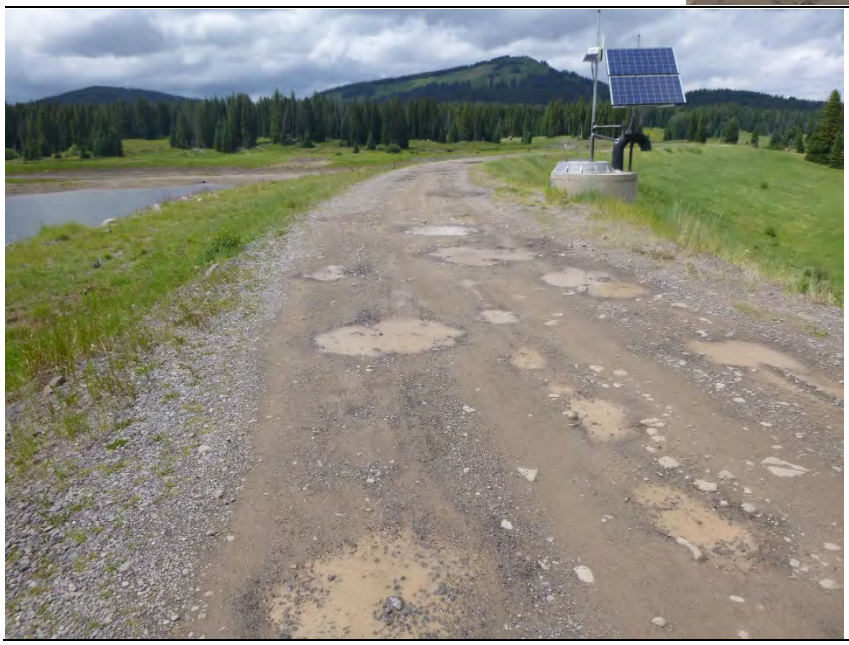
Outfall Spillway Structure Drain (per C-576C)



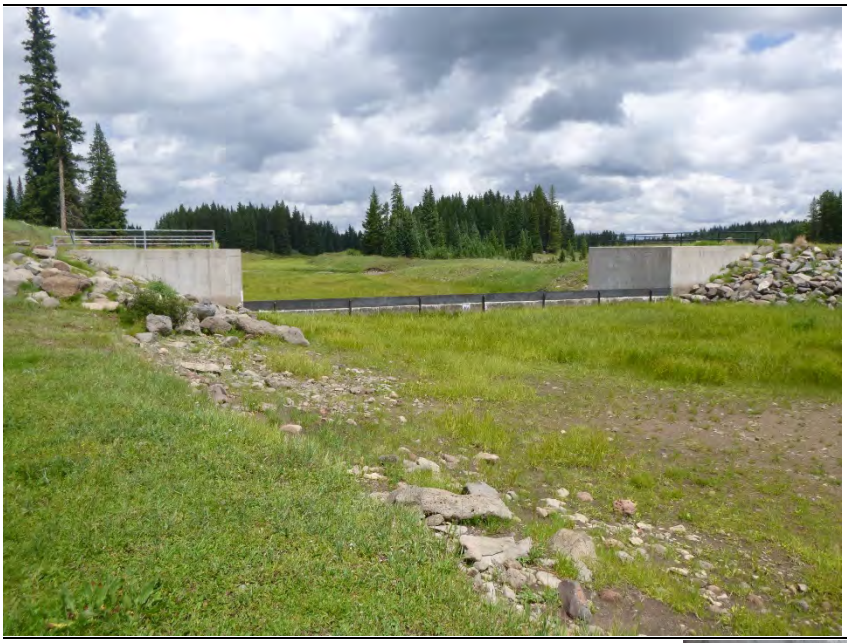
Outfall Spillway Underdrain (per C-576C)

Rutted, puddled, and muddy crest along far right end of dam.



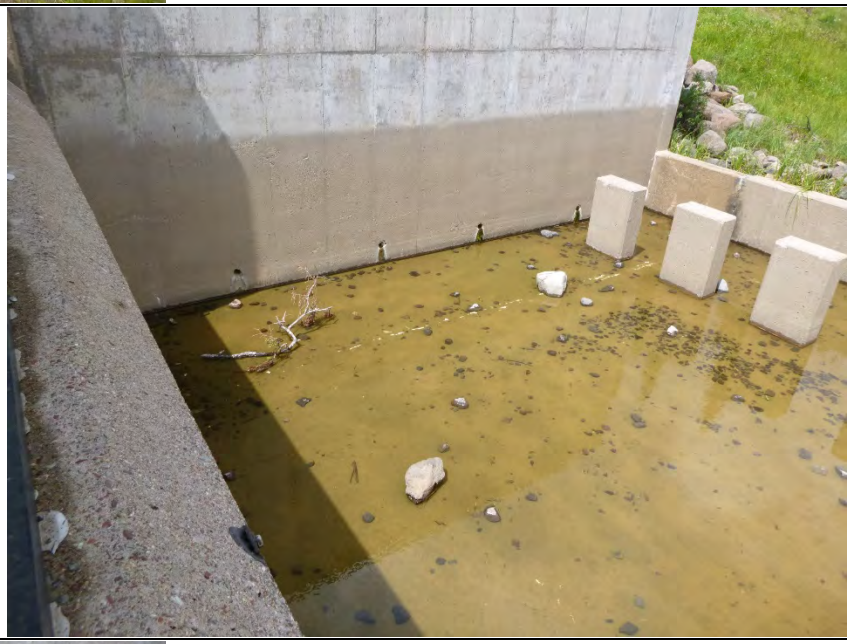


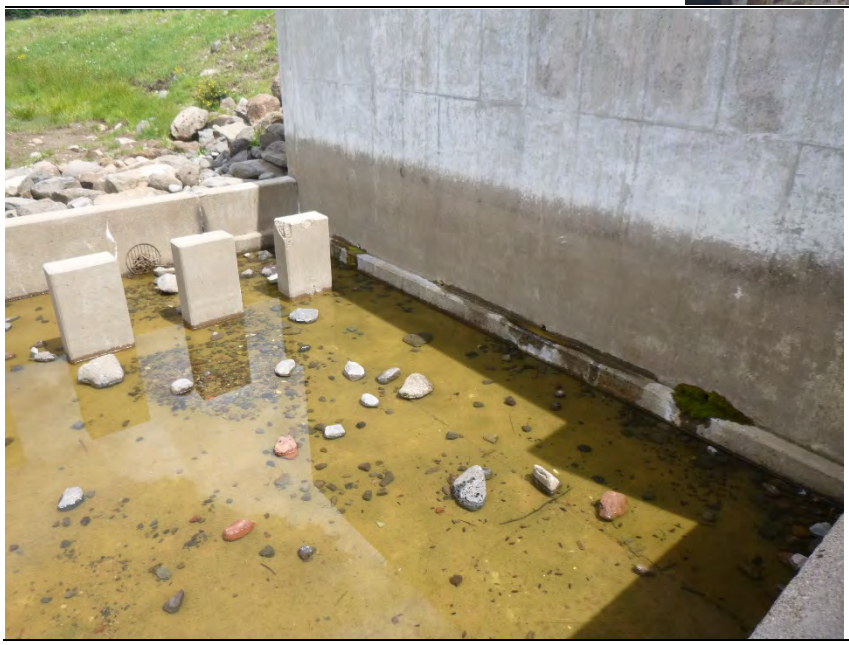
Puddles along dam crest near maximum section.



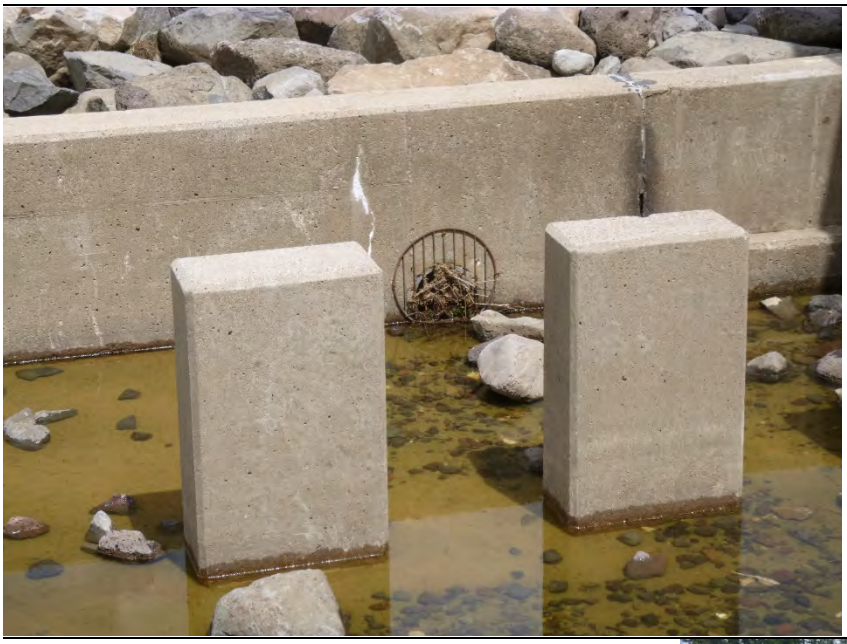
Looking downstream in spillway entrance channel.

Left spillway structure wall weep holes.



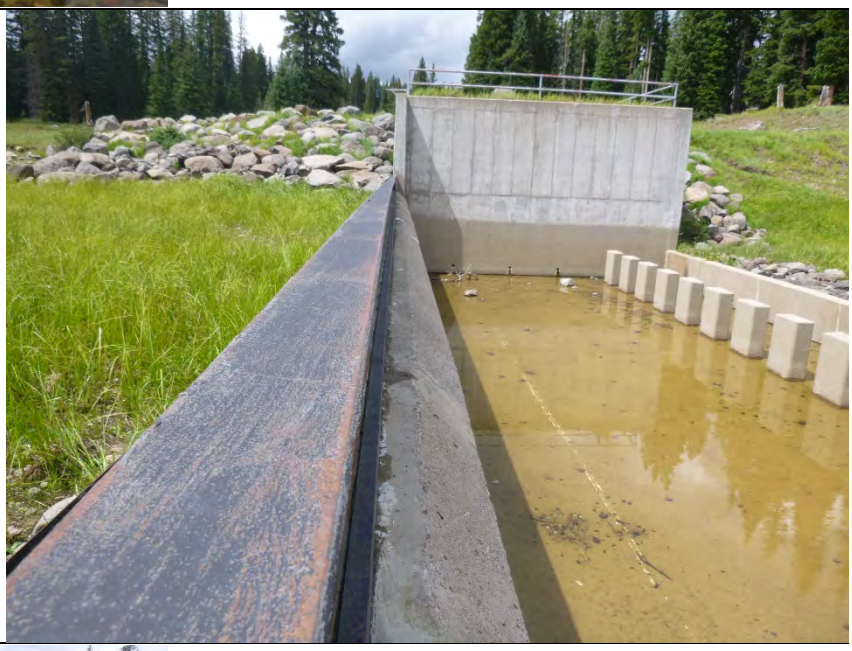


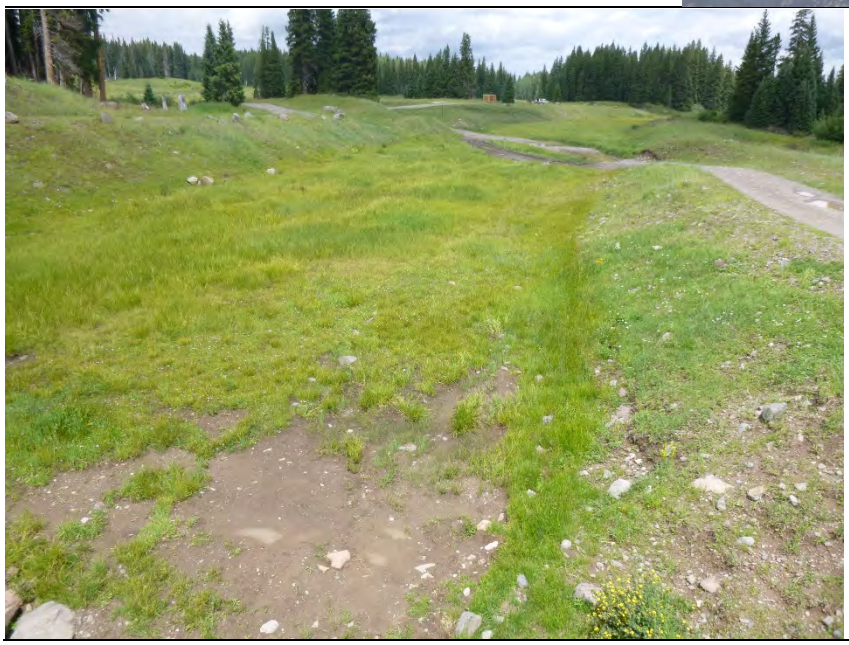
Right spillway structure wall weep holes.



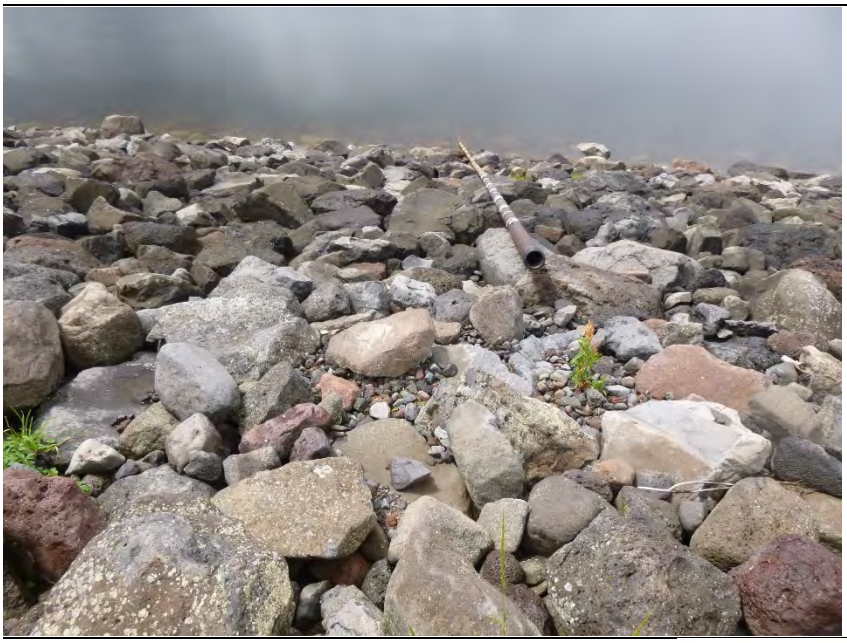
Spillway floor drain with new trashrack recently cleaned of debris.

View along steel beam stop log at spillway crest.



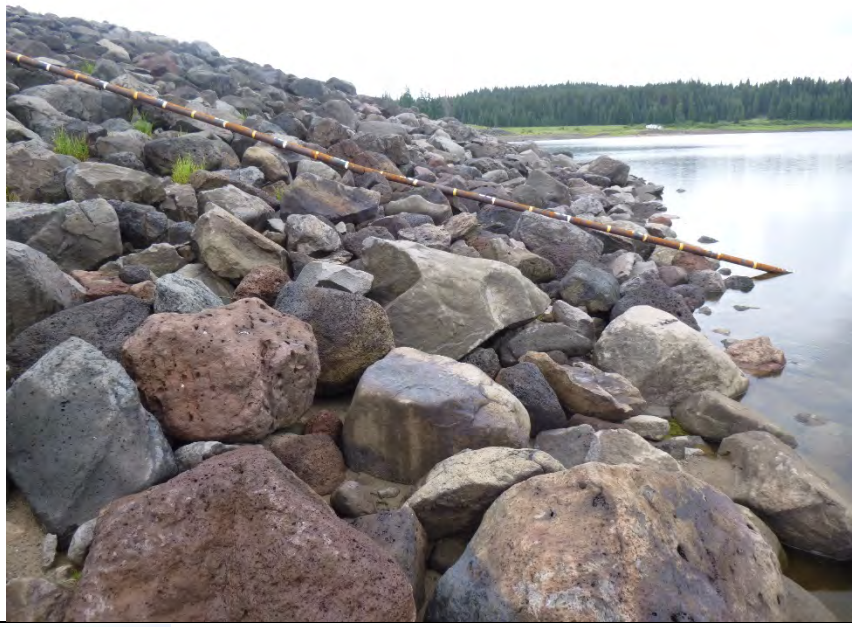


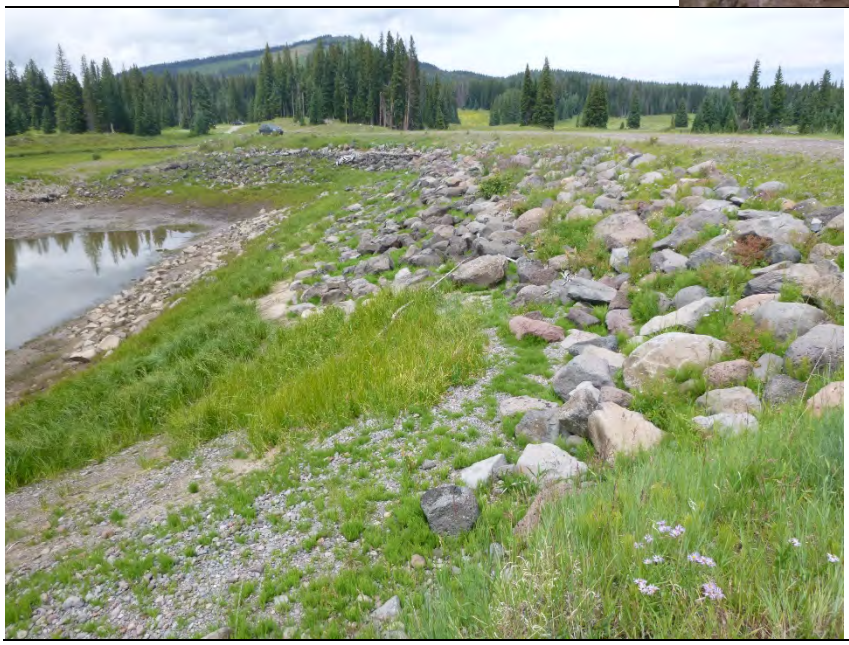
Looking downstream in spillway channel.



View along upstream slope riprap and gag rod.

Upstream slope at maximum section.

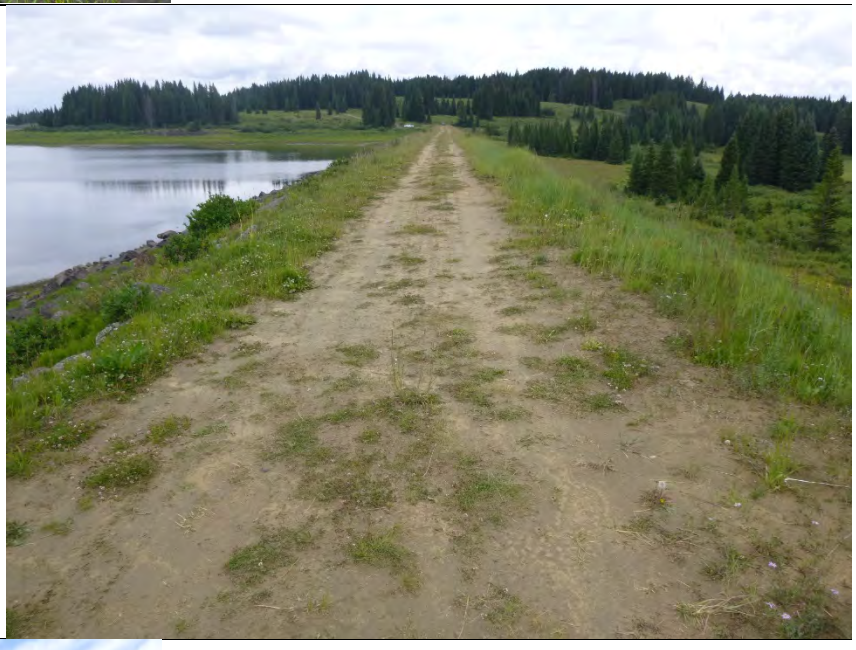


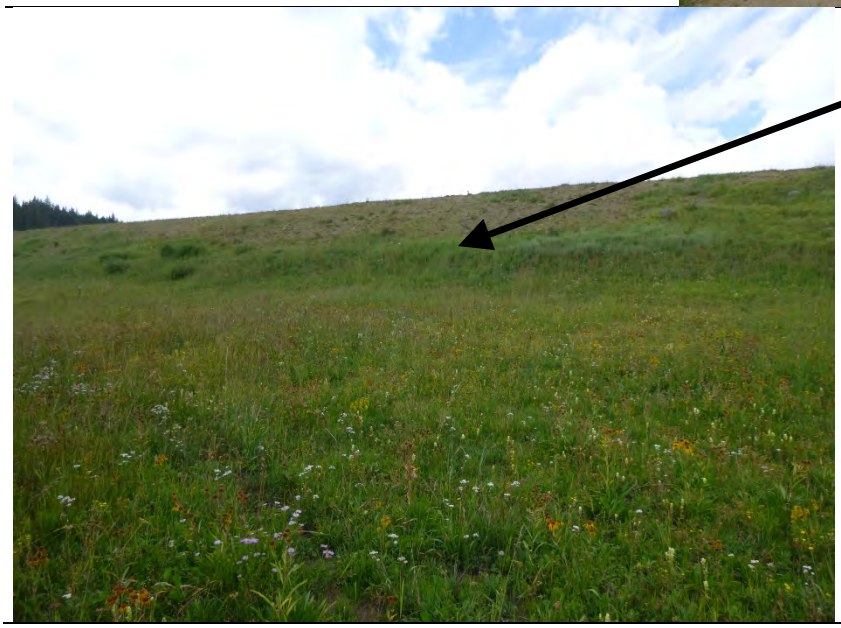


Upstream slope left of maximum section between main dam and spillway.

Typical view along upstream slope of Auxiliary Dam.

Typical view along dam crest of Auxiliary dam.





Historic line of bulge and change in vegetation along right portion of downstream slope.

Typical view of downstream slope on Auxiliary dam.