COLORADO
Division of Water Resources
Department of Natural Resources

Dam Safety

August 22, 2018

David Kuntz
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 Mr. Kuntz,

On July 23, 2018, 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
Shellie Gies, Overland Ditch & Reservoir Company, overlandditch@gmail.com
Bruce Marvin, Western Engineers, westeng23@gmail.com

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:	7/23/2018
DAM ID:	400422	YRCompl: 1987		DAM HEIGHT(FT):	60.0	SPILLWAY WIDTH(FT):	75.0	PREVIOUS INSPECTION:	8/7/2017
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; Doug Christner	David Kuntz, Shellie Gies	Bruce Marvin
REPRESENTING :	CO Dam Safety; DWR	Owners	Owner's Engineer

FIELD CONDITIONS OBSERVED

WATER LEVEL: BELOW DAM CREST 48 FT. Below Spillway 42 FT. GAGE ROD READING 0.00

GROUND MOISTURE CONDITION: [✓] DRY [ ] WET [ ] SNOWCOVER OTHER

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:
Full slope exposed with empty reservoir during inspection. Near full riprap coverage along maximum section of embankment. Few areas of beaching at upstream toe transition from riprap to reservoir bed. Some sand accumulation appears to have been pumped from under riprap by wave action. No problems or concerns observed.
(1) Riprap coverage becomes sparse along left and right freeboard sections of embankment. (2) Some wave erosion in these left and right wing dikes, but none severe or causing slope instability.

Auxiliary Dam:
(1) Riprap is sparsely placed. Periodic wave erosion; some large up to 12-inches high. No sign of worsening condition or slope instability.

All upstream slopes judged in Good to Acceptable condition.

CONDITIONS OBSERVED: [X] Good [X] 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:
Imported gravel treatment from left end near spillway to dogleg bend just before start of right end wing dike. Only minor (11) puddles observed in this section and appearance is fairly uniform. Crest of right wing dike appears mainly native embankment material with heavy rutting from vehicular traffic during wet periods. Poor drainage and rough surface. No significant change from recent past inspections, but crest in this section remains in Poor condition.

Auxiliary Dam:
Native embankment material surface. Gate closed to reduce vehicular access. Crest has rough and slightly uneven surface, but drainage appears acceptable and overall appearance is uniform.

Split Acceptable/Poor rating with poor condition confined to right wing dike rutting.

CONDITIONS OBSERVED: [ ] Good [X] Acceptable [X] 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:
Good visibility and access on entire downstream slope. Currently dry conditions allow for good visibility of vegetation cover. Grass color and coverage varies, but no outstanding areas that might show wet embankment areas, sloughs, etc. No signs of problems.

Auxiliary Dam:
Surface and slope inclination varies with few areas of bulges. All appears historic with no evidence of any recent movement of instability. Some livestock erosion on slope, but no apparent impact to stability.

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

ENGINEER'S INSPECTION REPORT

DAM NAME: OVERLAND #1

DATE. 7/23/2018

DAM I.D.: 400422

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 ☐ (37) FLOW INCREASED / MUDDY ☐ (38) DRAIN DRY / OBSTRUCTED

☐ (39) OTHER

No wet areas on embankment or beyond downstream toe with current empty reservoir. All drain outfalls located and observed either dry or very little flow (trickle), except for buttress drain outfall B-2 flowing at estimated 2 gpm. All seepage conditions acceptable based on current reservoir level and evidence of activity at recent past higher levels.

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 not operated during inspection, but no reported or known problems with reservoir releases during 2018 irrigation season.
Upstream intake structure and trashracks exposed at current empty reservoir level. Minor debris and sediment accumulation at trashracks, but generally no problems observed.

Automated valve operation attempted several years ago reportedly non-functioning and abandoned at this time. Fully manual hydraulic controls remain operable.

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 rocks in stilling basin

(59) Numerous rocks in stilling basin. No apparent damage to floor at this time, but rocks could cause ball milling erosion at high spillway flows.
Some concrete deterioration on tops of two or three baffle blocks. All blocks appear structurally sound and functional at this time.
Stilling basin floor drained and fully accessible. Several training wall relief drains observed damp, some with moss at outfall.
All cracks in concrete appear similar to past inspections with no apparent worsening condition.
Access road across channel rough, but easily accessible by 2WD SUV vehicle.

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

(111) Gage rod alignment appears skewed and lowest section of pipe is disconnected and displaced. Uncertain of gage rod accuracy at this time. Also, one-foot paint increments difficult to read.
(112) Piezometer inventory, condition assessment, flushing, and historic data reduction reportedly completed by Owner's engineer in late 2017. Report of findings and long-term monitoring plan to be completed by end of 2018.
(114) (115) Survey monuments and drain outfalls initially not part of engineer's evaluation and long-term monitoring plan. These instruments were discussed and added to the scope of work during the inspection for final reporting.

Monitoring rated as Acceptable based on diligence to complete and implement long-term monitoring program.

CONDITIONS OBSERVED: | Good | X | 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 Crest grading

(63)(64) Medium sized brush and small pines should be removed from all embankment surfaces, particularly from upstream slope of Auxiliary Dam.
(68) Repair rut damage and grade right end of Main dam crest. Mild grading and filling in of potholes needed on remainder of crest. Grade with slight inclination to upstream slope for drainage; do not crown center.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

Go to next page for Overall Conditions and Items Requiring Actions

OVERALL CONDITIONS

The priority action item for the owners of Overland Dam is to complete the instrumentation evaluation and long-term monitoring program ongoing since the last inspection. The owner's engineer indicated that the inventory, evaluation, and repairs to all instrumentation is nearly complete with report completion anticipated by late 2018. Implementation for the monitoring program should begin in 2019.

Owner indicates USFS road crews are scheduled to repair and grade the Main Dam crest in 2019. This is acceptable as long as problem to not worsen prior to repair and the grading is conducted in accordance with dam safety standards (i.e. uniform elevation with drainage to upstream slope; do not crown center).

All additional maintenance items listed below should be completed as part of normal operation and maintenance of the dam.

Based on results of the inspection and recent file review, a Conditionally Satisfactory rating is provided with Full Storage of the reservoir allowed if the action items listed below are completed.

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 safe operation of said dam rests with the owner, who should take every precaution 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 as part of normal operating procedures.**
☑ (82) CLEAR TREES AND/OR BRUSH FROM: **all embankment surfaces; particularly from upstream slope of Auxiliary Dam.**
☐ (83) INITIATE RODENT CONTROL PROGRAM AND PROPERLY BACKFILL EXISTING HOLES:
☑ (84) GRADE CREST TO A UNIFORM ELEVATION WITH DRAINAGE TO THE UPSTREAM SLOPE: **along right end of Main Dam and fill potholes along remainder of crest.**
☐ (85) PROVIDE SURFACE DRAINAGE FOR:
☑ (86) MONITOR: **Continue piezometer and seepage monitoring as agreed upon frequency until otherwise directed by forthcoming long-term monitoring plan.**
☑ (87) DEVELOP AND SUBMIT AN EMERGENCY ACTION PLAN: **Update and distribute with assistance from CO Dam Safety**
☑ (88) OTHER **Remove all rocks from spillway stilling basin to prevent 'ball milling' erosion.**
☑ (89) OTHER **Repair gage rod and verify elevation markings with reservoir capacity. Remark rod for clarify and accuracy.**

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 a long-term monitoring program**
☑ (96) PERFORM AN INTERNAL INSPECTION OF THE OUTLET: **due in 2019 per CO Dam Safety Rules and Regulations 10-year inspection frequency for high hazard dams**
☐ (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 new and outstanding action items listed above and in past recent inspection reports. Emphasis must be placed on completing item (95) prior to 2019 irrigation season.

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.

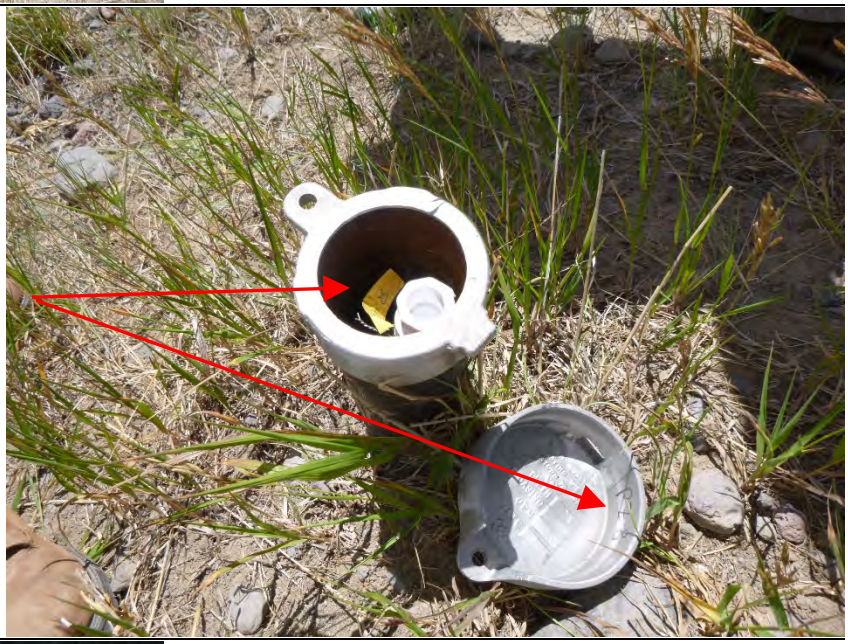
Significant hazard
Significant damage to improved property is expected in the event of failure of the dam while the reservoir is at the high water line, but no loss of human life is expected.

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.

Typical piezometer casing and lockable cap.

Typical piezometer with new wired on identification tag (yellow) with duplicated marking on inside of cap.



View looking downslope along pipe used as reservoir gage rod (note skewness).

Lower portion of gage rod pipe disconnected and displaced.

Outlet intake and trashrack structure.

Close-up of outlet intake headwall.

Note minor sediment and debris at base of trashrock.

Typical area of possible sediment pumping and beaching at upstream toe.

Typical view along upstream slope.

Typical view along dam crest. Note minor puddles in foreground.

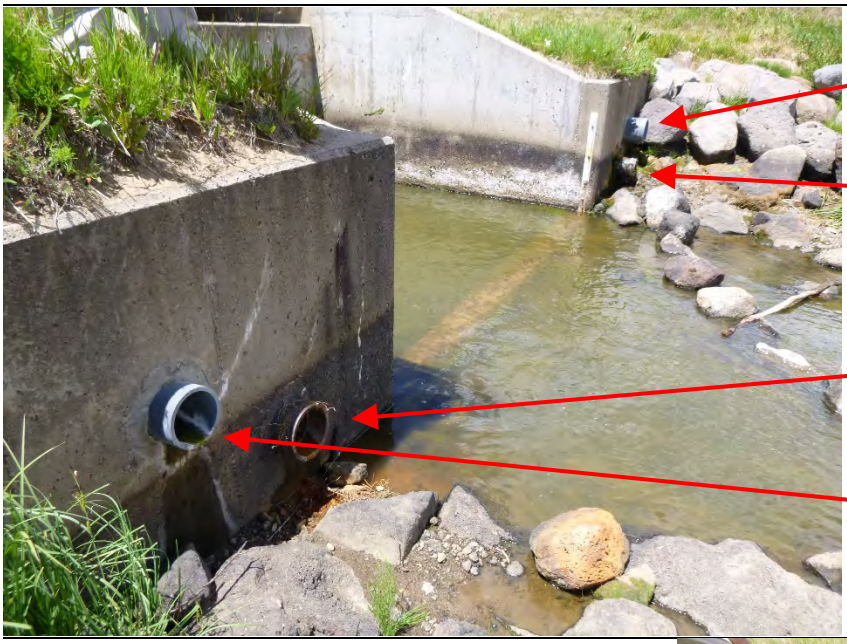
Heavily rutted and unprotected dam crest along right wing dike.

Right portion of dam downstream slope.

Downstream slope near maximum section.

Drain outfall ‘A’ (Ref drawing C-576C)

Drain outfalls ‘B-1’ (right in photo) and ‘B-2’ (left in photo).



Baffled outlet structure.

Spillway downstream sill and baffle blocks.

Close-up along spillway downstream sill and baffle blocks. Note rocks in stilling basin.

Close-up of stilling basin floor drain; cleaned since last inspection and allowed full drainage of stilling basin.

Close-up of deteriorated concrete on tops of several baffle blocks.

View of empty reservoir basin from crest of Auxiliary Dam.

Locked gate at left end of Auxiliary dam crest.

View looking downstream in spillway outlet channel.