

# ENGINEER'S INSPECTION REPORT

INSPECTOR: **JEH**

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: HALE - DWIGHT G T: 150S R: 0650W S: 29 COUNTY: EL PASO DATE OF INSPECTION: 12/7/2017  
DAM ID: 100136 YRComp: 1940 DAM HEIGHT(FT): 13.5 SPILLWAY WIDTH(FT): 82.0 PREVIOUS INSPECTION: 9/28/1987  
CLASS: Low hazard DAM LENGTH(FT): 600.0 SPILLWAY CAPACITY(CFS): 1062.0 NORMAL STORAGE (AF): 6.0  
DIV: 2 WD: 10 CRESTWIDTH(FT): 10.0 FREEBOARD (FT): 4.0 SURFACE AREA(AC): 2.0  
EAP: Not Required CRESTELEV(FT): 5600.0 DRAINAGE AREA (AC.): 1050.0 OUTLET INSPECTED:

**CURRENT RESTRICTION: -- NONE --**

OWNER: ELISE BERGSTEN, OWNER REP.: ELISE BERGSTEN  
ADDRESS: PO BOX 1834 CONTACT NAME: ELISE BERGSTEN  
COLORADO SPRINGS CO 80901 CONTACT PHONE:

INSPECTION PARTY : Elise Bergsten Gary Barber John Hunyadi, PE  
REPRESENTING : Cross Creek Metro District Colorado Dam Safety

FIELD CONDITIONS OBSERVED WATER LEVEL: BELOW DAM CREST -5 FT. Below Spillway -1 FT. GAGE ROD READING no gage  
GROUND MOISTURE CONDITION:  DRY  WET  SNOWCOVER OTHER Clear, Calm, 35F

**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 Trees and thick vegetation

The existing Hale dam is on property managed by Cross Creek Metro District. On June 7, 2014, this office approved design plans/specifications for removal of this existing structure and construction of a new dam slightly downstream. We discussed with CCMD representatives that the approval lasts for 5 years and would need to be re-submitted again to the SEO for approval. CCMD representatives indicated they have potential funding sources available that could allow construction to start/happen prior to June 7, 2019. Either way, this office is available for consultation/questions.

\*The existing Hale Dam is overall marginally considered conditionally satisfactory. Several issues that would require physical construction to address will be resolved with construction of the new dam. This report recognizes that and will focus on identifying critical issues for monitoring and maintenance of the existing structure to keep it operational between now and new dam construction.\*

### UPSTREAM SLOPE

The upstream slope is significantly overgrown with brush and numerous large trees with roots that visibly extend for many tens of feet. The majority of the upstream slope is near vertical due to wave erosion.

### ACTIONS

Slope should be monitored for signs of continued erosion that could affect the stability of the dam. In particular, should observed for signs of cracking on the crest, near the upstream slope. While not an ideal condition, no immediate stability concerns were identified on upstream slope as a whole. (Reference seepage section for concerns associated with previous embankment failure).

### PHOTOS 1 to 6

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

Crest is about 10-ft wide and has a gravel surface. There is a low spot where the dam had previously failed and been repaired towards the left end of the dam.

The area of the previous failure should be closely observed for continued settlement or sloughing on downstream slope around pipe.

### PHOTOS 7 to 9

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

The downstream slope is generally about 2.5H:1V with a covering of weeds. Overall, the slope is fairly uniform. The major point of concern would be the area of the previous failure (location shown in attached site location Map). This area was repaired with an about 12-inch diameter ADS plastic pipe that allows flows to enter from the reservoir (although the upstream intake could not be located). On the downstream side, the pipe enters into the downstream toe. The slopes are near vertical around the pipe and there is concrete rubble used as backfill around the pipe. No cloudy seepage was observed.

The area of the previous failure should be monitored regularly for signs of increasing seepage, or progressively steepening slopes around the ADS pipe. If there was not a plan to construct a new embankment in the works and planned relatively soon, this area would require full removal of the ADS pipe, and proper repair/compaction of the previously filled zone. If any signs of increased seepage, cloudy seepage, or progressive slope failures are observed prior to the new dam construction, it will be required to lower the reservoir and properly repair this area.

PHOTOS 10 to 11.

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

1. Seepage area 1 already described as pipe through at area of old embankment failure. This seepage disseminates into the downstream toe area from the pipe and is estimated to be about 10 to 20 gpm. The entrance to the pipe should be located, if practical.

2. Seepage area 2 is located near the old outlet pipe with the inoperable outlet wheel. There is standing water and an incised channel about 20-ft left of the concrete headwall that the old outlet discharges into at downstream toe. No adverse seepage conditions noted at this location.

PHOTOS 12 to 16

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

There is remnants of an old outlet near the right-central portion of the dam. An inoperable wheel/stem is on the upstream slope and the concrete headwall at the discharge downstream was located amongst thick cattails. There is no effective outlet for this structure. If a drawdown were planned/required, it would need to be pumped down.

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

There is an 18-inch CMP located near the left abutment that is slightly higher in elevation it appears that the emergency spillway channel located on the right abutment. The emergency spillway has significant headcutting about 40-ft below the spillway crest. The headcutting is about 4.5-ft deep in sandy soils and about 20-ft wide.

This headcutting should be repaired during the interim period to new dam construction, given the proven likelihood of storm events creating flow through the spillway in recent years. The slopes of the headcut area should be sloped back and allow for new fill to be properly compacted in thin lifts up to the spillway channel grade. The surface of the area should be protected with riprap as an armor protection measure.

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

**Key monitoring is located at the previous dam failure location. Any signs of increasing seepage, cloudy seepage, or active/progressive slope movement would initiate need to remove ADS black pipe and properly compact/repair this area interim to new construction. Therefore, it is considered important for the owner to visually inspect this area on a routine basis.**

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 primary maintenance required is to repair the emergency spillway channel headcut as described above.**

CONDITIONS OBSERVED:  Good  Acceptable  Poor

*Go to next page for Overall Conditions and Items Requiring Actions*

## OVERALL CONDITIONS

**Overall, it is recognized that this structure is slated for removal/replacement within the next year or two. With that in mind, the structure is considered conditionally satisfactory, only marginally so. Of primary importance is to monitor the area of the previous failure for changing seepage conditions and slope stability as well as repairing the headcut erosion in the emergency spillway channel.**

**Owner should continue to keep this office notified of planned construction period for project C-2022. As noted, approval of current plan set is set to expire on June 7, 2019.**

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 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.

**MAINTENANCE - MINOR REPAIR - MONITORING**

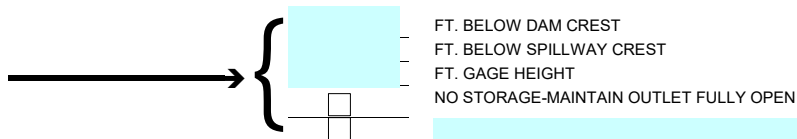
- (80) PROVIDE ADDITIONAL RIPRAP: \_\_\_\_\_
- (81) LUBRICATE AND OPERATE OUTLET GATES THROUGH FULL CYCLE \_\_\_\_\_
- (82) CLEAR TREES AND/OR BRUSH FROM: \_\_\_\_\_
- (83) INITIATE RODENT CONTROL PROGRAM AND PROPERLY BACKFILL EXISTING HOLES: \_\_\_\_\_
- (84) GRADE CREST TO A UNIFORM ELEVATION WITH DRAINAGE TO THE UPSTREAM SLOPE: \_\_\_\_\_
- (85) PROVIDE SURFACE DRAINAGE FOR: \_\_\_\_\_
- (86) MONITOR: **REFERENCE MONITORING SECTION** \_\_\_\_\_
- (87) DEVELOP AND SUBMIT AN EMERGENCY ACTION PLAN: \_\_\_\_\_
- (88) OTHER **REFERENCE MAINTENANCE SECTION** \_\_\_\_\_
- (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: \_\_\_\_\_
- (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



REASON FOR RESTRICTION \_\_\_\_\_

ACTIONS REQUIRED FOR CONDITIONAL FULL STORAGE ~~OR CONTINUED STORAGE AT THE RESTRICTED LEVEL~~ \_\_\_\_\_

Engineer's Signature: *J.E. A...*      Owner's Signature: \_\_\_\_\_      OWNER/OWNER'S REPRESENTATIVE      DATE: \_\_\_\_/\_\_\_\_/\_\_\_\_

INSPECTED BY

### 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 required.

##### 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 line.

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.

Hale Dam  
DAMID 100136  
Inspection Photos

JEH, 07 DEC 2017

Hale Dam (existing)

Legend  
★ Feature 1

★ Hale Dam

★ Previous failure (Culvert location)

★ Outlet Operator (non-operational)

★ Outlet Discharge

★ Spillway Headcutting

▲  
N  
200 ft



01\_Upstream Slope, from right abutment



02\_Upstream Slope, trees/roots





03\_Upstream Slope, roots



04\_Upstream Slope, previous failure



05\_Upstream Slope, previous failure location



06\_Upstream Slope, previous failure location



07\_Dam Crest



08\_Dam Crest



09\_Dam Crest



10\_Downstream Slope, looking right at central portion



11\_Downstream Slope, above old outlet



12\_Seepage, previous failure



13\_Seepage, previous failure



14\_Seepage, previous failure



15\_Outlet, old operator



15\_Seepage, previous failure



17\_Outlet, operator stem



18\_Outlet, old discharge point concrete





19\_Seepage area left of outlet



20\_Seepage area left of old outlet



21\_Pipe Spillway on left end of dam



22\_Pipe spillway on left end of dam



23\_Em Spwy crest



24\_Em Spwy headcutting



25\_Em Spwy Headcutting