

RECLAMATION

Managing Water in the West

High Lakes Stabilization Clements Lake Construction Report

Uinta Basin Replacement Project



U.S. Department of the Interior
Bureau of Reclamation
Provo Area Office
Provo, Utah

October 2008

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Uinta Basin Replacement Project

prepared by

**Provo Area Office
Upper Colorado Region**



**U.S. Department of the Interior
Bureau of Reclamation
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Introduction

The Uinta Basin Replacement Project (UBRP Project) was authorized by Section 203 of the Central Utah Project Completion Act [CUPCA: Titles II through VI of P.L. 102-575].

A component of the UBRP Project is that 13 high mountain lakes formerly used to store water rights would be stabilized at No-Hazard levels and the water rights transferred downstream for storage in the enlarged Big Sand Wash Reservoir, another feature of the UBRP Project. The stabilization of the thirteen reservoirs is mitigation for the enlargement of Big Sand Wash Reservoir.

Stabilization of the thirteen high mountain lakes at No-Hazard levels will provide constant lake water levels year-round. Nine of these lakes (Bluebell, Drift, Five Point, Superior, Water Lily, Farmers, East Timothy, White Miller, and Deer) are located in the upper Yellowstone River watershed and four (Brown Duck, Island, Kidney and Clements) are in the Brown Duck Basin portion of upper Lake Fork watershed.

The work accomplished in the Swift Creek Drainage portion of the upper Yellowstone River watershed in 2006 was to stabilize Water Lily Lake, plug the Farmers Lake Tunnel, and remove the outlet structure at White Miller Lake.

The work accomplished in the Brown Duck Basin in 2007 was to stabilize Clements Lake. This report describes the work and finished product of the stabilized Clements Lake. Work crews kept detailed logs of daily and/or weekly progress. Data from those logs are summarized in Appendix A. Appendix B contains letters accepting the completion of the Clements Lake stabilization project and recognition that the stabilized Clements Lake has a “No Hazard” rating. Appendix C contains design drawings showing location maps and applicable details for Clements Lake.

Construction Oversight

The Utah Reclamation Mitigation and Conservation Commission (Mitigation Commission) was responsible for stabilizing Clements Lake. The Mitigation Commission accepted responsibility for Clements Lake Dam under Special Use Authorization No. RST542601 issued by the U.S. Forest Service – Ashley National Forest, in accordance with prior agreement by multiple parties involved in the UBRP project. Construction oversight throughout the project was accomplished by multiple entities, including the Forest Service, Utah Department of Natural Resources – Division of Water Rights, and U.S. Bureau of Reclamation. Other agencies involved in the planning for the stabilization project included U.S. Fish and Wildlife Service, Central Utah Water Conservancy District, Moon Lake Water Users Association, and Duchesne County Water Conservancy District. This multi-agency participation ensured a successful project was accomplished.

SCA Crew

Construction work during the summer of 2007 consisted of preparation of the site by Student Conservation Association (SCA) crews prior to mobilization at the site by Reclamation Force Account Crew. The SCA crews were arranged and managed by the U.S. Forest Service.

The work consisted of the crews mobilizing to the site and establishing their camps. Once the camps were established the crews began moving downfallen timber off the upstream face of the dam and inlet channel. Cross-cut saws and axes were utilized to cut the timber into smaller sizes so the crews could manually move and stack into piles (which were burned at the end of the season by U.S. Forest Service fire crews). The inlet wheel house structure which included a gate, support, stem and wheel were dismantled and stacked for fly out later in the season.

The crews worked on demolishing the concrete inlet structure, which was necessary to remove entirely to the finished ground level. The crews used fires within the structure to heat the concrete, which stressed and cracked the concrete for easier removal. Sledgehammers and pry bars were then used to break up the structure into smaller pieces.

The crew moved riprap rock by hand and stockpiled for future use. The crews broke larger rock pieces into smaller sizes with sledgehammers to use for filling the gabion baskets and for filling gaps between larger riprap.

The crew established an area for the fuel containment area to be built. The crew built a wooden frame with hardware cloth attached for sieving filter sand to the required size for the outlet end of the pipe. The crews built gabion baskets and helped fill them with riprap. They mixed and placed cement into the voids between the riprap inside the gabion baskets.

Helicopter Fly-in

Equipment and materials were brought to the staging area adjacent to the Moon Lake Dam for loading by the helicopter contractor. The contractor was responsible for loading all equipment and materials to the helicopter. All material was safely flown to the work site at Clements Lake, except for a tractor bucket attachment that cut through support slings and dropped on the shoreline of Moon Lake. The attachment was recovered and replaced by the contractor.

Bureau of Reclamation Crew

A Bureau of Reclamation work crew consisting of three operators mobilized at the worksite and began moving equipment and materials into place from their fly-in locations.

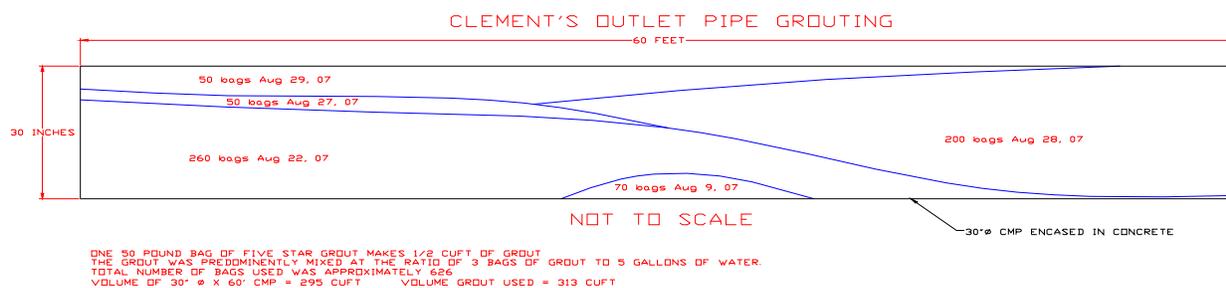
Excavation of the dam embankment was started on the upstream portion of the dam. It was quickly discovered that the backhoe attachment of the Challenger tractors were ineffective in

excavating material due to the limited reach and numerous set-ups required and their use for excavation was discontinued. The material was then primarily excavated with the mini-excavator along with some limited use of the front end bucket of the tractors. The front end bucket of the tractors was used to move and place riprap at the site. It was found that the high altitude reduced the power of the equipment and made the equipment more difficult to start at times in the morning.

Gabion baskets were utilized to establish grade control through the excavated breach. A trench was excavated in the bottom of the breach with the mini-excavator. The gabion baskets were placed in the excavated trench and filled with graded rock material. The graded rock material was then grouted with Five Star Grout and/or cement to fill the voids. The gabion baskets were then covered with riprap to conceal the appearance of the cement grout.

The outlet pipe through the dam was plugged at the downstream end with a gabion basket that was filled with riprap and grouted. Two grouting ports consisting of metal pipe were welded on the upstream and downstream ends of the pipe. An attempt was made to grout the pipe from the upstream end and allow the grout to flow down and fill the pipe. The first attempt was only partially successful because the Five Star grout, which contains a lot of sand in the mix, was segregating in the pump and hose, causing the grout pump to clog. More cement was added to the mix to enable the pump to be more effective at pumping the grout. Grouting was accomplished through five (5) separate grouting operations, as described below by Valton Mortenson, Ashley National Forest Engineer¹:

“The pipe has been grouted so that there are small if any voids in the outlet pipe. This was done by 5 different grout pours due to wrong type of pump, pump break downs, and insufficient labor force during the last grout pumping operations. This will create random cold joints. There is a presumed grout placement drawing attached to this document. The top of the grouted outlet pipe is approximately 1.5 feet below the channel and it was agreed that the grouted outlet pipe would have very little head on it.”



¹ Internal memorandum, 9-5-08, from Valton Mortenson, Ashley National Forest Engineer, to Mark Holden, Utah Reclamation Mitigation and Conservation Commission.

It is recommended that future grouting operations include the use of an additive to increase the grout flowability and not use a heavily-sanded cement product. Straight cement mix and water with a plasticizer additive (for flowability) is recommended.

Equipment

2 – Challenger Tractors with front end bucket and backhoe attachments.

1 – John Deere mini excavator

2 – Honda Generators

2 – Trash Pumps

2 – Concrete Mixers

1 – Grout Plant – Chem Grout - Self Contained

Miscellaneous Hand Tools - shovels, sledgehammers, pry bars, cross cut saws, axes

Diesel and Gasoline Fuel Containers

Detailed Crew Logs

Each crew kept detailed logs of daily and/or weekly progress. Data from those logs are summarized in Appendix A.

Photos



Figure 1 - SCA Crew along with Forest Service supervisors performed work at Clements Lake dam in 2007, including wheel and gate structure removal, log removal and piling, fuel containment area establishment, site rehabilitation and assisted in rock removal and riprap placement and the outlet pipe grout pumping operation.

Crew 1 (Back Left to Right) David Bakken (Green Shirt – White Pants), Dan Hausner (Wolf Print Shirt – Gray Shorts), Derek Link (Indian Pattern Shirt – Camo Shorts), and Josh Cowan (Light Blue Long-sleeved)

Crew 2 (Front and Back Right to Left); Kevin Prior (Front - Kneeling with Gray Cap), Rose Stoppels (Back - Brown Bandanna), Eric Carr (Back – Red Cap) and Mike Goodhue (Back – White Bandanna – Yellow Shirt)



Figure 2 - SCA students sitting in wheel house before removal.



Figure 3 - Student Conservation Association Student Rose Stoppels breaking up the remainder of the vault.



Figure 4 - The SCA used heat from burning logs removed from the shoreline to crack the vault and then break-up the materials with hand tools. Note start of excavation in the dam's embankment material. Riprap was stockpiled on both sides of the inlet channel for later use.



Figure 5 - The SCA used crosscut saws and axes (hand tools) to cut logs into manageable sizes in order to remove and pile them.



Figure 6 - SCA Crew No. 1 Rock Removal.



Figure 7 - SCA Crew No. 2 Rock Break Up.



Figure 8 - Challenger tractor being airlifted to worksite from Moon Lake staging site.



Figure 9 - KMAX Helicopter used to transport equipment to worksite.



Figure 10 - Reclamation work crew preparing to depart trailhead at Moon Lake for horseback ride to worksite.



Figure 11- – View of dam embankment prior to arrival of equipment.



Figure 12 - Equipment and materials layout at upstream face of dam after airlift.



Figure 13 - Dam inlet and upstream face of dam at the start of work.



Figure 14 - Fuel containment area. Forest Service Crew #2 Supervisor, Karin Harmon, in the background.



Figure 15 - Initial excavation through the dam. Tractor and mini-excavator are being used for excavation.



Figure 16 - Starting to widen bottom cut through dam embankment.



Figure 17 - Excavating middle cutoff trench.



Figure 18 - Installation of the downstream gabion basket cutoffs.



Figure 19 - Installation of the upstream cutoff wall.



Figure 20 – Rock filled gabion baskets.



Figure 21 - Gabion baskets after grouting voids.



Figure 22 - SCA Crew No. 2 Rip Rap Placement.



Figure 23 - View of inlet structure prior to backfilling with grout. Demolition was accomplished by heating structure with fire to weaken concrete and using hand tools to break up concrete around the pipe. Demolition performed by SCA crews.



Figure 24 - View of dam site during construction as breach and inlet lining is progressing.



Figure 25 - View of work area during outlet grouting operation. Note inlet channel remaining to be lined with riprap.



Figure 26 - View looking downstream through the excavated and rip rap lined breach. Note grout plant that was positioned to grout the outlet pipe.



Figure 27 - View of group discussing the completed stabilized breach through dam embankment.



Figure 28 - View of finished upstream inlet channel graded and lined with rip rap.



Figure 29 - Reclamation Camp, including cooking and personal sleeping tents.



Figure 30 - Reclamation camp equipment bundled for fly out.



Figure 31 - Piled logs were burned by crew members of the Forest Service Kings Peak Fire Use Module on the Duchesne Ranger District, Ashley National Forest in first week of October.

Appendix A

Work Crew Daily/Weekly Logs

Construction Log

Student Conservation Association (SCA) Crew

Date	Work Area/Description	Crew Size
6/16/07	logs at inlet	5
6/17/07	logs at inlet	3
6/17/07	wheel house	2
6/18/07	logs at inlet	3
6/18/07	wheel house	2
6/19/07	logs at inlet	3
6/19/07	wheel house	2
6/19/07	lay out new trail	2
6/21/07	cut out new trail	5
6/22/07	remove rock from downstream side	5
6/23/07	remove rock from downstream side	3
6/23/07	logs at inlet	2
6/25/07	logs at inlet	4
6/29/07	move rock to north end	4
6/29/07	wheel house	1
6/29/07	fuels area	2
6/30/07	widened downstream cut	3
6/30/07	move rock to north end	2
7/1/07	busted and move lakeside riprap	3
7/1/07	wheel house	2
7/2/07	busted and move lakeside riprap	3
7/2/07	wheel house	2
7/3/07	busted and move lakeside riprap	3
7/3/07	wheel house (done)	2
7/3/07	logs at inlet	2
7/12/07	silt fencing installed	2
7/12/07	help motorized with rip rap	3
7/12/07	clean up and inventory concrete	2
7/13/07	help motorized with riprap	2
7/13/07	inlet vault	2
7/13/07	cement in meadow	2
7/14/07	inlet vault	3
7/14/07	rehab meadow	2
7/15/07	inlet vault	2
7/15/07	sort material for gravel drain	1
7/15/07	build gabion baskets	2
7/16/07	grout gabion basket at outlet	5
7/16/07	rehab dam surface	3
7/17/07	logs at inlet	2
7/17/07	rehab dam surface	3
7/18/07	move rocks at coffer	

Clements Lake Construction Report

Date	Work Area/Description	Crew Size
7/25/2007	Hiking along the Brown Duck trail to Clements Lake Work Site	4
7/26/2007	Sorted rocks according to size for various projects 6" or less	4
7/27/2007	Assembled Gabion Baskets (10) and continue to sort and stack rocks Continued with rock gathering 1 1/2" & under for specific work project.	4 4
7/28/2007	Moved culvert & other scraps of iron to new location so area could be covered with dirt. Continue to gather 1 1/2" & under rocks Mike and Eric broke out some concrete	4
7/29/2007	Built sand/rock sifter and sifted sand and sorted rocks	4
7/30/2007	Moved sand & gravel to outlet and collected more 1 1/2" rock shoveled all the sand piles of sand & 1 1/2" and under rock into tractor bucket for outlet project. We ran short of rock so we gathered what as needed to finish the project.	4
7/31/2007	Loaded large rocks into loader and removed rocks from the side grade We removed all but very large rocks from the side grade of the outlet channel	4
8/1/2007	Hiking back from Clements Lake work site	4
8/8/2007	Hiking back to Clements Lake	3
8/9/2007	Mixed grout for culvers and loaded rocks for the side slope We started at 7:00 a.m. for a full day of mixing and pumping, however, there were problems with the grout consistency and the ability of the pumps to disburse the grout into the culvert. The work was halted after 70 large bags until a more suitable pump could be located and brought to the work site. The rest of the day was spent loading large rocks into the loader for the side cuts. We also taped the open bags of grout and put them back under the top for later use.	3
8/10/2007	We moved and loaded large rocks for the side slopes and put them in gabion baskets. We put in three gabion baskets and filled them with rocks. We moved rocks on side slope in order to produce greater thickness.	3
8/11/2007	We mixed grout for the gabion baskets and continued to move rocks where needed. We mixed 60 bags of grout and 1 bag of cement for 3 gabion baskets We loaded rocks to cover the wire and side slopes up to next row of gabion baskets.	3
8/12/2007	We put in the next row of 3 gabion baskets and filled them with rocks and closed them with wire. We mixed 30 bags of grout and poured into gabions We loaded rocks to cover wire and side slopes to the next row of gabions.	3
8/13/2007	We continued to move large rocks to cover the side cuts and channel. We put in the last row of gabions.	3
8/14/2007	We mixed and poured grout and cement in the last row of gabion baskets. We then covered the area with rocks. We mixed 75 bags of grout & 15 bags of cement for the last row of 3 gabion baskets. We started moving rocks to the gabion baskets to cover it but it started raining.	3
8/15/2007	We hiked back down the mountain	3

Bureau of Reclamation Crew

SHIFT #1

7-10-07	Fly-in
7-11-07	Set up camp
7-12 to 7-13-07	Riprap removal
7-14 to 7-19	Embankment excavation

SHIFT #2

7-24 to 7-30-07	Embankment excavation
7-31 to 8-1-07	Riprap placement in channel

SHIFT #3

8-8-07	Riprap placement in channel
8-9-07	Grout placement-aborted
8-10-07	Place 1 st grade control structure
8-11-07	Riprap placement in channel
8-12-07	Place 2 nd grade control structure
8-13-07	Riprap placement in channel
8-14-07	Place 3 rd grade control structure
8-15-07	Riprap placement in inlet channel

SHIFT #4

8-22-07	Grout placement. pump plugged after app. 100 bags
8-23-07	Repairing grout pump
8-24-07	Repairing grout pump
8-25-07	Grout placement
8-26-07	Final grout placement
8-27 to 8-29-07	Placed riprap

SHIFT #5

9-4 TO 9-7-07	Finished riprap
9-8-07	Pack up camp and fly out

Production rates for the equipment used on the job averaged 30 cubic yards per day for the embankment excavation and 20 cubic yards per day for the riprap placement.

Appendix B

Letters from U.S. Forest Service

and

State of Utah



Forest Service

Ashley National Forest

Supervisor's Office
355 North Vernal Avenue
Vernal, UT 84078

File Code: 2320

Date: October 17, 2007

MITIGATION COMMISSION
OFFICIAL FILE COPY

CLASSIFICATION _____
PROJECT _____
FOLDER _____ CONTROL _____

OCT 18 2007

Mark Holden
CUP Mitigation Commission
230 South 500 East
Suite 230
Salt Lake City, UT 84102-2045

CODE	INITIALS
MCO2	WJA

Dear Mr. Holden:

In the summer of 2007, Clements Lake dam was stabilized as planned. A 15-foot wide breach was cut through the maximum section of the dam next to the outlet pipe alignment for passage of the Maximum Inflow Design flood. The slopes were laid back on a 2:1 slope and the breach was completely rip-rapped. Three grouted gabion structures were installed on the bottom, on the breach, as grade control at elevations of 10,445.5, 10,444.75, and 10,444.0 respectively. The BOR operators also installed a rock control structure at elevation 10,446.5. The outlet pipe was trimmed, blocked at both ends and filled with grout during five different grout pours. There are non-continuous cold joints in the grouted outlet pipe because of difficulties encountered during the grouting operation. A filter drain was constructed around the downstream end of the outlet pipe to control any seepage which might occur. The dam and spillway were cleared of woody debris and will be left in place as a monument to the men who built it years ago.

The rock control structure and the grouted gabions are slightly higher than the inlet of the old outlet and they are lower than required for the design. The State of Utah has downgraded the dam to a "No Hazard" inactive structure on their inventory and they are no longer going to regularly inspect the dam. The work performed has eliminated the risk to property below the dam and the Forest Service agrees with the state's "No Hazard" rating.

The Forest Service appreciates the work of the Mitigation Commission, State of Utah, Moon Lake Water Users, Bureau of Reclamation, and the Central Utah Water Conservancy District on this project. We look forward to working with you for the successful completion of the High Lakes Stabilization Project.

Sincerely,

KEVIN B. ELLIOTT
Forest Supervisor





JON M. HUNTSMAN, JR.
Governor
GARY R. HERBERT
Lieutenant Governor

State of Utah
DEPARTMENT OF NATURAL RESOURCES

MICHAEL R. STYLER
Executive Director
Division of Water Rights
JERRY D. OLDS
State Engineer/Division Director

4 BR...
Clements
MITIGATION COMMISSION
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CLASSIFICATION _____
PROJECT _____
FOLDER _____ CONTROL _____
SEP 18 2007

CODE	INITIALS
MCO2	mbd

September 17, 2007

Mark Holden
CUP Mitigation Commission
230 South 500 East, Ste. 230
Salt Lake City, UT 84102-2045

RE: Clements Lake/UT00070 - Dam Removal

Mark,

On September 5, 2007, you rode into the Clements Lake Dam removal site to do a final inspection with representatives from the Moon Lake Water Users, the Bureau of Reclamation, Central Utah Water Conservancy District, the U.S. Forest Service and our representative from our Vernal Regional Office, Brad Weber. A large 15-17 foot wide breach had been cut through the maximum section of the dam next to the outlet alignment for passage of the Maximum Inflow Design flood. The slopes had been laid back on a 2:1 slope and the breach had been rippedraped completely with three grouted gabion sections serving as grade control in the breach channel. The outlet pipe had been trimmed, blocked on both ends and filled with grout on five different difficult pours, with a few random and non-continuous cold joints that should not promote seepage. A filter drain was constructed around the downstream end of the outlet pipe to control any seepage that could appear. The rest of the dam and spillway have been cleared and cleaned of debris and will be left in place as a monument of the men who built it years ago.

The upstream channel dug below the natural lake level has been filled. The final control elevation of 10445.5 was slightly higher than the old outlet and lower than we required during design. The breach is also slightly lower than the natural lake level, so this dam will be downgraded to a "No Hazard", Inactive structure on our inventory and we will cease our regularly scheduled dam inspections of this site. Water rights for the storage in Clements Lake must be moved down for storage in Big Sand Wash.

We appreciate all the heroic effort in completing this project in a difficult, sensitive location and trust that the lessons learned on this project can be transferred to the next dams to be stabilized and removed for this project. We look forward to working with you for the successful completion of this entire mitigation project.



1594 West North Temple, Suite 220, PO Box 146300, Salt Lake City, UT 84114-6300
telephone (801) 538-7240 • facsimile (801) 538-7467 • TTY (801) 538-7458 • www.waterrights.utah.gov

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UT00070
September 17, 2007

If you have any questions or comments, please do not hesitate to call Matt Lindon or myself at 801-538-7372.

Sincerely,



David K. Marble, P.E.
Assistant State Engineer, Dam Safety

DKM/mcl/jm

cc: Bob Leake, Vernal
Bill Self, USFS
Gene Shawcroft, CUWCD
Bruce Barrett, BOR
Randy Crozier, Moon Lake Water Users

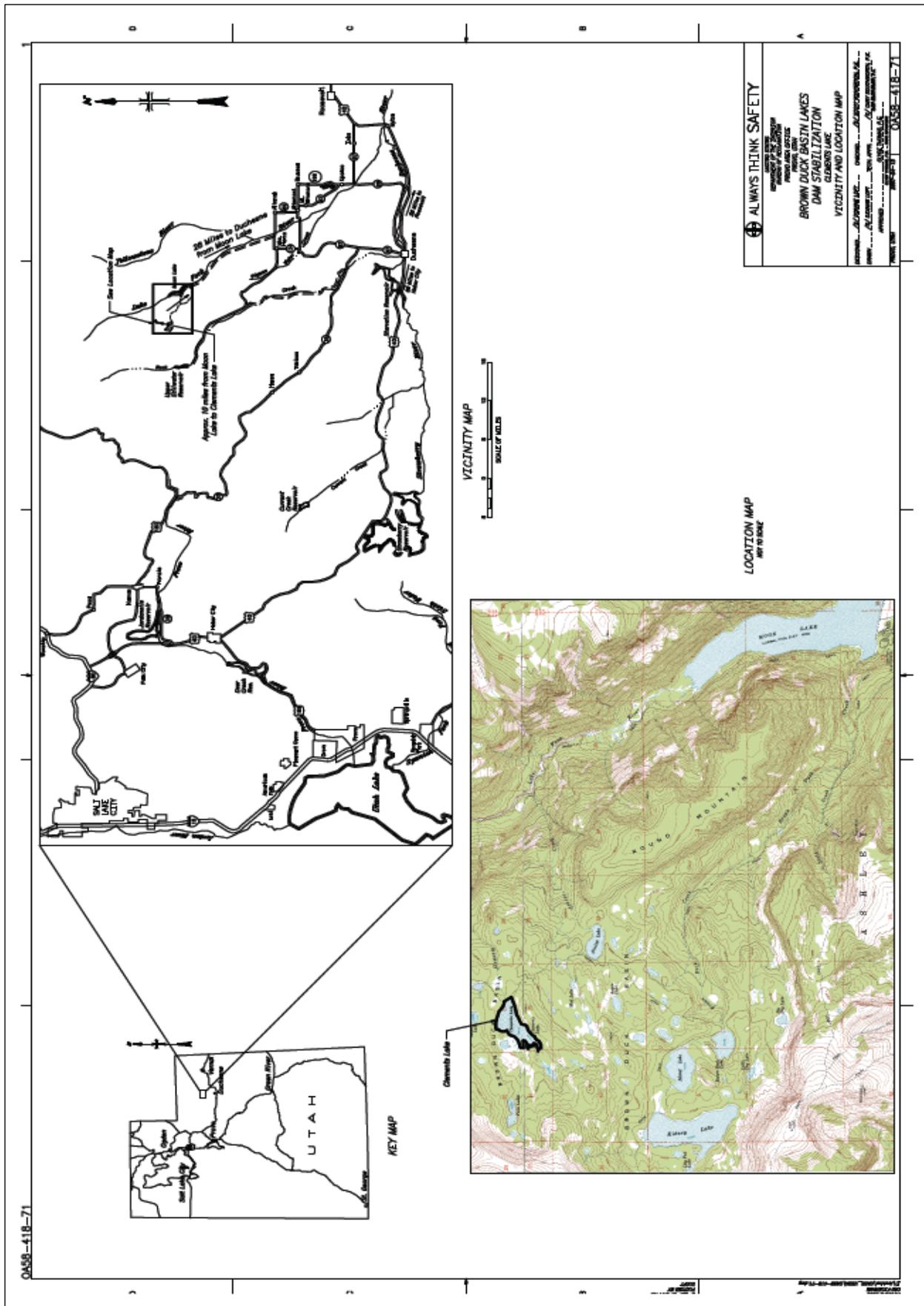


Clement's breach looking upstream.

Photo by Brad Weber

Appendix C

Construction Record Drawings



Appendix D

Historical Drawings

