RECLAMATION

Managing Water in the West

High Lakes Stabilization Construction Report

Uinta Basin Replacement Project

Garfield Basin

Five Point Lake, Bluebell Lake, Drift Lake, Superior Lake

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

January 2010

High Lakes Stabilization Construction Report

Uinta Basin Replacement Project

Garfield Basin

Five Point Lake, Bluebell Lake, Drift Lake, Superior Lake

prepared by

Provo Area Office
Upper Colorado Region

Contents

Page

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. Clements Lake, in the Brown Duck Basin was stabilized in 2007. The work accomplished in the Brown Duck Basin in 2008 was the stabilization of Island Lake and Brown Duck Lake.

This report includes work completed during 2009 to stabilize Five Point, Bluebell, Drift, and Superior lakes in the Garfield Basin. Contract record drawings showing location maps and applicable details for each of the lakes are included in the Appendices. For complete details on design analysis and methodology of the process used to stabilize these lakes, please refer to the High Lake Stabilization Technical Memorandum for Garfield Basin dated January 2009 by the Bureau of Reclamation, Upper Colorado Region, Provo Area Office.

Garfield Basin Construction

Construction Oversight

Construction oversight throughout the project was accomplished by multiple entities. The U.S. Forest Service, Department of the Interior, Utah Reclamation Mitigation and Conservation Commission, Utah Department of Natural Resources, U.S. Fish and Wildlife Service, Duchesne County Water Conservancy District, Central Utah Water Conservancy District, Utah Division of Water Rights, Moon Lake Water Users Association, and the Bureau of Reclamation (Reclamation) were involved in ensuring a successful project was accomplished.

It should be noted that all of the construction work on these four Garfield Basin Lakes (Five Point, Bluebell, Drift, and Superior) was done by the Duchesne County Water Conservancy District (DCWCD). The DCWCD crews set their base camp near Five Point Lake and started work on Five Point, Bluebell, and Drift concurrently. The DCWCD crews worked on Superior Lake after Bluebell and Drift Lakes were completed.

Helicopter Fly in

Equipment and materials were brought to the staging area at Mill Park 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 sites at each lake.

Figure 1: Columbia Helicopter used to transport equipment to worksite.

Figure 2: Helicopter picking up supplies to drop off at Five Point Lake.

Equipment

5 – Caterpillar 305C Trackhoes
3 – Caterpillar 287B Skid Steer Loaders
4 – Honda Generators; 4 – Trash Pumps
4 – Concrete Mixers; 1 – Grout Plant – Chem Grout - Self Contained
Miscellaneous Hand Tools - shovels, sledgehammers, pry bars, cross cut saws, axes, pedestal gate stand, sawz-all, pipe wrenches, diesel and gasoline fuel containers generator, arc welder, air compressor and power tools for equipment repair & assembly, 1 roll of fuel containment pond liner & 2 rolls of visqueen w/ nylon tarp cover (30' x 40') w/nylon reinforcement & 10 planks (4x4x12), hoses, fittings & nozzles (for trash pump, for flushing outlet pipe and serving as a grout plant back-up)

Figure 3: Equipment used at Garfield Basin.

Figure 4: Reclamation and DCWCD crew at Mill Park preparing equipment and supplies for fly in.

Five Point Lake Construction

Five Point Lake is located near the top of Garfield Creek. It had a surface area of about 87 acres at the existing spillway and held approximately 627 acre-feet of water. The dam was a homogeneous earthfill embankment with stone riprap facing. The dam was 15 feet high and has a 24-inch diameter low-level outlet pipe (62 feet long) located at the maximum section. There was a concrete-walled vertical shaft located on top of the dam; it extended from the top of the dam, down through the dam to the outlet pipe.

The outlet headworks was removed and the existing 24-inch pipe was grouted shut. A breach was constructed to restore the outlet flows from Five Point Lake to its natural drainage. A summary of the work completed is given herein and a copy of the crew's daily log is included in Appendix A.

June 18-June 20 Activities at Five Point Lake began on Thursday, June 18th, 2009. The Duchesne County Water Conservancy District (DCWCD) crew hiked in and set up camp and put up containment cover for the fuel tanks. Equipment and supplies were flown in successfully by the Helitech crew.

Figure 5: Crew clearing snow from spillway at Five Point.

June 21-June 27 The DCWCD crew continued work on Five Point on Monday, June 22nd by removing riprap from the upstream and downstream faces of the dam and collecting rocks for the gabion baskets. The crew also started excavation of the breach and removed the headgate and upper portion of the concrete wet well.

Figure 6: Crew cutting the breach through the Five Point dam.

Figure 7: Skid Steer and trackhoe used to make the cut.

June 29-July 4 Survey staking indicated differences in elevations from the design. Randy Crozier, DCWCD General Manager and construction foreman, contacted Valton Mortenson regarding the break in elevation compared to the design drawings at Five Point Lake. The actual elevation as surveyed and staked in the field for the bed of the existing outlet channel was ~ 0.8 feet lower than was shown on the design drawing. To make up for this drop, Randy proposed to lower the elevation of the middle and lower gabions by 0.8 feet. This would preserve the slope between the middle and lower gabions, but would increase the slope between the upper and middle gabions. Valton contacted Cary Southworth and Scott Winterton at USBR to discuss this

proposal. Scott analyzed the change in slope due to the proposed drop in elevation of the middle and lower gabions, and determined the slope would still be less than 5 %. This would stay within the design criteria we had established as a target to ensure fish passage. Also, the riprap sizing for the entire outlet channel was calculated based on the highest slope (between the middle and lower gabions) on the initial design. This slope is staying the same. They concluded that the riprap sizes identified in the design would be adequate to protect the outlet channel if the revisions were made. Scott Winterton discussed this with Everett Taylor, Utah Division of Water Rights, on June 30, 2009, and Everett concurred with the proposed design change.

Valton Mortenson visited the site July 1-3 for an inspection. During the inspection, Valton reviewed the elevation markings and verified that the elevation marked on the upstream stakes and the downstream stakes did not tie out; there was a 3 foot elevation bust. He assumed this occurred because the downstream portion of the dam was staked while covered by a snow drift. The breach channel had been shifted to the right hand side by 3.5 feet to help lengthen the channel. The downstream gabion was shown on the drawing to be in the existing outlet channel. It was impossible to install it in this location due to the amount of water, so it was installed at Sta 1+10. The downstream portion of the gabion is at Sta 1+10 and the upstream portion at Sta 1+07. This gabion was installed after placing a temporary coffer dam at the inlet. The elevation of the top of gabion is 10,991. The gabion was installed in several lifts by placing a layer of gabion rock and then a layer of cement and having hand crew with muck boots mix everything together to fill all the voids. They used 67 bags of 47 pound cement. This type of cement placement eliminates voids but it uses more cement. Figuring a 6-bag mix, the crew made 5.5 cubic yards of cement for the gabion. The estimates were to use approximately 4 cubic yards of cement for the gabion. The middle gabion was moved upstream to Sta 0+60. This was done so that it could be set in the breach of the dam section and not near the outlet pipe headwall. At Sta 0+70 where the gabion was called for, the removal of the outlet pipe headwall would have removed all of the soil on the left hand side of the gabion. The gabion was placed at elevation 10,993.73. The gabion was installed just like the downstream gabion. The upstream gabion was lowered to elevation 10,996. This provides a 4.5 percent slope for the breach channel. The elevation of 10,996 also fits the old lake level better as this elevation corresponds with the top of the rock ring of the pre-dam lake. The Crew set top of control gabion at 10,996.0 as approved, with top of riprap at 10,997.0. Valton Mortenson arranged a conference call among the parties to discuss the in-field adjustments that had been made. This discussion occurred and the changes were approved.

NOTE: The as-built survey was conducted after the project was complete. The survey data indicates the stabilized elevation is 10,998.0 feet, where the design designated an elevation of 10,997.0 feet. Based on the WMS SMPDBK model for Five Point Lake established by Reclamation engineers, the maximum breach flow was designed to be 450 cfs with the anticipated maximum depth in the channel downstream of the dam equal to 3.9 feet. By increasing the breach elevation to 10,998.0 feet, as currently constructed, the maximum breach flow would be 566 cfs with the corresponding maximum depth downstream of the dam equal to 4.3 feet. The anticipated increase in flood depth between design and construction is 0.4 feet. According to the digital elevation model (DEM) utilized in the WMS SMPDBK analysis, the increase in breach flow would not appear to result in significant additional environmental impact. It is important to note DEM's available for remote areas such as this have limited resolution making it difficult to clearly delineate small mountain streams. The maximum depth section

appears to be a small length of the stream in a narrower reach of the channel. The majority of the output file from the SMPDBK analysis indicates the maximum depths are 2-3 feet. In wide, flat, meadow areas, the difference in flow depths for 450 cfs to 566 cfs would be less than 0.4 feet and Reclamation's opinion is the anticipated additional impact would be negligible. The Utah State Division of Water Rights concurs with this assessment, and Five Point Lake Dam is regarded as a "No Hazard" dam and will be removed from the State's active inventory.

Figure 8: Crew using trackhoe to remove outlet works at Five Point.

Figure 9: Removing inlet structure at Five Point.

Figure 10: Installation of the middle cutoff wall at Five Point.

Figure 11: Grouting operation with DCWCD hand crew for cutoff walls.

Figure 12: Five Point Lake Dam breach looking downstream with the gabion cutoff walls in place.

July 6-July 11 Work continued at Five Point; the crew moved old equipment to the flight deck and removed wire from the old spillway. All old equipment was photographed, and inventoried for later disposition according to the Memorandum of Agreement for cultural and historic resources. The crew also continued gathering riprap. The Forest Service arrived on July 10th and set up a safety hut for the crew.

Figure 13: Old equipment to be flown out.

July 12-July 18

Work continued at Five Point Lake. The DCWCD crew installed temporary and permanent coffer dams, and removed the inlet structure using a hydraulic stinger attachment. The crew also removed the concrete box culvert on the upstream end. They finished removing the downstream headwall and grouted the outlet pipe and old wet-well. The grouting required 420 bags (47 lbs each) of Type I Cement powder, mixed with water and Super-P. The crew started cleaning up and broke down the grout plant. They also removed wire from old spillway, and continued to riprap the channel.

Figure 14: Inlet structure being removed using a stinger attachment.

Figure 15: Installing gabion basket at outlet pipe prior to grouting.

Figure 16: Grouted outlet pipe with sand filter in place.

July 19-July 25 The DCWCD crew continued to riprap the channel until it was all completed and worked on naturalizing the old lake shore basin and washed fines into the new outlet channel.

Figure 17: Breach channel prior to placing riprap.

Figure 18: Crew placing riprap in the channel using mini-excavator.

Figure 19: Hand crew washing fines into new outlet channel.

July 26-Aug. 1

Activities continued at Five Point with Dex Winterton coming in to relieve Randy Crozier on Sunday, July 26th. The DCWCD crew finished up their work and started clean-up and packaging materials and equipment for fly out. They also did some dress up and rehabilitation work in the areas where the riprap was removed. Old equipment that was onsite was repackaged and bundled for fly out. The crew left one Fresno scraper and a roller on the dam for historical purposes.

Figure 20: Rehabilitation of Five Point Lake.

Aug. 2-Aug. 8

Final Inspection was conducted on Aug. 6th, 2009 for Five Point with the following people present: Bob Leake and Brad Weber (Utah Division of Water Rights), Valton Mortenson and Brian Paul (U.S. Forest Service), Scott Winterton (U.S. Bureau of Reclamation), and Hailey Crozier and Dex Winterton (DCWCD). The inspection crew found the Five Point Lake work to be satisfactory. They asked the crew to remove the stakes and flags as well as turn over painted rocks so the public doesn't notice any paint on the rocks. The hand crew worked on re-packaging and arranging the tool house for fly out.

Figure 21: View of finished channel at Five Point graded and lined with riprap.

Figure 22: View of finished channel at Five Point from top gabion, looking downstream.

Bluebell Lake Construction

Bluebell Lake is also located near the top of Garfield Creek. Bluebell Lake Dam was constructed in 1930 by Farmers Irrigation Company to improve late season water storage in the High Uintas. It had a surface area of about 48 acres at the existing spillway and held

approximately 235 acre-feet of water. The dam was a homogeneous earthfill embankment with stone riprap facing. The dam was 8 feet high and had 24-inch diameter low-level outlet pipe (22 feet long) located at the maximum section. The outlet pipe was slip-lined with a smaller diameter High Density Poly Ethylene (HDPE) pipe in the late 1980s. The void between the 24-inch diameter pipe and the inner HDPE pipe was filled with grout.

The outlet headworks and the existing 24-inch pipe was removed. A breach was constructed along the original outlet alignment to restore the outlet flows from Bluebell Lake to its natural drainage. A summary of the work completed is given herein and a copy of the crew's daily log is included in Appendix A.

June 21-June 27 — Construction activities at Bluebell Lake began on Tuesday, June 23rd, 2009. The DCWCD crew hiked from base camp near Five Point every day to work on Bluebell. The DCWCD crew removed the headgate and excavated main embankment to the top of pipe and removed section of old CMP pipe using a combination of hand tools and mechanized equipment. The crew moved pipe pieces into a pile ready for fly out.

Figure 23: DCWCD crew removing headgate.

Figure 24: Crew removing outlet pipe.

June 29-July 4 The DCWCD crew resumed work at Bluebell on Monday by placing an earthen coffer dam and removing the outlet pipe and head structure. The breach grade was rebuilt using rock sills. The crew continued constructing the main channel and placing riprap in the channel.

Figure 25: Crew installing rock sills at Bluebell Lake.

Figure 26: Hand crew assisting with breaking up concrete structure with sledge hammers which was proven ineffective, so they used the stinger attachment to get the job done. Bluebell Lake.

July 6-July 11

The crew continued working on Bluebell on July 6th with the placing of riprap and washing fines in the channel. They also loaded scrap metal, headgate, and outlet pipe on deck ready for fly out. The hand crew piled all slash to be burned and loaded the tool house on the containment deck and packaged deck for fly out.

Figure 27: Looking upstream to the finished channel w/ riprap in place.

July 12-July17 — On July 15th, Valton Mortenson and Randy Crozier inspected the completed work.

Aug. 2-Aug. 8 — The final inspection for Bluebell Lake was conducted on August 5th with the following people present: Bob Leake and Brad Weber (Utah Division of Water Rights), Valton Mortenson and Brian Paul (U.S. Forest Service), Scott Winterton (U.S. Bureau of Reclamation), and Hailey Crozier and Dex Winterton (DCWCD The inspection crew found the work at Bluebell Lake to be satisfactory with some minor items the crew needed to take care of before hiking out.

The crew needed to remove a sand bag, one piece of concrete, wooden stakes and flagging before fly out. The crew also needed to rake out some trackhoe ruts in the meadow.

Final work was completed on Aug. 7th when crew members rehabilitated the meadow and cleaned up micro litter.

Drift Lake Construction

Drift Lake is also located near the top of Garfield Creek. It had a surface area of about 31 acres at the existing spillway and held approximately 158 acre-feet of water. The dam was a homogeneous earthfill embankment with stone riprap facing. The dam was 12 feet high and had a 24-inch diameter low-level outlet pipe (44 feet long) located at the maximum section. The outlet pipe was slip-lined with a smaller diameter HDPE pipe in the late 1980s. The void between the 24-inch diameter pipe and the inner HDPE pipe was filled with grout.

The outlet headworks was removed and the existing 24-inch pipe was also removed. A breach was constructed to restore the outlet flows from Drift Lake to its natural drainage. A summary of the work completed is given herein and a copy of the crew's daily log is included in Appendix A of this report.

June 21-June 27 — Construction activities at Drift Lake began on Tuesday, June 23rd, 2009. The DCWCD crew hiked in from base camp and worked on removing the headgate. The crew put containment covers over fuel tanks and worked on removing the snow drift from below the dam. Two trackhoes were used to remove rocks and excavate the breach.

Figure 28: Crews working to remove the snow drift below dam at Drift Lake.

Figure 29: Fuel containment area and safety hut. Drift Lake.

June 29-July 4 — Work at Drift continued after a Sunday off. The crew verified grades and finished constructing main channel and placing riprap. Valton Mortenson rode in on July 1st and the crew discussed grades to make sure it worked with existing conditions.

Figure 30: Crew working on removing riprap from existing channel.

Figure 30: Crew cut through dam and removed the outlet pipe.

July 6-July 11 The crew continued work at Drift on July 6th by cutting the final grade and putting in a permanent coffer dam. Crew also removed outlet pipe using stinger attachment on trackhoe. The hand crew continued placing riprap and washed fines into the channel. They also piled all slash to be burned and loaded old equipment on deck and packaged for fly out.

Figure 31: Crew cutting final grade.

Figure 32: Temporary coffer dam put in place to control water flow.

Figure 33: Crew used trackhoe to remove the outlet pipe.

July 13-July 18 Valton Mortenson and Randy Crozier inspected the work on July 15th and discussed additional work to be done at Drift. The crew worked on finishing the outlet channel, placing riprap and shaping the entrance side slopes with two trackhoes.

Figure 34: Rock sills placed in channel.

Figure 35: Rock sills in place.

July 20-July 25 Work continued at Drift Lake with the DCWCD crew placing riprap at the channel and slopes using two trackhoes. Other crew members moved supplies to the south side of the cut in the dam.

Figure 36: Crews continue to place riprap along the sides of the new outlet channel.

July 27-Aug. 1 Activities at Drift continued on July 27th. The crew finished sealing up channel seepage and did some clean-up and dressed-up channel. The

hand crew packaged for fly out and cleaned up area by cutting and gathering angle irons and scrap metals. Other crew members worked on gathering drift wood and other organic materials to place in burn pile.

Figure 37: Looking upstream on the completed breach channel at Drift Lake.

Aug. 2-Aug. 8

The final inspection for Drift Lake was conducted on August 5th with the following people present: Bob Leake and Brad Weber (Utah Division of Water Rights), Valton Mortenson and Brian Paul (U.S. Forest Service), Scott Winterton (U.S. Bureau of Reclamation), and Hailey Crozier and Dex Winterton (DCWCD). The inspection team found the work at Drift Lake to be satisfactory. The crew did final cleanup by turning over painted rocks and cleaning up the micro litter.

Figure 38: Looking downstream through the completed breach channel at Drift Lake.

Superior Lake Construction

Superior Lake is located near the top of Garfield Creek. It had a surface area of about 38 acres at the existing spillway and held approximately 320 acre-feet of water. The dam was a homogeneous earthfill embankment with stone riprap facing. The dam was 15 feet high and has a 20-inch diameter low-level outlet pipe (38 feet long) located at the maximum section.

The existing outlet channel from Superior Lake is diverted from its natural channel about 0.2 miles downstream of Superior Lake Dam, and a small canal conveys the water into Five Point Lake. As part of the stabilization project, the channel was rehabilitated to restore the outlet flows from Superior Lake to its natural drainage.

June 21-June 27 — Construction activities at Superior Lake began on Sunday, June 21st, 2009. The DCWCD crews put in a temporary diversion and backup dam in the old canal.

June 29-July 4 — The DCWCD hand crew replaced the temporary cutoff dam and began removing gabions from the old spillway.

July 6-July 11 — Work on Superior Lake continued on Tuesday, July 7th with the DCWCD hand crew continuing to remove gabions and membrane from the old spillway.

Figure 40: Hand crew removed gabions from old spillway.

July 13-July 18 — Construction continued on Superior Lake on Wednesday, July 15th. Valton Mortenson and Randy Crozier discussed and verified the location for the stream reconnects.

July 19-July 25 — Activities at Superior Lake resumed on July 20th. The hand crew collected rocks for gabion cutoff walls using wheelbarrows. The crew completed three stream reconnects on the way to Superior and moved 1 trackhoe, 1 skid steer, grout plant, hydraulic hammer, and a 30 inch bucket from Five Point to Superior Lake. The crew worked on removing riprap and wired the headgate open and cut the stem. The hand crew removed the old gate operator and cut off additional stem length on the outlet works. The other crew members laid out upstream gabion location and determined old lake elevation and grades as per the plans.

Figure 41: Outlet channel prior to construction.

Figure 39: Crew cutting through dam at Superior Lake.

Figure 40: Completed breach prior to placing gabion cutoff walls and riprap.

July 26-Aug 1

Construction continued at Superior Lake with Randy Crozier riding in on Sunday to replace Dex Winterton as supervisor. The crew started cutting through the dam with the trackhoe and skid steer, while other crew members screened filter sand. The gabion cutoff wall was placed and the crew verified location with Valton Mortenson and Randy Crozier. The crew set up the safety shower and continued removing material from the cut. The hand crew constructed three 3x3x9 feet gabion baskets for the cutoff walls. They also piled driftwood and organic material at the burn pile. A temporary coffer dam was constructed to slow the flow of water.

Figure 41: Placing of cutoff wall at top of breach.

Figure 42: Grouting operation for the gabion cutoff walls.

Figure 43: Grouted middle cutoff wall in place with forms removed.

Figure 44: Placing riprap after cutoff walls were in place.

Aug. 3-Aug. 8

Work continued at Superior Lake on Monday, August 3rd . The crew placed a permanent coffer dam and removed the headgate and about 10 feet of the outlet pipe on the upstream end.

The crew installed a 3x3x3 gabion on the upstream side of the outlet pipe and a 3x3x6 foot gabion at the downstream side of the outlet pipe to assure a solid connection to the outlet pipe. The outlet pipe grouting

operation started on August 5th and the crew quickly learned that the outlet pipe had several holes in it which required extra cement bags to fill. Bob Leake and Brad Weber rode to Five Point to carry 40 leftover bags of cement back to Superior Lake using their pack horses, enabling the crew to fill the Superior outlet pipe. The calculated volume of cement needed to grout the outlet pipe was 140 bags, when all was completed the crew used 189 bags of cement (47 pounds each) to fully grout the outlet pipe. Filter sand and gravel was installed at the downstream side of the lower outlet gabion to bedrock.

The crew placed the middle and upstream gabion walls on Tuesday. They did not encounter bedrock at these locations. The crew used 68 bags of 47 pound cement for the upstream gabion and also for the middle gabion.

The inspection team stopped by on August 5th and determined that the upstream gabion wall was too narrow on one side. The inspection team directed the DCWCD crew to chip out a 9 foot section of the gabion on the right hand side and extend the flat portion to the specified length of 15 feet. The crew removed 9 feet of the front gabion on the west side as directed and re-installed it.

Figure 45: Hand crew cutting off a portion of the outlet pipe prior to grouting.

Figure 46: Removing the upstream portion of the outlet pipe.

Figure 50: Grouting operation underway for plugging the outlet pipe.

Figure 47: Crew sealed outlet pipe by placing 3'x3'x3' gabion basket filled with rock and grout on the upstream side of the outlet pipe.

Figure 48: Sand filter in place at plugged outlet.

Aug. 10-Aug. 15 Construction resumed at Superior Lake after a Sunday off. Dex Winterton rode out and Randy Crozier came in to supervise the work. The hand crew washed fines into the channel while other crew members continued to riprap the channel. Some crew members started breaking down camp and packed materials and supplies for fly out.

Final inspection of Superior Lake was completed on Aug. 13th with the following people present: Valton Mortenson (U.S. Forest Service), Bob Leake and Brad Weber (UtahDivision of Water Rights), and Randy Crozier (DCWCD). The inspection team noted with appreciation the good work done by the DCWCD crew. There were a few items that the team wanted done and all the items were completed that same day. The stream reconnection between Superior Lake and Five Point was completed to the satisfaction of the inspection crew and the Forest Hydrologist, Mark Muir.

Figure 49: New breach at Superior Lake after work was completed.

With all four dams stabilized, the DCWCD crew finished breaking down main camp, packaged everything ready for fly out and rode out on August 16th, 2009.

The Duchesne County Water Conservancy District crew stabilized Five Point, Bluebell, Drift, and Superior in eight weeks.

Appendix A – Crew Daily Logs

Duchesne County Water Conservancy District Crew Daily Log

Date	Work Area/Description
6/17/2009	Flew all supplies and equipment to kidney
6/18/2009	Flew all supplies and equipment to Garfield basin lakes
6/19/2009	DCWCD crew rode in and set a partial camp
6/20/2009	Safety meeting Crew continued setting camp Five Point Lake - put containment cover over fuel tanks *snowed and rained all day
6/21/2009	Safety meeting Superior Lake - Put in a temporary diversion dam in old canal *snowed all day
6/22/2009	Safety meeting Five Point Lake - stripped riprap from up and downstream faces - 2 trackhoes - collected 25 yards of gabion rock - constructed gabion baskets Superior and Drift Lakes - Put containment covers over fuel tanks Finished setting camp
6/23/2009	Safety Meeting Five Point Lake - started main excavation of cut - 1/3rd of the yardage removed - 2 skids and 2 trackhoes - stock piled material Bluebell Lake - removed head gate - built containment basin - put up latrine - excavated main embankment to top of pipe and removed a portion of old cmp top pipe sections - 1 trackhoe Drift Lake - removed head gate
6/24/2009	Safety Meeting Five Point Lake - built sand screen and screened about 4 yards of sand - excavated 200 yards material from cut - *1 trackhoe 2 skids - removed headgate and upper portion of concrete wet well Drift Lake - dug out snowdrift below dam (180 yards) - 2 trackhoes - started pulling riprap (60 yards)
6/25/2009	Safety Meeting

Five Point
- sorted 3 yards of filter sand
- continued main embankment cut (200 yards)
- resolved elevation differences with Valton

Drift Lake
- continued to remove rock
- 2 trackhoes

Bluebell Lake
- handcrew moved pipe pieces for fly out

Superior Lake
- put in a back-up dam in old canal

6/26/2009 Safety Meeting

Five Point
- busted concrete structure with stinger
- 2 trackhoes 4 handcrew
- “rain day”
- gathered wood at camp
- moved latrines

6/27/2009 Safety Meeting

Five Point
- continued removing material and shooting grades of cut
- 2 trackhoes 2 skids
- removed headgate from center of dam
- cut steel rebar from concrete for disposal
- gathered more riprap
- moved old equipment to the dam

Drift Lake
- continued to remove rock in cut of dam
- 2 trackhoes 2 hand crew

6/28/2009 Sunday Off

6/29/2009 Safety Meeting

Drift Lake
- verified grades and continued to excavate
- 2 trackhoes 2 hand crew

Bluebell
- placed earthen coffer dam
- removed outlet pipe and head structure, used hydraulic hammer, steel and hdpe
- started re-building grade with rock seals
- Hand crew assisted with excavation and reconstruction
- 1 track hoe 7 hand crew

6/30/2009 Safety Meeting

Bluebell Lake
- finished constructing main channel and riprap
- 1 trackhoe 2 handcrew

Drift Lake
- continued excavation
- 2 trackhoes 2 handcrew
- hydraulic hose broke on trackhoe

Five Point Lake
- removed rebar from old spillway crest

- started removing wire from existing spillway
- constructed road to cement mixer
- 1 skid 4 handcrew

Superior

- re-placed temporary cutoff dam – handcrew

7/1/2009 Safety Meeting

Five Point Lake

- Cut final grade
- 2 trackhoes 2 skids

Superior

- started to remove gabions in old spillway (8 hand crew)
- *Valton came in

7/2/2009 Safety Meeting

Five Point

- poured downstream gabion
  - 67 bags cement
  - 2 skids, generator, mixer, all crew
- put in temporary cofferdam upstream

Bluebell and Drift Lakes

- talked about final grades

7/3/2009 Safety Meeting

Five Point

- dug and poured center gabion
  - 2 skids, generator, mixer, all crew
  - 65 bags concrete

Drift Lake

- fixed broken line on track hoe

Five Point Lake

- welded shank and fixed bucket
- set top elevation to 10996 at top of gabion (Valton approved)

7/4/2009 Safety Meeting

- dug and poured upstream gabion
  - 2 skids, generator, mixer, all crew
- started collecting riprap from old lake bed area
  - 1 trackhoe

7/5/2009 Sunday Off

7/6/2009 Safety Meeting

Bluebell Lake

- finished placing riprap in channel
- washed fines into channel – hand crew and 3” pump
- piled all slash to burn
- Loaded scrap metal, headgate, and outlet pipe on deck
- Loaded tool house on containment deck and packaged deck to fly
- Dismantled toilet and filled hole

Drift Lake

- continued cutting final grade
  - 2 trackhoes

Five Points

- continued gathering riprap
  - 2 trackhoes

Drift Lake
- continued cutting final grade
  - 2 trackhoes
- put in permanent coffer dam
- removed outlet pipe
  - used stinger on trackhoe to remove

concrete structure
- started placing rock seals in channel

Superior Lake
- continued removing gabions from old spillway – hand crew

7/8/2009 Safety Meeting

Five Point Lake
- continued gathering riprap
  - 2 trackhoes

Superior Lake
- continued removing gabions from old (hand crew)

Drift Lake
- continued placing riprap and fines in channel (2 trackhoes)
- began cutting outlet pipe into smaller pieces for fly-out

7/9/2009 Safety Meeting

Five Point Lake
- continued gathering riprap (2 trackhoes)

Superior Lake
- continued removing gabions from old spillway (hand crew)

7/10/2009 Safety Meeting

Five Point Lake
- continued gathering riprap (2 trackhoes)
- forest service set up safety hut

Drift Lake
- continued to riprap and place fines in channel (2 trackhoes)

Superior
- Continued removing gabions and membrane from old spillway (hand crew)

7/11/2009 Safety Meeting

Five Point Lake
- continued gathering riprap (2 trackhoes)
- mechanic work on trackhoes (kryto claws)

Drift Lake
- washed fines into channel bed (hand crew)
- turned over painted rocks

7/12/2009 Sunday Off

7/13/2009 Safety Meeting

Five Point Lake
- put in temporary and permanent coffer dams
- removed inlet structure
  - used hydraulic stinger on trackhoe
- repaired equipment (kryto claw)
- poured inlet gabion – hand crew and 2 skidsteers
- set up safety shower and eye wash station
- dug out downstream headwall – 1 trackhoe
- removed 4 ft of pipe downstream end

- removed 10 feet of concrete box culvert upstream end

*Dex and 3 crew members rode out

7/14/2009 Safety Meeting

Five Point Lake

- finished breaking out downstream headwall- used (hydraulic hammer and trackhoe)
- constructed the lower rock ring cutoff
- riprapped part of dike and rehabilitated (2 trackhoes 2 skids)
- re-graded lower sections of channel
- filled part of the old outlet channel upstream
- poured gabion on the end of downstream pipe (hand crew)
- put in sand and gravel filter downstream
- set up grout pland and 4 inch pump
- 2 inch pump quit running – mechanic on no luck
- Removed and cut rebar and steel from downstream headwall and upstream concrete and old wet well

*Valton came in and reviewed site with Randy

7/15/2009 Extensive Safety Meeting

Five Point Lake

- grouted outlet pipe and old wet-well
  - 416 bags of concrete and 1 skid
- disposed of cut rebar from concrete into grout
- filled part of existing channel downstream
- placed select fill in front of upstream gabion
- riprapped lake side of gabion (2 trackhoes 2 skids)

Superior Lake

- Valton and Randy discussed and verified location for stream reconnects

Drift Lake

- Valton and Randy discussed additional work to be completed

Bluebell Lake

- Valton and Randy looked over the work done

7/16/2009 Safety Meeting

Five Point

- cleaned up and broke down grout plant (hand crew)
- removed wire from spillway
- packaged up trash
- worked on filling and building old inlet and outlet channels riprapped (2 trackhoes 2 skids)
- set up drinking water facility and pump at spring (other spring closer to camp went dry)

Drift Lake

- finished outlet channel
- riprapped and shaped entrance side slopes (2 trackhoes)
  - track came off on trackhoe and was put back on

7/17/2009 Safety Meeting

Five Point Lake

- filled in the rest of downstream embankment
- began to riprap channel (2 trackhoes 2 skids)
- some clean up
- Loaded historic equipment and scrap metal onto flight deck
- Filled in old wet well and finished grade up the east slope

- handcrew took forms and sand screen to superior

*Randy and Julie rode out

7/18/2009 Safety Meeting

Five Point

- riprapped southeast face and channel (2 trackhoes 2 skids)
- started doing re-hab on the lake shore with pump and hand crew
- cleaned up around lake

7/19/2009 Sunday Off (Randy and Julie rode in)

7/20/2009 Safety Meeting

Five Point

- continued to riprap channel, slopes and berms (2 trackhoes 2 skids)
- put in silt fence along shore line
- Hand crew assisted equipment to naturalize lake shore where it was used as a borrow area to collect riprap

Drift

- continued to place riprap at drift (2 trackhoes)

7/21/2009 Safety Meeting

Five Point Lake

- continued to riprap channel and slopes (2 trackhoes 2 skids)
- continued naturalizing old lake shore basin
- washed fines into the new outlet channel

Drift

- continued to riprap the channel and slopes
- moved supplies to south side of cut in dam

7/22/2009 Safety Meeting

Five Point Lake

- continued to riprap channel (2 trackhoes 2 skids)
- built dirt berm on upstream east side of channel
- hand placed riprap in channel

Superior Lake

- hand crew collected gabion rock (used wheelbarrows)

7/23/2009 Safety Meeting

Five Point Lake

- continued to riprap channel (2 trackhoes 2 skids)
- gathered more riprap
- hand crew washed fines into channel

Superior Lake

- hand crew continued gathering gabion rock

7/24/2009 Safety Meeting

Five Point

- continued to riprap the channel (2 trackhoes 2 skids)
- continued re-hab at old lake basin with 4” pump

Superior

- Completed three stream reconnects on the way to Superior (1 trackhoe, 3 hours)
- Moved 1 trackhoe 1 skid, grout plant, hydraulic hammer, and 30 inch bucket to Superior Lake– left 9:30a.m., used trail
- started removing riprap
- wired headgate open and cut stem and hand crew removed old operator

7/25/2009 Safety Meeting

Five Point Lake

- rehabilitated with 1 trackhoe and 1 skid
- finished riprap
- continued washing fines into channel
- hand crew used rock bars to seal channel bottom
- continued rehabilitating the area with 4” pump

Superior
- continued removing riprap
- cutoff additional stem on outlet works
- dug back to large seepage collar on upstream end of pipe (12 feet back 3 feet thick)
- laid out upstream gabion location
- Determined old lake elevation and grades as per plan

7/26/2009 Sunday Off (Randy road out and Dex came in)

7/27/2009 Safety Meeting

Five Point Lake
- did some dress up and rehabilitation with trackhoe

Superior Lake
- began making cut through the dam (1 trackhoe 1 skid)
- screened 4 yards of filter sand – hand crew
- verified front gabion

Drift Lake
- finished sealing up the channel seepage
- did some clean-up and dressed up the channel (2 trackhoes)

7/28/2009 Safety Meeting

Drift Lake
- Hand crew packaged for fly-out and cleaned up the area
- gathered and cut angle iron and scrap metal

Superior
- continued rough cut through dam and slopes
- continued screening filter sand and gravel
- moved gabion and verified with Valton and Randy

7/29/2009 Safety Meeting

Five Point Lake
- more clean-up and packaging
- took down safety shower and fs safety cabana

Superior Lake
- set up safety shower
- continued removing material from cut (1 trackhoe, 1 skid)
- screened 5 yards of sand
- compressed wire from old gabions and membrane from old spillway for fly-out
- gathered drift wood and other organic material and placed in burn pile
- hand crew constructed 3-3x3x9 gabion baskets
- hand crew cut more wood and moved outhouses

7/30/2009 Safety Meeting

Superior Lake
- dug out and poured upstream gabion (1 trackhoe 1 skid, mixer, 3” pump; 64 bags of concrete)
- filtered water for safety shower

7/31/2009 Safety Meeting

Superior Lake

- continued removing material from cut (1 trackhoe 1 skid)
- put in temporary coffer dam
- Removed rocks from around downstream outlet works
- Gathered more gabion rock (1 skid)
- Used demolition saw to cut steel stem and pipe on upstream headworks

8/1/2009 Safety Meeting
Superior Lake
- finished removing material from cut in dam (1 trackhoe 1 skid)
  - final grade in bottom and slopes
- packaged old wire and membrane to fly
- gathered driftwood and put in burn pile
- screened 2 more yards of sand
- found and put wheelbarrow on trash deck to fly

Five Point Lake
- re-packaged old equipment
- left one fresno for historical purposes

8/2/2009 Sunday off

8/3/2009 Superior Lake
- Put in permanent coffer dam (1 trackhoe 1 skid)
- excavated out the front headgate
- cut and removed pipe upstream to old concrete headwall in dam
- poured downstream gabion of outlet pipe (22 bags of concrete)
  - made a custom fit gabion that filled channel crossways from rock to rock
- poured upstream gabion on outlet pipe
  -1-3'x3'x3'gabion basket
  -11 bags of concrete

8/4/2009 Safety Meeting
Superior Lake
- dug and poured middle gabion in channel (1 trackhoe 1 skid, mixer, 3" pump; 64 bags concrete used)
- hit ledge rock at 2' 3"

8/5/2009 Safety Meeting
Superior Lake
- grouted pipe (189 bags concrete)
  -40 bags concrete packed on horses from
- tightened tracks on skidsteer

Final Inspection for bluebell and drift (Bob, Brad, Valton, Russel, Dex)

8/6/2009 Safety Meeting
Five Point Lake
- Final Inspection for Five Point conducted today by (Bob, Brad, Valton, Hailey, Dex)

Superior Lake
- Tore out 9 feet of front gabion on west side (because it was too narrow) and re-poured
  - needed a 15' bottom
  - 16 bags concrete
  - 1-3'x3'x9' gabion basket
- Put in sand and gravel filter downstream of lower outlet gabion rock to rock and encased filter with excess gravel material

8/7/2009 Safety Meeting
Five Point Lake

- Hand crew re-packaged and arranged tool house for fly out

Drift Lake
- turned over painted rocks
- cleaned up micro litter

Bluebell Lake
- rehabbed the meadow (trackhoe tracks)
- cleaned up micro litter

Superior Lake
- cleaned up and did packaging
- filled in upstream and downstream of grouted
- pipe with dirt and rock and compacted (1 trackhoe, 1 skid)
- riprapped downstream berm
- shot and graded bottom of channel to middle gabion
- began to riprap channel, starting at ledge rock on downstream toe

*started running 2 shifts - daylight to dark

8/8/2009 Safety Meeting

Five Point Lake
- did more packaging

Superior Lake
- riprapped the bottom of channel up to the front lakeside gabion
- placed riprap on the east and west side slopes
- cut more firewood

*continued running 2 shifts-daylight to dark

8/9/2009 Sunday off – Dex rode out and randy rode ine

8/10/2009 Safety Meeting

Superior Lake
- Hand crew washed fines into channel and used rock bars
- continued to riprap channel
- Did reconnect in the bottom of the channel to original channel
- hand crew continued packaging to fly

8/11/2009 Safety Meeting

Superior Lake
- Shaped the old spillway, sloped sides and floor and rip rapped (1 trackhoe, 1 skid)
- Did re-hab on east side of channel
- continued packaging
- started breaking down camp

*took final pictures of all lakes

8/12/2009 Safety Meeting - main crew rode out

Superior Lake
- re-hab on west side of channel
- shaped leftover dirt mound and rehabed
- continued breaking down camp

8/13/2009 Safety Meeting

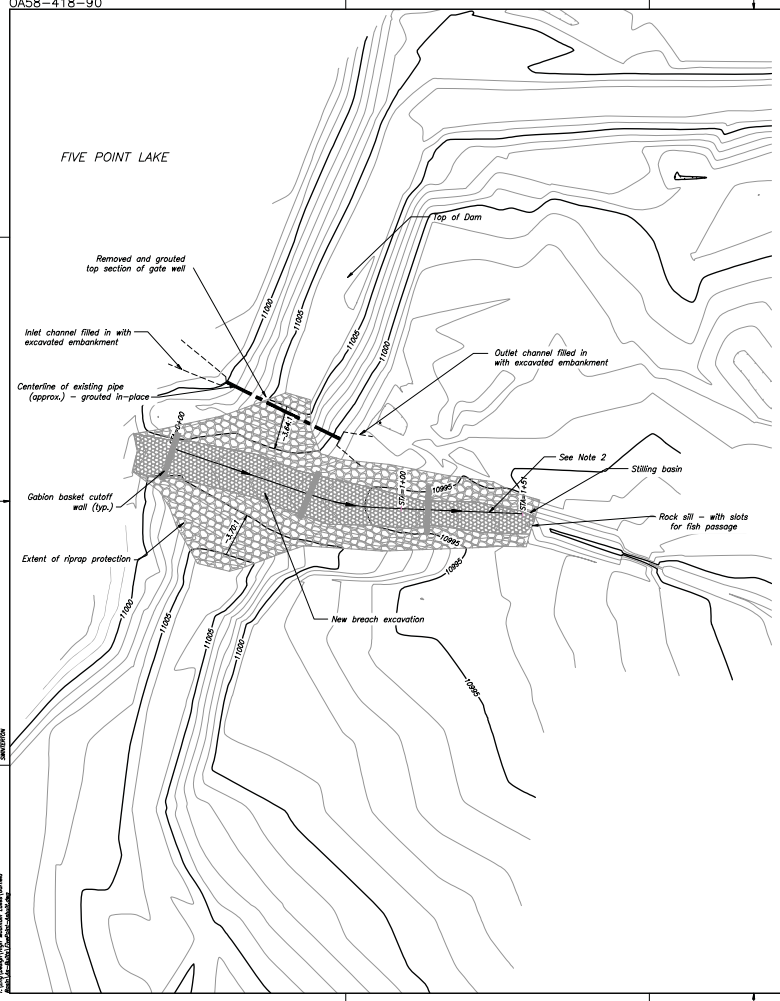
Superior Luke
- Conducted Final Inspection (Valton, Bob, Brand, Randy)

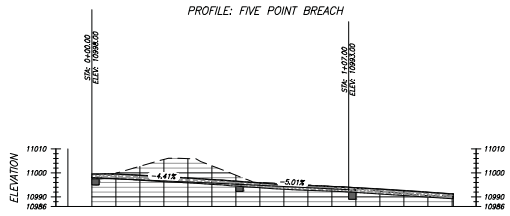
8/14/2009 Safety Meeting
- continued breaking camp

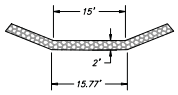
8/15/2009 Safety Meeting
- DCWCD crew finished breaking camp and rode out

Appendix B – As-Built Drawings

0A58-418-90







Breach – 24" Riprap Thickness
15 ft. bottom width
2.5:1 Cut slopes

NOTES

1. Contour interval is 1 foot.
2. Varied centerline alignment along ramp creating resting pools.
3. Top of gabion el. 10,998.0
4. Total cut vol. ≈ 950 c.y. to bottom of riprap
5. Riprap vol. ≈ 510 c.y.
6. Grid factor = 0.99949466

20 0 20 40 60
SCALE OF FEET

REV NO	2009-11-17	AS-BUILT DRAWINGS
1	418 WCS	

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
PROVO AREA OFFICE
PROVO, UTAH

GARFIELD BASIN LAKES DAM STABILIZATION

FIVE POINT LAKE BREACH

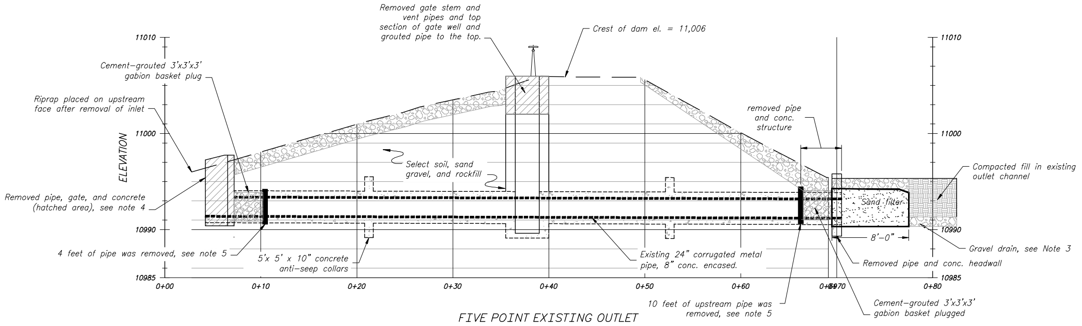
SITE PLAN – CONTRACT RECORD

DESIGNED _/s/ Scott_Whetstone_P.E._ CHECKED _ _ _ _/s/_Mike_Tuttle_P.E._ _ _
DRAWN _ _/s/ Jeff_Spitzenberger_P.E._ _TECH. APPR. _/s/_Clay_Seymour_P.E._ _ _
APPROVED _ _ _/s/_David_Tuttle_P.E._ _ _ _ _ _ _
FOR RECORD

PROVO, UTAH 2009-11-17 0A58-418-90

DATE AND TIME PLOTTED
2009-11-17 14:19
PLOTTED BY
Scott Whetstone

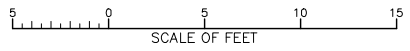
CAD SYSTEM
AUTOCAD 2009
FILE NAME
P:\Proj\Design\Dgn Structs Layouts\Five Mountain Lakes\Certified Plans\Five Mountain Lakes.dwg



FIVE POINT EXISTING OUTLET

SAND FILTER MATERIAL GRADATION REQUIREMENTS	
SIEVE SIZE	% PASSING BY WEIGHT
½ inch	100
⅜ inch	100
No. 4	95−100
No. 8	80−100
No. 16	50−85
No. 30	25−60
No. 50	10−30
No. 100	2−10
No. 200	0−3

GRAVEL DRAIN MATERIAL GRADATION REQUIREMENTS	
SIZE	% PASSING BY WEIGHT
1 ½ inch	90−100
¾ inch	55−100
⅜ inch	19−75
No. 4	0−40
No. 8	0−10
No. 16	0



NOTES

1. Compacted filtered sand was placed over last 8 feet of pipe removal trench.
2. Trench walls were sloped to allow compaction between fill and natural ground.
3. Gravel drain was extended through compacted sloped ramp material to discharge under riprap.
4. Filled inlet area with embankment material compacted to 95% maximum density.
5. 4 feet of upstream side and 10 feet of downstream side of existing pipe was removed and remaining pipe grouted with cement.

REV NO		
1	2009−11−17 418 WES	AS−BUILT DRAWINGS

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

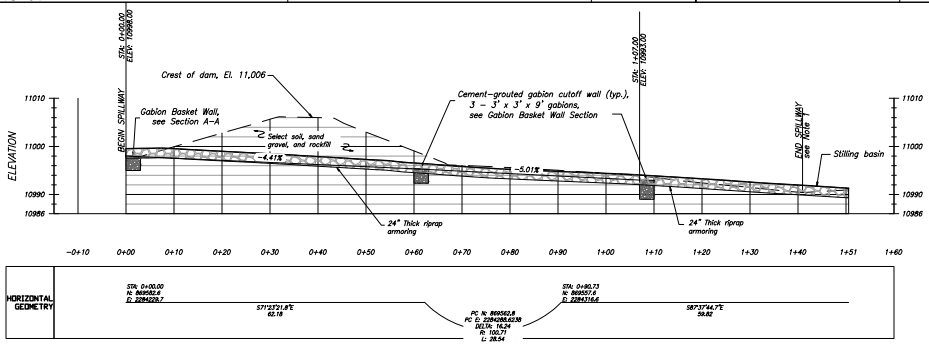
PROVO AREA OFFICE
PROVO, UTAH

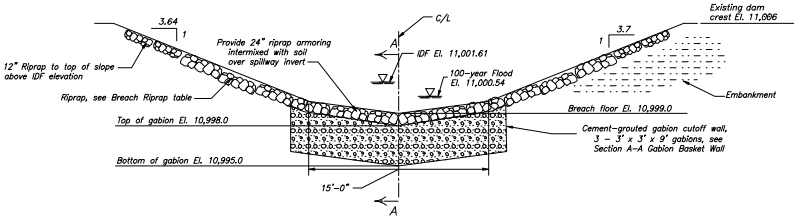
GARFIELD BASIN LAKES
DAM STABILIZATION
FIVE POINT LAKE BREACH
EXISTING OUTLET PROFILE−CONTRACT DRAWINGS

DESIGNED /s/ Scott Winterton, P.E. CHECKED /s/ Mike Talbot, P.E.
DRAWN /s/ Will Spitzenberg, P.E. TECH. APPR. /s/ Cary Southworth, P.E.
APPROVED ______________
PEER REVIEWER
PROVO, UTAH 2009−11−17 OA58−418−92

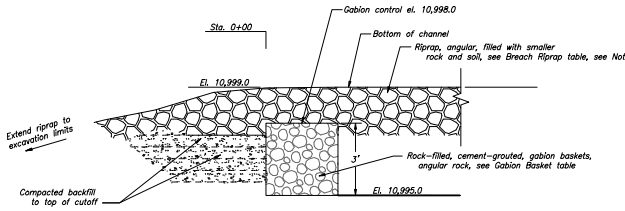
DATE AND TIME PLOTTED
8−Dec−09 12:02 PM
PLOTTED BY
WSPITZENBERG

CAD SYSTEM
AUTOCAD 2005
CAD FILENAME
T:\Eng\Design\High Mountain Lakes\Garfield Basin\As−Builts\FivePoints−KidneyLakes_ExistOutletProfiles−As_built.dwg





BREACH CHANNEL SECTION AT STA. 0+00
(FOR STA 0+60 AND 1+07, SEE TABLE)



SECTION A-A
GABION BASKET WALL

BREACH RIPRAP				
D MIN.	D15	D50	D MAX.	THICKNESS MIN.
6"	8"	12"	16"	24"

GABION BASKET ROCK GRADATIONS			
GABION BASKET	PREDOMINATE ROCK SIZE (INCHES)	MINIMUM ROCK SIZE (INCHES)	MAXIMUM ROCK SIZE (INCHES)
36	6 to 10	4	12

GABION CUTOFF WALL ELEVATIONS					
STATION	BREACH FLOOR	TOP OF GABION	BOTTOM OF GABION	100 YEAR FLOOD ELEVATION	IDF ELEVATION
0+00	10,999.0	10,998.0	10,995.0	11,000.54	11,001.61
0+60	10,996.5	10,995.35	10,992.35	10,998.04	10,999.11
1+10	10,994.04	10,993.0	10,990.0	10,995.58	10,996.65

NOTES

1. Riprap armoring placed from end of spillway to existing ground to prevent headcutting and erosion.
2. Flood elevations through the breach represent elevations as if the existing spillway does not operate.
3. Placed riprap through breach in layers to maintain correct gradations.

REV NO.	2009-11-17	AS-BUILT DRAWINGS
1	418 WCS	

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
PROVO AREA OFFICE
PROVO, UTAH

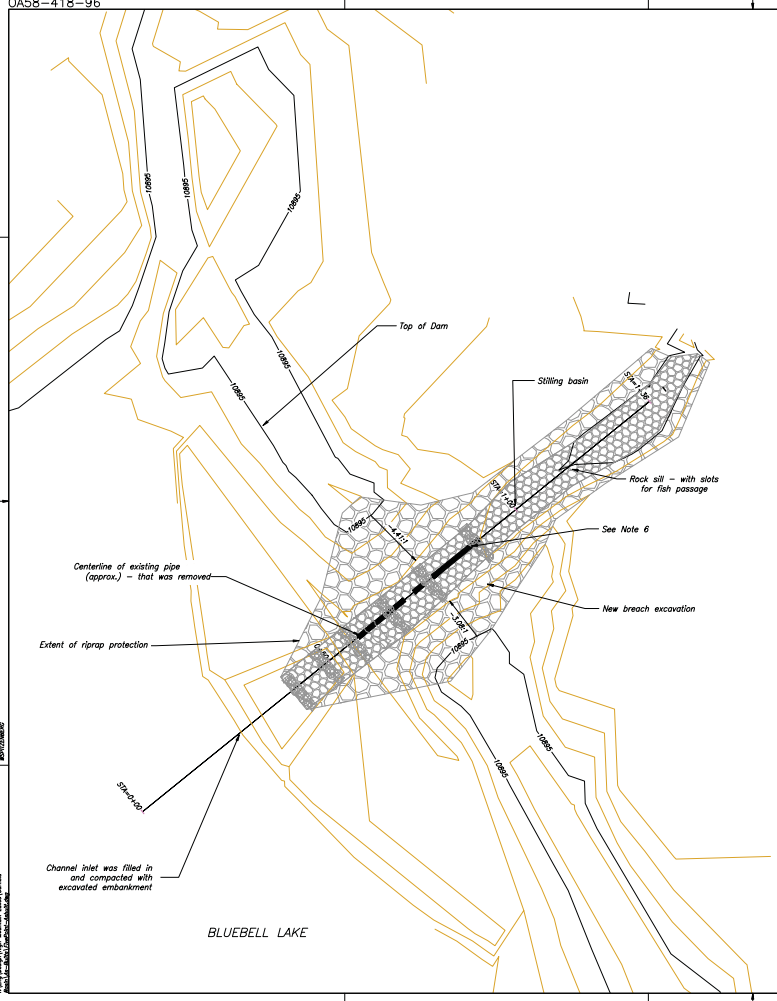
GARFIELD BASIN LAKES
DAM STABILIZATION
PINE POINT LAKE BREACH
PROFILE AND SECTIONS-CONTRACT RECORD

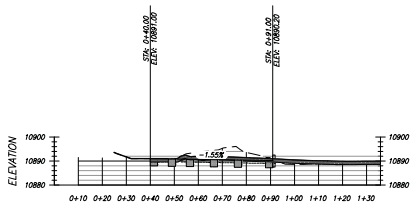
DESIGNED _/s/ Brad_Mickelsen_P.E._ CHECKED _ _ _ _/s/_Mike_Tobin_P.E._ _ _ _
DRAWN _ _/s/ Bill_Spackman_P.E._ _ TECH. APPR. _/s/_Clay_Saunders_P.E._ _ _
APPROVED _ _ _/s/ Brad_Tobin_P.E._ _ _ _ _ _ _
FOR REGION

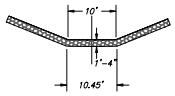
PROVO, UTAH | 2009-11-17 | 0A58-418-91

DATE AND TIME PLOTTED
FILE NAME
PLOTTED BY
SCALE

CAD SYSTEM
AUTOCAD 2009
DWG NO. 0A58-418-91
F:\Dwg\Design\Gpe_Mountain_Lakes\Certified As-Built Drawings\0A58-418-91.dwg







HORIZONTAL GEOMETRY	STA: 0+00.00 N: 862581.4 E: 2282402.5
	N51°00'35.0"E 135.85

Breach – 16 inch riprap depth
10 ft. bottom width
1.33 ft. riprap thickness
2.5:1 Cut slopes

NOTES

1. Contour interval is 1 feet.
2. Breach El. 10,891.50
3. Cut vol. ≈ 190 c.y. to bottom of riprap
4. Riprap vol. ≈ 90 c.y.
5. Grid factor = 0.99949466
6. Existing pipe removed and breach constructed in its place

REV NO		
1	2009–11–17 418 WES	AS–BUILT DRAWINGS

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

PROVO AREA OFFICE
PROVO, UTAH

GARFIELD BASIN LAKES DAM STABILIZATION

BLUEBELL LAKE BREACH

SITE PLAN – CONTRACT RECORD

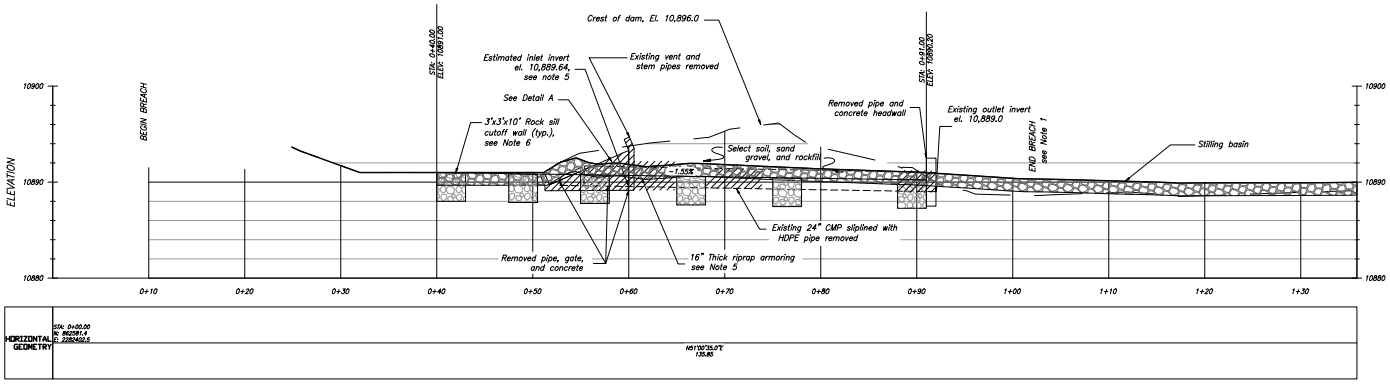
DESIGNED /s/ Scott Winterton, P.E. CHECKED /s/ Mike Talbot, P.E.
DRAWN /s/ Will Spitzenberg, P.E. TECH. APPR. /s/ Cary Southworth, P.E.
APPROVED ______________________
PEER REVIEWER

PROVO, UTAH 2009–11–17 0A58–418–96

DATE AND TIME PLOTTED
8–Dec–09 11:48 AM
PLOTTED BY
WSPITZENBERG

CAD SYSTEM
AUTOCAD 2005
CAD FILENAME
T:\Eng\Design\High Mountain Lakes\Garfield Basin\As–Builts\FivePoint–Asbuilt.dwg

PROFILE: BLUEBELL BREACH



SCALE OF FEET

BREACH RIPRAP				
D MIN.	D15	D50	D MAX.	THICKNESS MIN.
4"	6"	8"	12"	16"

SAND FILTER MATERIAL GRADATION REQUIREMENTS	
SIEVE SIZE	% PASSING BY WEIGHT
½ inch	100
⅜ inch	100
No. 4	95–100
No. 8	80–100
No. 16	50–85
No. 30	25–60
No. 50	10–30
No. 100	2–10
No. 200	0–3

NOTES

1. Riprap armoring was placed at end of breach to existing ground to prevent headcutting and erosion.
2. Riprap was placed through breach in layers to maintain correct gradations.
3. Sand filter material was mixed into riprap for 5 feet every 15 feet through breach.
4. Rock sills of 18"–24"ø riprap intermixed with smaller rock to lock riprap together.

REV NO.	2009-11-17	AS-BUILT DRAWINGS
1	418 WCS	

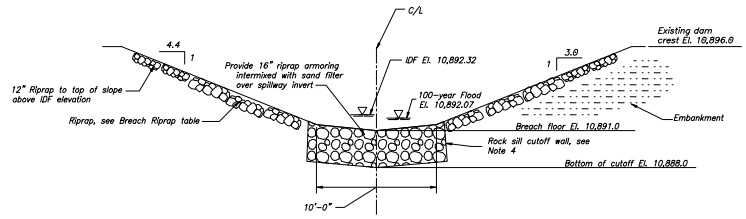
ALWAYS THINK SAFETY

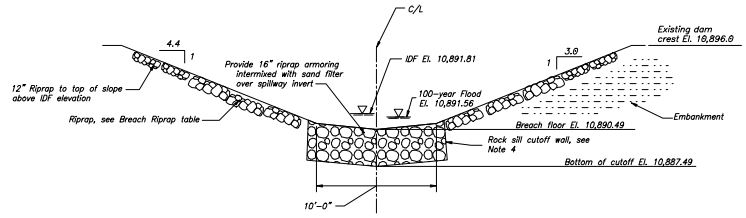
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
PROVO AREA OFFICE
PROVO, UTAH

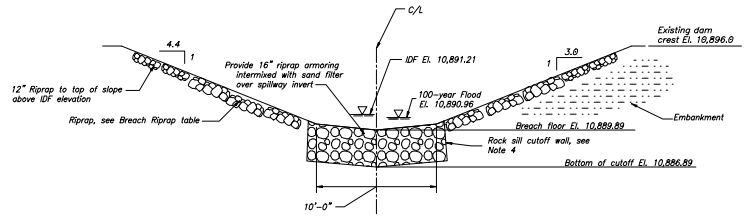
GARFIELD BASIN LAKES
DAM STABILIZATION
BLUEBELL LAKE BREACH
PROFILE – CONTRACT RECORD

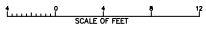
DESIGNED _/s/ Scott_Wahlstrom_P.E._ CHECKED _ _ _/s/_Mike_Tuttle_P.E._ _ _
DRAWN _ _/s/ Jill_Spackman_P.E._ _TECH. APPR. _/s/_Clay_Saunders_ P.E._ _
APPROVED _
FOR RECORD

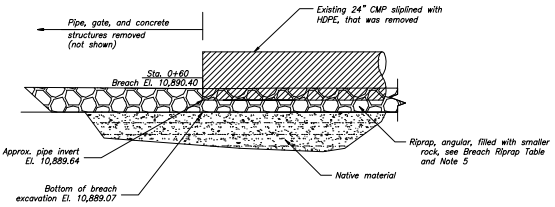
PROVO, UTAH | 2009-11-17 | 0A58-418-97

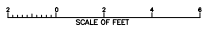












BREACH CHANNEL SECTION AT STA. 0+00

BREACH CHANNEL SECTION AT STA. 0+55

BREACH CHANNEL SECTION AT STA. 0+88

4 0 4 8 12
SCALE OF FEET

DETAIL A
OUTLET REMOVAL

2 0 2 4 6
SCALE OF FEET

NOTES

1. Riprap was placed through breach in layers to maintain correct gradations.
2. A minimum of 16" thick layer of riprap was placed at the breach.
3. Sand filter material was mixed into riprap for 5 feet every 15 feet through breach.
4. Rock sill comprised of 18"–24"ø riprap intermixed with smaller rock to lock riprap together.

BREACH RIPRAP				
D MIN.	D15	D50	D MAX.	THICKNESS MIN.
4"	6"	8"	12"	16"

SAND FILTER MATERIAL GRADATION REQUIREMENTS	
SIEVE SIZE	% PASSING BY WEIGHT
1/2 inch	100
3/8 inch	100
No. 4	95–100
No. 8	80–100
No. 16	50–85
No. 30	25–60
No. 50	10–30
No. 100	2–10
No. 200	0–3

REV NO		
1	2009-11-17 418 WES	AS-BUILT DRAWINGS

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
PROVO AREA OFFICE
PROVO, UTAH

GARFIELD BASIN LAKES DAM STABILIZATION

BLUEBELL LAKE BREACH

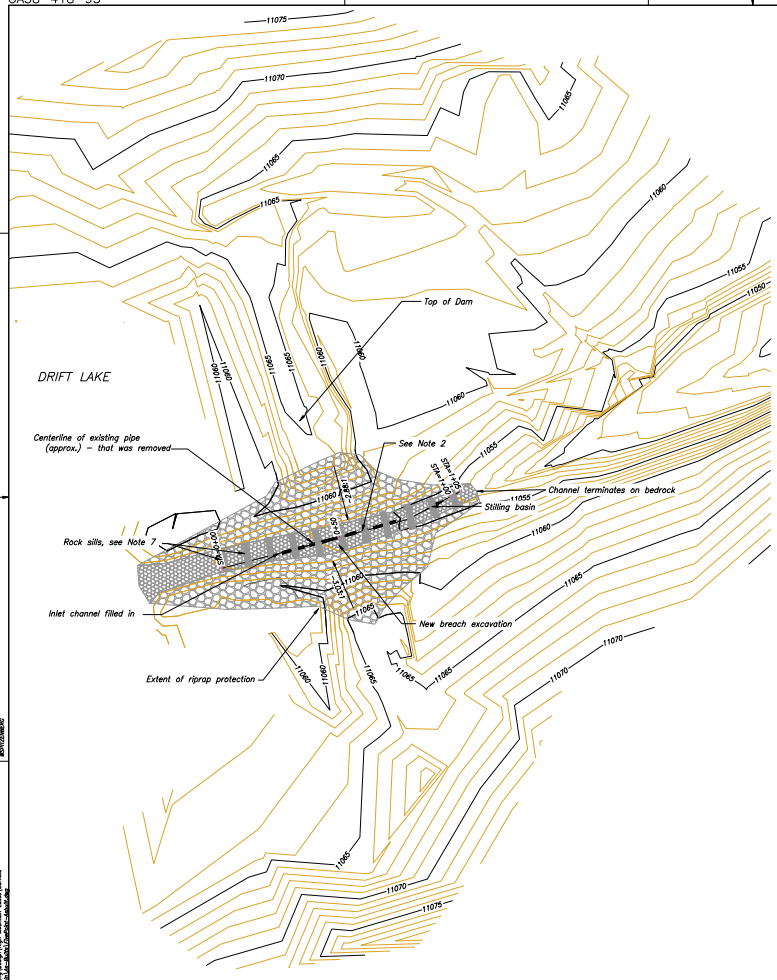
SECTIONS AND DETAIL – CONTRACT RECORDS

DESIGNED /s/ Scott Winterton, P.E. CHECKED /s/ Mike Talbot, P.E.
DRAWN /s/ Will Spitzenberg, P.E. TECH. APPR. /s/ Cary Southworth, P.E.
APPROVED ____________________
PEER REVIEWER
PROVO, UTAH 2009-11-17 0A58-418-98

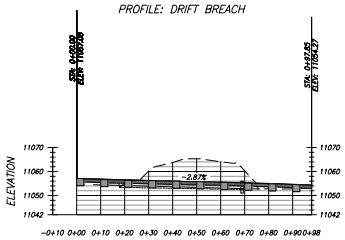
DATE AND TIME PLOTTED
8-Dec-09 11:42 AM
PLOTTED BY
WSPITZENBERG

CAD SYSTEM
AUTOCAD 2005
CAD FILENAME
T:\Eng\Design\High Mountain Lakes\Garfield Basin\As-Builts\FivePoint-Asbuilt.dwg

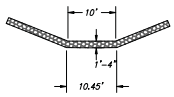
0A58-418-93



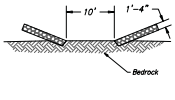
PROFILE: DRIFT BREACH



HORIZONTAL GEOMETRY		
	STA: 0+00.00 N: 864385.4 E: 2281061.3	STA: 0+85.05 N: 864285.9 E: 2281138.7
	N79°10'45.3"E 85.05	N62°11'13.5"E 24.80



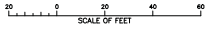
Breach – 16 inch riprap depth
10 ft. bottom width
1.33 ft. riprap thickness
2.5:1 Cut slopes



Breach – excavated to bedrock
10 ft. bottom width
1.33 ft. riprap thickness on side slopes
2.5:1 Cut slopes

NOTES

1. Contour interval is 1 feet.
2. Varying centerline alignment along breach created resting pools.
3. Breach El. 11,056.9
4. Cut vol. ≈ 730 c.y. to bottom of riprap
5. Riprap vol. ≈ 175 c.y.
6. Grid factor = 0.99949466
7. Rock sills placed along breach at 10 foot intervals.
8. Existing pipe was removed and breach constructed in its place.



REV NO.	2009-11-17	AS-BUILT DRAWINGS
1	418 WES	

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
PROVO AREA OFFICE
PROVO, UTAH

GARFIELD BASIN LAKES DAM STABILIZATION

DRIFT LAKE BREACH

SITE PLAN – CONTRACT DOCUMENT

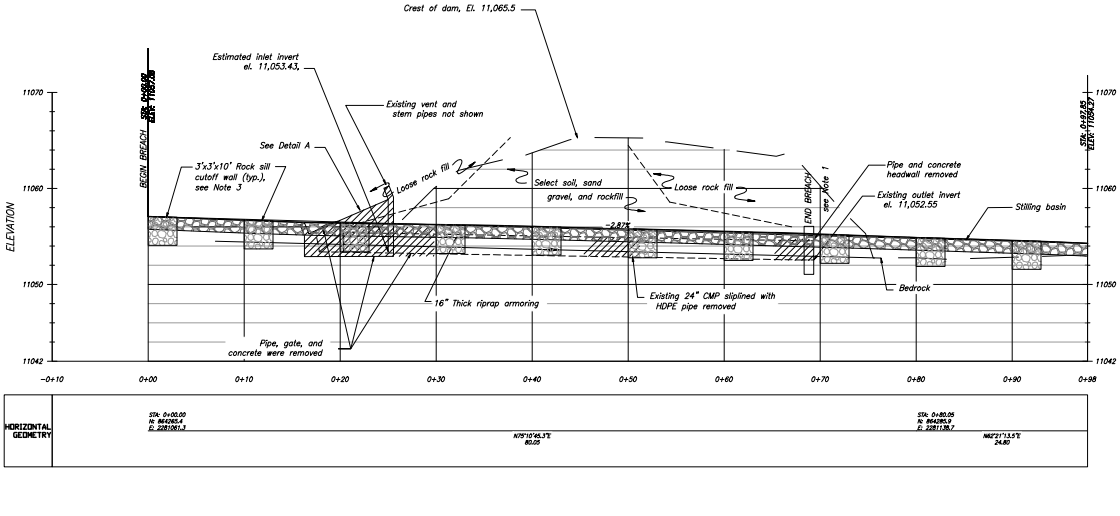
DESIGNED _/s/ Scott_Wahlstrom_P.E._ CHECKED _____/s/_Mike_Tullis_P.E._____
DRAWN _/s/ Jill_Spitzenberger_P.E._ TECH. APPR. _/s/_Clay_Seymour_P.E._____
APPROVED _____ FOR DIRECTOR _____

PROVO, UTAH 2009-11-17 0A58-418-93

SITE AND TREE PLOTTED
TREE PLOTTED BY
PLOTTED BY

CAD SYSTEM
AUTOCAD 2009
FILE NAME
F:\Dwg\Design\Dgn_Mountain Lakes\Garfield Basin\Drift Lake\Drift Lake Breach.dwg

PROFILE: DRIFT BREACH



SCALE OF FEET

BREACH RIPRAP				
D MIN.	D15	D50	D MAX.	THICKNESS MIN.
4"	6"	8"	12"	16"

SAND FILTER MATERIAL GRADATION REQUIREMENTS	
SIEVE SIZE	% PASSING BY WEIGHT
½ inch	100
⅜ inch	100
No. 4	95–100
No. 8	80–100
No. 16	50–85
No. 30	25–60
No. 50	10–30
No. 100	2–10
No. 200	0–3

NOTES

1. Riprap was placed through breach in layers to maintain correct gradations.
2. Mixed sand filter material into riprap for 5 feet every 15 feet through breach.
3. Rock sills placed along breach at 10 foot intervals.

REV NO.	DATE	BY	AS-BUILT DRAWINGS
1	2009-11-17	WCS	

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
PROVO AREA OFFICE
PROVO, UTAH

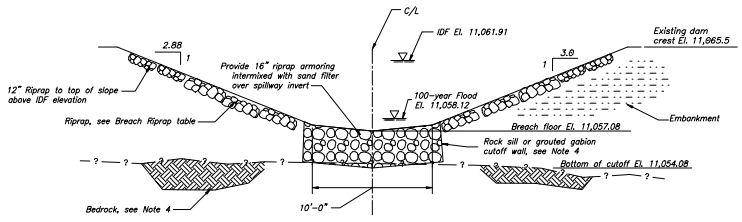
GARFIELD BASIN LAKES
DAM STABILIZATION
DRIFT LAKE BREACH
PROFILE – CONTRACT RECORD

DESIGNED _/s/ Scott_Whetstone_P.E._ CHECKED _ _ _/s/_Mike_Tullis_P.E._ _ _
DRAWN _ _/s/ Jill_Spitzenberger_P.E._ TECH. APPR. _/s/_Clay_Seyfarth_ P.E._ _ _
APPROVED _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
FOR RECORD

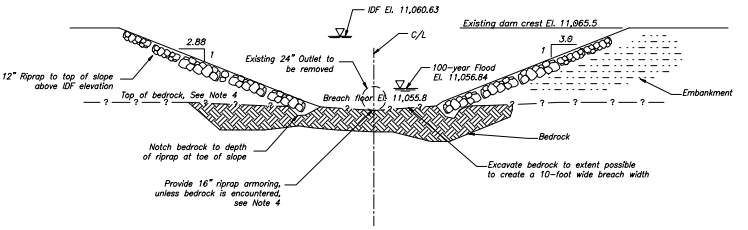
PROVO, UTAH 2009-11-17 0A58-418-94

DATE AND TIME PLOTTED
11/17/2009 11:11 AM
PLOTTED BY
Jill Spitzenberger

CAD SYSTEM
AUTOCAD 2009
FILE NAME
P:\Proj\Design\Dgn_Mountain_Lakes\Certified As-Built Drawings\Sheets\0A58-418-94.dgn

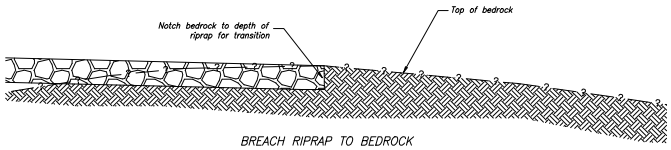


BREACH CHANNEL SECTION AT STA. 0+00



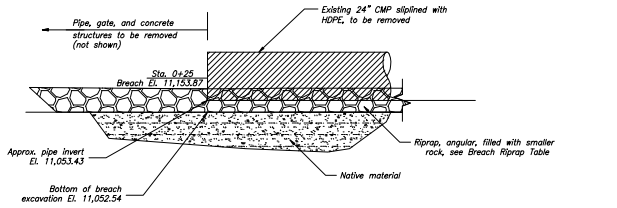
BREACH CHANNEL SECTION AT STA. 0+50

SCALE OF FEET 4 0 4 8 12



BREACH RIPRAP TO BEDROCK TRANSITION DETAIL

SCALE OF FEET 4 0 4 8 12



DETAIL A OUTLET REMOVAL

SCALE OF FEET 2 0 2 4 6

NOTES

1. Riprap was placed through breach in layers to maintain correct gradations.
2. A minimum of 16" thick layer of riprap was placed at the breach.
3. Sand filter material was mixed into riprap for 5 feet every 15 feet through breach.
4. Rock sills comprised of 18"-24"ø riprap intermixed with smaller rock to lock riprap together.

BREACH RIPRAP

D MIN.	D15	D50	D MAX.	THICKNESS MIN.
4"	6"	8"	12"	16"

SAND FILTER MATERIAL GRADATION REQUIREMENTS

SIEVE SIZE	% PASSING BY WEIGHT
$\frac{1}{2}$ inch	100
$\frac{3}{8}$ inch	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-10
No. 200	0-3

SCALE OF FEET 4 0 4 8 12

REV NO		
1	2009-11-17 418 WES	AS-BUILT DRAWINGS

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

PROVO AREA OFFICE
PROVO, UTAH

GARFIELD BASIN LAKES DAM STABILIZATION

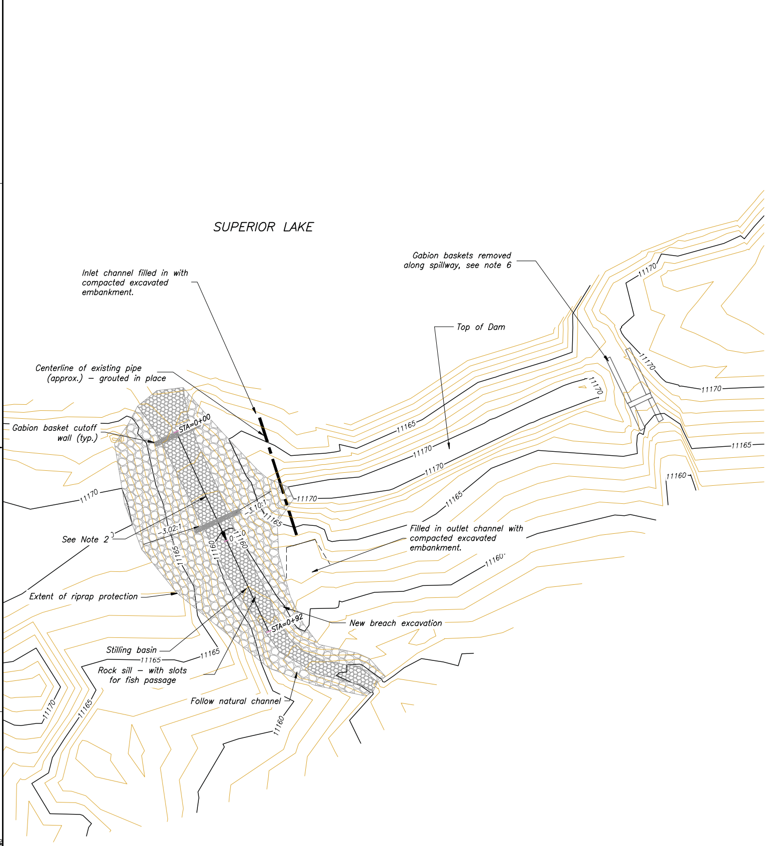
DRIFT LAKE BREACH

SECTIONS AND DETAILS-CONTRACT RECORD

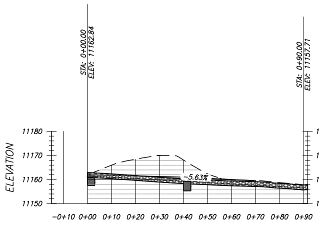
DESIGNED /s/ Scott Winterton, P.E. CHECKED /s/ Mike Talbot, P.E.
DRAWN /s/ Will Spitzenberg, P.E. TECH. APPR. /s/ Cary Southworth, P.E.
APPROVED ____________________
PEER REVIEWER
PROVO, UTAH 2009-11-17 0A58-418-95

DATE AND TIME PLOTTED
8-Dec-09 11:51 AM
PLOTTED BY
WSPITZENBERG

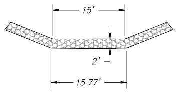
CAD SYSTEM
AUTOCAD 2005
CAD FILENAME
T:\Eng\Design\High Mountain Lakes\Garfield Basin\As-Builts\FivePoint-Asbuilt.dwg



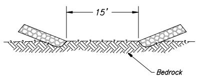
PROFILE: SUPERIOR BREACH



HORIZONTAL GEOMETRY	STA: 0+00.00 N: 873895.3 E: 2285282.8 S24°53'49.9"E 91.63



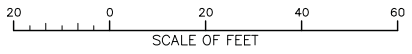
Breach – 24" Riprap Thickness
15 ft. bottom width
2.5:1 Cut slopes



Breach – excavated to bedrock
15 ft. bottom width
2.5:1 Cut slopes

NOTES

1. Contour interval is 1 foot.
2. Centerline alignment varied along breach to create resting pools.
3. Breach El. 11,162.84
4. Cut vol. ≈ 855 c.y. to bottom of riprap
5. Riprap vol. ≈ 340 c.y.
5. Grid factor = 0.99949466
6. Existing gabion baskets were removed along spillway and spillway restored to a natural state.



REV NO		
1	2009-11-17 418 WES	AS-BUILT DRAWINGS

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

PROVO AREA OFFICE
PROVO, UTAH

GARFIELD BASIN LAKES
DAM STABILIZATION

SUPERIOR LAKE BREACH

SITE PLAN – CONTRACT RECORD

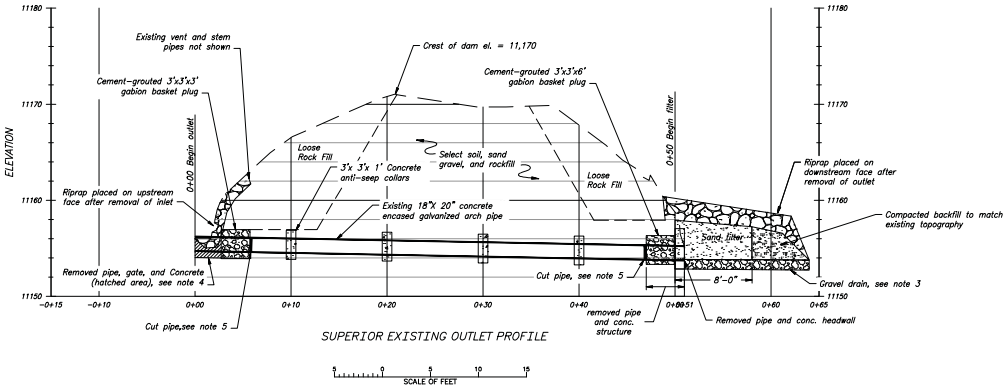
DESIGNED /s/ Scott Winterton, P.E. CHECKED /s/ Mike Talbot, P.E.
DRAWN /s/ Will Spitzenberg, P.E. TECH. APPR. /s/ Cary Southworth, P.E.
APPROVED
PEER REVIEWER

PROVO, UTAH 2009-11-24 0A58-418-87

DATE AND TIME PLOTTED
26-Jan-10 9:55 AM
PLOTTED BY
WSPITZENBERG

CAD SYSTEM
AUTOCAD 2005
CAD FILENAME
T:\Eng\Design\High Mountain Lakes\Garfield Basin\As-Builts\FivePoint-Asbuilt.dwg

0A58-418-89



SUPERIOR EXISTING OUTLET PROFILE

SAND FILTER MATERIAL GRADATION REQUIREMENTS	
SIEVE SIZE	% PASSING BY WEIGHT
½ inch	100
⅜ inch	100
No. 4	95–100
No. 8	80–100
No. 16	50–85
No. 30	25–60
No. 50	10–30
No. 100	2–10
No. 200	0–3

GRAVEL DRAIN MATERIAL GRADATION REQUIREMENTS	
SIZE	% PASSING BY WEIGHT
1 ½ inch	90–100
¾ inch	55–100
⅜ inch	19–75
No. 4	0–40
No. 8	0–10
No. 16	0

NOTES

1. Compacted filter material placed over last 8' of pipe removal trench.
2. Trench was sloped to allow adequate compaction between fill and natural ground.
3. Extended gravel drain through compacted sloped material to discharge under riprap.
4. Inlet area filled in with embankment material compacted to 95% maximum density.
5. Outlet cutoff collar remained in place.

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
PROVO AREA OFFICE
PROVO, UTAH

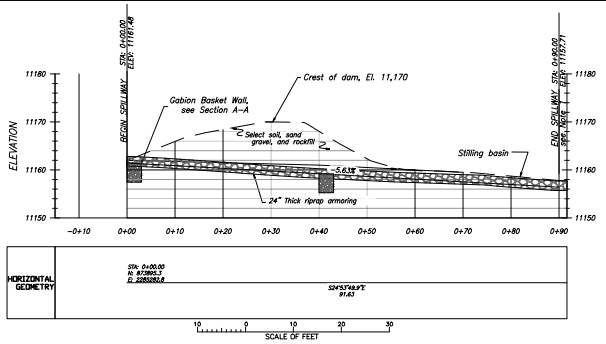
GARFIELD BASIN LAKES
DAM STABILIZATION
SUPERIOR LAKE BREACH
EXISTING OUTLET PROFILE – CONTRACT RECORD

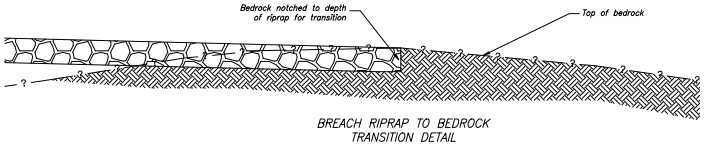
DESIGNED _/s/ Brad_Wimberley_P.E._ CHECKED _ _ _/s/_Mike_Talbot_P.E._ _ _
DRAWN _ _/s/ Jill_Spackman_P.E._ _ TECH. APPR. _/s/_Clay_Seymour_P.E._ _ _
APPROVED _ _ _ _ _ _ _ _ _ _ _ _ _
FOR RECORD

PROVO, UTAH | 2009-11-24 | 0A58-418-89

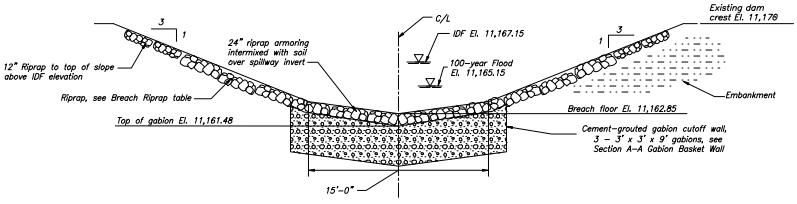
DATE AND TIME PLOTTED
2009-11-24 14:48
PLOTTED BY
jspackman

CAD SYSTEM
AUTOCAD 2009
FILE NAME
F:\Projects\Design\Upper_Bluewater_Lakes\Garfield\Superior_Outlet_Profile_Contract_Record.dwg

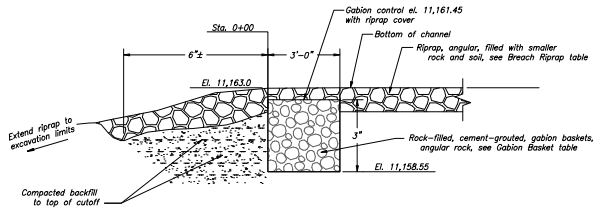




BREACH RIPRAP TO BEDROCK
TRANSITION DETAIL



BREACH CHANNEL SECTION AT STA. 0+00

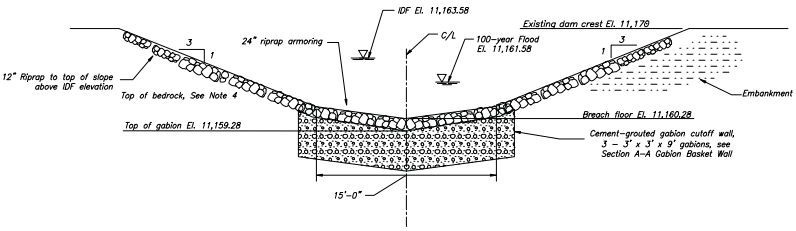


SECTION A–A
GABION BASKET WALL

NOTES

1. Riprap armoring were placed on existing ground to prevent headcutting and erosion.
2. Riprap was placed through breach in layers to maintain correct gradations.

GABION BASKET			
GABION BASKET	PREDOMINATE ROCK SIZE (INCHES)	MINIMUM ROCK SIZE (INCHES)	MAXIMUM ROCK SIZE (INCHES)
36	6 to 10	4	12



BREACH RIPRAP				
D MIN.	D15	D50	D MAX.	THICKNESS MIN.
6"	8"	12"	16"	24"

BREACH CHANNEL SECTION AT STA. 0+40

REV NO		
1	2009–11–17 418 WES	AS–BUILT DRAWINGS

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
PROVO AREA OFFICE
PROVO, UTAH

GARFIELD BASIN LAKES
DAM STABILIZATION

SUPERIOR LAKE BREACH

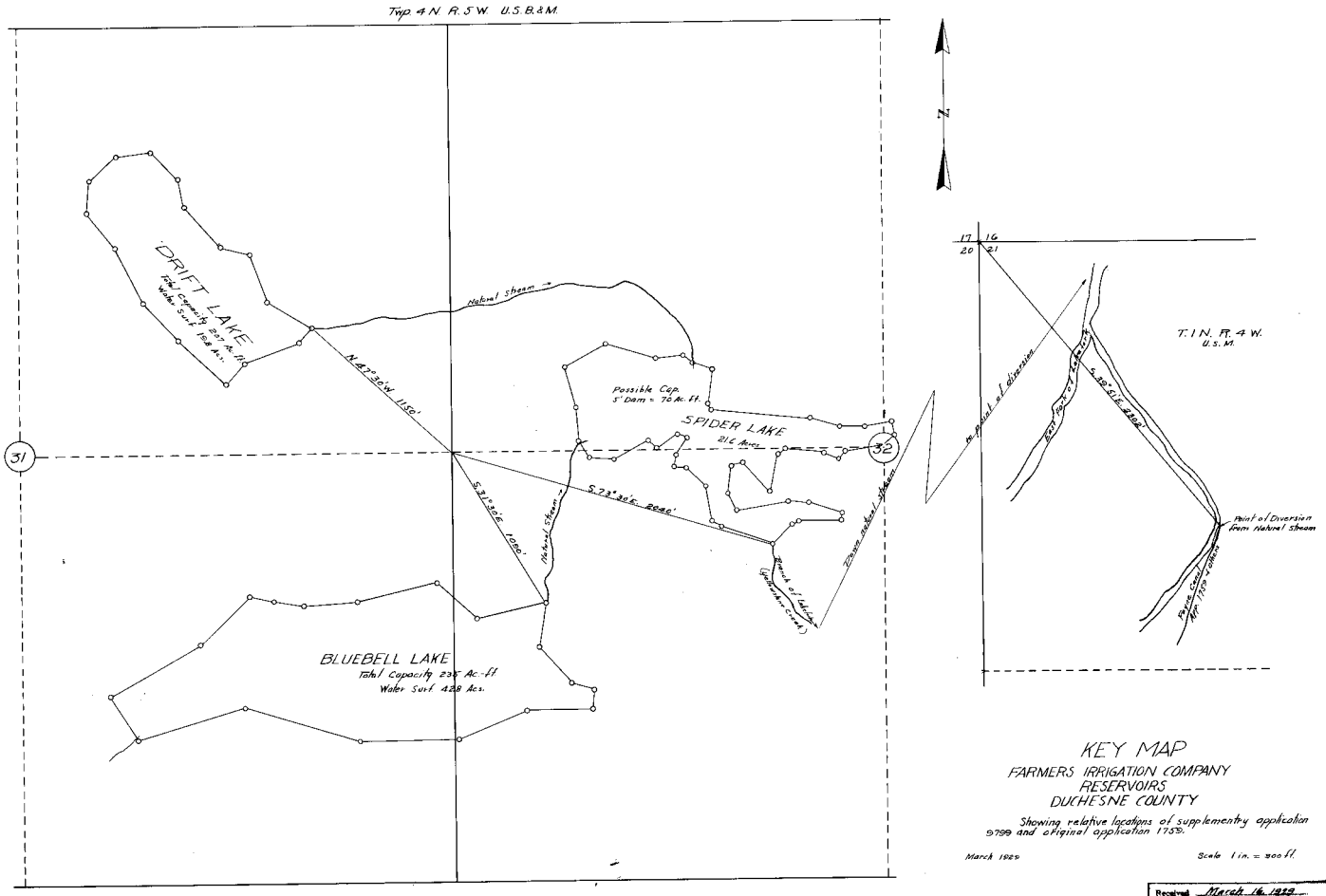
PROFILE AND SECTIONS – CONTRACT RECORDS

DESIGNED /s/ Scott Winterton, P.E. CHECKED /s/ Mike Talbot, P.E.
DRAWN /s/ Will Spitzenberg, P.E. TECH. APPR. /s/ Cary Southworth, P.E.
APPROVED ______________________
PEER REVIEWER
PROVO, UTAH 2009–11–24 0A58–418–88

DATE AND TIME PLOTTED
26–Jan–10 9:40 AM
PLOTTED BY
WSPITZENBERG

CAD SYSTEM
AUTOCAD 2005
CAD FILENAME
T:\Eng\Design\High Mountain Lakes\Garfield Basin\As–Builts\FivePoint–Asbuilt.dwg

Appendix C – Historical Drawings



KEY MAP

FARMERS IRRIGATION COMPANY
RESERVOIRS
DUCHESNE COUNTY

Showing relative locations of supplementary application 9799 and original application 1758.

March 1929 — Scale 1 in. = 800 ft.

Received March 16, 1929
Returned June 2, 1929
Approved Jan. 8, 1931
State Engineer

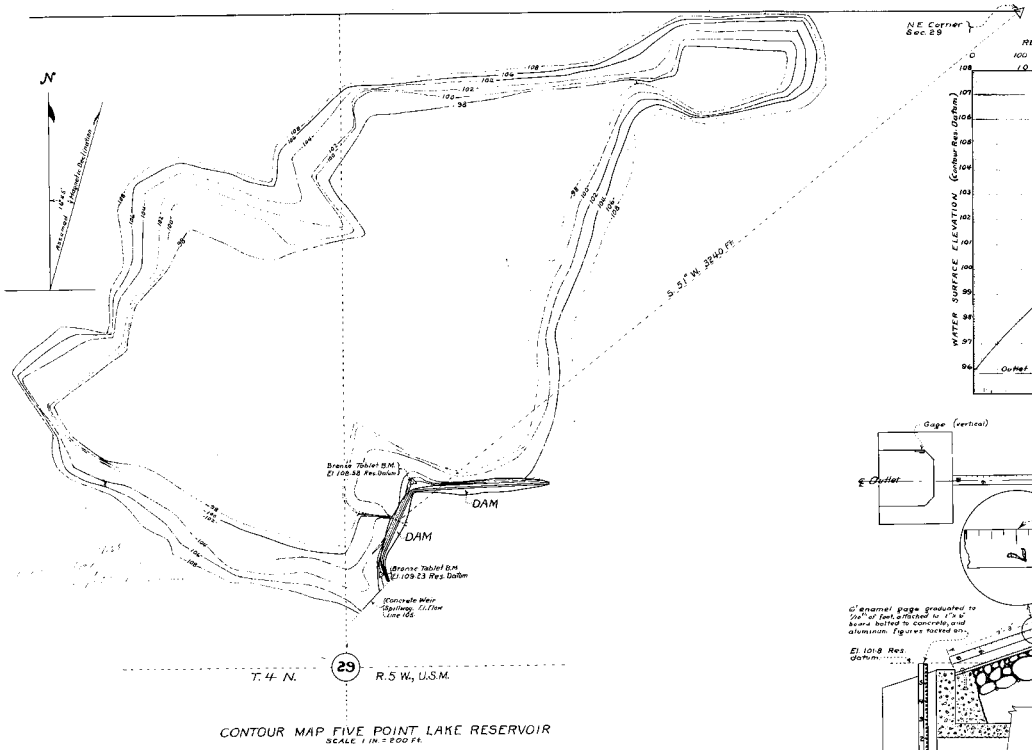
14
2
3

71

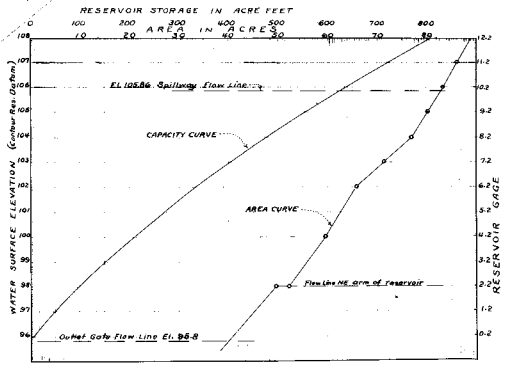
App. #9799

H-170, 170-A, 26
141

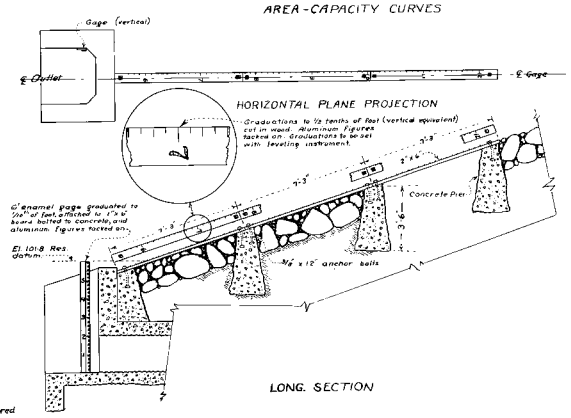
Spider - Drift - Blue bell
P-71



CONTOUR MAP FIVE POINT LAKE RESERVOIR
SCALE 1 IN. = 200 FT.



AREA-CAPACITY CURVES



LONG. SECTION

CONTOUR	RESERVOIR GAGE	AREA (ACRES) At Contour	Average	VOLUME (AC FT.) Segment	Total	NOTATIONS
95.8	0	* 38.8		0.0	0.0	Flow line outlet gate
96.0	.2	* 40.7	40.2	8.0	8.0	
97.0	1.2	* 45.2	42.9	42.9	50.9	
98.0	2.2	48.7	47.0	47.0	97.9	
98.8	2.8	52.2				
99.0	3.2	53.8	54.0	54.0	151.9	
100.0	4.2	59.4	57.6	57.6	210.0	
101.0	5.2	62.6	61.0	61.0	271.0	
102.0	6.2	65.8	64.2	64.2	335.2	
103.0	7.2	71.4	68.6	68.6	403.8	
104.0	8.2	77.0	74.2	74.2	478.0	
105.0	9.2	80.1	78.6	78.6	556.6	
105.86	10.06				626.3	Flow line spillway
106.0	10.2	83.3	81.7	81.7	638.3	
107.0	11.2	86.6	84.7	84.7	723.0	
108.0	12.2	88.8	87.4	87.4	810.4	
* Not surveyed Area obtained by deduction						

AREA-CAPACITY TABLE

ENGINEER'S CERTIFICATE

Louis Galloway being first duly sworn, certifies that he is the Engineer of the Moon Lake Water Users' Assn and he has prepared plans and specifications for the proposed revision in the dam which was constructed to impound water in the Five Point Lake reservoir in connection with the appropriation of water under application 8300; that these plans consisting of 4 sheets numbered 1 to 4 inclusive indicate the information to be submitted for approval of said plans, and the survey of the site was made between the 8th day of Sept. 1933 and the 13th day of Aug. 1940.

Louis Galloway

Subscribed and sworn to before me this 12th day of Aug., 1941.

Commission Expires Mar. 11-1944

Agnes Edwards
Notary Public. Roosevelt, Utah.

OWNER'S CERTIFICATE

Floyd Case, being first duly sworn, certifies that he is the Pres of the Moon Lake Water Users's Association and that Louis Galloway is the Association's Engineer and that Louis Galloway was authorized to prepare the accompanying plans for a revision in the dam constructed to impound water in connection with the appropriation of water under application 8300 and that the said Moon Lake Water Users Association hereby accepts these plans.

Floyd Case
President

Subscribed and sworn to before me this 7th day of Aug., 1941.

Agnes Edwards
Notary Public, Roosevelt, Utah

Commission Expires:
Mar. 11-1944

RESERVOIR GAGE

Scale 1 in. = 1 Ft.

For the reason that the dam represented by these plans and specifications was for the most part constructed prior to the filing of the plans and specifications, the State Engineer cannot approve them as provided in Sec. 100-5-2, Revised Statutes of Utah 1933, amended by the Session Laws 1937. However, they are filed as of this date in the State Engineer's office as a matter of public record.

Received Aug 8th 1941.
Filed Dec 27th 1941.

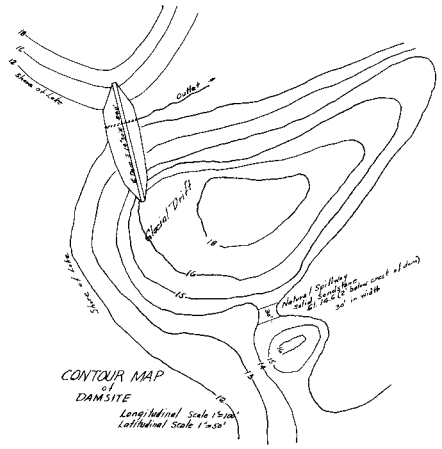
C. N. Watson
State Engineer

MAPS PROFILE & DRAWINGS
FOR REVISION IN DAM
FIVE POINT LAKE RESERVOIR
IN DUCHESNE COUNTY
APPLICATION NO. 8300
MOON LAKE WATER USERS' ASSOCIATION

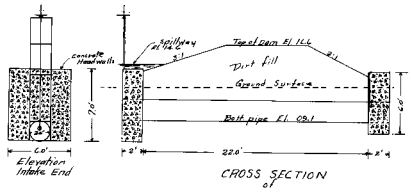
Sheet 1 of 4 Sheets

H-32-51

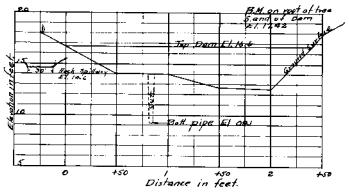
Five Point Lake Res.



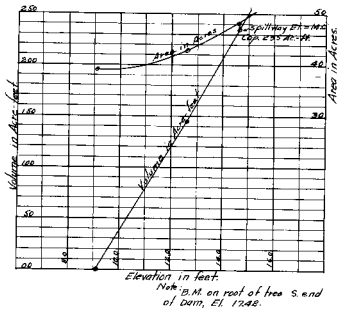
CONTOUR MAP
of
DAMSITE
Longitudinal Scale 1"=50'
Latitudinal Scale 1"=50'



CROSS SECTION
of
DAM
Scale 1"=5'

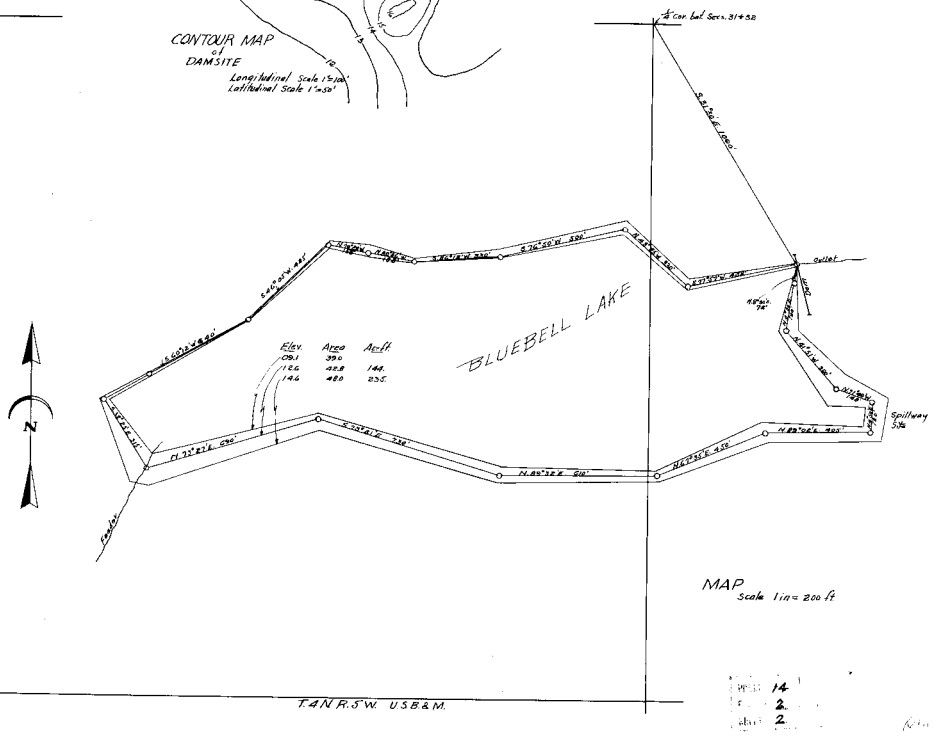


PROFILE
of
Center line of Dam



Note "B.M. on root of tree S. end of Dam, El. 1248."

CAPACITY CURVE



MAP
Scale 1 in = 200 ft

DRAWINGS, MAP AND PROFILE
OF
BLUEBELL LAKE RESERVOIR
IN
DUCHESNE COUNTY
BY
FARMERS IRRIGATION COMPANY
APPLICATION 9799
Feb. 20, 1929 Scales as shown

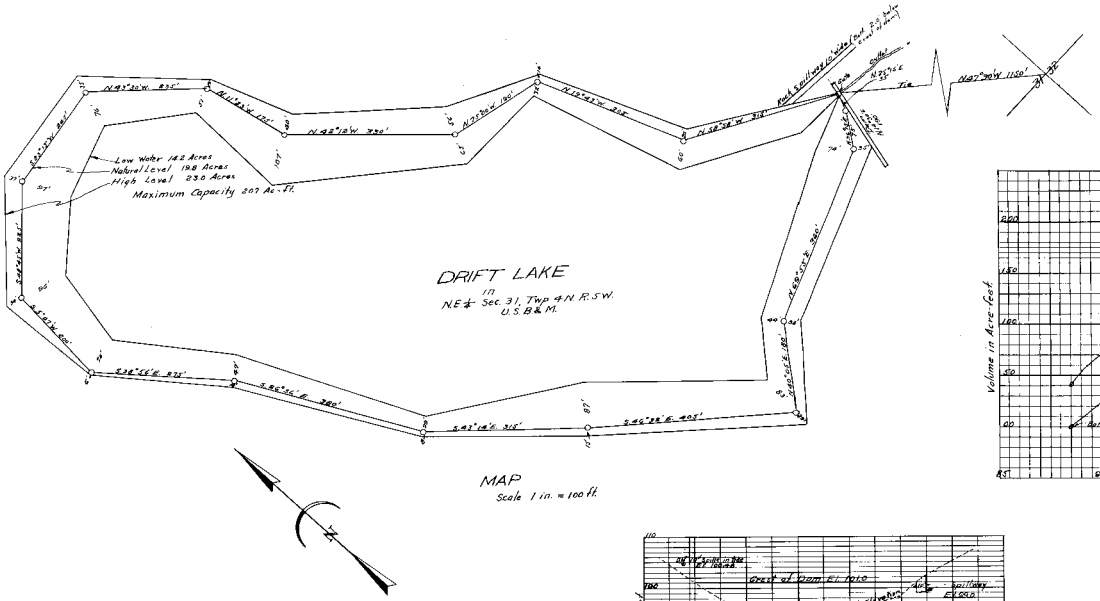
14
2
2

Received March 16, 1929
Returned June 7, 1929
Approved Jan. 8, 1931
State Engineer

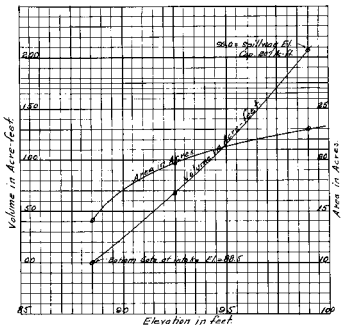
Bluebell Lake Reservoir
P-70

70

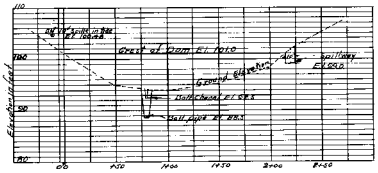
App. # 9799
H-71926



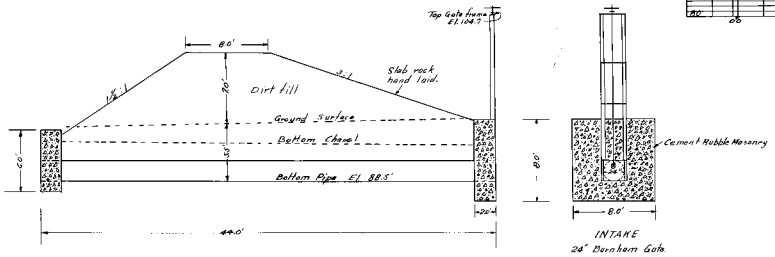
MAP
Scale 1 in. = 100 ft.



CAPACITY CURVE



PROFILE
of
CENTER LINE OF DAM



CROSS SECTION
of
DAM
Scale 1"=5'

INTAKE
24" Bonham Gate

DRAWINGS, MAP AND PROFILE
OF
DRIFT LAKE RESERVOIR
IN
DUCHESNE COUNTY
BY
FARMERS IRRIGATION COMPANY
APPLICATION 9799

Feb. 12-1929 — 14 — 2 — 1 — Scales as shown

Drift Lake
P-69

OWNER'S CERTIFICATE

W. G. Laird Jr. for Farmers Irrigation Company, being first duly sworn, certifies that he employed C. J. Preece of Duchesne, Utah to prepare the accompanying plans of dam to be constructed in connection with the appropriation of water under application 9799 and that he hereby accepts these plans.

W. G. Laird Jr.

Subscribed and sworn to before me this 24th day of June 1929

Mabel Thurman
Notary Public
Duchesne County, Utah
Com. expires March 5, 1930

ENGINEER'S CERTIFICATE.

C. J. Preece, being first duly sworn certifies that he was employed to prepare the plans and specifications for the dam proposed to be constructed in connection with appropriation of water under application 9799, that these plans consisting of three sheets indicate the information to be submitted for approval of said plans, and the survey of the sites were made by him on the 16th day of August 1928.

C. J. Preece

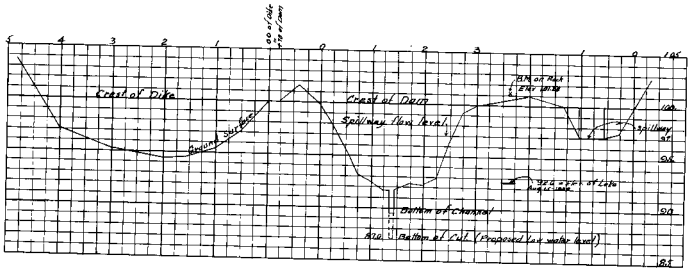
Subscribed and sworn to before me this 26th day of June 1929

Mabel Thurman
Notary Public
Duchesne County, Utah
Com. expires March 5, 1930

Received March 16, 1929
Returned June 2, 1929
Approved Jan. 8, 1930
J. A. Breese
State Engineer

69
Ac-1929
UT 97
App. 9799
26
H-17634

SHEET NO. II
of 2 Sheets

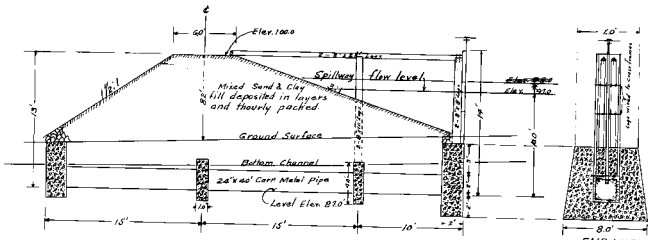


PROFILE
of
DAM & SPILLWAY SITES
Horizontal Scale 1"=100'
Vertical Scale 1"=5'

Quantities

Main Dam	1039	Cu. Yds.	Embankment
Dike	889	"	"
Spillway	51	"	"
	2079	"	"

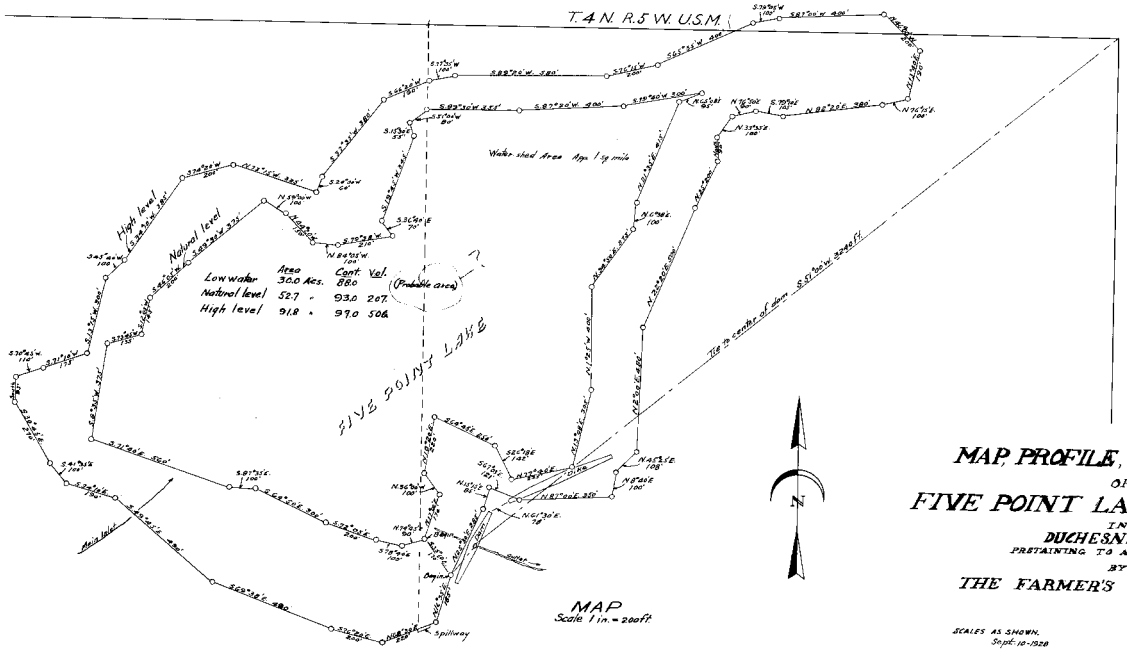
Channel Cutting 212 Cu. Yds. Excavation



CROSS SECTION of DAM
at Sta. 1+42
Showing outlet Pipe, Concrete Collars etc.
Scale 1"=5'

Concrete Cl. A:
52 Cu. yds. Concrete
39 Bbl. Best Portland Cement
2.3 Cu. yds. Sand
4.6 " " Gravel

2'X14' Burnham Gate



MAP
Scale 1 in. = 200 ft

MAP, PROFILE, & DRAWINGS
OF
FIVE POINT LAKE RESERVOIR
IN
DUCHESNE COUNTY
PERTAINING TO APPLICATION No. 8300
BY
THE FARMER'S IRRIGATION COMPANY

SCALES AS SHOWN.
Sept. 10-1928

APPROVED _____
STATE ENGINEER.

29

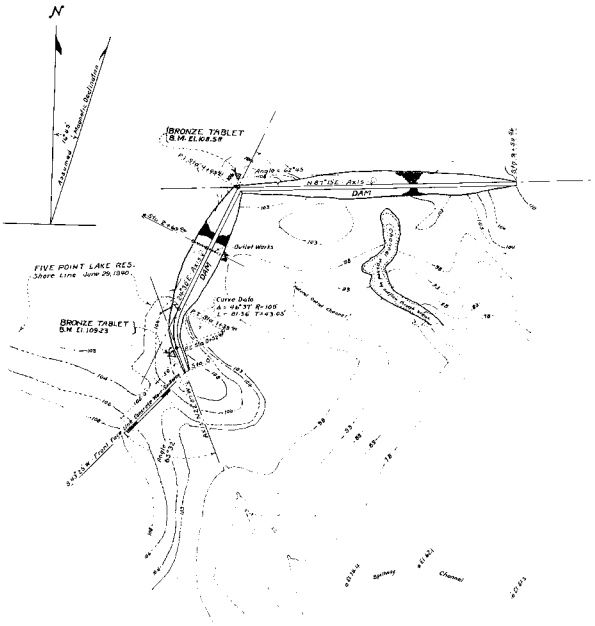
14
1
55

Received Sept. 15, 1928.
Returned June 13, 1929.
Approved Feb. 6, 1930.
John H. Bacon
State Engineer

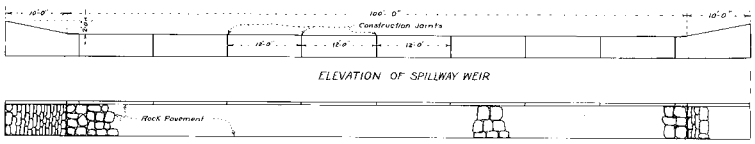
FILE NO. 8300 38

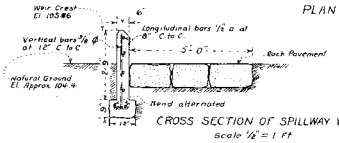
H-16730

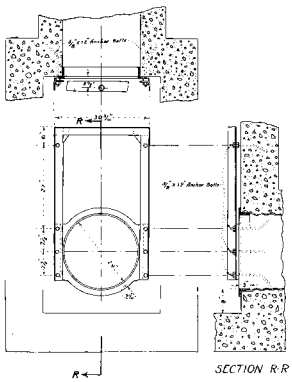
Duchesne UT 113

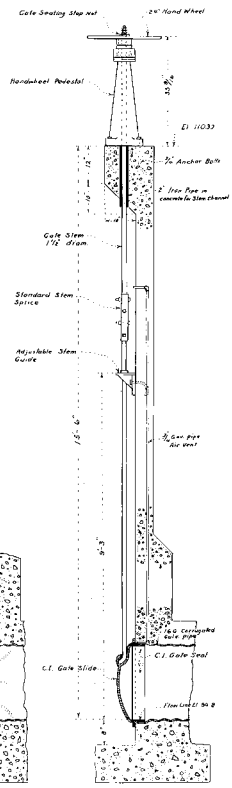


MAP
CONTOURS & DAM
Scale 1" = 100'





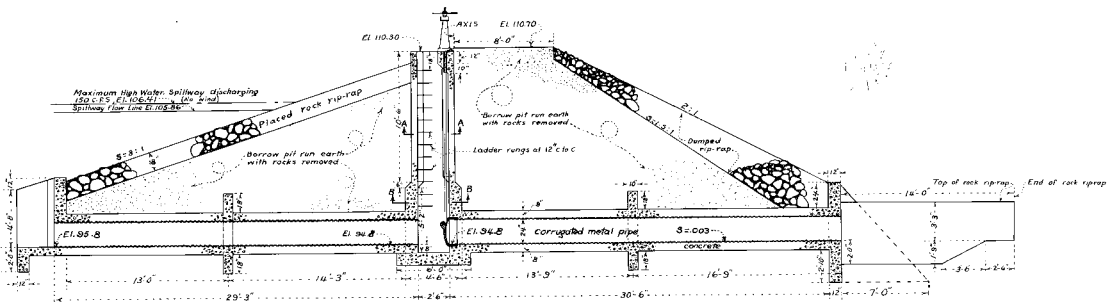




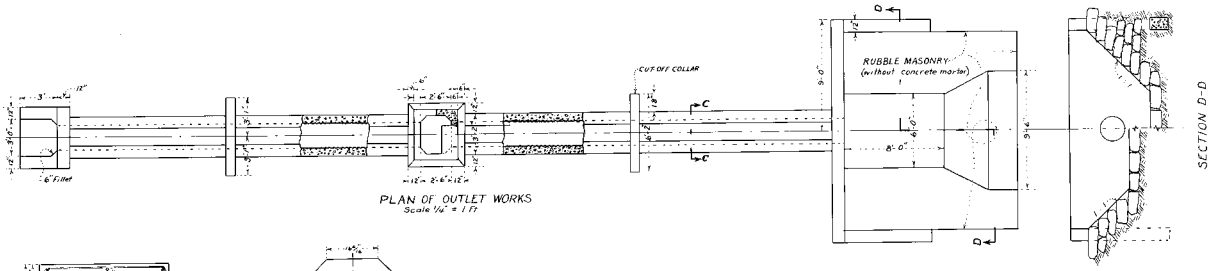
FIVE POINT LAKE RES.
MAPS & DRAWINGS
Sheet 2 of 4 Sheets

H-32-52

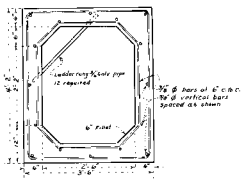
Five Point Lake Res.



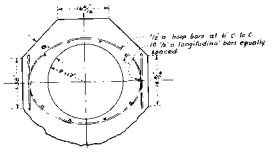
MAXIMUM CROSS SECTION OF DAM THROUGH ℄ OF OUTLET WORKS



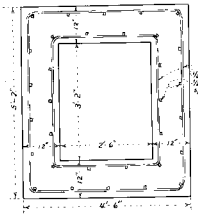
PLAN OF OUTLET WORKS
Scale 1/4" = 1 Ft



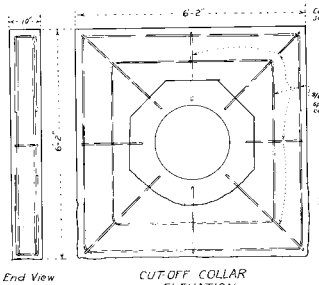
SECTION A-A



SECTION C-C

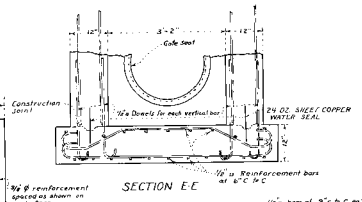


SECTION B-B

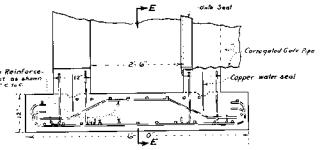


End View

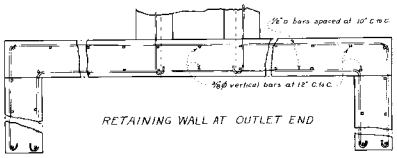
CUT OFF COLLAR ELEVATION



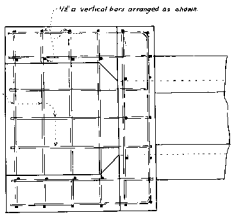
SECTION E-E



GATE WELL FOOTING
SECTION on ℄ of OUTLET



RETAINING WALL AT OUTLET END



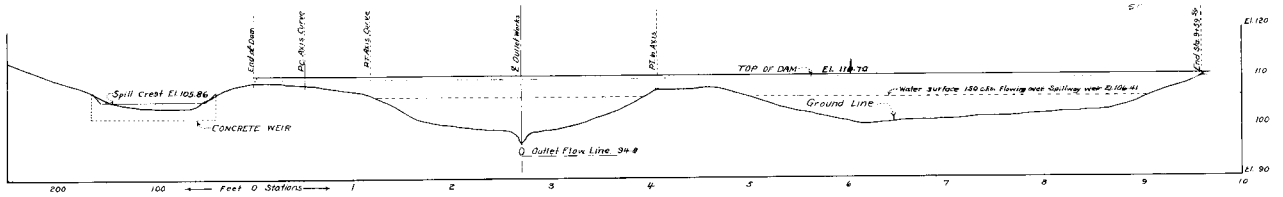
INTAKE BOX

OUTLET STRUCTURE REINFORCEMENT DETAILS
Scale 3/4" = 1 Ft

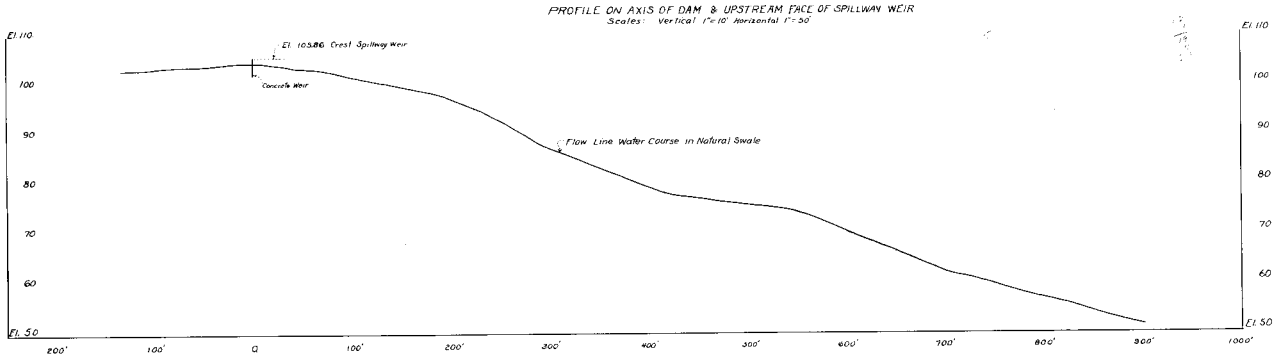
FIVE POINT LAKE RES.
MAPS & DRAWINGS
Sheet 3 of 4 Sheets
H-32-53

Five Point Lake Res.

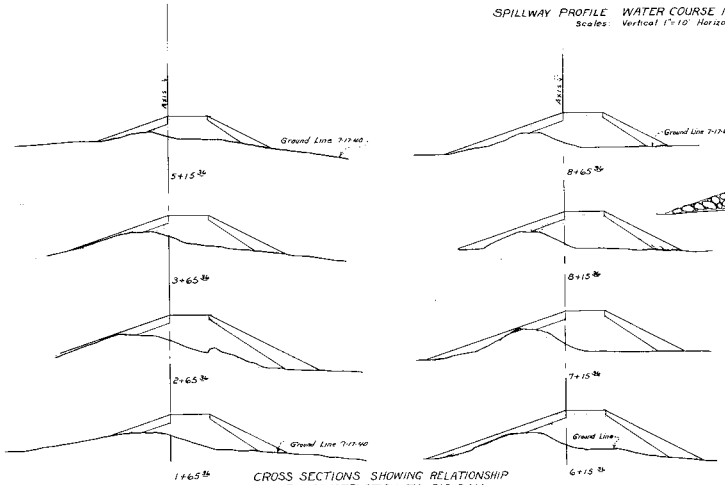
54



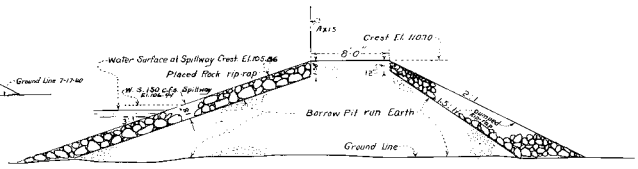
PROFILE ON AXIS OF DAM & UPSTREAM FACE OF SPILLWAY WEIR
Scales: Vertical 1"=10' Horizontal 1"=50'



SPILLWAY PROFILE WATER COURSE NATURAL SWALE
Scales: Vertical 1"=10' Horizontal 1"=50'



CROSS SECTIONS SHOWING RELATIONSHIP OF NEW CONSTRUCTION TO OLD DAM
NATURAL SCALE 1"=10'



CROSS SECTION OF DAM AS DESIGNED
Scale 1/n = 5 ft.

FIVE POINT LAKE RES.
MAPS & DRAWINGS
Sheet 4 of 4 Sheets

H-32-54

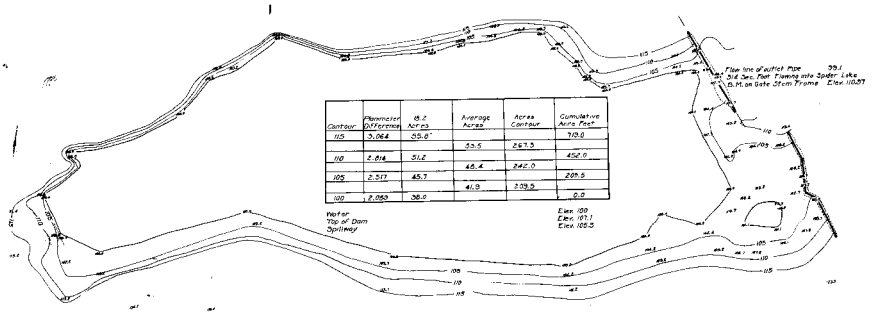
Five Point Lake Res.

STATE OF UTAH
OFFICE OF STATE ENGINEER

SURVEYED BY U.S. INDIAN SERVICE

BLUEBELL LAKE - BEAN LAKE - LOWER SPIDER LAKE
UPPER SPIDER LAKE - SUPERIOR LAKE

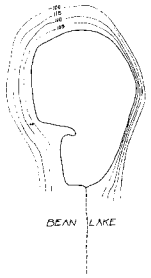
7-10



Contour	Planimeter Difference	18.2 Acres	Average Acres	Acres Contour	Cumulative Acre Feet
115	3.064	55.8			710.0
			53.5	267.5	
110	2.814	51.2			452.0
			46.4	242.0	
105	2.547	45.7			205.5
			41.9	209.5	
100	2.060	38.0			0.0

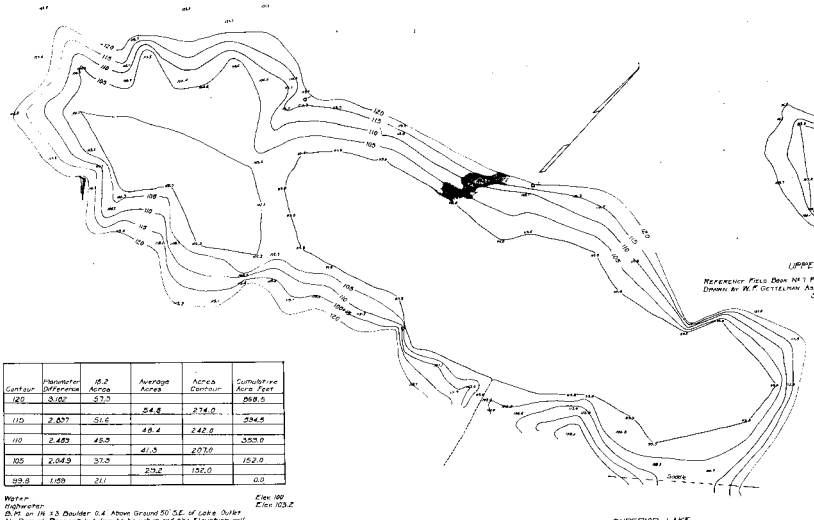
BLUEBELL LAKE

REFERENCE FIELD BOOK NO 7 PAGES 21 TO 25 LOCATED ABOUT ONE MILE WEST OF FIVE POINT LAKE
SURVEYED SEPT. 22, 1931 W.F. GETTELMAN, ASSISTANT ENGINEER
SCALE 1 INCH = 200 FEET.



BEAN LAKE

Contour	Planimeter Difference	18.2 Acres	Average Acres	Acres Contour	Cumulative Acre Feet
120	0.371	6.8			100.0
			6.6	33.0	
115	0.332	6.2			77.0
			5.9	23.5	
110	0.283	5.5			47.5
			5.1	25.5	
105	0.252	4.8			22.0
			4.4	22.0	
100	0.224	4.1			0.0



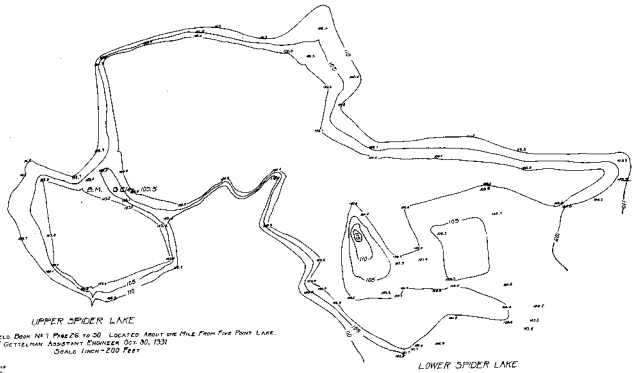
Contour	Planimeter Difference	18.2 Acres	Average Acres	Acres Contour	Cumulative Acre Feet
120	3.182	57.5			868.5
			54.8	274.0	
115	2.837	51.6			594.5
			46.4	232.0	
110	2.483	45.5			353.0
			41.3	207.0	
105	2.249	37.5			152.0
			29.2	152.0	
99.8	1.159	21.1			0.0

Water
Highwater
B.M. on IN 33 Boulder 0.4 Above Ground 50 S.E. of Lake Outlet
No Dam at Present but dam to be put in and the Elevation will be according to Fill Stakes put in this summer

Elev. 100
Elev. 103.2

SUPERIOR LAKE

REFERENCE FIELD BOOK NO 7 PAGES 12 TO 17 LOCATION N.E. ¼ SEC. 2 T. 4 N. R. 5 W.
SURVEYED SEPT. 17, 1931 PLOTTED BY A.W. JOHNSON
SCALE 1 INCH = 200 FEET



UPPER SPIDER LAKE

REFERENCE FIELD BOOK NO 7 PAGE 26 TO 30 LOCATED ABOUT ONE MILE FROM FIVE POINT LAKE.
DRAWN BY W.F. GETTELMAN ASSISTANT ENGINEER OCT. 30, 1931
SCALE 1 INCH = 200 FEET

LOWER SPIDER LAKE

Contour	Planimeter Difference	18.2 Acres	Average Acres	Acres Contour	Cumulative Acre Feet
110	2.106	38.6			233.7
			34.9	174.5	
105	1.710	31.1			134.7
			24.5	73.5	
103.7	0.871	17.9			0.0

Water Elev. Upper
Water Elev. Lower
Bench Mark on Boulder Elev. 105.5

Elev. 105.8
Elev. 100

Bluebell 1:41

PROPOSED

SUPERIOR LAKE RESERVOIR
OF THE
FARMERS IRRIGATION CO.
APPLICATION FILE NO. 8298
LOCATED IN DUCHESNE COUNTY, UTAH

SURVEY MADE SEPTEMBER 4, 1931
By Austin G. Burton

ENGINEER'S CERTIFICATE

Austin G. Burton being first duly sworn, certifies that he was employed to prepare the plans and specifications for the dam proposed to be constructed in connection with the appropriation of water under application No. 8298; that these plans consisting of one sheet indicate the information to be submitted for approval of said plans, and the survey of the site was made by him between the 4th day of September 1931 and the 4th day of September 1931.

Austin G. Burton

Subscribed and sworn to before me this 4th day of Feb. 1933

Lucile Cardon
Notary Public

OWNER'S CERTIFICATE

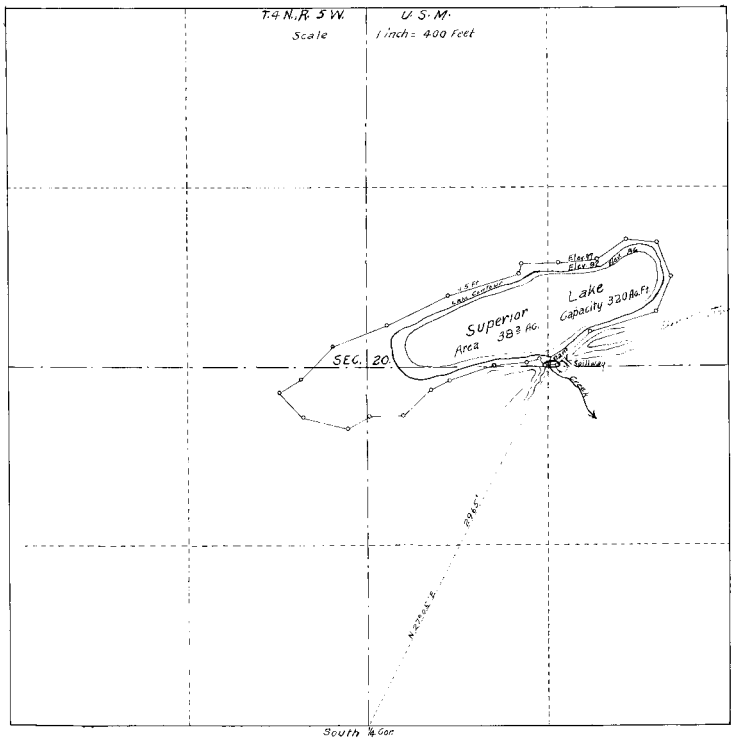
W. E. Davis Jr. being first duly sworn, certifies that he employed Aug. Burton of Talmage, Utah to prepare the accompanying plans of dam to be constructed in connection with the appropriation of water under application No. 8298 and that he hereby accepts these plans.

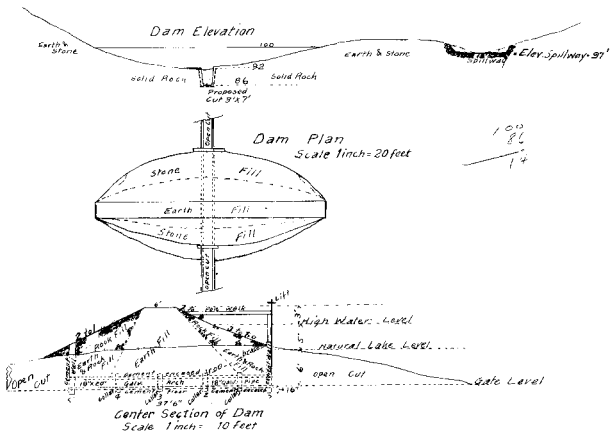
W. E. Davis Jr.
President Farmers Irrig. Co.

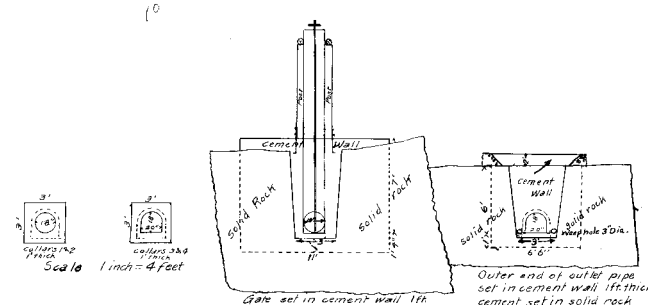
Subscribed and sworn to before me this 1st day of September 1933

My commission expires July 7-1935

Austin G. Burton
Notary Public







22
H-32

March 6th, 1933.
Aug. 17, 1933
Sept. 26, 1933

Superior Lakes Res.

A. Baumgartner.

PROOF 19
2.
36