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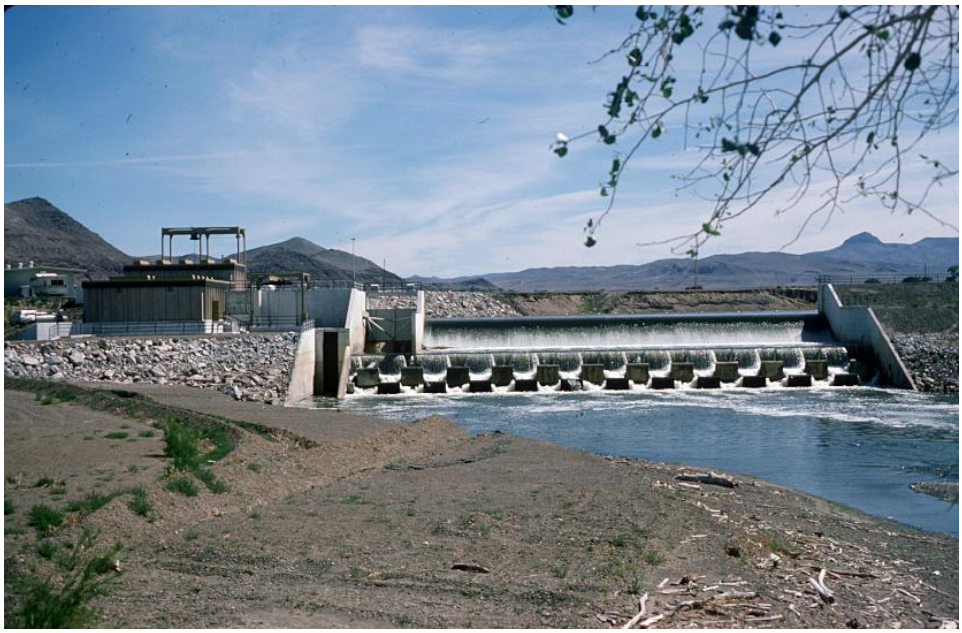
Hydraulic Laboratory Technical Memorandum PAP-1076

2013 Feasibility Level Fish Bypass Design at Marble Bluff Dam



U.S. Department of the Interior
Bureau of Reclamation
Technical Service Center
Hydraulic Investigations and Laboratory Services Group
Denver, Colorado

May 2013

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2013 Feasibility Level Fish Bypass Design at Marble Bluff Dam

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Executive Summary

The objective of this study is to provide the Fish and Wildlife Service (FWS) with appraisal-level quantities and cost estimates for reconstruction of the Pyramid Lake fishway at Marble Bluff Dam. Pyramid Lake Fishway and Marble Bluff Dam are Bureau of Reclamation (Reclamation) facilities operated by FWS.

Historically, when the water elevation in Pyramid Lake falls below 3805 feet, fish passage access up the river is blocked by a sediment delta at the river's mouth. During these periods of low lake elevations the fishway serves as the main access for fish moving upriver to spawn. The fishway as constructed in 1976 fails to provide effective fish passage for the endangered and threatened Cui-ui lake sucker and Lahontan cutthroat trout fish species of Pyramid Lake. Without an effective fishway, spawning during years when the lake elevation falls below 3805 is severely restricted.

The existing fishway contains five fish ladders. Starting at the lake, the ladders are referred to as the entrance ladder (also referred to as the terminal ladder in prior documents), intermediate ladders 1, 2 and 3 and the exit ladder. In its current condition (April 2013) the original fishway is operational but limits passage at each of the intermediate ladders.

Two main concepts were developed during this study, both providing passage along the existing fishway alignment from Pyramid Lake to the exit ladder but using two different fish ladder types. Both designs were initially investigated and developed by Relacmation in November 2000 (Reclamation, 2000), this report slightly modifies the 2000 design and updates the cost estimates.

Design A (concrete ladders) includes replacing the existing fish ladders with concrete or steel baffles in a 3.25 percent sloped concrete rectangular channel with 8.0-ft bottom width and 8.0-ft channel depth with approximately 6-ft of flow. Chevron shaped baffles, developed for effective Cui-ui passage, will be constructed of either concrete or steel and will be spaced 8 feet apart.

Design B (rock riffle ladders) includes replacing the existing fish ladders with rock baffles placed in a 6.0-ft bottom width, 5.5-ft deep riprap lined channel with 1.5:1 H:V side slopes. The ladder will provide passage using large boulder weir drops spaced 28 ft apart along a 1.20 percent slope.

Appraisal level drawings, construction quantities, and cost estimates are presented for both options. To replace all 3 ladders Design A (concrete ladders) and B (rock ladder) are estimated to approximately cost $5.9M and $2.3M respectively. Maintenance and inspection costs were estimated based on discussion with fishway operators and are approximately $25,000 annually for either option.

The remainder of this report contains a summary of the findings, assumptions and design criteria for both options.

Background

Marble Bluff Dam is located on the Truckee River approximately 50 miles downstream of Reno, Nevada and approximately 3 miles upstream of Pyramid Lake (Figure 2). The terminal waters (no outlet) of Pyramid Lake are supplied largely by flow from the Truckee River. Both the Truckee River and Pyramid Lake contain unique habitats for the spawning and survival of endangered Cui-ui lake suckers (Chasmistes cujus) and threatened Lahontan cutthroat trout (Oncorhynchus clarki) (LCT).

Historically Pyramid Lake elevations have fluctuated widely creating a unique challenge to keeping Cui-ui and LCT from becoming extinct. Records dating sporadically from about 1844 indicate that the lake elevation remained relatively stable, with cyclical fluctuations of about 20 feet maximum until about 1910, when a general decline began. In the last 100 years, the lake elevation has dropped as much as 80 feet due to upstream diversions coupled with periods of drought (Figure 1). A declining lake elevation lead to severe degradation of the Lower Truckee River. Upstream passage problems for both Cui-ui and LCT developed as a result.

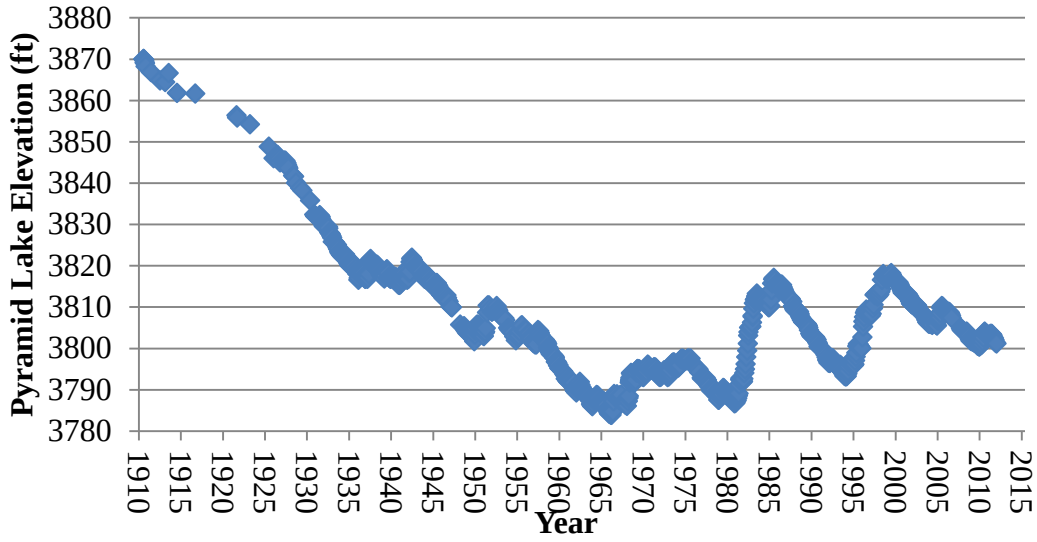

Figure 1 – Pyramid Lake elevation from 1910 to 2013

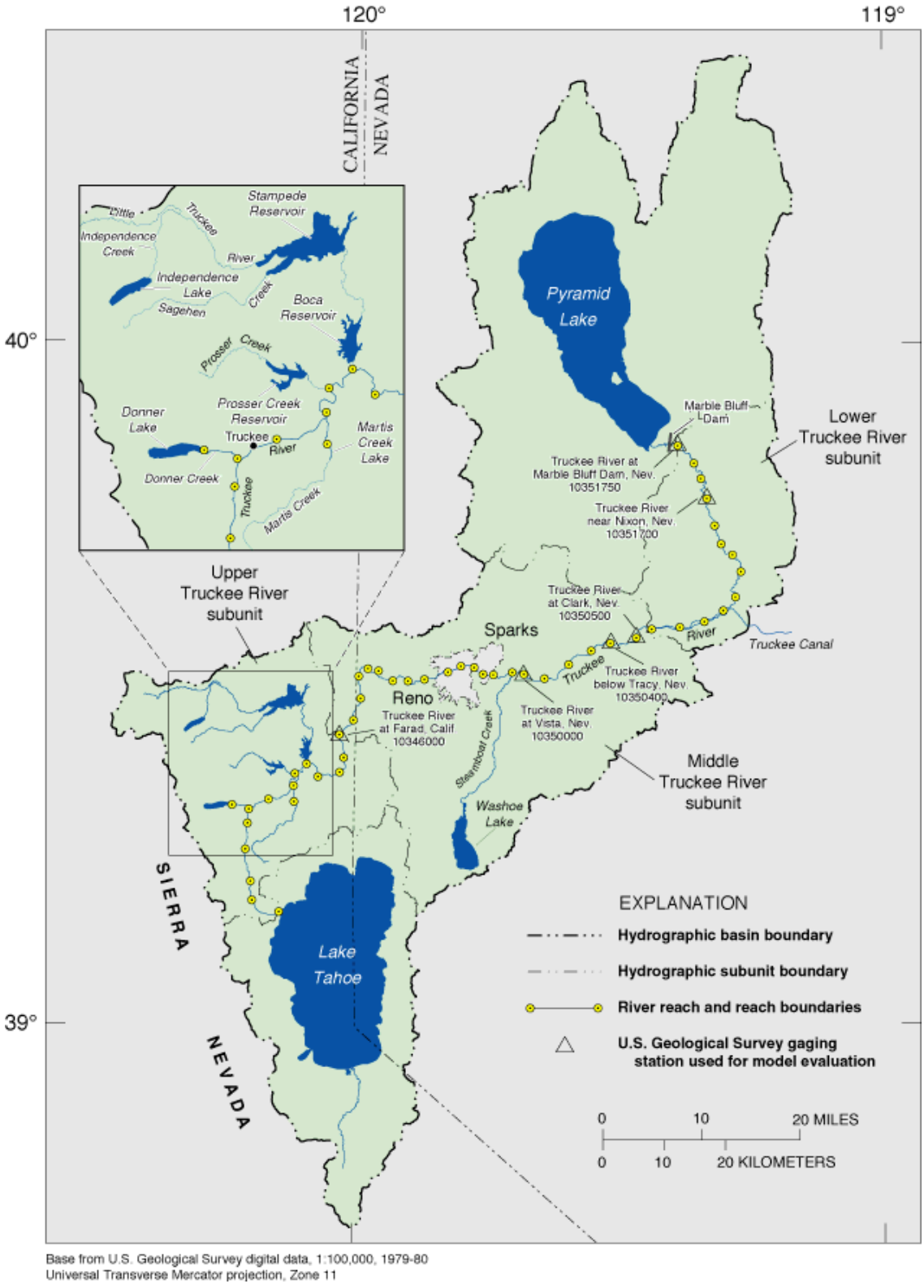

Figure 2 – Area map showing the location of Marble Bluff dam (courtesy of USGS)

In 1992 the U.S. Fish and Wildlife Service (FWS) issued a recovery plan for the endangered Cui-ui lake sucker (Service, 1992) and in 1995 a recovery plan for Lahontan cutthroat trout (LCT) (Service, 1995). These plans identify improving passage at Marble Bluff Dam as a key component to the recovery of these species.

In 1976 the Bureau of Reclamation constructed Marble Bluff Dam and fish passage facilities for the U.S. Fish and Wildlife Service. The facilities were designed to aid fish passage and stabilize the rapidly degrading river channel. For conditions when fish were not able to pass up the natural river, the Pyramid Lake fishway was constructed to provide fish passage directly from the lake to upstream of Marble Bluff Dam. The three-mile-long fishway contains five fishway ladders and was designed to provide fish passage for a maximum elevation gain between the lake and the river upstream of the dam of about 76 ft. The five fish ladders are linked by an earth lined trapezoidal channel. The fishway ladders are commonly referenced by location in the upstream direction of fish movement. Starting at Pyramid Lake the ladders are referred to as the fishway entrance ladder (or terminal ladder as in previous documents), ladder 1, ladder 2, ladder 3 (or intermediate ladders), and the exit ladder (Figure 3).

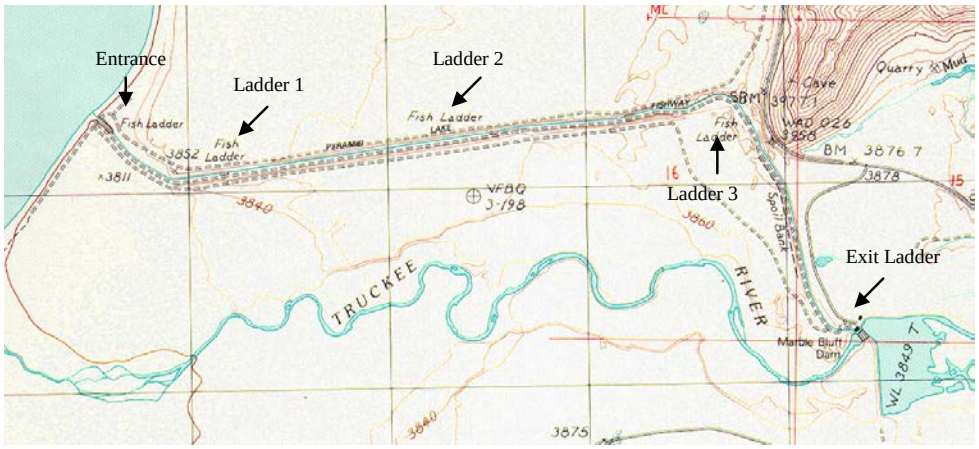

Figure 3 - Location map showing Marble Bluff dam and Pyramid Lake fishway

Each ladder contains a series of baffles (weir and orifice combination) that were originally spaced every 10 ft. Each baffle provided a water surface drop of 1 ft and a passage flow velocity of 8 ft/sec. The ladder design was based on experience with salmonid passage and available studies of the Cui-ui physical and behavioral attributes (Koch, 1972) (Koch, 1976) (Koch, 1973) (Ringo, et al., 1977).

During initial operation of the fishway, the ladder baffle design and head drop were found to be a poor match for Cui-ui behavior and swimming strength. Cui-ui that attempted to move up the ladders crowded near the fishway invert. The 8 ft/sec passage velocity was found to be too high for efficient passage. In addition, the bottom-oriented behavior of the Cui-ui was contrary to passing over a weir that forced them high in the water column. To improve passage, FWS added weirs halfway between the original baffles. This reduced the drop over each baffle to 0.5 ft and reduced the pool length between baffles to 5 ft. Velocity over

the baffles was reduced to about 5 ft/sec. Passage of Cui-ui improved; however fish passage efficiency remains low.

Starting in 1995, FWS and other organizations pursued a project to develop better methods for passing Cui-ui suckers and LCT that move up the river to Marble Bluff Dam. The project resulted in three major structures being built. These are; replacement of the river fish trap and hoist system with a hydraulic fish lock, construction of a gradient control structure in the river downstream of the dam and replacement of the exit fishway ladder with a new fish ladder designed for Cui-ui (Mefford, et al., 1995).

The replacement exit ladder was an 8-ft-wide, 6-ft-deep concrete channel with baffles placed every 8 ft of length. To improve flow conditions, the ladder gradient was set at 0.031-ft-vertical to 1-ft-horzontal (3.13 percent) and new dual slot chevron shaped steel baffles were designed specifically for Cui-ui passage. Flow through the exit ladder varied from 30-46 ft^3/sec depending on river stage. When needed, supplemental flow can be added to increase the fishway capacity to 50 ft^3/sec (Mefford, et al., 1995).

The new fish lock and gradient control structure have functioned well. However, the existing fishway channel, including the new exit fish ladder, is not considered operational as the fish ladders downstream of the exit have not been replaced to allow effective Cui-ui passage.

In 2011, FWS partnered with the U.S. Army Corp of Engineers and Reclamation to create feasibility level fish passage replacement designs for the entire Marble Bluff Fishway (Heiner, 2011). The proposed design included rehabilitation of the entire fishway to increase the current capacity to 100 ft^3/sec. After completing the feasibility designs, the Corp of Engineers withdrew their support and FWS determined it more economical to redesign the fishway based on the current 50 ft^3/sec capacity and conveyance channel.

Fishway Design Criteria

Fishway ladder and conveyance channel designs were selected based on achieving flow conditions suitable for efficient Cui-ui and LCT passage. Fishway design criteria set by FWS are as follows:

- Utilize the existing conveyance channel and exit ladder
- Fishway flow capacity of 50 ft^3/sec
- Normal conveyance channel flow depth of 4.0 ft
- Maximum conveyance channel flow velocity of 2 ft/sec
- Maximum average fish ladder baffle velocity of 4 ft/sec
- Strong downstream flow to enhance fish orientation

- Provide passage at all levels within the water column
- Provide designs for each ladder to be replaced independently
- Provide designs for both concrete- and rock-lined replacement ladders.

Fishway Design Options

The Fish and Wildlife Service requested that Reclamation develop two separate designs for rehabilitating the fishway at Marble Bluff Dam. Both designs utilize the existing entrance meander, conveyance channel and exit ladder. The two design options are described as follows:

Design A (concrete)

Design A includes replacing the existing fish ladders with concrete chute and baffle fish ladders similar to the new exit ladder. Baffles will be placed in a 3.25 percent sloped concrete rectangular channel with 8.0-ft bottom width and 8.0-ft channel depth. Chevron shaped baffles, developed for effective Cui-ui passage, will be constructed of either concrete or steel and will be spaced 8 feet apart.

Design B (rock)

Design B includes replacing the existing fish ladders with large rock boulder baffles placed in a 6.0-ft bottom width, 5.5-ft deep riprap lined channel with 1.5:1 H:V side slopes. The large boulder baffle drops will be spaced 28 feet apart along a 1.20 percent slope.

Base Stationing

Due to the discontinuity of the stationing between the existing construction drawings from 1973 and the 1996 re-construction drawings of the new exit ladder and fish lock, new stationing was determined starting from station 0+00.00 off the 1996 exit ladder specification drawings (Spec. No. 20-C0451) that was constructed in 1998. The approximate centerline of the existing fishway and channel was used as a baseline for both designs to reduce right of way concerns and minimize excavation costs.

Design A – Concrete Channel with Steel or Concrete Chevron Baffles

Description

Design A includes replacing the three intermediate ladders built in 1976 with ladders that resemble the new exit ladder that was replaced in 2000. The new ladders would be constructed on a 0.0325 slope with a water surface drop across each baffle of approximately 0.26 ft. Detailed plan and profile drawings of the proposed fishway can be found in Appendix B (Drawings 949-D-A1 thru A4).

The slope of the proposed fishway was selected to keep velocities less than 4.0 ft/sec. The proposed ladder channels are 8 ft wide by 8 ft deep.

Baffles in each ladder will have two 1-ft-wide slots and will be spaced every 8 ft down the fishway. Baffles will be similar to those found in the exit ladder except guidance vanes will be added which will allow fish to navigate more efficiently. Both concrete (Drawings 949-D-CB1 & CB2 in Appendix A) and steel baffles (Drawings 949-D-SB1 & SB2 in Appendix A) were priced during this study to determine what would be the most economical for construction. Both designs are the same basic shape and size but the steel baffles will be removable and the concrete baffles will be permanent.

Overflow Bypass

Each fishway ladder is designed with a flow bypass system that can convey flow around the fishway ladder. The flow bypass provides overflow protection should the fishway baffles become partially plugged with debris. The bypass system includes a 12-ft-long weir overflow located 4 ft above the channel bottom just upstream of each fishway ladder, an energy dissipation box at the downstream end of each ladder and a 24-in diameter pipe linking the two structures. The overflow is designed to pass 40 ft^3/sec when the channel depth is 1 ft above the weir crest, leaving approximately 0.5 ft of freeboard in the channel.

Flow Characteristics

Flow through each fishway is determined by the flow depth in the conveyance channel upstream and downstream of the ladders as shown in Table 1. Assuming a Manning's *n* of 0.03 the channel roughness will control the depth in the channel until flows reach about 37 ft^3/sec. Above 37 ft^3/sec the ladder baffles and overflow bypass will control the depth in the channel. Any flow above that which can pass through the baffles will be passed through the overflow bypass.

Velocities in the conveyance channels will range from 0.67-0.82 ft/sec and the average velocity through each baffle will be between 1.85 and 3.23 ft/sec. Velocities in both the conveyance channel and through the baffles meet the recommended design criteria set by the FWS.

Flow depth in the conveyance channels will meet the recommended design criteria of 4 ft when flows down the fishway are at or above 39 ft^3/sec. Each ladder section is offset 2 ft lower than the channel upstream and downstream to increase the depths in the ladder and reduce the average baffle velocity.

Table 1 - Design A - Concrete ladder channel and ladder flow characteristics

Depth in U/S & D/S Channel (ft)	Total Drop per Ladder (ft)	Water Surface drop per baffle (ft)	Estimated Ladder Flow[+] (ft^3/sec)	Estimated Channel Flow[*] (ft^3/sec)	Average Baffle Velocity (ft/sec)	Average Channel Velocity (ft/sec)
2.5	13	0.26	~~29.1~~	16.7	1.85	0.68
3.0	13	0.26	~~32.3~~	23.7	2.37	0.75
3.5	13	0.26	~~35.6~~	32.1	2.92	0.82
4.0	13	0.26	38.8	~~42.0~~	3.23	0.81
4.5	13	0.26	42.0	~~53.5~~	3.23	0.73
5.0	13	0.26	45.3	~~66.6~~	3.23	0.67

[+]values that are crossed out indicate that channel roughness is controlling

[*]values that are crossed out indicate that ladder baffles are controlling

Location

Each replacement ladder will utilize the existing conveyance channel and entrance meander. Individual ladders will be located based on Drawings 949-D-A1 thru A4 (Appendix B) and Table 2. Brief descriptions of each ladder are as follows:

Concrete Ladder #3 – Contains a series of chevron baffles at a 3.25 percent slope (0.0325 ft/ft). The baffles will be spaced every 8.0 ft apart between stations 40+79.70 and 45+19.56 over 13 feet of elevation change (see Table 2 and Drawing 949-D-A2 in appendix B).

Concrete Ladder #2 – Contains a series of chevron baffles at a 3.25 percent slope (0.0325 ft/ft). The baffles will be spaced every 8.0 ft apart between stations 85+29.85 and 89+69.71 over 13 feet of elevation change (see Table 2 and Drawing 949-D-A3 in appendix B).

Concrete Ladder #1 – Contains a series of chevron baffles at a 3.25 percent slope (0.0325 ft/ft). The baffles will be spaced every 8.0 ft apart between stations 130+29.85 and 134+69.71 over 13 feet of elevation change (see Table 2 and Drawing 949-D-A4 in appendix B).

Table 2 - Design A - Concrete ladder stationing and elevation details

Description	Station	Channel Invert	Grade In	Grade Out
	(ft)	Elevation (ft)	(ft/ft)	(ft/ft)
U/S Run #4	2+79.44	3846.00	-	-0.0001
D/S Run #4	40+79.70	3845.61	-0.0001	-0.0325
U/S Concrete Ladder #3	40+79.70	3845.61	-0.0001	-0.0325
D/S Concrete Ladder #3	45+19.56	3832.59	-0.0325	-0.0001
U/S Run #3	45+19.56	3832.59	-0.0325	-0.0001
D/S Run #3	85+29.85	3832.18	-0.0001	-0.0325
U/S Concrete Ladder #2	85+29.85	3832.18	-0.0001	-0.0325
D/S Concrete Ladder #2	89+69.71	3819.16	-0.0325	-0.0001
U/S Run #2	89+69.71	3819.16	-0.0325	-0.0001
D/S Run #2	130+29.85	3818.75	-0.0001	-0.0325
U/S Concrete Ladder #1	130+29.85	3818.75	-0.0001	-0.0325
D/S Concrete Ladder #1	134+69.71	3805.73	-0.0325	-0.0001
U/S Run #1	134+69.71	3805.73	-0.0325	-0.0001

Design B – Riprap Channel with Boulder Baffles

Description

Design B includes replacing the three intermediate ladders built in 1976 with rock riffle ladders that resemble the fishway that was installed at Derby Dam in 2000 (Heiner, 2011). The new rock riffle ladders would be constructed on a 0.012 slope with a water surface drop across each baffle of approximately 0.33 ft. The slope of the proposed rock riffle ladders was selected to keep average drop velocities less than 4.0 ft/sec. The proposed rock riffle ladders will be placed in a trapezoidal channel with similar dimensions as the conveyance runs (6 ft bottom width, 5.5 ft depth and 1.5:1 side slopes) except they will be lined with 2-10 inch well-graded riprap. Detailed plan and profile drawings of the proposed rock riffle ladders can be found in Appendix B (Drawings 949-D-B1 thru B4).

Baffles in each rock riffle ladder will consist of three boulders. Two 3.5 ft diameter (outside) and one 4-4.5 ft diameter (center) boulders spaced in a chevron shape with approximately 1 ft clearance between the boulders. Boulder baffles will be spaced every 28 ft down the rock riffle ladders.

The rock riffle ladders will be constructed by over excavating the channel 1.5 ft, laying down a low porosity geotextile fabric, laying the riprap lining then placing the boulder baffles. The three boulders used for each baffle drop will provide four passage routes (also referred to as chutes). Boulders will be positioned on a 60 degree angle to the channel centerline with roughly 1 ft of clear space between them (Drawing 949-D-B1 in Appendix B). The large center boulders will be

placed on the riprap bedding and the side boulders will be set a minimum of 6 inches below the riprap grade.

Overflow Bypass

Each rock riffle ladder is designed such that a separate flow bypass is not necessary. Any flow over that which is designed to pass through the rock baffle chutes will be transferred downstream by overtopping the boulder weirs.

Flow Characteristics

Flow through each fishway is determined by the flow depth in the conveyance channel upstream and downstream of the ladders. The boulder arrays are designed to pool water to a depth of about 3.5 to 4 ft with an average drop in water surface of about 0.33 ft across each array. The boulder weir drops are designed to convey the full 50 ft^3/sec fishway design flow with an average passage velocity of about 4 ft/sec. As rock boulders are different shapes, flow conditions will vary through each drop structure. Some tuning of the individual boulder arrays after initial operation is expected. As is typical with rock boulder ladders hydraulic conditions are more sensitive to changes in flow, headwater and tailwater conditions.

Location

Each replacement ladder will utilize the existing conveyance channel and entrance meander. Individual ladders will be located based on the based on Drawings 949-D-B1 thru B4 (Appendix B) and Table 3. Brief descriptions of each ladder are as follows:

Rock Riffle Ladder #3 – Contains a series of boulder arrays at a 1.2 percent slope (0.0120 ft/ft). The boulder arrays will be spaced every 28.0 ft apart between stations 38+00.00 and 48+91.12 over 13 feet of elevation change (see Table 3 and Drawing 949-D-B2 in appendix B).

Rock Riffle Ladder #2 – Contains a series of boulder arrays at a 1.2 percent slope (0.0120 ft/ft). The boulder arrays will be spaced every 28.0 ft apart between stations 83+00.00 and 93+91.12 over 13 feet of elevation change (see Table 3 and Drawing 949-D-B3 in appendix B).

Rock Riffle Ladder #1 – Contains a series of boulder arrays at a 1.2 percent slope (0.0120 ft/ft). The boulder arrays will be spaced every 28.0 ft apart between stations 127+00.00 and 137+91.12 over 13 feet of elevation change (see Table 3 and Drawing 949-D-B4 in appendix B)

Table 3 - Design B – Rock riffle ladder stationing and elevation details

Description	Station	Channel Invert	Grade In	Grade Out
	(ft)	Elevation (ft)	(ft/ft)	(ft/ft)
U/S Run #4	2+79.44	3846.00	-	-0.0001
D/S Run #4	38+00.00	3845.64	-0.0001	-0.0120
U/S Rock Ladder #3	38+00.00	3845.64	-0.0001	-0.0120
D/S Rock Ladder #3	48+91.12	3832.55	-0.0120	-0.0001
U/S Run #3	48+91.12	3832.55	-0.0120	-0.0001
D/S Run #3	83+00.00	3832.21	-0.0001	-0.0120
U/S Rock Ladder #2	83+00.00	3832.21	-0.0001	-0.0120
D/S Rock Ladder #2	93+91.12	3819.11	-0.0120	-0.0001
U/S Run #2	93+91.12	3819.11	-0.0120	-0.0001
D/S Run #2	127+00.00	3818.79	-0.0001	-0.0120
U/S Rock Ladder #1	127+00.00	3818.79	-0.0001	-0.0120
D/S Rock Ladder #1	137+91.12	3805.69	-0.0120	-0.0001
U/S Run #1	137+91.12	3805.69	-0.0120	-0.0001

Sediment Flushing

Reclamation's 2000 and 2011 reports provide detailed analysis on the viability of flushing windblown sediment deposits down the fishway. The studies looked at a variety of options for addressing sediment including channel slope, flow velocity, flow depth and channel width. Both studies utilized the Corps of Engineers SAM Model for hydraulic design of channels (now available in the Corps HEC-RAS model).

Both studies determined that transportation of all sediment would be unlikely given the current design flows and slope of the existing channel. As such, it is assumed that yearly inspection and cleaning of any sand deposits will be needed.

To aid in the removal of sand deposits in Design A, the downstream end of each concrete ladder will have a zero- or flat-slope 8-ft wide concrete section where the water velocity will approach 1 ft/sec and allow suspended sediments to settle on the channel bottom. Deposited sediment can be removed during the off season by means of a shovel or bucket loader.

Due to the complex flow patterns in Design B, it is anticipated that little deposition will occur in the rock riffle ladders. Experience from similar rock fishways operating with high sediment loads shows deposition only occurs in low velocity zones but does not significantly alter flow conditions or passage efficiency. To prevent excess deposition of sediment, the fishway can be operated

for a short period of time at flows less than the design discharge. Reducing fishway flow alters the flow pattern in the rock riffle ladder from a step-pool regime to a shallow boundary flow capable of transporting sediment deposits into the conveyance channels where removal can be performed as needed.

Construction Dewatering Plan

Dewatering estimates were made based on groundwater data that was collected in 1972 and is available on the 1973 construction drawings. Any location where the ground water was expected to be within 2.5 ft of the cut invert was assumed to need dewatering. As contractors prefer different methods for construction dewatering no detailed dewatering plan is presented in this report. Both the 2000 and 2011 Reclamation reports present possible dewatering options. Table 4 and Table 5 provide the estimated dewatering including location and estimated maximum drawdown for both Design A and Design B.

Table 4 - Estimated groundwater control required for Design A

Location	Stationing		Length	Max Drawdown
	Start (Upstream)	End (Downstream)	(ft)	(ft)
Concrete Ladder 3	NA	NA	0	NONE
Concrete Ladder 2	88+00	89+75	175	3.9 ft
Concrete Ladder 1	NA	NA	0	NONE

Table 5 - Estimated groundwater control required for Design B

Location	Stationing		Length	Max Drawdown
	Start (Upstream)	End (Downstream)	(ft)	(ft)
Rock Ladder 3	48+93	49+05	12	2.0
Rock Ladder 2	93+60	94+08	48	3.7
Rock Ladder 1	137+93	138+05	12	1.8

Project Construction Costs

Estimated construction costs were prepared using the Bureau of Reclamation's Technical Service Center standard cost estimate worksheets. Worksheets were developed for both Design A (concrete ladder) and Design B (rock riffle ladder). For Design A costs were estimated for two different chevron baffle designs, steel or concrete. Each steel baffle was estimated to cost $23,000 and each concrete

baffle was estimated to cost $8,000. Individual cost estimate worksheets can be found in Appendix A. Table 6 provides the overall estimated costs for each design option. It should be noted that the price of Design B is very sensitive to the price and availability of rock which is approximately 35% of the cost shown. Rock prices fluctuate frequently bases on supply and demand and should be verified prior to selecting a design option.

Table 6 - Fishway construction cost summary for Design A and B.

Ladder	Design A (Concrete Ladder)		Design B (Rock Ladder)
	Steel Chevron Baffles	Concrete Chevron Baffles	
#1	$3,100,000.00	$1,950,000.00	$730,000.00
#2	$3,200,000.00	$2,000,000.00	$760,000.00
#3	$3,100,000.00	$1,950,000.00	$790,000.00
ALL	$9,400,000.00	$5,900,000.00	$2,280,000.00

Operation

Both Design A and Design B will not modify existing fishway operations. Currently the fishway is operated by fully opening the slide gate at the head of the fishway and allowing water to pass down the exit ladder. Auxiliary water can be added downstream of the exit ladder by opening Gate #5. Flow should be added if the flow depth in the fishway channel is less than 4.0 feet. The swing bar gate at the downstream end of the exit ladder should be positioned to guide fish up the exit ladder. Fish may need to be controlled into the fishway at the lake interface with the entrance meander by the means of a bar gate structure. The bar gate could be moved each year as needed to follow changes in the lake elevation.

Maintenance

The fishway will require cleaning prior to each operation. Cleaning will consist of removing blown in weeds and large sediment deposits. Within the fishway weeds should be removed to prevent possible debris plugging of the baffles or boulder riffles. The ladders should not require mechanical removal of sediment. If large windblown sand deposits form within the riffles the fishway should be operated at low flows prior to the fish run to flush material out of the ladders where it can be removed by a small bobcat type loader. In the channel between riffles, blown in weeds should be removed by hand. Large sediment deposits should be removed by a small loader driven along the channel invert. The cleaning crew should be versed in proper cleaning techniques that protect the

integrity of the channel lining. Based on FWS experience, in most years the cleaning is estimated to require two people four days plus any additional inspection time and costs around $25,000. If the fishway is not used or cleaned for several years, the cleaning requirements may increase.

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APPENDIX A

QUANTITY ESTIMATE WORKSHEET

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FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #1 - Concrete

PROJECT:
Washoe Project

WOID: OA227 **ESTIMATE LEVEL:** Appraisal
REGION: MP **UNIT PRICE LEVEL:** Oct-12
FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		MOBILIZATION					
		REMOVAL OF EXISTING STRUCTURES	68140				
		Assume removal, haul off and disposal of					
		Include cost of transportation and disposal					
		structures are 1'-0" thick and reinforced					
		Concrete Fish Ladder #1					
	a-01	Concrete (walls, floor, baffles & transitions)		260	CY	$125.00	$32,500.00
	a-02	Handrails		320	LF	$12.00	$3,840.00
	a-03	24" Concrete Pipe		120	LF	$62.00	$7,440.00
	a-04	EXCAVATION		3,200	CY	$13.50	$43,200.00
		Common, removal and disposal (max 3 miles)					
	a-05	COMPACTED BACKFILL		3,000	CY	$20.00	$60,000.00
		Structural, hauled in from borrow (max 3 miles)					
	a-06	CAST-IN-PLACE CONCRETE		460	CY	$1,050.00	$483,000.00
		Includes 8' high wall 9' wide slab					
	a-07	CONCRETE REINFORCEMENT		69,000	LB	$1.55	$106,950.00
		rebar calculated assuming 150 lb/cy of concrete					
	a-08	CEMENTIOUS MATERIAL		130	TON	$200.00	$26,000.00
		cement calculated assuming 0.282 ton/cy of concrete					
	a-09	TRANSITION RIPRAP		8	CY	$150.00	$1,200.00
		4-10" diam. well graded riprap (≈1.5 ton/cy)					
	a-10	GRAVEL SURFACING		75	CY	$63.00	$4,725.00
		12' X 4" access road along the entire fishway					
		SUBTOTAL THIS SHEET					**$768,855.00**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #1 - Concrete

PROJECT:
Washoe Project

WOID:	**OA227**	**ESTIMATE LEVEL:**	**Appraisal**
REGION:	**MP**	**UNIT PRICE LEVEL:**	**Oct-12**

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	a-11	METALWORK					
		Handrails		880	LF	$65.00	$57,200.00
		Along viewing area and bridge					
	a-12	HDPE PIPE					
		24" diameter		450	LF	$104.00	$46,800.00
	a-13	DEWATERING		1	LS	$10,500.00	$10,500.00
		minimal dewatering is anticipated					
		based on 1972 groundwater data					
	a-14	CONTROL OF SURFACE WATER		1	LS	$10,000.00	$10,000.00
		3' high sandbag cofferdam at upstream end of					
		work area, gravel drain and intermittent sump pump					
		SUBTOTAL THIS SHEET					**$124,500.00**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:

Marble Bluff Dam - Fishway Modifications

Existing Fishway Modifications

Replacement of Ladder #1 - Concrete

Concrete Baffles

PROJECT:

Washoe Project

WOID: OA227 **ESTIMATE LEVEL:** Appraisal

REGION: MP **UNIT PRICE LEVEL:** Oct-12

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	b-15	CAST-IN-PLACE CONCRETE		115	CY	$1,250.00	$143,750.00
		50 baffles with 2.3 CY/baffle					
	b-16	CONCRETE REINFORCEMENT		17,250	LB	$1.55	$26,737.50
		rebar calculated assuming 150 lb/cy of concrete					
	b-17	CEMENTIOUS MATERIAL		33	TON	$200.00	$6,600.00
		cement calculated assuming 0.282 ton/cy of concrete					
	b-18	METALWORK					
		Each Baffle contains custom metal work:		24,000	LB	$9.20	$220,800.00
		4X corner supports 1/4"X7.5"X7.5'					
		(48 lbs each)					
		2X adjustable panels 1/4"X23"(unbent)X7.5'					
		(147 lbs each)					
		SUBTOTAL THIS SHEET					**$397,887.50**

QUANTITIES

BY	CHECKED
Bryan Heiner	Jason Wagner
DATE PREPARED	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12

PRICES

BY	CHECKED
Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**
04/25/13	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #1 - Concrete

Summary Sheet

PROJECT:
Washoe Project

WOID: OA227 **ESTIMATE LEVEL:** Appraisal

REGION: MP **UNIT PRICE LEVEL:** Oct-12

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Subtotal (sheet 1)					$768,855.00
		Subtotal (sheet 2)					$124,500.00
		Subtotal (sheet 3)					$397,887.50
		Subtotal					**$1,291,242.50**
		Mobilization	5%	+/-			$65,000.00
		Subtotal with Mobilization					**$1,356,242.50**
		Contract Cost Allowances (Sum of):	15%	+/-			$193,757.50
		Design Contingencies, 15% (+/-)					
		APS, 0% (+/-). Type of procurement: Assumes sealed bids, full and open competition					
		CONTRACT COST					**$1,550,000.00**
		Construction Contingencies	25%	+/-			$400,000.00
		FIELD COST (Unit Price Level Oct 2012)					**$1,950,000.00**
		Non-Contract Costs		**To be determined by the appropriate responsible office**			
		CONSTRUCTION COST		**To be determined by the appropriate responsible office**			
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY** Jerry Zander	**CHECKED**
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED** 04/25/13	**PEER REVIEW / DATE**

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #1 - Concrete

PROJECT:
Washoe Project

WOID: OA227 **ESTIMATE LEVEL:** Appraisal
REGION: MP **UNIT PRICE LEVEL:** Oct-12
FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		MOBILIZATION					
		REMOVAL OF EXISTING STRUCTURES	68140				
		Assume removal, haul off and disposal of					
		Include cost of transportation and disposal					
		structures are 1'-0" thick and reinforced					
		Concrete Fish Ladder #1					
	a-01	Concrete (walls, floor, baffles & transitions)		260	CY	$125.00	$32,500.00
	a-02	Handrails		320	LF	$12.00	$3,840.00
	a-03	24" Concrete Pipe		120	LF	$62.00	$7,440.00
	a-04	EXCAVATION		3,200	CY	$13.50	$43,200.00
		Common, removal and disposal (max 3 miles)					
	a-05	COMPACTED BACKFILL		3,000	CY	$20.00	$60,000.00
		Structural, hauled in from borrow (max 3 miles)					
	a-06	CAST-IN-PLACE CONCRETE		460	CY	$1,050.00	$483,000.00
		Includes 8' high wall 9' wide slab					
	a-07	CONCRETE REINFORCEMENT		69,000	LB	$1.55	$106,950.00
		rebar calculated assuming 150 lb/cy of concrete					
	a-08	CEMENTIOUS MATERIAL		130	TON	$200.00	$26,000.00
		cement calculated assuming 0.282 ton/cy of concrete					
	a-09	TRANSITION RIPRAP		8	CY	$150.00	$1,200.00
		4-10" diam. well graded riprap (≈1.5 ton/cy)					
	a-10	GRAVEL SURFACING		75	CY	$63.00	$4,725.00
		12' X 4" access road along the entire fishway					
		SUBTOTAL THIS SHEET					**$768,855.00**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #1 - Concrete

PROJECT:
Washoe Project

WOID:	**OA227**	**ESTIMATE LEVEL:**	**Appraisal**
REGION:	**MP**	**UNIT PRICE LEVEL:**	**Oct-12**

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	a-11	METALWORK					
		Handrails		880	LF	$65.00	$57,200.00
		Along viewing area and bridge					
	a-12	HDPE PIPE					
		24" diameter		450	LF	$104.00	$46,800.00
	a-13	DEWATERING		1	LS	$10,500.00	$10,500.00
		minimal dewatering is anticipated					
		based on 1972 groundwater data					
	a-14	CONTROL OF SURFACE WATER		1	LS	$10,000.00	$10,000.00
		3' high sandbag cofferdam at upstream end of					
		work area, gravel drain and intermittent sump pump					
		SUBTOTAL THIS SHEET					**$124,500.00**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #1 - Concrete
Metal Baffles

PROJECT:
Washoe Project

WOID: OA227 | **ESTIMATE LEVEL:** Appraisal
REGION: MP | **UNIT PRICE LEVEL:** Oct-12
FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		METALWORK					
	a-15	50 CUSTOM WEIRS/BAFFLES		135,000	LB	$8.50	$1,147,500.00
		individual baffles include custom metal work					
		approximately (2300#/baffle & 400#/guide)					
		assume epoxy coating					
		SUBTOTAL THIS SHEET					**$1,147,500.00**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #1 - Concrete

Summary Sheet

PROJECT:
Washoe Project

WOID: OA227 **ESTIMATE LEVEL:** Appraisal

REGION: MP **UNIT PRICE LEVEL:** Oct-12

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Subtotal (sheet 1)					$768,855.00
		Subtotal (sheet 2)					$124,500.00
		Subtotal (sheet 3)					$1,147,500.00
		Subtotal					**$2,040,855.00**
		Mobilization	5%	+/-			$100,000.00
		Subtotal with Mobilization					**$2,140,855.00**
		Contract Cost Allowances (Sum of):	15%	+/-			$359,145.00
		Design Contingencies, 15% (+/-)					
		APS, 0% (+/-). Type of procurement: Assumes sealed bids, full and open competition					
		CONTRACT COST					**$2,500,000.00**
		Construction Contingencies	25%	+/-			$600,000.00
		FIELD COST (Unit Price Level Oct 2012)					**$3,100,000.00**
		Non-Contract Costs		**To be determined by the appropriate responsible office**			
		CONSTRUCTION COST		**To be determined by the appropriate responsible office**			
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY** Jerry Zander	**CHECKED**
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED** 04/25/13	**PEER REVIEW / DATE**

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #1 - Rock

PROJECT:
Washoe Project

WOID: OA227 **ESTIMATE LEVEL:** Appraisal
REGION: MP **UNIT PRICE LEVEL:** Oct-12
FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		MOBILIZATION					
		REMOVAL OF EXISTING STRUCTURES	68140				
		Assume removal, haul off and disposal of					
		Include cost of transportation and disposal					
		structures are 1'-0" thick and reinforced					
		Concrete Fish Ladder #1					
	c-01	Concrete (walls, floor, baffles & transitions)		260	CY	$125.00	$32,500.00
	c-02	Handrails		320	LF	$12.00	$3,840.00
	c-03	24" Concrete Pipe		120	LF	$62.00	$7,440.00
	c-04	EXCAVATION		5,000	CY	$13.50	$67,500.00
		Common, removal and disposal (max 3 miles)					
	c-05	COMPACTED BACKFILL		2,200	CY	$20.00	$44,000.00
		Structural, hauled in from borrow (max 3 miles)					
	c-06	LADDER LINING - RIPRAP		2,200	CY	$68.00	$149,600.00
		4-10" diam. well graded riprap (≈1.5 ton/cy)					
	c-07	GEOTEXTILE FABRIC		5,700	SY	$4.70	$26,790.00
		make allowance for overlapping joints 3 feet					
	c-08	GRAVEL SURFACING		200	CY	$63.00	$12,600.00
		12' X 4" access road along the fishway					
		ROCK CHEVRON WEIRS		39	WEIRS		
		individual weirs include one 4.5' and two 3'					
	c-09	4.5' diameter boulder		39	EACH	$810.00	$31,590.00
	c-10	3' diameter boulder		78	EACH	$660.00	$51,480.00
	c-11	Grout in place		35	CY	$650.00	$22,750.00
		SUBTOTAL THIS SHEET					**$450,090.00**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #1 - Rock

PROJECT:
Washoe Project

WOID:	**OA227**	**ESTIMATE LEVEL:**	**Appraisal**
REGION:	**MP**	**UNIT PRICE LEVEL:**	**Oct-12**

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	b-13	DEWATERING		1	LS	$27,000.00	$27,000.00
		contractor to specify drain type					
		from sta: 137+93 to 138+08 @ avg. 1.8 ft drawdown					
		zone is about 12' long by 50' wide					
		based on 1972 groundwater data					
	a-14	CONTROL OF SURFACE WATER		1	LS	$10,000.00	$10,000.00
		3' high sandbag cofferdam at upstream end of					
		work area, gravel drain and intermittent sump pump					
		SUBTOTAL THIS SHEET					**$37,000.00**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #1 - Rock

Summary Sheet

PROJECT:
Washoe Project

WOID:	**OA227**	**ESTIMATE LEVEL:**	**Appraisal**
REGION:	**MP**	**UNIT PRICE LEVEL:**	**Oct-12**

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Subtotal (sheet 1)					$450,090.00
		Subtotal (sheet 2)					$37,000.00
		Subtotal					**$487,090.00**
		Mobilization	5%	+/-			$24,000.00
		Subtotal with Mobilization					**$511,090.00**
		Contract Cost Allowances (Sum of):	15%	+/-			$78,910.00
		Design Contingencies, 15% (+/-)					
		APS, 0% (+/-). Type of procurement: Assumes sealed bids, full and open competition					
		CONTRACT COST					**$590,000.00**
		Construction Contingencies	25%	+/-			$140,000.00
		FIELD COST (Unit Price Level Oct 2012)					**$730,000.00**
		Non-Contract Costs		**To be determined by the appropriate responsible office**			
		CONSTRUCTION COST		**To be determined by the appropriate responsible office**			
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY** Jerry Zander	**CHECKED**
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED** 04/25/13	**PEER REVIEW / DATE**

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #2 - Concrete

PROJECT:
Washoe Project

WOID: OA227 **ESTIMATE LEVEL:** Appraisal
REGION: MP **UNIT PRICE LEVEL:** Oct-12
FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		MOBILIZATION					
		REMOVAL OF EXISTING STRUCTURES	68140				
		Assume removal, haul off and disposal of					
		Include cost of transportation and disposal					
		structures are 1'-0" thick and reinforced					
		Concrete Fish Ladder #2					
	a-01	Concrete (walls, floor, baffles & transitions)		260	CY	$125.00	$32,500.00
	a-02	Handrails		320	LF	$12.00	$3,840.00
	a-03	24" Concrete Pipe		120	LF	$62.00	$7,440.00
	a-04	EXCAVATION		3,200	CY	$13.50	$43,200.00
		Common, removal and disposal (max 3 miles)					
	a-05	COMPACTED BACKFILL		3,000	CY	$20.00	$60,000.00
		Structural, hauled in from borrow (max 3 miles)					
	a-06	CAST-IN-PLACE CONCRETE		460	CY	$1,050.00	$483,000.00
		Includes 8' high wall 9' wide slab					
	a-07	CONCRETE REINFORCEMENT		69,000	LB	$1.55	$106,950.00
		rebar calculated assuming 150 lb/cy of concrete					
	a-08	CEMENTIOUS MATERIAL		130	TON	$200.00	$26,000.00
		cement calculated assuming 0.282 ton/cy of concrete					
	a-09	TRANSITION RIPRAP		8	CY	$150.00	$1,200.00
		4-10" diam. well graded riprap (≈1.5 ton/cy)					
	a-10	GRAVEL SURFACING		75	CY	$63.00	$4,725.00
		12' X 4" access road along the entire fishway					
		SUBTOTAL THIS SHEET					**$768,855.00**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #2 - Concrete

PROJECT:
Washoe Project

WOID:	**OA227**	**ESTIMATE LEVEL:**	**Appraisal**
REGION:	**MP**	**UNIT PRICE LEVEL:**	**Oct-12**

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		METALWORK					
	a-11	Handrails		880	LF	$65.00	$57,200.00
		Along viewing area and bridge					
	a-12	HDPE PIPE					
		24" diameter		450	LF	$104.00	$46,800.00
	d-13	DEWATERING		1	LS	$64,000.00	$64,000.00
		contractor to specify drain type					
		from sta: 88+00 to 89+75 @ avg. 2.0 ft drawdown					
		zone is about 175' long by 50' wide					
		based on 1972 groundwater data					
	a-14	CONTROL OF SURFACE WATER		1	LS	$10,000.00	$10,000.00
		3' high sandbag cofferdam at upstream end of					
		work area, gravel drain and intermittent sump pump					
		SUBTOTAL THIS SHEET					**$178,000.00**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #2 - Concrete
Concrete Baffles

PROJECT:
Washoe Project

WOID: OA227 **ESTIMATE LEVEL:** Appraisal
REGION: MP **UNIT PRICE LEVEL:** Oct-12
FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	b-15	CAST-IN-PLACE CONCRETE		115	CY	$1,250.00	$143,750.00
		50 baffles with 2.3 CY/baffle					
	b-16	CONCRETE REINFORCEMENT		17,250	LB	$1.55	$26,737.50
		rebar calculated assuming 150 lb/cy of concrete					
	b-17	CEMENTIOUS MATERIAL		33	TON	$200.00	$6,600.00
		cement calculated assuming 0.282 ton/cy of concrete					
	b-18	METALWORK					
		Each Baffle contains custom metal work:		24,000	LB	$9.20	$220,800.00
		4X corner supports 1/4"X7.5"X7.5'					
		(48 lbs each)					
		2X adjustable panels 1/4"X23"(unbent)X7.5'					
		(147 lbs each)					
		SUBTOTAL THIS SHEET					**$397,887.50**

QUANTITIES

BY	CHECKED
Bryan Heiner	Jason Wagner
DATE PREPARED	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12

PRICES

BY	CHECKED
Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**
04/25/13	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #2 - Concrete

Summary Sheet

PROJECT:
Washoe Project

WOID:	**OA227**	**ESTIMATE LEVEL:**	**Appraisal**
REGION:	**MP**	**UNIT PRICE LEVEL:**	**Oct-12**

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Subtotal (sheet 1)					$768,855.00
		Subtotal (sheet 2)					$178,000.00
		Subtotal (sheet 3)					$397,887.50
		Subtotal					**$1,344,742.50**
		Mobilization	5%	+/-			$67,000.00
		Subtotal with Mobilization					**$1,411,742.50**
		Contract Cost Allowances (Sum of):	15%	+/-			$188,257.50
		Design Contingencies, 15% (+/-)					
		APS, 0% (+/-). Type of procurement: Assumes sealed bids, full and open competition					
		CONTRACT COST					**$1,600,000.00**
		Construction Contingencies	25%	+/-			$400,000.00
		FIELD COST (Unit Price Level Oct 2012)					**$2,000,000.00**
		Non-Contract Costs		**To be determined by the appropriate responsible office**			
		CONSTRUCTION COST		**To be determined by the appropriate responsible office**			
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY** Jerry Zander	**CHECKED**
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED** 04/25/13	**PEER REVIEW / DATE**

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #2 - Concrete

PROJECT:
Washoe Project

WOID: OA227 **ESTIMATE LEVEL:** Appraisal
REGION: MP **UNIT PRICE LEVEL:** Oct-12
FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		MOBILIZATION					
		REMOVAL OF EXISTING STRUCTURES	68140				
		Assume removal, haul off and disposal of					
		Include cost of transportation and disposal					
		structures are 1'-0" thick and reinforced					
		Concrete Fish Ladder #2					
	a-01	Concrete (walls, floor, baffles & transitions)		260	CY	$125.00	$32,500.00
	a-02	Handrails		320	LF	$12.00	$3,840.00
	a-03	24" Concrete Pipe		120	LF	$62.00	$7,440.00
	a-04	EXCAVATION		3,200	CY	$13.50	$43,200.00
		Common, removal and disposal (max 3 miles)					
	a-05	COMPACTED BACKFILL		3,000	CY	$20.00	$60,000.00
		Structural, hauled in from borrow (max 3 miles)					
	a-06	CAST-IN-PLACE CONCRETE		460	CY	$1,050.00	$483,000.00
		Includes 8' high wall 9' wide slab					
	a-07	CONCRETE REINFORCEMENT		69,000	LB	$1.55	$106,950.00
		rebar calculated assuming 150 lb/cy of concrete					
	a-08	CEMENTIOUS MATERIAL		130	TON	$200.00	$26,000.00
		cement calculated assuming 0.282 ton/cy of concrete					
	a-09	TRANSITION RIPRAP		8	CY	$150.00	$1,200.00
		4-10" diam. well graded riprap (≈1.5 ton/cy)					
	a-10	GRAVEL SURFACING		75	CY	$63.00	$4,725.00
		12' X 4" access road along the entire fishway					
		SUBTOTAL THIS SHEET					**$768,855.00**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #2 - Concrete

PROJECT:
Washoe Project

WOID:	**OA227**	**ESTIMATE LEVEL:**	**Appraisal**
REGION:	**MP**	**UNIT PRICE LEVEL:**	**Oct-12**

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		METALWORK					
	a-11	Handrails		880	LF	$65.00	$57,200.00
		Along viewing area and bridge					
	a-12	HDPE PIPE					
		24" diameter		450	LF	$104.00	$46,800.00
	d-13	DEWATERING		1	LS	$64,000.00	$64,000.00
		contractor to specify drain type					
		from sta: 88+00 to 89+75 @ avg. 2.0 ft drawdown					
		zone is about 175' long by 50' wide					
		based on 1972 groundwater data					
	a-14	CONTROL OF SURFACE WATER		1	LS	$10,000.00	$10,000.00
		3' high sandbag cofferdam at upstream end of					
		work area, gravel drain and intermittent sump pump					
		SUBTOTAL THIS SHEET					**$178,000.00**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #2 - Concrete
Metal Baffles

PROJECT:
Washoe Project

WOID: OA227 **ESTIMATE LEVEL:** Appraisal
REGION: MP **UNIT PRICE LEVEL:** Oct-12
FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		METALWORK					
	a-15	50 CUSTOM WEIRS/BAFFLES		135,000	LB	$8.50	$1,147,500.00
		individual baffles include custom metal work					
		approximately (2300#/baffle & 400#/guide)					
		assume epoxy coating					
		SUBTOTAL THIS SHEET					**$1,147,500.00**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #2 - Concrete

Summary Sheet

PROJECT:
Washoe Project

WOID:	**OA227**	**ESTIMATE LEVEL:**	**Appraisal**
REGION:	**MP**	**UNIT PRICE LEVEL:**	**Oct-12**

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Subtotal (sheet 1)					$768,855.00
		Subtotal (sheet 2)					$178,000.00
		Subtotal (sheet 3)					$1,147,500.00
		Subtotal					**$2,094,355.00**
		Mobilization	5%	+/-			$105,000.00
		Subtotal with Mobilization					**$2,199,355.00**
		Contract Cost Allowances (Sum of):	15%	+/-			$300,645.00
		Design Contingencies, 15% (+/-)					
		APS, 0% (+/-). Type of procurement: Assumes sealed bids, full and open competition					
		CONTRACT COST					**$2,500,000.00**
		Construction Contingencies	25%	+/-			$700,000.00
		FIELD COST (Unit Price Level Oct 2012)					**$3,200,000.00**
		Non-Contract Costs		**To be determined by the appropriate responsible office**			
		CONSTRUCTION COST		**To be determined by the appropriate responsible office**			
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY** Jerry Zander	**CHECKED**
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED** 04/25/13	**PEER REVIEW / DATE**

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #2 - Rock

PROJECT:
Washoe Project

WOID:	**OA227**	**ESTIMATE LEVEL:**	**Appraisal**
REGION:	**MP**	**UNIT PRICE LEVEL:**	**Oct-12**

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		MOBILIZATION					
		REMOVAL OF EXISTING STRUCTURES	68140				
		Assume removal, haul off and disposal of					
		Include cost of transportation and disposal					
		structures are 1'-0" thick and reinforced					
		Concrete Fish Ladder #2					
	c-01	Concrete (walls, floor, baffles & transitions)		260	CY	$125.00	$32,500.00
	c-02	Handrails		320	LF	$12.00	$3,840.00
	c-03	24" Concrete Pipe		120	LF	$62.00	$7,440.00
	c-04	EXCAVATION		3,500	CY	$13.50	$47,250.00
		Common, removal and disposal (max 3 miles)					
	c-05	COMPACTED BACKFILL		3,300	CY	$20.00	$66,000.00
		Structural, hauled in from borrow (max 3 miles)					
	c-06	LADDER LINING - RIPRAP		2,200	CY	$68.00	$149,600.00
		4-10" diam. well graded riprap (≈1.5 ton/cy)					
	c-07	GEOTEXTILE FABRIC		5,700	SY	$4.70	$26,790.00
		make allowance for overlapping joints 3 feet					
	c-08	GRAVEL SURFACING		200	CY	$63.00	$12,600.00
		12' X 4" access road along the fishway					
		ROCK CHEVRON WEIRS		39	WEIRS		
		individual weirs include one 4.5' and two 3'					
	c-09	4.5' diameter boulder		39	EACH	$810.00	$31,590.00
	c-10	3' diameter boulder		78	EACH	$660.00	$51,480.00
	c-11	Grout in place		35	CY	$650.00	$22,750.00
		SUBTOTAL THIS SHEET					**$451,840.00**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #2 - Rock

PROJECT:
Washoe Project

WOID:	**OA227**	**ESTIMATE LEVEL:**	**Appraisal**
REGION:	**MP**	**UNIT PRICE LEVEL:**	**Oct-12**

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	c-13	DEWATERING		1	LS	$40,000.00	$40,000.00
		contractor to specify drain type					
		from sta: 93+60 to 94+08 @ avg. 1.85 ft drawdown					
		zone is about 48' long by 50' wide					
		based on 1972 groundwater data					
	a-14	CONTROL OF SURFACE WATER		1	LS	$10,000.00	$10,000.00
		3' high sandbag cofferdam at upstream end of					
		work area, gravel drain and intermittent sump pump					
		SUBTOTAL THIS SHEET					**$50,000.00**

QUANTITIES

BY	**CHECKED**
Bryan Heiner	Jason Wagner
DATE PREPARED	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12

PRICES

BY	**CHECKED**
Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**
04/25/13	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #2 - Rock

Summary Sheet

PROJECT:
Washoe Project

WOID:	**OA227**	**ESTIMATE LEVEL:**	**Appraisal**
REGION:	**MP**	**UNIT PRICE LEVEL:**	**Oct-12**

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Subtotal (sheet 1)					$451,840.00
		Subtotal (sheet 2)					$50,000.00
		Subtotal					**$501,840.00**
		Mobilization	5%	+/-			$25,000.00
		Subtotal with Mobilization					**$526,840.00**
		Contract Cost Allowances (Sum of):	15%	+/-			$83,160.00
		Design Contingencies, 15% (+/-)					
		APS, 0% (+/-). Type of procurement: Assumes sealed bids, full and open competition					
		CONTRACT COST					**$610,000.00**
		Construction Contingencies	25%	+/-			$150,000.00
		FIELD COST (Unit Price Level Oct 2012)					**$760,000.00**
		Non-Contract Costs		**To be determined by the appropriate responsible office**			
		CONSTRUCTION COST		**To be determined by the appropriate responsible office**			
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY** Jerry Zander	**CHECKED**
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED** 04/25/13	**PEER REVIEW / DATE**

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #3 - Concrete

PROJECT:
Washoe Project

WOID: OA227 **ESTIMATE LEVEL:** Appraisal
REGION: MP **UNIT PRICE LEVEL:** Oct-12
FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		MOBILIZATION					
		REMOVAL OF EXISTING STRUCTURES	68140				
		Assume removal, haul off and disposal of					
		Include cost of transportation and disposal					
		structures are 1'-0" thick and reinforced					
		Concrete Fish Ladder #3					
	a-01	Concrete (walls, floor, baffles & transitions)		260	CY	$125.00	$32,500.00
	a-02	Handrails		320	LF	$12.00	$3,840.00
	a-03	24" Concrete Pipe		120	LF	$62.00	$7,440.00
	a-04	EXCAVATION		3,200	CY	$13.50	$43,200.00
		Common, removal and disposal (max 3 miles)					
	a-05	COMPACTED BACKFILL		3,100	CY	$20.00	$62,000.00
		Structural, hauled in from borrow (max 3 miles)					
	a-06	CAST-IN-PLACE CONCRETE		460	CY	$1,050.00	$483,000.00
		Includes 8' high wall 9' wide slab					
	a-07	CONCRETE REINFORCEMENT		69,000	LB	$1.55	$106,950.00
		rebar calculated assuming 150 lb/cy of concrete					
	a-08	CEMENTIOUS MATERIAL		130	TON	$200.00	$26,000.00
		cement calculated assuming 0.282 ton/cy of concrete					
	a-09	TRANSITION RIPRAP		8	CY	$150.00	$1,200.00
		4-10" diam. well graded riprap (≈1.5 ton/cy)					
	a-10	GRAVEL SURFACING		75	CY	$63.00	$4,725.00
		12' X 4" access road along the entire fishway					
		SUBTOTAL THIS SHEET					**$770,855.00**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #3 - Concrete

PROJECT:
Washoe Project

WOID:	**OA227**	**ESTIMATE LEVEL:**	**Appraisal**
REGION:	**MP**	**UNIT PRICE LEVEL:**	**Oct-12**

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	a-11	METALWORK					
		Handrails		880	LF	$65.00	$57,200.00
		Along viewing area and bridge					
	a-12	HDPE PIPE					
		24" diameter		450	LF	$104.00	$46,800.00
	a-13	DEWATERING		1	LS	$10,500.00	$10,500.00
		minimal dewatering is anticipated					
		based on 1972 groundwater data					
	a-14	CONTROL OF SURFACE WATER		1	LS	$10,000.00	$10,000.00
		3' high sandbag cofferdam at upstream end of					
		work area, gravel drain and intermittent sump pump					
		SUBTOTAL THIS SHEET					**$124,500.00**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #3 - Concrete
Concrete Baffles

PROJECT:
Washoe Project

WOID: OA227 **ESTIMATE LEVEL:** Appraisal
REGION: MP **UNIT PRICE LEVEL:** Oct-12
FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	b-15	CAST-IN-PLACE CONCRETE		115	CY	$1,250.00	$143,750.00
		50 baffles with 2.3 CY/baffle					
	b-16	CONCRETE REINFORCEMENT		17,250	LB	$1.55	$26,737.50
		rebar calculated assuming 150 lb/cy of concrete					
	b-17	CEMENTIOUS MATERIAL		33	TON	$200.00	$6,600.00
		cement calculated assuming 0.282 ton/cy of concrete					
	b-18	METALWORK					
		Each Baffle contains custom metal work:		24,000	LB	$9.20	$220,800.00
		4X corner supports 1/4"X7.5"X7.5'					
		(48 lbs each)					
		2X adjustable panels 1/4"X23"(unbent)X7.5'					
		(147 lbs each)					
		SUBTOTAL THIS SHEET					**$397,887.50**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #3 - Concrete

Summary Sheet

PROJECT:
Washoe Project

WOID: OA227 **ESTIMATE LEVEL:** Appraisal
REGION: MP **UNIT PRICE LEVEL:** Oct-12

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Subtotal (sheet 1)					$770,855.00
		Subtotal (sheet 2)					$124,500.00
		Subtotal (sheet 3)					$397,887.50
		Subtotal					**$1,293,242.50**
		Mobilization	5%	+/-			$65,000.00
		Subtotal with Mobilization					**$1,358,242.50**
		Contract Cost Allowances (Sum of):	15%	+/-			$191,757.50
		Design Contingencies, 15% (+/-)					
		APS, 0% (+/-). Type of procurement: Assumes sealed bids, full and open competition					
		CONTRACT COST					**$1,550,000.00**
		Construction Contingencies	25%	+/-			$400,000.00
		FIELD COST (Unit Price Level Oct 2012)					**$1,950,000.00**
		Non-Contract Costs		**To be determined by the appropriate responsible office**			
		CONSTRUCTION COST		**To be determined by the appropriate responsible office**			
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY** Jerry Zander	**CHECKED**
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED** 04/25/13	**PEER REVIEW / DATE**

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #3 - Concrete

PROJECT:
Washoe Project

WOID: OA227 **ESTIMATE LEVEL:** Appraisal
REGION: MP **UNIT PRICE LEVEL:** Oct-12
FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		MOBILIZATION					
		REMOVAL OF EXISTING STRUCTURES	68140				
		Assume removal, haul off and disposal of					
		Include cost of transportation and disposal					
		structures are 1'-0" thick and reinforced					
		Concrete Fish Ladder #3					
	a-01	Concrete (walls, floor, baffles & transitions)		260	CY	$125.00	$32,500.00
	a-02	Handrails		320	LF	$12.00	$3,840.00
	a-03	24" Concrete Pipe		120	LF	$62.00	$7,440.00
	a-04	EXCAVATION		3,200	CY	$13.50	$43,200.00
		Common, removal and disposal (max 3 miles)					
	a-05	COMPACTED BACKFILL		3,100	CY	$20.00	$62,000.00
		Structural, hauled in from borrow (max 3 miles)					
	a-06	CAST-IN-PLACE CONCRETE		460	CY	$1,050.00	$483,000.00
		Includes 8' high wall 9' wide slab					
	a-07	CONCRETE REINFORCEMENT		69,000	LB	$1.55	$106,950.00
		rebar calculated assuming 150 lb/cy of concrete					
	a-08	CEMENTIOUS MATERIAL		130	TON	$200.00	$26,000.00
		cement calculated assuming 0.282 ton/cy of concrete					
	a-09	TRANSITION RIPRAP		8	CY	$150.00	$1,200.00
		4-10" diam. well graded riprap (≈1.5 ton/cy)					
	a-10	GRAVEL SURFACING		75	CY	$63.00	$4,725.00
		12' X 4" access road along the entire fishway					
		SUBTOTAL THIS SHEET					**$770,855.00**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #3 - Concrete

PROJECT:
Washoe Project

WOID:	**OA227**	**ESTIMATE LEVEL:**	**Appraisal**
REGION:	**MP**	**UNIT PRICE LEVEL:**	**Oct-12**

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		METALWORK					
	a-11	Handrails		880	LF	$65.00	$57,200.00
		Along viewing area and bridge					
	a-12	HDPE PIPE					
		24" diameter		450	LF	$104.00	$46,800.00
	a-13	DEWATERING		1	LS	$10,500.00	$10,500.00
		minimal dewatering is anticipated					
		based on 1972 groundwater data					
	a-14	CONTROL OF SURFACE WATER		1	LS	$10,000.00	$10,000.00
		3' high sandbag cofferdam at upstream end of					
		work area, gravel drain and intermittent sump pump					
		SUBTOTAL THIS SHEET					**$124,500.00**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #3 - Concrete
Metal Baffles

PROJECT:
Washoe Project

WOID: OA227 | **ESTIMATE LEVEL:** Appraisal
REGION: MP | **UNIT PRICE LEVEL:** Oct-12
FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		METALWORK					
	a-15	50 CUSTOM WEIRS/BAFFLES		135,000	LB	$8.50	$1,147,500.00
		individual baffles include custom metal work					
		approximately (2300#/baffle & 400#/guide)					
		assume epoxy coating					
		SUBTOTAL THIS SHEET					**$1,147,500.00**

QUANTITIES		PRICES	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #3 - Concrete

Summary Sheet

PROJECT:
Washoe Project

WOID:	**OA227**	**ESTIMATE LEVEL:**	**Appraisal**
REGION:	**MP**	**UNIT PRICE LEVEL:**	**Oct-12**

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Subtotal (sheet 1)					$770,855.00
		Subtotal (sheet 2)					$124,500.00
		Subtotal (sheet 3)					$1,147,500.00
		Subtotal					**$2,042,855.00**
		Mobilization	5%	+/-			$100,000.00
		Subtotal with Mobilization					**$2,142,855.00**
		Contract Cost Allowances (Sum of):	15%	+/-			$357,145.00
		Design Contingencies, 15% (+/-)					
		APS, 0% (+/-). Type of procurement: Assumes sealed bids, full and open competition					
		CONTRACT COST					**$2,500,000.00**
		Construction Contingencies	25%	+/-			$600,000.00
		FIELD COST (Unit Price Level Oct 2012)					**$3,100,000.00**
		Non-Contract Costs		**To be determined by the appropriate responsible office**			
		CONSTRUCTION COST		**To be determined by the appropriate responsible office**			
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY** Jerry Zander	**CHECKED**
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED** 04/25/13	**PEER REVIEW / DATE**

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #3 - Rock

PROJECT:
Washoe Project

WOID: OA227 **ESTIMATE LEVEL:** Appraisal
REGION: MP **UNIT PRICE LEVEL:** Oct-12
FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		MOBILIZATION					
		REMOVAL OF EXISTING STRUCTURES	68140				
		Assume removal, haul off and disposal of					
		Include cost of transportation and disposal					
		structures are 1'-0" thick and reinforced					
		Concrete Fish Ladder #3					
	c-01	Concrete (walls, floor, baffles & transitions)		260	CY	$125.00	$32,500.00
	c-02	Handrails		320	LF	$12.00	$3,840.00
	c-03	24" Concrete Pipe		120	LF	$62.00	$7,440.00
	c-04	EXCAVATION		5,600	CY	$13.50	$75,600.00
		Common, removal and disposal (max 3 miles)					
	c-05	COMPACTED BACKFILL		3,400	CY	$20.00	$68,000.00
		Structural, hauled in from borrow (max 3 miles)					
	c-06	LADDER LINING - RIPRAP		2,200	CY	$68.00	$149,600.00
		4-10" diam. well graded riprap (≈1.5 ton/cy)					
	c-07	GEOTEXTILE FABRIC		5,700	SY	$4.70	$26,790.00
		make allowance for overlapping joints 3 feet					
	c-08	GRAVEL SURFACING		200	CY	$63.00	$12,600.00
		12' X 4" access road along the fishway					
		ROCK CHEVRON WEIRS		39	WEIRS		
		individual weirs include one 4.5' and two 3'					
	c-09	4.5' diameter boulder		39	EACH	$810.00	$31,590.00
	c-10	3' diameter boulder		78	EACH	$660.00	$51,480.00
	c-11	Grout in place		35	CY	$650.00	$22,750.00
		SUBTOTAL THIS SHEET					**$482,190.00**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #3 - Rock

PROJECT:
Washoe Project

WOID:	**OA227**	**ESTIMATE LEVEL:**	**Appraisal**
REGION:	**MP**	**UNIT PRICE LEVEL:**	**Oct-12**

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	d-14	DEWATERING		1	LS	$30,000.00	$30,000.00
		contractor to specify drain type					
		from sta: 48+93 to 49+05 @ avg. 2.0 ft drawdown					
		zone is about 12' long by 50' wide					
		based on 1972 groundwater data					
	a-14	CONTROL OF SURFACE WATER		1	LS	$10,000.00	$10,000.00
		3' high sandbag cofferdam at upstream end of					
		work area, gravel drain and intermittent sump pump					
		SUBTOTAL THIS SHEET					**$40,000.00**

QUANTITIES		**PRICES**	
BY	**CHECKED**	**BY**	**CHECKED**
Bryan Heiner	Jason Wagner	Jerry Zander	
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED**	**PEER REVIEW / DATE**
11/06/12	Brent Mefford/ 10/16/12	04/25/13	

BUREAU OF RECLAMATION

ESTIMATE WORKSHEET

FEATURE:
Marble Bluff Dam - Fishway Modifications
Existing Fishway Modifications
Replacement of Ladder #3 - Rock

Summary Sheet

PROJECT:
Washoe Project

WOID:	**OA227**	**ESTIMATE LEVEL:**	**Appraisal**
REGION:	**MP**	**UNIT PRICE LEVEL:**	**Oct-12**

FILE: C:\JZ- Files\2012 JWZ Projects\Marble Bluff - Feasib Est\[Total Est - Marble Bluff Fishway - 12-2012.xlsx]Example - FC Summary Sheet (3)

PLANT ACCOUNT	PAY ITEM	DESCRIPTION	CODE	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		Subtotal (sheet 1)					$482,190.00
		Subtotal (sheet 2)					$40,000.00
		Subtotal					**$522,190.00**
		Mobilization	5%	+/-			$26,000.00
		Subtotal with Mobilization					**$548,190.00**
		Contract Cost Allowances (Sum of):	15%	+/-			$81,810.00
		Design Contingencies, 15% (+/-)					
		APS, 0% (+/-). Type of procurement: Assumes sealed bids, full and open competition					
		CONTRACT COST					**$630,000.00**
		Construction Contingencies	25%	+/-			$160,000.00
		FIELD COST (Unit Price Level Oct 2012)					**$790,000.00**
		Non-Contract Costs		**To be determined by the appropriate responsible office**			
		CONSTRUCTION COST		**To be determined by the appropriate responsible office**			
		Ref.: For appropriate use and terminology, see Reclamation Manual, Directives and Standards FAC; 09-01, 09-02 and 09-03.					

QUANTITIES		PRICES	
BY	**CHECKED**	**BY** Jerry Zander	**CHECKED**
DATE PREPARED	**PEER REVIEW / DATE**	**DATE PREPARED** 04/25/13	**PEER REVIEW / DATE**

APPENDIX B
DESIGN DRAWINGS

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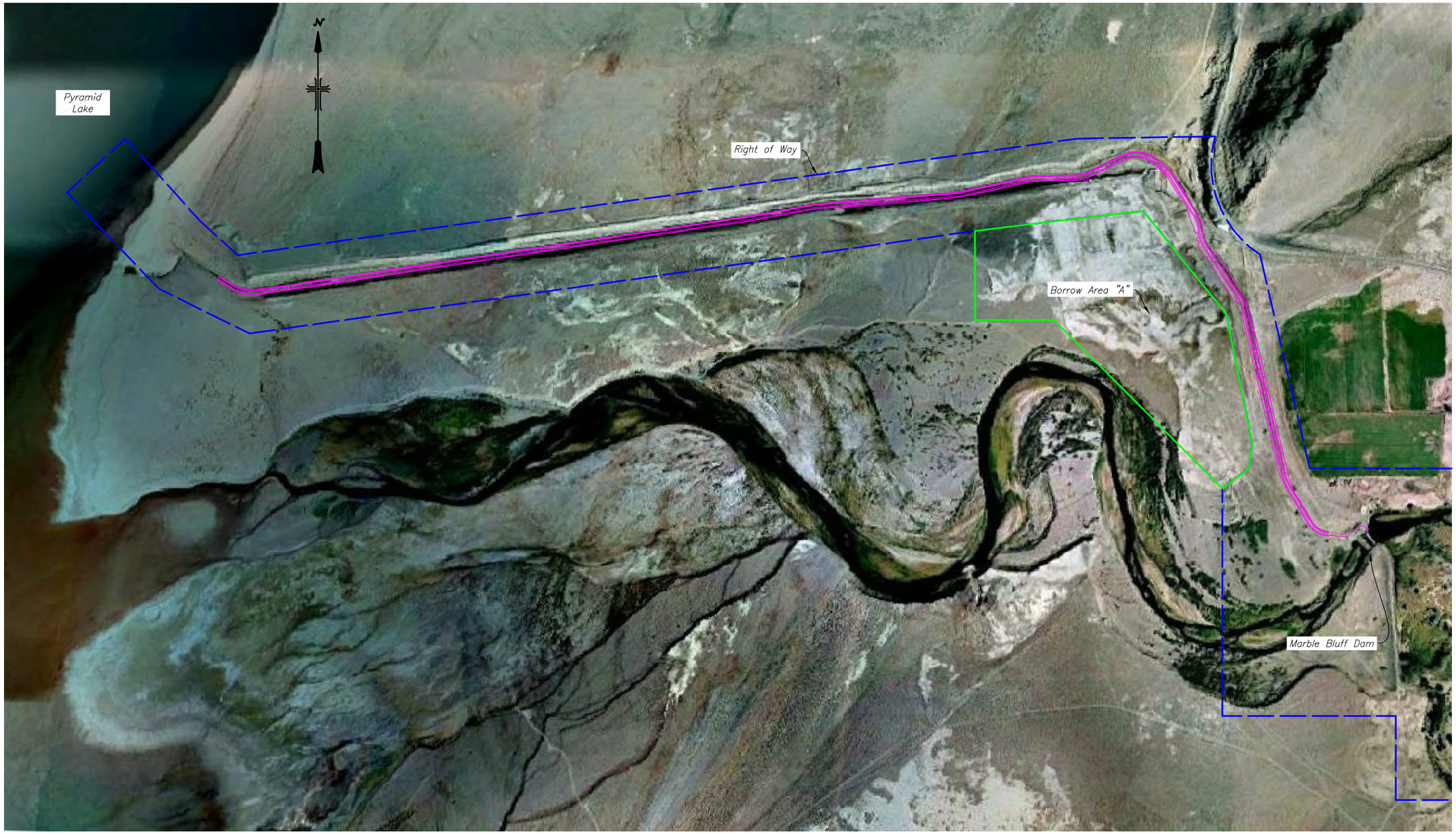

PLAN

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SCALE OF FEET

PROFILE

ELEVATION

RECLAMATION
Managing Water in the West

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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

WASHOE PROJECT
NIXON NEVADA

MARBLE BLUFF DAM
PYRAMID LAKE FISHWAY

GENERAL PLAN VIEW

GENERAL PLAN TYP5

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DESIGNED: Bryan Heiner
DRAWN: Bryan Heiner
CHECKED
TECH. APPR.
APPROVED

DENVER, COLORADO 2012-11-08

949-D-XXXX

SHEET 1 OF 1

DATE AND TIME PLOTTED
December 14, 2012 01:34
PLOTTED BY
BRENDA

DESCRIPTION

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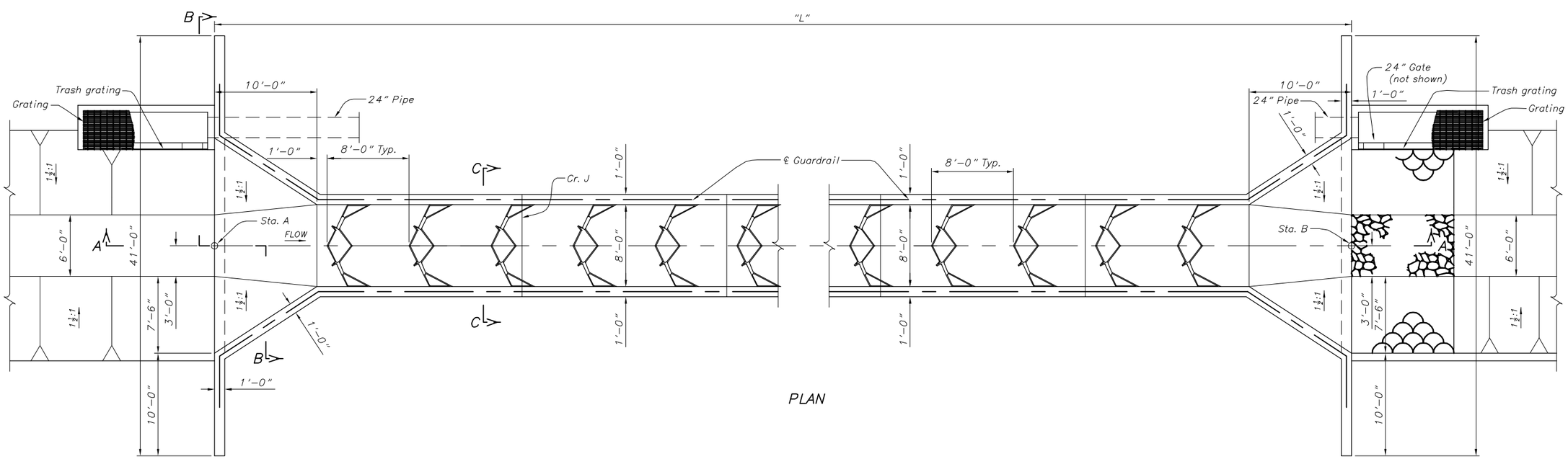

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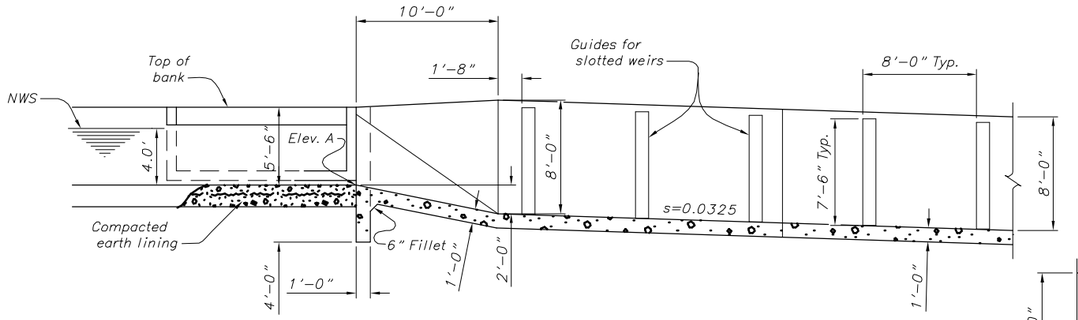
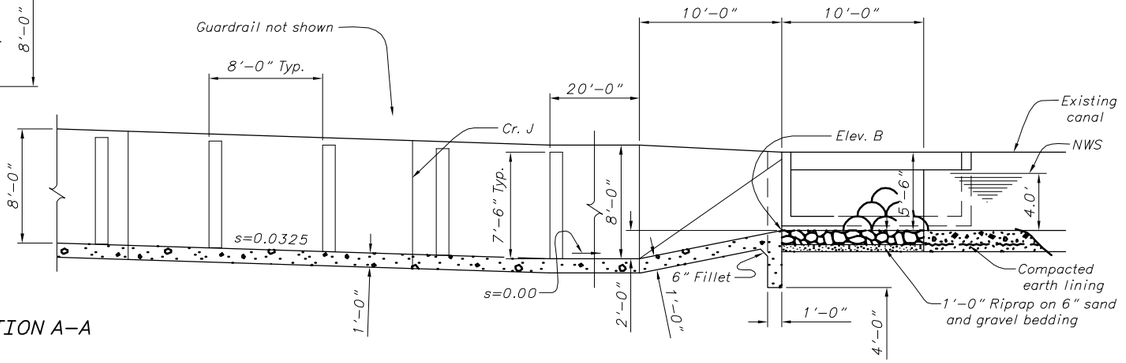
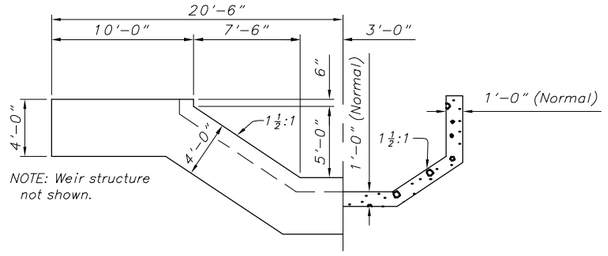




SECTION A–A



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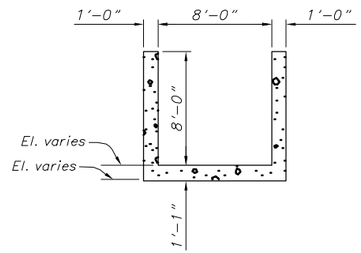

SECTION C–C

TABLE OF DIMENSIONS

LADDER	STA. A[1]	EL. A	STA. B[1]	EL. B	"L"	# BAFFLES	FLOW (cfs)
3	40+79.70	3845.61	48+13.83	3832.59	439.86'	50	38.3
2	85+29.85	3832.18	89+69.71	3819.16	439.86'	50	38.3
1	130+29.85	3818.75	134+69.71	3805.73	439.86'	50	38.3

NOTES

SCALE OF FEET

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Managing Water in the West

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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
WASHOE PROJECT
NIXON NEVADA

MARBLE BLUFF DAM
PYRAMID LAKE FISHWAY
GENERAL PLAN VIEW

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Property of
Distribution

DESIGNED: Bryan Heiner
DRAWN: Bryan Heiner
CHECKED
TECH. APPR.
APPROVED
DENVER, COLORADO 2012-11-08

949-D-A1
SHEET 1 OF 1

DATE AND TIME PLOTTED
February 27, 2013 08:54
PLOTTED BY
Bryan Heiner
DESCRIPTION

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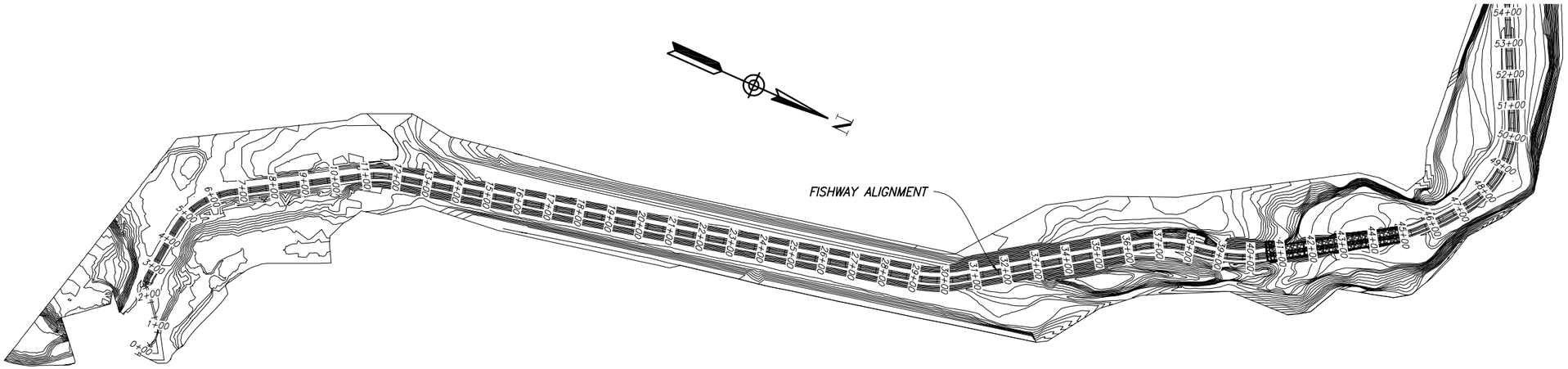

PLAN

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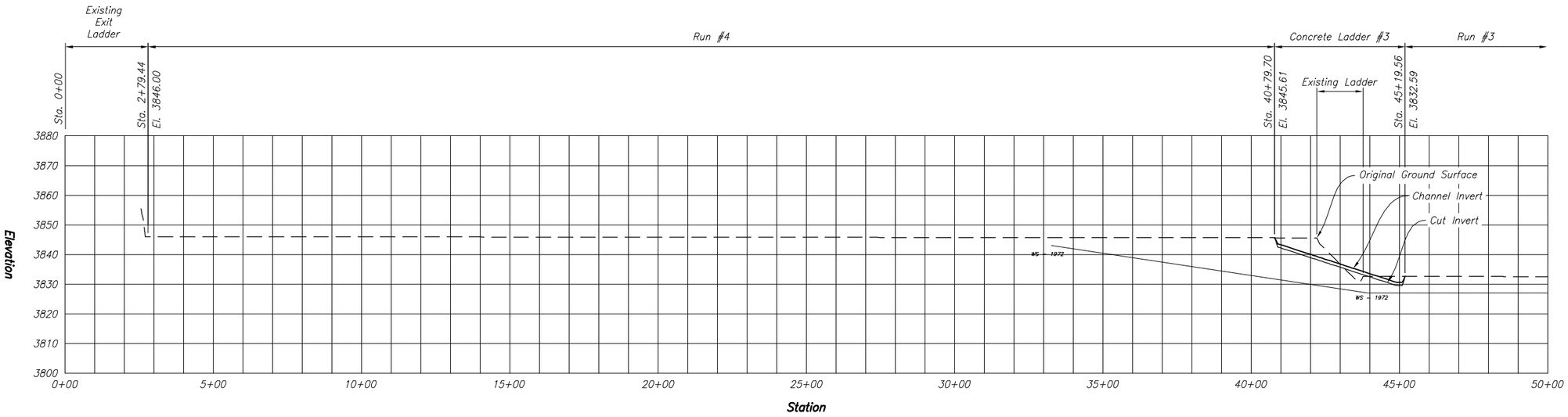
SCALE OF FEET



PROFILE

ELEVATION

RECLAMATION
Managing Water in the West

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MARBLE BLUFF DAM
PYRAMID LAKE FISHWAY
FISH LADDER REPLACEMENT / CONCRETE LADDER
STATION 00+00 TO 50+00
PLAN AND PROFILE VIEW

DESIGNED: Bryan Heiner
DRAWN: Bryan Heiner
CHECKED
TECH. APPR.
APPROVED
DENVER, COLORADO 2012-11-09

949-D-A2
SHEET 1 OF 3

DATE AND TIME PLOTTED
2/27/2013 9:58 AM
PLOTTED BY
Heiner, Bryan J.

CAD SYSTEM
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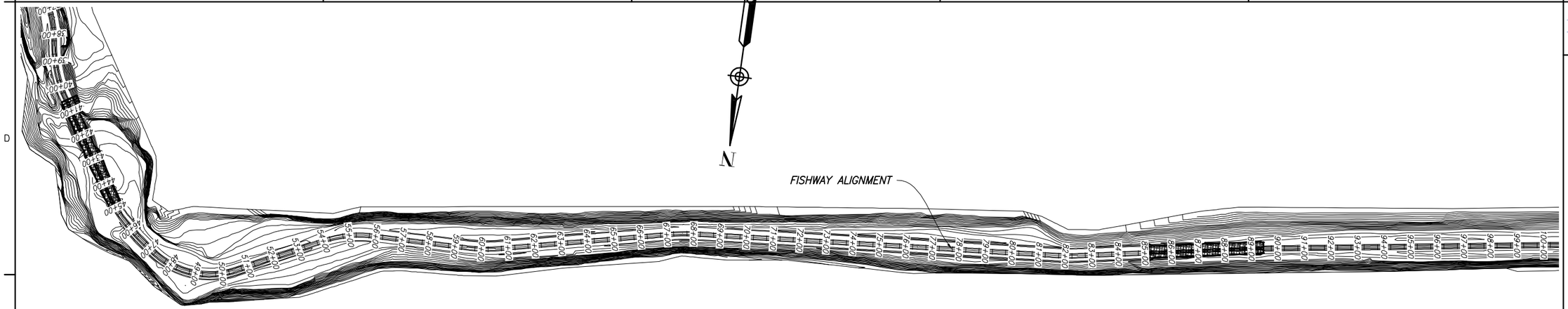

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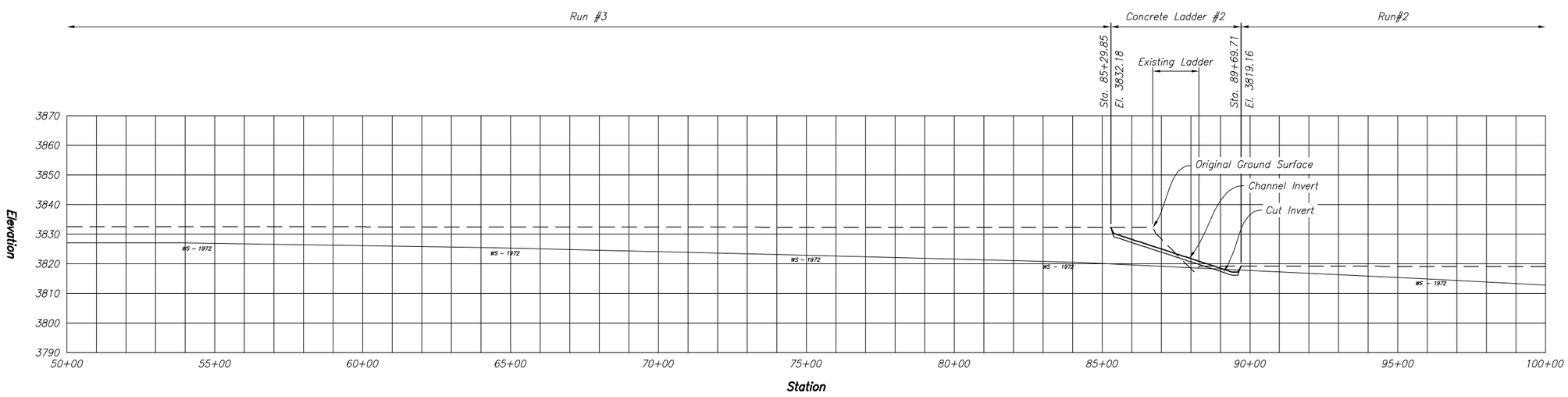

PROFILE

ELEVATION

DATE AND TIME PLOTTED
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PLOTTED BY
Heiner, Bryan J.

CAD SYSTEM
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2012 - Marble Bluff Fishway - Concrete2Ladders.dwg

RECLAMATION
Managing Water in the West

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BUREAU OF RECLAMATION
WASHOE PROJECT
NIXON, NEVADA

MARBLE BLUFF DAM
PYRAMID LAKE FISHWAY
FISH LADDER REPLACEMENT - CONCRETE LADDER
STATION 50+00 TO 100+00
PLAN AND PROFILE VIEW

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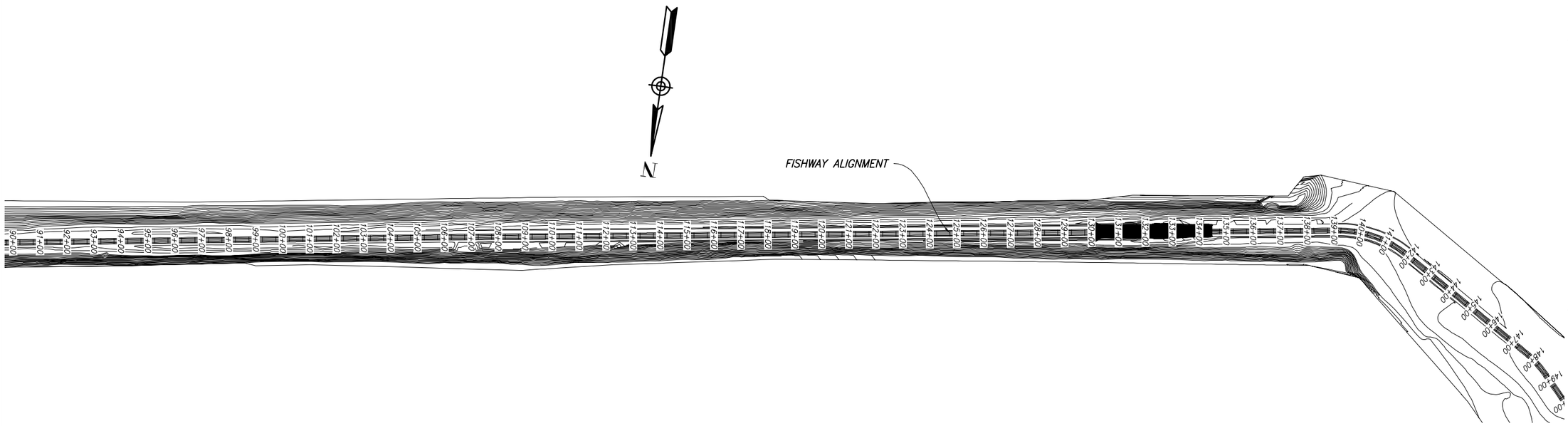
DRAWN: Bryan Heiner
CHECKED
TECH. APPR.
APPROVED
DENVER, COLORADO 2012-11-09

949-D-A3
SHEET 2 OF 3



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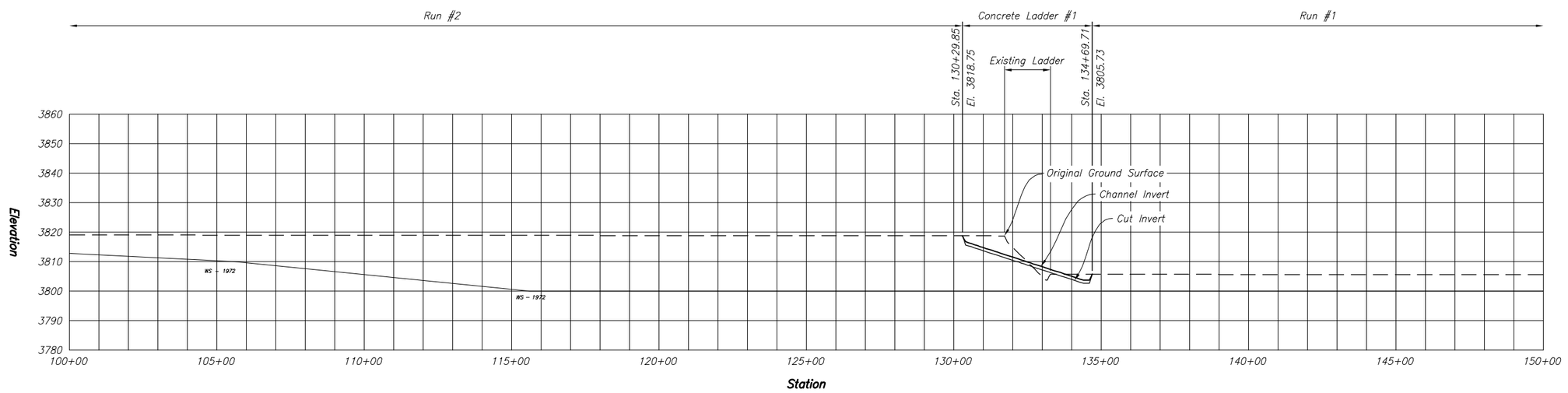

PROFILE

ELEVATION

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Heiner, Bryan J.

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Managing Water in the West

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WASHOE PROJECT
NIXON, NEVADA

MARBLE BLUFF DAM
PYRAMID LAKE FISHWAY
FISH LADDER REPLACEMENT - CONCRETE LADDER
STATION 100+00 TO 150+00
PLAN AND PROFILE VIEW

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DESIGNED: Bryan Heiner
DRAWN: Bryan Heiner
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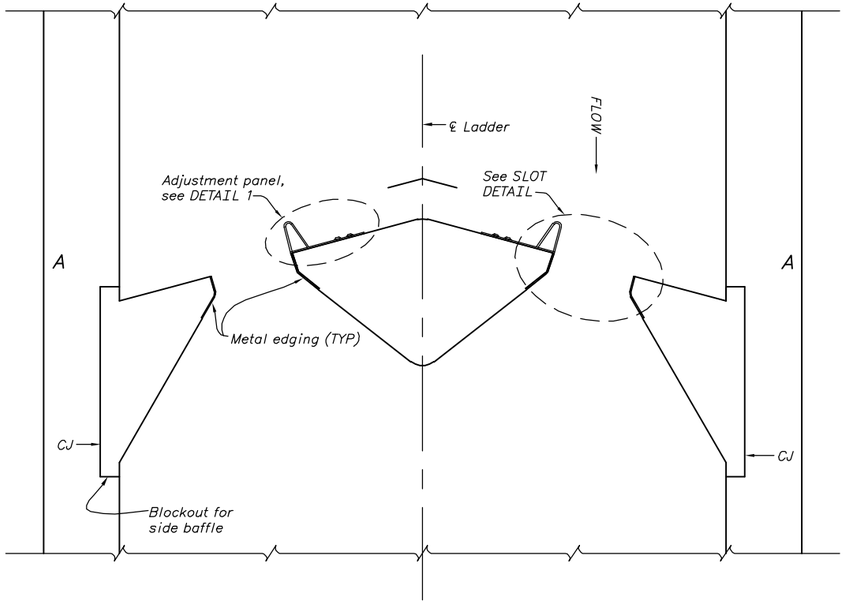
DENVER, COLORADO 2012-11-09

949-D-A4
SHEET 3 OF 3



PLAN

FOR DETAILS, SEE BAFFLE GEOMETRY PLAN (XX2)

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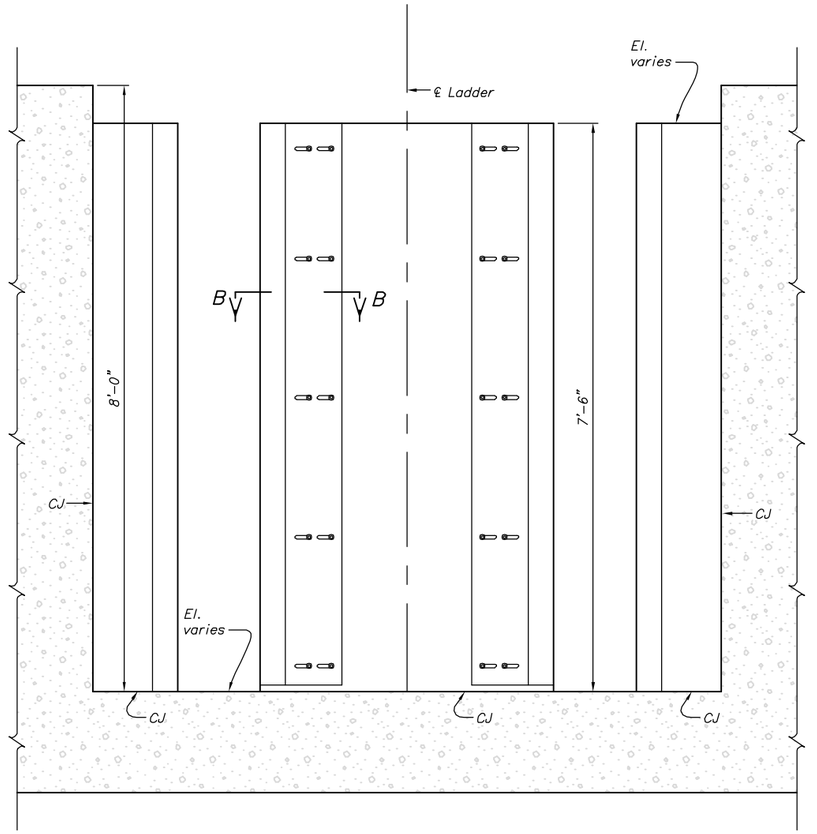

SECTION A–A

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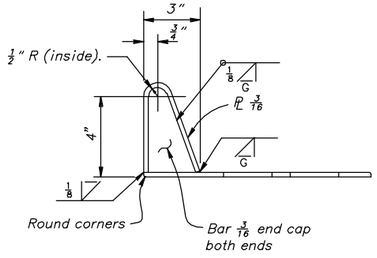
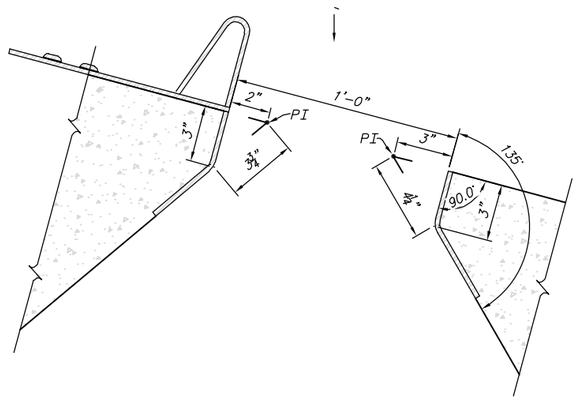


DETAIL 1



SLOT DETAIL (TYP)

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NOTES

1. Abc

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BUREAU OF RECLAMATION
"WASHOE PROJECT"
NIXON, NEVADA

MARBLE BLUFF DAM
PYRAMID LAKE FISHWAY
FISH LADDER REPLACEMENT / CONCRETE LADDER
FISH LADDER BAFFLES
CONCRETE BAFFLE OPTION
PLAN, SECTION, AND DETAILS

DESIGNED
DRAWN
CHECKED
TECH. APPR. NAME, PROF. ABBR.
PEER REVIEW
NAME
TITLE
DENVER, COLORADO 2012-11-26

949-D-CB1
SHEET 1 OF 2

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BREHNER

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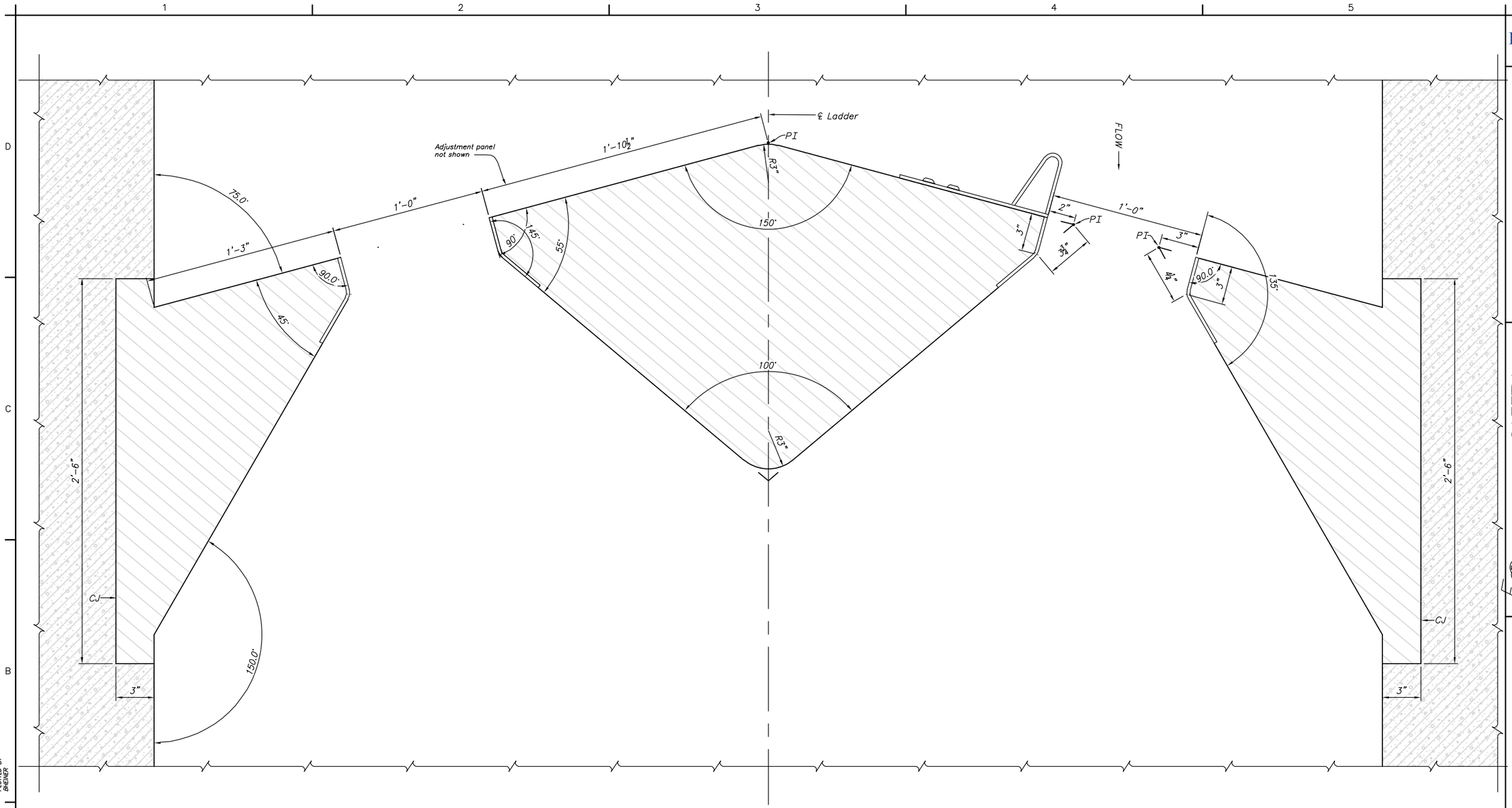

BAFFLE GEOMETRY PLAN

0 3 6 9 12
SCALE OF INCHES

RECLAMATION
Managing Water in the West

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DES. CONFORMS TO DEPT OF INTERIOR
BUREAU OF RECLAMATION
"PROJECT"
WASHOE PROJECT
NIXON, NEVADA

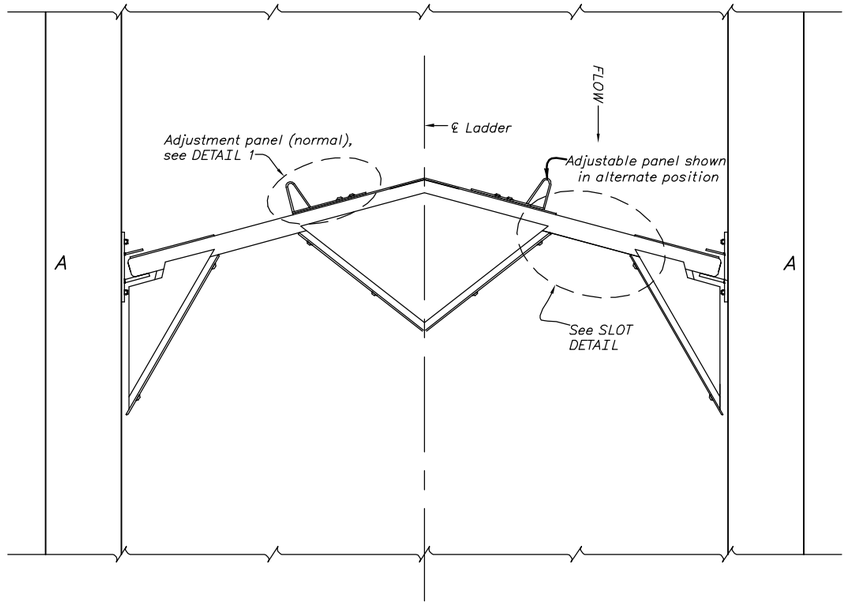
MARBLE BLUFF DAM
PYRAMID LAKE FISHWAY
FISH LADDER REPLACEMENT / CONCRETE LADDER
FISH LADDER BAFFLES
CONCRETE BAFFLE OPTION
PLAN, SECTION, AND DETAILS

DESIGNED
DRAWN
CHECKED
TECH. APPR. NAME, PROF. ABBR.
PEER REVIEW
NAME
TITLE
DENVER, COLORADO 2012-11-26

949-D-CB2
SHEET 1 OF 2

DATE AND TIME PLOTTED
February 27, 2013 10:07
PLOTTED BY
BREINER

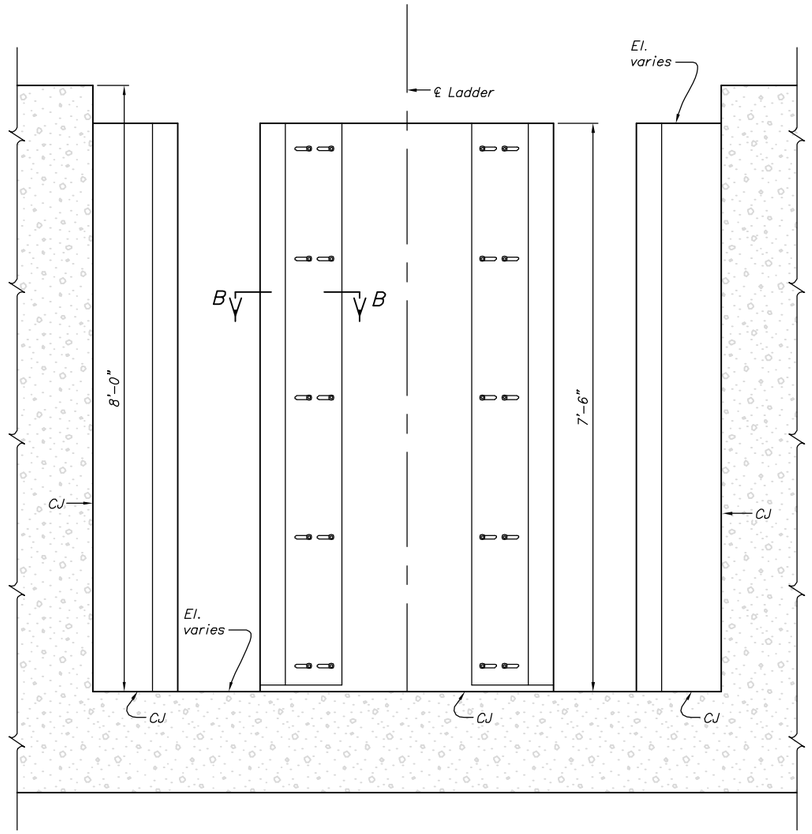
CADD SYSTEM
AutoCAD Rel. 19.0s (LMS Tech)
CADD FILENAME
Concrete Baffles 1_9_13.dwg



PLAN

FOR DETAILS, SEE BAFFLE GEOMETRY PLAN (XX2)

1 0 1 2 3
SCALE OF FEET



SECTION A–A

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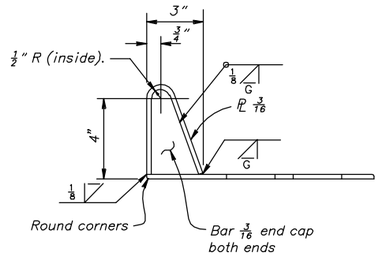

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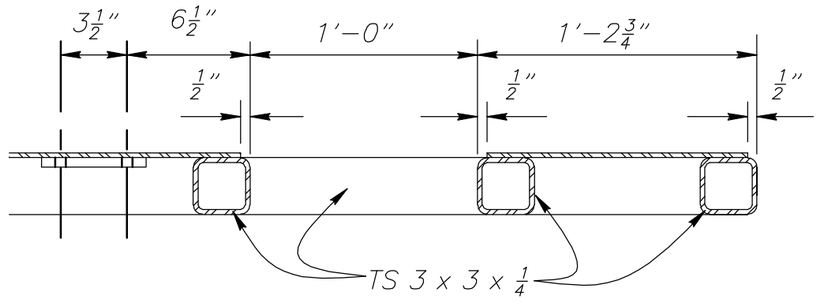

SLOT DETAIL (TYP)

0 3 6 9 12
SCALE OF INCHES

NOTES

1. Abc

RECLAMATION
Managing Water in the West

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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
WASHOE PROJECT
NIXON, NEVADA

MARBLE BLUFF DAM
PYRAMID LAKE FISHWAY
FISH LADDER REPLACEMENT - CONCRETE LADDER
FISH LADDER BAFFLES
STEEL BAFFLE OPTION
PLAN, SECTION, AND DETAILS

DESIGNED
DRAWN
CHECKED
TECH. APPR. NAME, PROF. ABBR.
PEER REVIEW
NAME
TITLE
DENVER, COLORADO 2012-11-26

949-D-SB1
SHEET 1 OF 2

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DATE AND TIME PLOTTED
February 27, 2013 10:09
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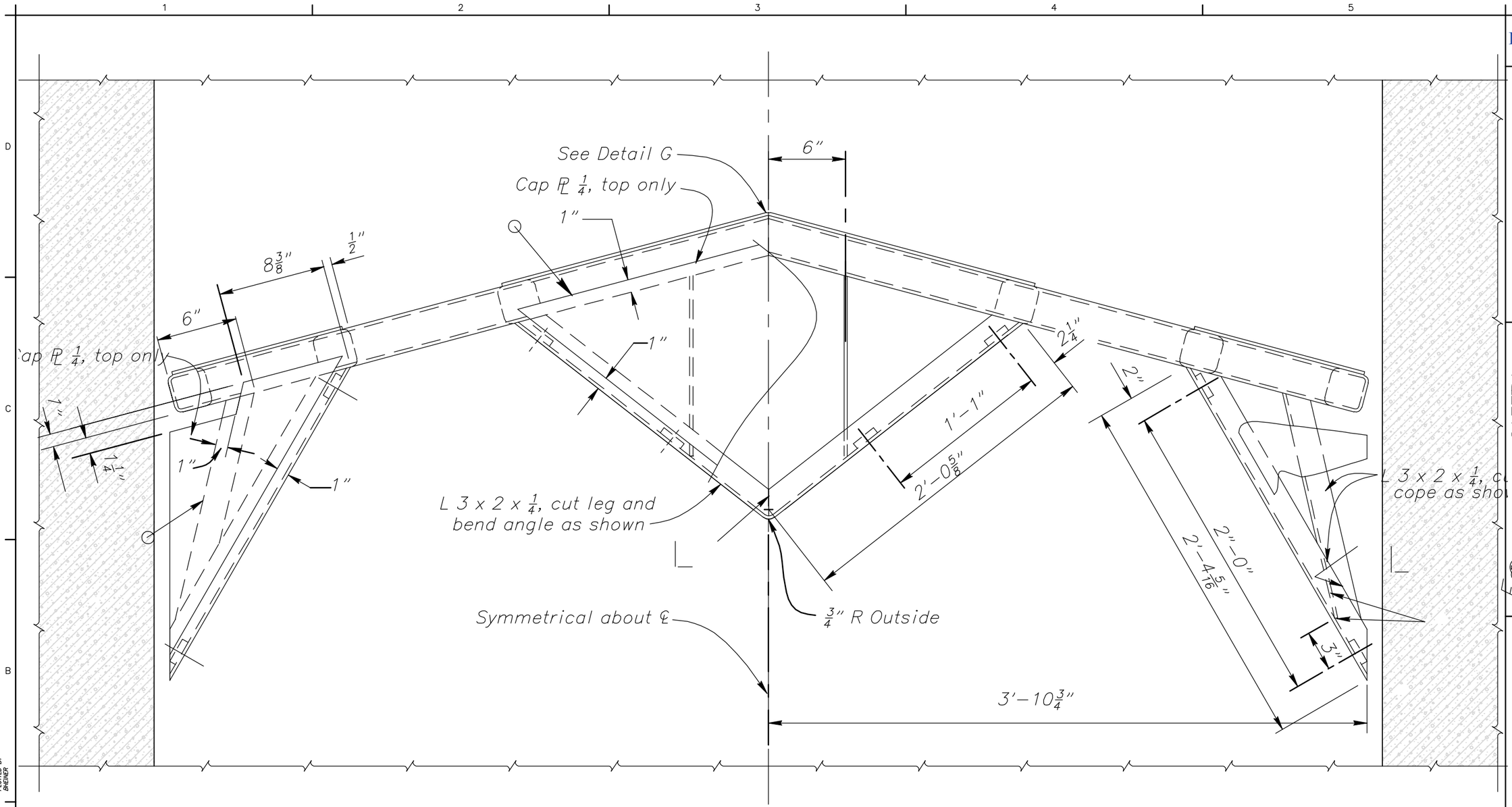
BHEINER

CADD SYSTEM
AutoCAD Rel. 19.0s (LMS Tech)
CADD FILENAME
Steel Baffle 1_9_13.dwg



BAFFLE GEOMETRY PLAN

SCALE OF INCHES 0 3 6 9 12

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Managing Water in the West

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DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
WASHOE PROJECT
NIXON, NEVADA

MARBLE BLUFF DAM
PYRAMID LAKE FISHWAY
FISH LADDER REPLACEMENT / CONCRETE LADDER
STEEL BAFFLE OPTION
PLAN, SECTION, AND DETAILS

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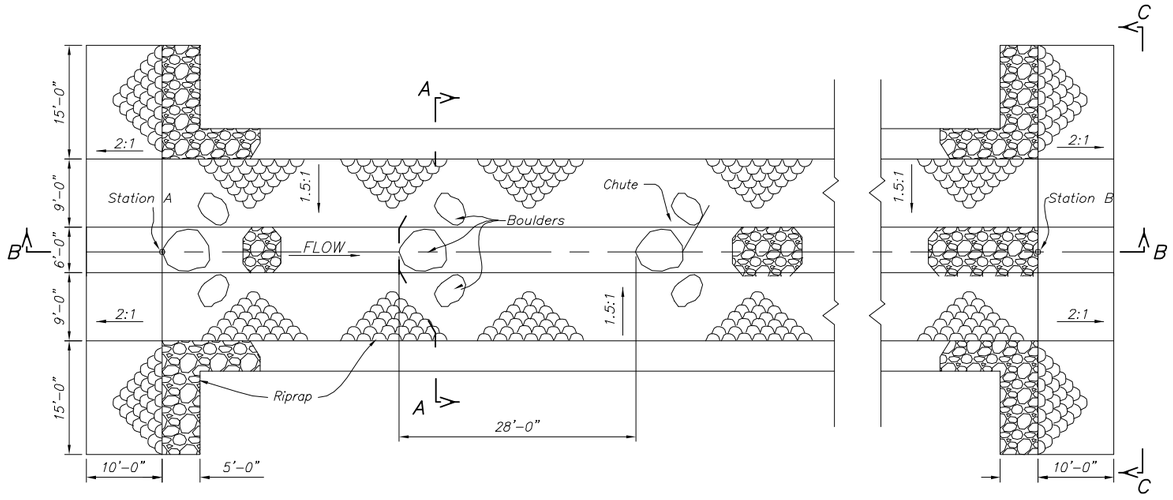
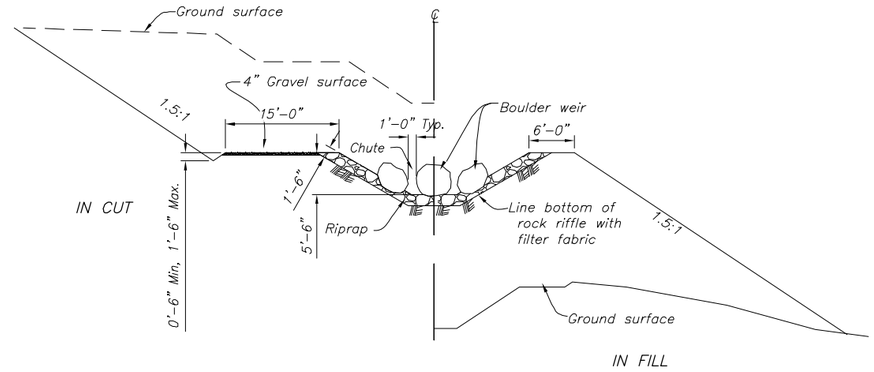
DESIGNED
DRAWN
CHECKED
TECH. APPR. NAME, PROF. ABBR.
PEER REVIEW
NAME
TITLE
DENVER, COLORADO 2012-11-26

949-D-SB2
SHEET 1 OF 2

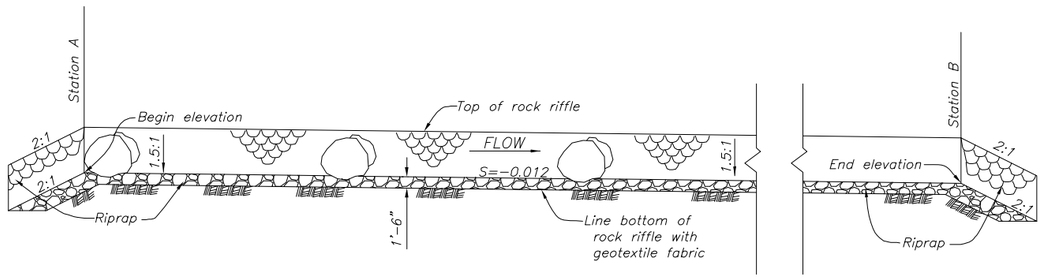
DATE AND TIME PLOTTED
February 27, 2013 10:10
PLOTTED BY
BREHNER

CADD SYSTEM
AutoCAD Rel. 19.0s (LMS Tech)
CADD FILENAME
Steel Baffle 1_8_13.dwg





SECTION A–A



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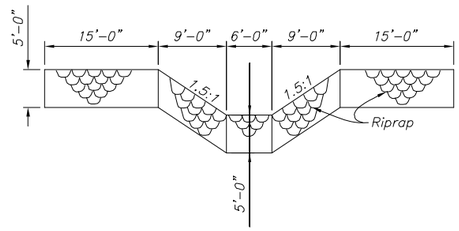

ELEVATION C–C

TABLE OF DIMENSIONS

LADDER	STA. A	EL. A	STA. B	EL. B	"L"	# BAFFLES	FLOW (cfs)
3	38+00.00	3845.64	48+91.12	3832.55	1091.12'	39	50
2	83+00.00	3832.21	93+91.12	3819.11	1091.12'	39	50
1	127+00.00	3818.79	137+91.12	3805.69	1091.12'	39	50

10 0 10 20 30
SCALE OF FEET

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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
WASHOE PROJECT
NIXON, NEVADA

MARBLE BLUFF DAM
PYRAMID LAKE FISHWAY
REPLACEMENT / ROCK RIFFLE

TYPICAL EARTHWORK

DESIGNED: Bryan Heiner
DRAWN: Bryan Heiner
CHECKED
TECH. APPR.
APPROVED

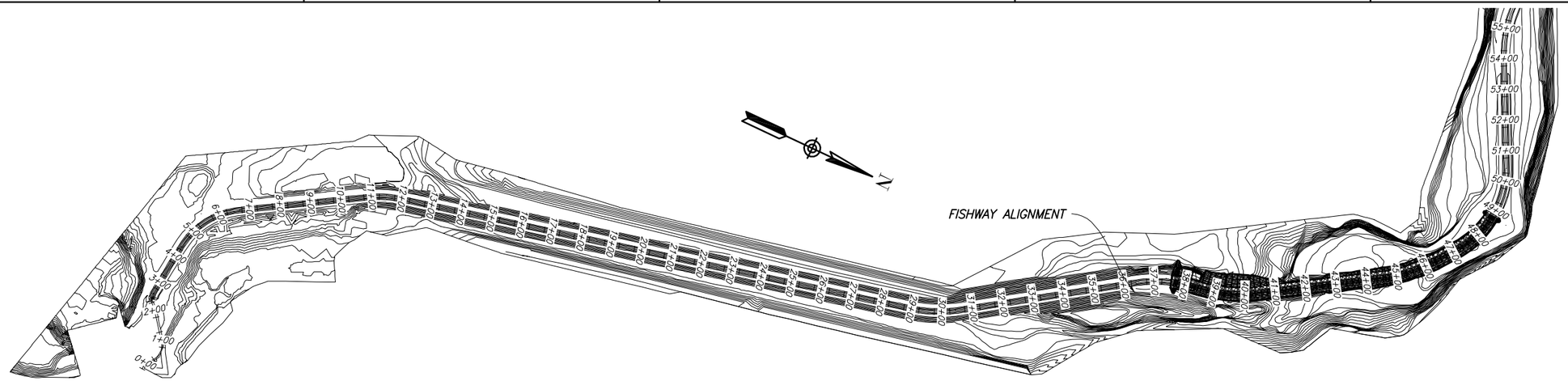
DENVER, COLORADO 2012-11-08

949-D-B1

SHEET 1 OF 1

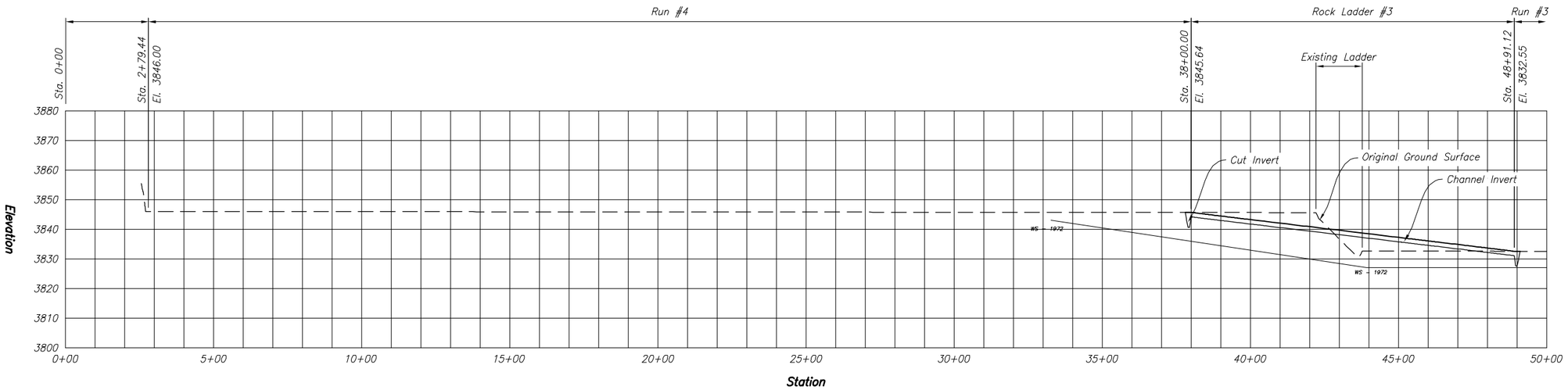
DATE AND TIME PLOTTED
ARBNEUSR, BDACH, 11:25
PLOTTED BY
PROJECT DESCRIPTION

CADD SYSTEM
AutoCAD Rel. 19.0 (2017.0.0 Tech)
CADD FILENAME
2012 = Marble Bluff Fishway = Details =>Rock Ladder.dwg



PLAN

200 0 200 400 600
SCALE OF FEET



PROFILE

ELEVATION

RECLAMATION
Managing Water in the West

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U.S. Department of the Interior
Bureau of Reclamation

MARBLE BLUFF DAM
PYRAMID LAKE FISHWAY
FISH LADDER REPLACEMENT - ROCK RIFFLE
WASHOE PROJECT
NIXON, NEVADA
STATION 0+00 TO 50+00
PLAN AND PROFILE VIEW

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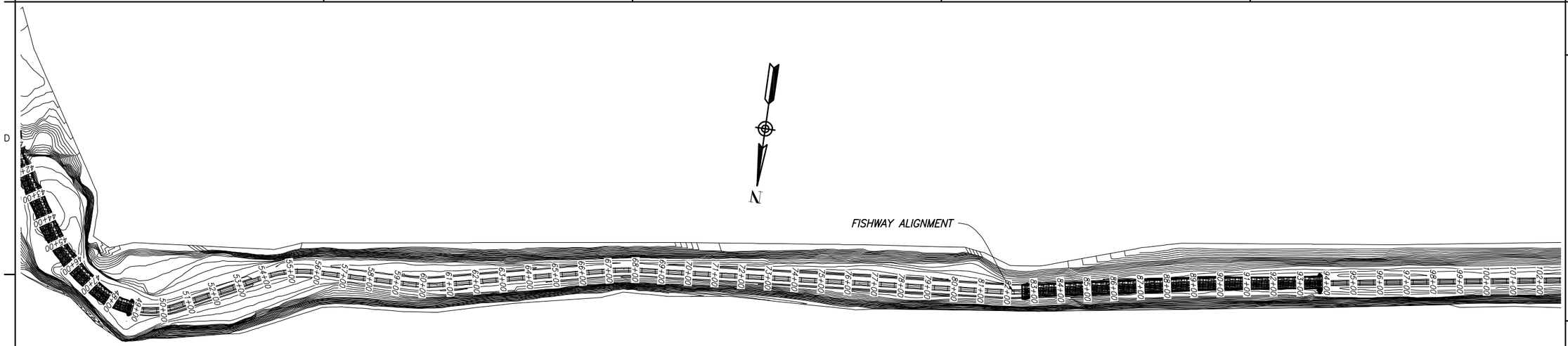
DESIGNED: Bryan Heiner
DRAWN: Bryan Heiner
CHECKED
TECH. APPR.
APPROVED

DENVER, COLORADO 2012-11-09

949-D-B2
SHEET 1 OF 3

DATE AND TIME PLOTTED
2/27/2013 10:03 AM
PLOTTED BY
Heiner, Bryan J.

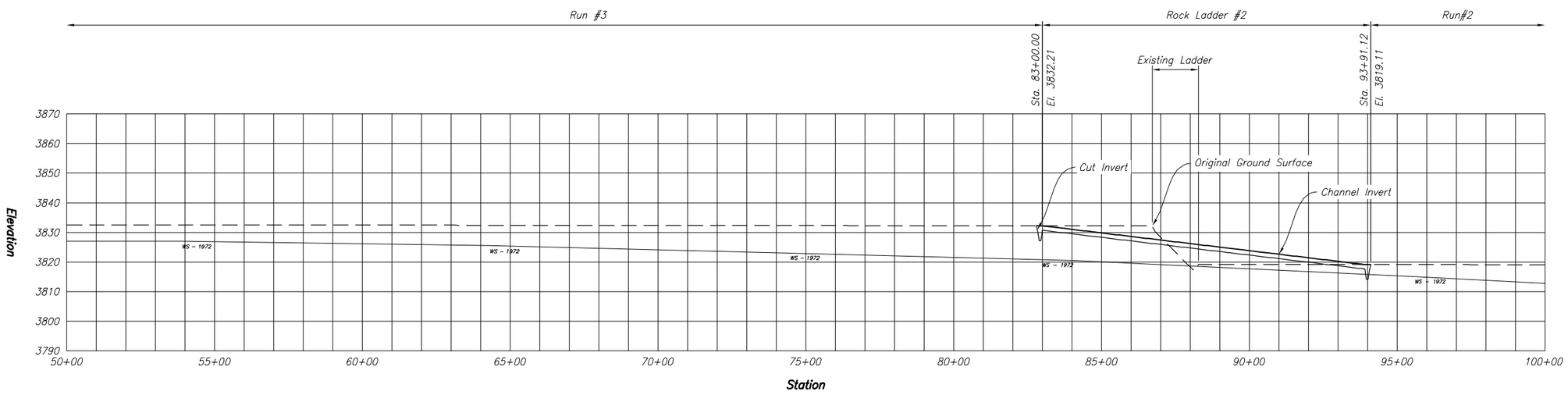
CAD SYSTEM
AutoCAD Civil 3D 2012
CAD FILENAME
2012 - Marble Bluff Fishway - Rock Ladders.dwg



N

PLAN

200 0 200 400 600
SCALE OF FEET



PROFILE

ELEVATION

RECLAMATION
Managing Water in the West

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MARBLE BLUFF DAM
PYRAMID LAKE FISHWAY
FISH LADDER REPLACEMENT - ROCK RIFFLE
STATION
50+00 TO 100+00
PLAN AND PROFILE VIEW

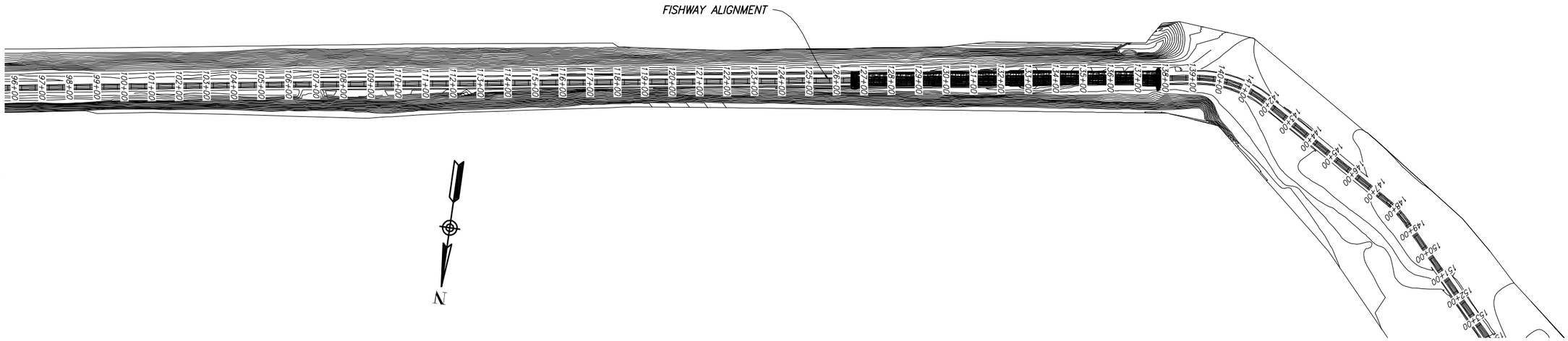
DESIGNED: Bryan Heiner
DRAWN: Bryan Heiner
CHECKED
TECH. APPR.
APPROVED

DENVER, COLORADO 2012-11-09

949-D-B3
SHEET 2 OF 3

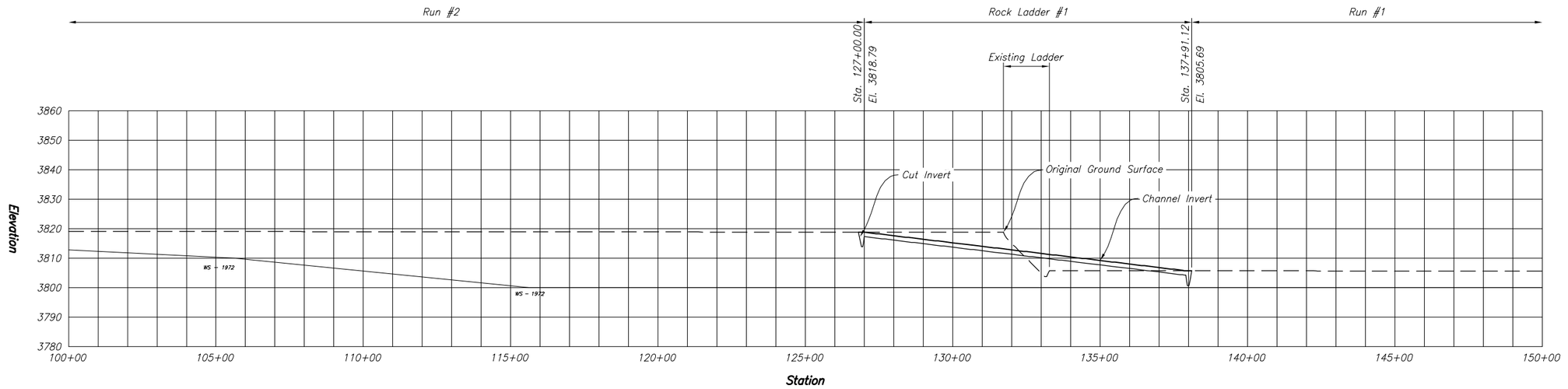
DATE AND TIME PLOTTED
2/27/2013 10:03 AM
PLOTTED BY
Heiner, Bryan J.

CAD SYSTEM
AutoCAD Civil 3D 2012
CAD FILENAME
2012 - Marble Bluff Fishway - Rock Ladders.dwg



PLAN

200 0 200 400 600
SCALE OF FEET



PROFILE

ELEVATION

RECLAMATION
Managing Water in the West

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U.S. Department of the Interior
Bureau of Reclamation

MARBLE BLUFF DAM
PYRAMID LAKE FISHWAY
FISH LADDER REPLACEMENT - ROCK RIFFLE
WASHOE PROJECT
NIXON, NEVADA

STATION
100+00 TO 150+00
PLAN AND PROFILE VIEW

Not For Construction

DESIGNED: Bryan Heiner
DRAWN: Bryan Heiner
CHECKED
TECH. APPR.
APPROVED

DENVER, COLORADO 2012-11-09

949-D-B4
SHEET 3 OF 3

DATE AND TIME PLOTTED
2/27/2013 10:04 AM
PLOTTED BY
Heiner, Bryan J.

CAD SYSTEM
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CAD FILENAME
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