Completion Report

Squaw Creek Culvert
Fish Passage Improvement Project

Squaw Creek, Little Salmon River Subbasin
North Central Idaho

Prepared for
Idaho County Commission
Grangeville, Idaho

Prepared by
Bureau of Reclamation
Pacific Northwest Region
Snake River Area Office
Grangeville Field Station

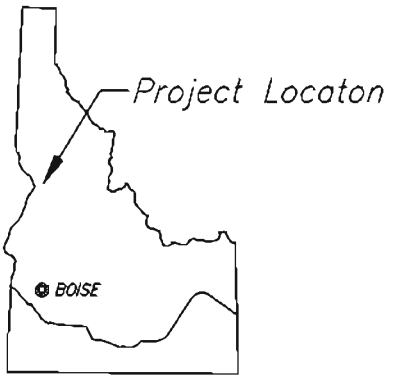
February 2008

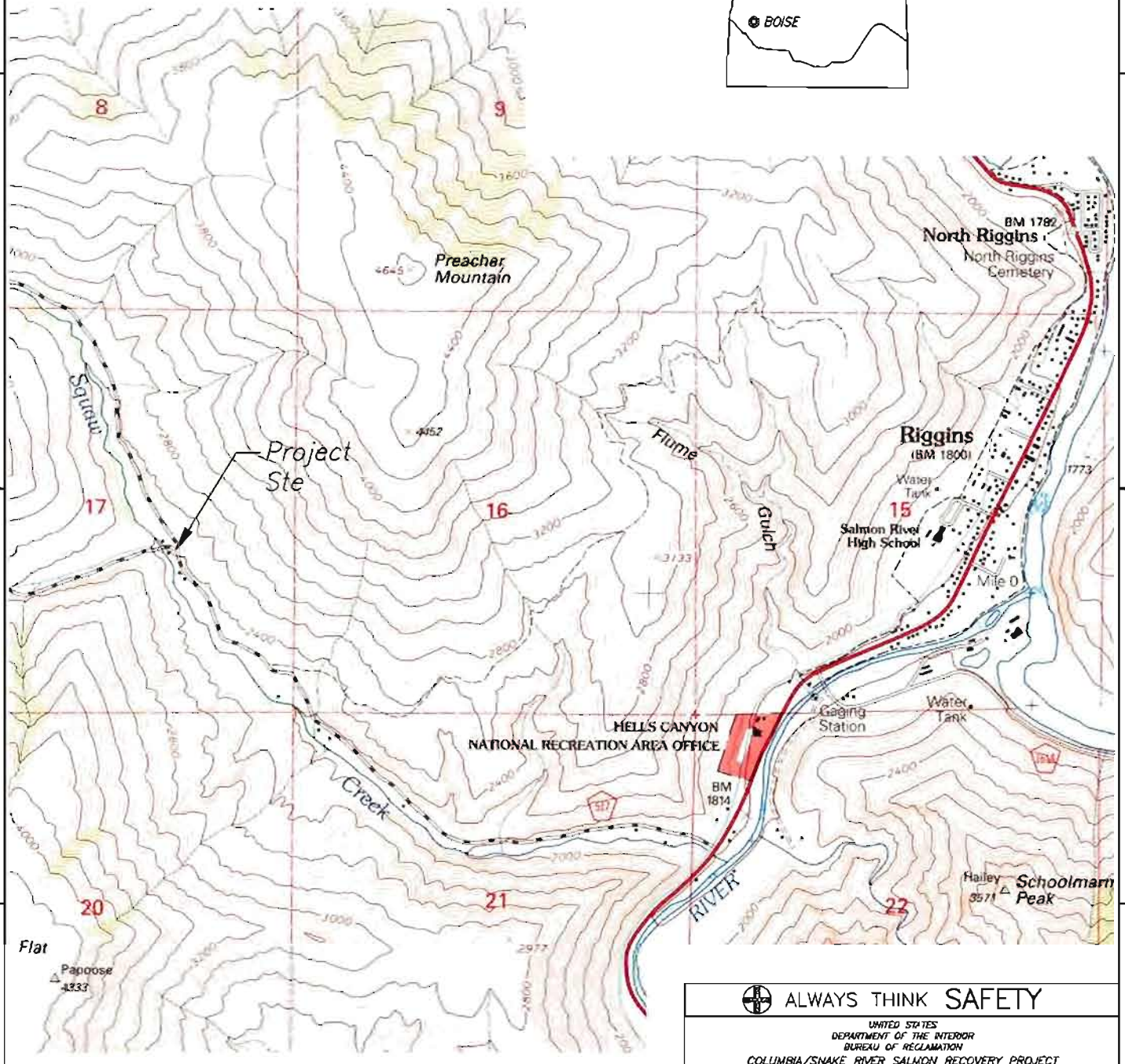
Squaw Creek Culvert before modification
(June 29, 2005)

Squaw Creek Culvert after modification
(November 6, 2007)

This project was initiated and completed through the combined efforts of many entities, public and private. The purpose of the project was to provide for continued use of water while enhancing conditions for anadromous fish listed under the Endangered Species Act. The Bureau of Reclamation prepared this completion report in accordance with the 2004 National Marine Fisheries Service Federal Columbia River Power System Biological Opinion to describe the design and construction of this project.

Sec 17, T.24N., R.1E.,B.M.





RIGGINS, IDAHO 7.5" QUADRANGLE

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SCALE OF FEET

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

COLUMBIA/SNAKE RIVER SALMON RECOVERY PROJECT
FCRPS HABITAT IMPROVEMENT PROGRAM–LITTLE SALMON SUBBASIN–IDAHO

SQUAW CREEK CULVERT REPLACEMENT

LOCATION MAP

DESIGNED Jesse Chan, P.E. CHECKED Eugene Humbles, P.E.
DRAWN C.Hsue/L.Boskers TECH. APPROVAL Jesse Chan, P.E.
APPROVAL Steve Montague, P.E. – Acting
PROGRAM MANAGER

CADD FILENAME 1678-100-822.DWG
BOISE, IDAHO

CADD SYSTEM AutoCAD Rel. 17.0s
MARCH 2006

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Contents

Attachments

1. Introduction and Background

The Squaw Creek culvert fish passage improvement project replaced a perched corrugated metal pipe culvert that was impeding fish passage in Squaw Creek, a tributary to the Little Salmon River, with a bottomless arch culvert. The project was approved and implemented by the Idaho Board of County Commissioners. Funding for the project was provided by the Idaho Office of Species Conservation (Pacific Coast Salmon Recovery Funds), the Bonneville Power Administration, and American Rivers and the Idaho Fish and Wildlife Foundation.

The primary objective of the project was to restore access to approximately 4.0 miles of spawning and rearing habitat for Snake River steelhead and Chinook salmon in Squaw and Papoose creeks. Salmon and steelhead have not had access to this portion of Squaw Creek until a recent project removed the city of Riggins diversion dam at stream mile 0.25 in December 2005.

This project was identified and planned as part of the implementation of a conservation measure in the 2004 Remand version of the Federal Columbia River Power System (FCRPS) Biological Opinion (NMFS 2004b). The Tributary Habitat Program is designed as a voluntary program to work with private landowners and water users to address specific limiting factors in the basins in an attempt to offset mortality associated with the main stem Columbia River dams. Flow, diversions, and altered channel morphology were identified to limit spring/summer Chinook salmon and steelhead trout in the Little Salmon River Basin (NMFS 2004b, Ecovista 2004a, Ecovista 2004b).

1.1 Problems and Solutions

The Squaw Creek culvert was a full passage barrier to juvenile and adult Chinook salmon and steelhead trout, and disconnected the aquatic community from habitats upstream and downstream. The culvert prevented steelhead trout from accessing approximately 4.0 miles of spawning and early rearing habitat in Squaw and Papoose creeks. The existing culvert was replaced with a bottomless arch culvert that would maintain a natural stream bottom restoring connectivity. A functional fishway was designed into the streambed to improve passage conditions for upstream migrating fish resulting in a beneficial action for listed aquatic species.

The streambed was designed to be natural; native materials were used to create eddies and pool habitats to facilitate passage at this site for juvenile and adult salmon and steelhead. The project design meets the National Marine Fisheries Service (NMFS) criteria for upstream passage for juvenile and adult anadromous fish (Reclamation 2005).

1.2 Participation and Cooperation

The Bureau of Reclamation (Reclamation) implemented the Tributary Habitat Program for the Little Salmon River subbasin, as set forth in the updated proposed action, as a conservation measure to provide for early actions to assist with recovery of the evolutionary significant units (ESUs) within the lower Salmon River. The Little Salmon River subbasin ESUs includes the Snake River steelhead and the Snake River spring/summer Chinook. Within these conservation measures, Reclamation addresses limiting factors such as instream flow, barriers, channel morphology, and entrainment. Alternatives considered at the site were designed to meet Fish Passage Guidelines (NMFS 2004a). For this program, Reclamation works with willing partners to provide technical assistance to implement habitat restoration projects to improve survival of listed anadromous fish.

Project assistance for coordination and grant writing was provided by the Idaho Soil Conservation Commission. Funding was provided by the Idaho Office Species Conservation - Pacific Coast Salmon Recovery Fund, Bonneville Power Administration, American Rivers, and Idaho Fish and Wildlife Foundation. The Idaho Board of County Commissioners administered the contract. Reclamation provided technical assistance with the engineer design, environmental permitting, and construction inspection. The contractor was Cook and Sons Construction, White Bird, Idaho.

1.3 Fishery and Terrestrial Species

The aquatic species protected under the Endangered Species Act (ESA) that were present in the affected area of the project include summer steelhead (*Oncorhynchus mykiss*) and spring/summer Chinook salmon (*Oncorhynchus tschawytcha*). Bull trout (*Salvelinus confluentus*) and several terrestrial species present in the area were not effected by the project activities.

Spring/summer Chinook salmon were listed as threatened in 1992 (57 FR 14653). Chinook salmon have not been documented in Squaw Creek upstream of the old city of Riggins diversion dam at stream mile 0.25. The main stem Little Salmon River

downstream of Squaw Creek provides juvenile rearing and adult migration habitat (BLM 2000). The population in the Little Salmon is heavily supplemented by hatchery fish released at the Rapid River hatchery.

Steelhead trout (*O. mykiss*) were listed as threatened under the ESA in 1997 (62 FR 43937). The habitat in Squaw Creek is identified as spawning and early rearing for steelhead (BLM 2000). The population in the Little Salmon is supplemented with hatchery fish annually released in the main stem Little Salmon. Juvenile and adult steelhead are frequently observed in Squaw Creek. Fish sampling efforts above the old city of Riggins diversion dam have found few rainbow/steelhead trout. However, adult steelhead were observed spawning upstream of the old diversion site during April 2006 soon after the completion of the diversion dam removal.

The Columbia Basin bull trout (*Salvelinus confluentus*) were listed as threatened under the ESA in 1998 by the U. S. Fish & Wildlife Service (63 FR 31647). Currently, there is no critical habitat proposed for this species in the project area. Bull trout have never been observed in this tributary. Juvenile and adult rearing habitat is located on the main stem Little Salmon River upstream and downstream of Squaw Creek (BLM 2000).

1.4 Permits

Formal consultation under the ESA was completed with the National Marine Fisheries Service (2006). A programmatic Environmental Assessment under the National Environmental Protection Act was completed for the Tributary Habitat Program by the Bureau of Reclamation (Reclamation 2003). A 404 permit with the Corps of Engineers was issued in November 2006 and state permits for construction in the streambed were issued by the Department of Water Resources and the Department of Environmental Quality in November 2006.

1.4.1 Contracts Specifications and Bidding

Final designs and contract specifications for the project were prepared by Reclamation and provided to Idaho County. Idaho County advertised an announcement for project bids in the Lewiston Morning Tribune, Lewiston, Idaho (3/8/07, 3/19/07); Idaho Statesman, Boise, Idaho (3/9/07, 3/19/07); and Idaho Free Press, Grangeville, Idaho (3/7/07, 3/21/07). The contract was awarded to Cook and Sons Construction from White Bird, Idaho.

2. Project Description and Affected Area

The Squaw Creek diversion is located at stream mile 2.0, and has been in place for an unknown length of time. The existing culvert was a corrugated metal pipe-arch culvert that was 8 feet wide by 6 feet high. The slope in the culvert was approximately 2.6 percent and the culvert was perched 3.5 feet on boulders and other fill material. The existing culvert was replaced with a bottomless arch culvert that will pass the 100-year flood event, sediment, and fish maintaining connected stream habitats for aquatic species. The slope of the streambed invert is approximately 8 percent, constructed with 4-foot diameter boulders and a subsequent well-graded material as part of the streambed matrix. Boulder clusters were added to Papoose Creek to provide fish passage during periods of time water flows in the creek. A concrete retaining wall was constructed on the downstream adjacent landowner's property to block the property from large flood events. The upstream adjacent landowner received a rock retaining wall to retain material from the property's driveway. The rock retaining wall will greatly reduce the amount of material entering the creek. New asphalt was laid to complete the road construction and guardrails were installed to protect automobile traffic over the bottomless arch culvert.

Instream work for the project was located on Squaw Creek (no. 170602100107) in the NW ¼, SE ¼ section 17, T. 24N., R. 1 E (Frontispiece).

The project affected area extended from the project location on Squaw Creek downstream to the mouth of Squaw Creek.

2.1 Construction Process

Construction activities occurred from August 2007 through November 2007, but activity was not continuous. Most of the construction activity occurred during the month of August, and required that the Seven Devils Road be closed over the culvert for a 3-week period. An alternate route was provided over Forest Service Road 486, and access was open to the Seven Devils Recreation Area during the construction period. An emergency services plan was completed with Idaho County and the city of Riggins prior to road closure.

A cofferdam was installed at the upstream side of the existing culvert to dewater the project area. The stream was diverted into a flexible pipe to minimize water quality impacts from construction. Fish salvage was conducted in the dewatered reach and the existing culvert prior to dewatering.

Fish present in the dewatered reach of stream at the culvert construction site were captured with a backpack electrofisher and released upstream of the project site.

During construction, fish were allowed to pass the project site downstream through the bypass pipe. Eight steelhead parr were collected in the dewatered reach downstream of the existing culvert ranging in size from 3-8 inches.

The existing culvert was removed, footers were placed, and the culvert was assembled at the site. Delays with culvert assembly extended the road closure period. After assembling the culvert, the road fill was replaced and the road was re-paved with asphalt. Guard rails were installed alongside the road bed.

2.1.1 Description of Work

August 7

The contractor arrived on site with a 320C Cat and 724E Fiate Allis front-end loader. The existing corrugated metal pipe (CMP) was excavated and readied for removal. The contractor constructed a sandbag diversion into a 24-inch pipe to bypass the work area. The pipe discharged onto plastic sheets to minimize streambank erosion. There were several extensive leaks and the dam was removed and rebuilt. Attempts were made to seal leaks at the pipe joints.

August 8

The contractor loaded the existing CMP onto a low boy trailer and removed it from the site. The new band did not seal leaks at the pipe joints so additional sandbags were placed along the pipe to contain the water. The water was diverted along the pipe to the creek discharge point. The contractor continued excavation for the footings. Materials for the new arch culvert arrived and were off loaded.

August 9

Part of the cofferdam failed during the night and water was running into the excavation (natural streambed). The water was removed and the leaking area repaired. Excavation for the footing was completed to grade. Precast concrete footers were delivered and set one at a time on the right and left sides until they were complete.

August 10

Precast concrete footers were installed. Rock for weirs and ramp were installed into the streambed.

August 13

Assembly of the new bottomless arch culvert began. Parts were bolted together and placed in the creek area with the excavator.

August 14

Completed placing metal bottomless pipe in the work area. Finished placing all the bolts and nuts in the culvert. Started placing grout on the left side.

August 15

Placed 5 panels of wing wall on left side downstream end. Finished placing grout on the right side at the footing. Placed grout in the picking eyes of the footing.

August 16

Placed wing wall panels and whalers at the left side downstream. Started placing backfill inside the culvert by hand. Hauled in one more excavator for work on the right side. Started hauling in material for backfill to be placed next to the culvert.

August 17

Continue to place backfill inside the culvert by hand. Placed more large rock in the channel area inside the culvert. Started placing wing wall panels on the right upstream side and found the panels are not fitting correctly.

August 20

Started placing backfill on both sides of the upstream wing wall on the left side. Wall panel tops had to be cut so the top angle would fit.

August 21

Removed cofferdam and returned the streamflow back into the creek channel. Loader is hauling material to the 320 excavator to be placed on the left side. The 312 excavator is placing fill material on the right side. Compaction was done with a jumping jack compactor and double drum wacker compacter. Placed one dead man for the wing wall on the left side downstream. Hauled in four loads of bedding material.

August 22

The bypass pipe was removed. All streamflow is restored to the creek channel under the new culvert. Backfill has been placed on both sides of the downstream wing wall. Placed and completed setting the right side wing wall panels and whalers.

August 23

Backfill has been placed and compacted on both sides over the metal arch pipe. Began installing deadman anchors.

August 24

Continued placing fill and compacting around the deadman anchors and the headwall tiebacks. Backfill material was delivered with the front-end loader. Completed installing the deadman anchors. Road was re-opened to traffic.

August 25

Completed the transition from the backfill to the road at the west end. Performed cleanup at the work site.

August 27 - August 28

Placed fill material on right side downstream end of culvert. Placed riprap on the right side at the end of the culvert.

August 29 - September 10

Material not used for fill was hauled from the site. Placed riprap for retaining wall upstream of the culvert on the left side. Excavated for the concrete wall downstream from the culvert. Compacted the subbase, set forms, and placed rebar for the footings. Finished placing the rebar for the concrete footing downstream of the culvert on the left side. Placed subbase material and asphalt base material.

September 11

Placed more base material on the road and placed rebar and concrete for the wall downstream of the culvert. Grade was checked with a string line to match the old asphalt grade. Cleaned off the old asphalt with water which made the road base very wet. Asphalt cannot be placed until the base material dries out. Concrete came on site very wet.

September 12

Removed entire wet base and placed more base. Finished placing the road base and started placing asphalt. Stripped the concrete forms from the wall on the left side of the downstream end of culvert.

September 13

Placed curbing and cleaned the road. Overlay to be placed on the road.

September 14

Placed guard rails and removed material on uphill sides of road over the culvert. Sloped embankment from the fence to the road. Placed riprap from the concrete wall to the stream.

November 6

Project was completed.

3. Conclusions

Steelhead parr were found to be present up to the downstream end of the existing culvert. Restoring streambed connectivity will aid upstream passage for juvenile steelhead rearing in the stream and will improve access for adult steelhead returning to Squaw Creek to spawn. In addition, restoring the natural stream bottom will reconnect the acquatic community and restore more natural stream processes.

4. References

57 FR 14653 — Federal Register. 1992. National Marine Fisheries Service Final Rule: Endangered and Threatened Species; Threatened Status for Snake River Spring/Summer Chinook Salmon, Threatened Status for Snake River Fall Chinook Salmon. April 22, 1992, Vol. 57, No. 78, pp. 14653-14663.

62 FR 43937 — Federal Register. 1997. National Marine Fisheries Service Final Rule: Endangered and Threatened Species; Listing of Several Evolutionarily Significant Units (ESUs) of West Coast Steelhead. August 18, 1997, Vol. 62, No. 159, pp. 43937-43954.

63 FR 31647 — Federal Register. 1998. Fish and Wildlife Service, Interior Final Rule: Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Klamath River and Columbia River Distinct Population Segments of Bull Trout. June 10, 1998, Vol. 63, No. 111, pp. 31647-31674.

BLM 2000 — Bureau of Land Management (BLM) 2000. Little Salmon River Subbasin Biological Assessment of ongoing and proposed Bureau of Land Management activities on Sockeye salmon, fall Chinook salmon, spring/summer Chinook salmon, steelhead trout, bull trout and westslope cutthroat trout. Prepared by the Bureau of Land Management, Upper Columbia-Salmon Clearwater District, Cottonwood Field Office, Cottonwood, Idaho.

BOR 2003 — Bureau of Reclamation (Reclamation) 2003. Finding of No Significant Impact and Programmatic Environmental Assessment for implementing fish habitat measured in four mountain Snake Province Subbasins under Action 149 of the December 2000 National Marine Fisheries Service Federal Columbia River Power System Biological Opinion. Pacific Northwest Region, Boise, Idaho.

BOR 2005 — Bureau of Reclamation (Reclamation) 2005. Predesign Memorandum for Squaw Creek Culvert Improvements. Pacific Northwest Region, Boise, Idaho.

Ecovista 2004a — Salmon Subbasin Assessment. Prepared for the Nez Perce Tribe, Lapwai, Idaho for the Northwest Power and Conservation Council, Columbia River Basin Fish and Wildlife Program. http://www.nwcouncil.org/fw/subbasinplanning/salmon/default.asp

Ecovista 2004b — Salmon Subbasin Management Plan. Prepared for the Nez Perce Tribe, Lapwai, Idaho for the Northwest Power and Conservation Council, Columbia River Basin Fish and Wildlife Program. http://www.nwcouncil.org/fw/subbasinplanning/salmon/default.asp

NMFS 2004a — National Marine Fisheries Service (NMFS) 2004a. Anadromous salmonid passage facility guidelines and criteria. Draft 31 January 2004.

NMFS 2004b — National Marine Fisheries Service (NMFS) 2004b. ESA Section 7 Consultation on Remand for the Operation of the Columbia River Power System and 19 Bureau of Reclamation Projects in the Columbia Basin. NOAA Fisheries log no. F/NWR/2004/00727.

NMFS 2006 — National Marine Fisheries Service (NMFS) 2006. Endangered Species Act – Section 7 Consultation Biological Opinion and Magnuson-Stevens Fisher Conservation and Management Act Essential Fish Habitat Consultation for the Squaw Creek culvert replacement project. Issued to the Bureau of Reclamation, Snake River Area Office, Boise, Idaho.

Squaw Creek Culvert
Fish Passage Improvement Project

Little Salmon River Subbasin
North Central Idaho

Attachment A

Construction Photographs

Photograph 1. Squaw Creek culvert downstream side north bank before project construction. Photo by: D. Weigel, Reclamation.

Photograph 2. Close up of the old mouth of Papoose Creek downstream of the culvert. This channel is now blocked by the road and the creek has been moved upstream of the culvert. Photo by D. Weigel, Reclamation.

Photograph No. 3. Squaw Creek downstream of culvert. Landowner's property backs up to Squaw Creek. Photo by D. Weigel, Reclamation

Photograph No. 4. Fish Biologist shocking fish to remove from the work area. Photo by J. Farver.

Photograph No. 5. Looking downstream at the existing corrugated metal pipe. Photo by J. Farver.

Photograph No. 6. Checking excavation grade. Photo by J. Farver.

Photograph No. 7. Left side footers in place and completing installation. Photo by J. Farver.

Photograph No. 8. Installation of deadman anchor for downstream left wingwall of arch pipe. Photo by C. Kriewald.

Photograph No. 9. Excavator installing backfill for arch pipe culvert.
Photo by C. Kriewald.

Photograph No. 10. Bottomless arch culvert with wingwalls installed.
Photo by C. Kriewald.

Photograph No. 11. Creek bed inside of the bottomless arch culvert. Photo by J. Chan, Reclamation.

Photograph No. 12. Looking at the upstream side of the bottomless arch culvert showing retaining wall and riprap on creek bank. Property owner's driveway is accessed thru open gate at the top and center of photograph. Photo by J. Chan, Reclamation.

Photograph No. 13. Completion of the project site showing curbing and guardrails installed along the road bed, the bottomless arch culvert covered with road fill and the road re-paved with asphalt. Photo by J. Chan, Reclamation.

Photograph No. 14. Clean-up of property owners' driveway after restacking bricks and firewood. Photo by J. Chan, Reclamation.

Squaw Creek Culvert
Fish Passage Improvement Project

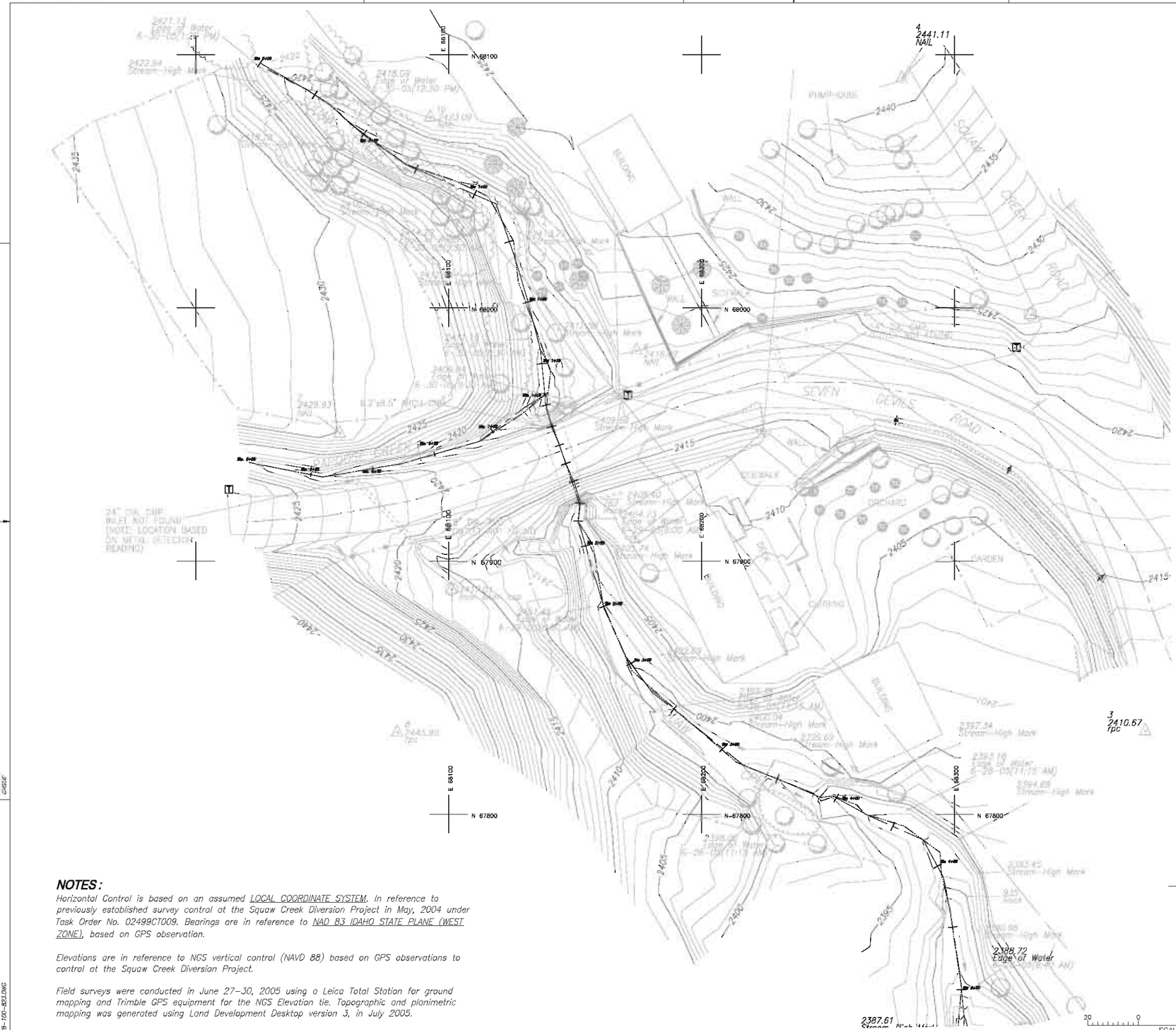
Little Salmon River
Little Salmon River Subbasin
North Central Idaho

Attachment B

Final Design Drawings

Drawing No. 1678-100-823	Existing Site Plan
Drawing No. 1678-100-824	Site Plan
Drawing No. 1678-100-825	Bottomless Culvert Plan, Sections, and Detail
Drawing No. 1678-100-826	Rock Weirs Plan and Sections
Drawing No. 1678-100-828	Plan and Sections
Drawing No. 1678-100-829	Profiles
Drawing No. 1678-100-830	Bottomless Culvert Plan, Sections, and Details

1678-100-823



SYMBOLS LEGEND

- NORTHING AND EASTING GRID TICKS
- PRIMARY SURVEY CONTROL
- SECONDARY SURVEY CONTROL
- EXISTING DELINEATOR POST
- EXISTING HOSE BIB
- EXISTING TELEPHONE PEDESTAL
- EXISTING ROAD SIGN
- EXISTING POWER POLE
- EXISTING CULVERT PIPE
- EXISTING INDEX CONTOUR
- EXISTING MINOR CONTOUR
- EXISTING TOP OF BANK
- EXISTING FENCE LINE
- EXISTING EDGE OF ASPHALT
- EXISTING STREAM OR DITCH CENTERLINE
- EXISTING OVERHEAD POWER LINE
- EXISTING UNDERGROUND TELEPHONE
- EXISTING SHRUB OR SMALL TREE LINE
- EXISTING TREE – EVERGREEN (LARGER THAN 3" IN DIA.)
- EXISTING TREE – DECIDUOUS (LARGER THAN 3" IN DIA.)
- EXISTING SHRUBS OR TREES UNDER 3" IN DIA.
- DJ&A, P.C. RED PLASTIC CAP
- BUREAU OF RECLAMATION 2 1/2" ALUMINUM CAP
- CROSS SECTION NUMBER
- *Stream–High Mark* STREAM HIGH WATER MARK

SURVEY CONTROL COORDINATES

Number	(Local) Northing(Feet)	(Local) Easting(Feet)	(NAVD88) Elevation(Feet)	Description
1	67997.3171	68330.0600	2426.69	Control Pt. 2.5" AL. CAP
2	67888.8691	68101.3110	2417.01	Control Pt. 2.5" AL. CAP
3	67832.9837	68375.4114	2410.67	Control Pt. 1" RPC
4	68090.6581	68279.2376	2441.11	Control Pt. NAIL
5	67679.5083	68255.5654	2393.92	Control Pt. NAIL
6	67983.2105	68174.3932	2418.02	Control Pt. NAIL
7	67950.5434	68057.1823	2429.93	Control Pt. NAIL
8	67832.4004	68079.8821	2445.90	Control Pt. 1" RPC
9	68140.3587	68102.1363	2425.95	Control Pt. NAIL
10	68075.3637	68092.8864	2423.09	Control Pt. NAIL
1941	63946.2961	75535.1260	1821.63	Control Pt. 1" RPC
3000	64141.9501	75182.6560	1852.47	Control Pt. 2.5" AL. CAP

NOTES:

Horizontal Control is based on an assumed LOCAL COORDINATE SYSTEM. In reference to previously established survey control at the Squaw Creek Diversion Project in May, 2004 under Task Order No. 02499CT009. Bearings are in reference to NAD 83 IDAHO STATE PLANE (WEST ZONE), based on GPS observation.

Elevations are in reference to NGS vertical control (NAVD 88) based on GPS observations to control at the Squaw Creek Diversion Project.

Field surveys were conducted in June 27–30, 2005 using a Leica Total Station for ground mapping and Trimble GPS equipment for the NGS Elevation tie. Topographic and planimetric mapping was generated using Lond Development Desktop version 3, in July 2005.

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UNITED STATES
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BUREAU OF RECLAMATION

COLUMBIA/SNAKE RIVER SALMON RECOVERY PROJECT

FCRPS HABITAT IMPROVEMENT PROGRAM – LITTLE SALMON SUBBASIN – IDAHO

SQUAW CREEK CULVERT REPLACEMENT

EXISTING SITE PLAN

DESIGNED JESSE CHAN, P.E. CHECKED EUGENE HUMBLES, P.E.
DRAWN LELAND B. TECH. APPR. JESSE CHAN, P.E.
APPROVED STEVEN MAWDSLEY – ACTING PROGRAM MANAGER
BOISE, IDAHO 2005-07-20
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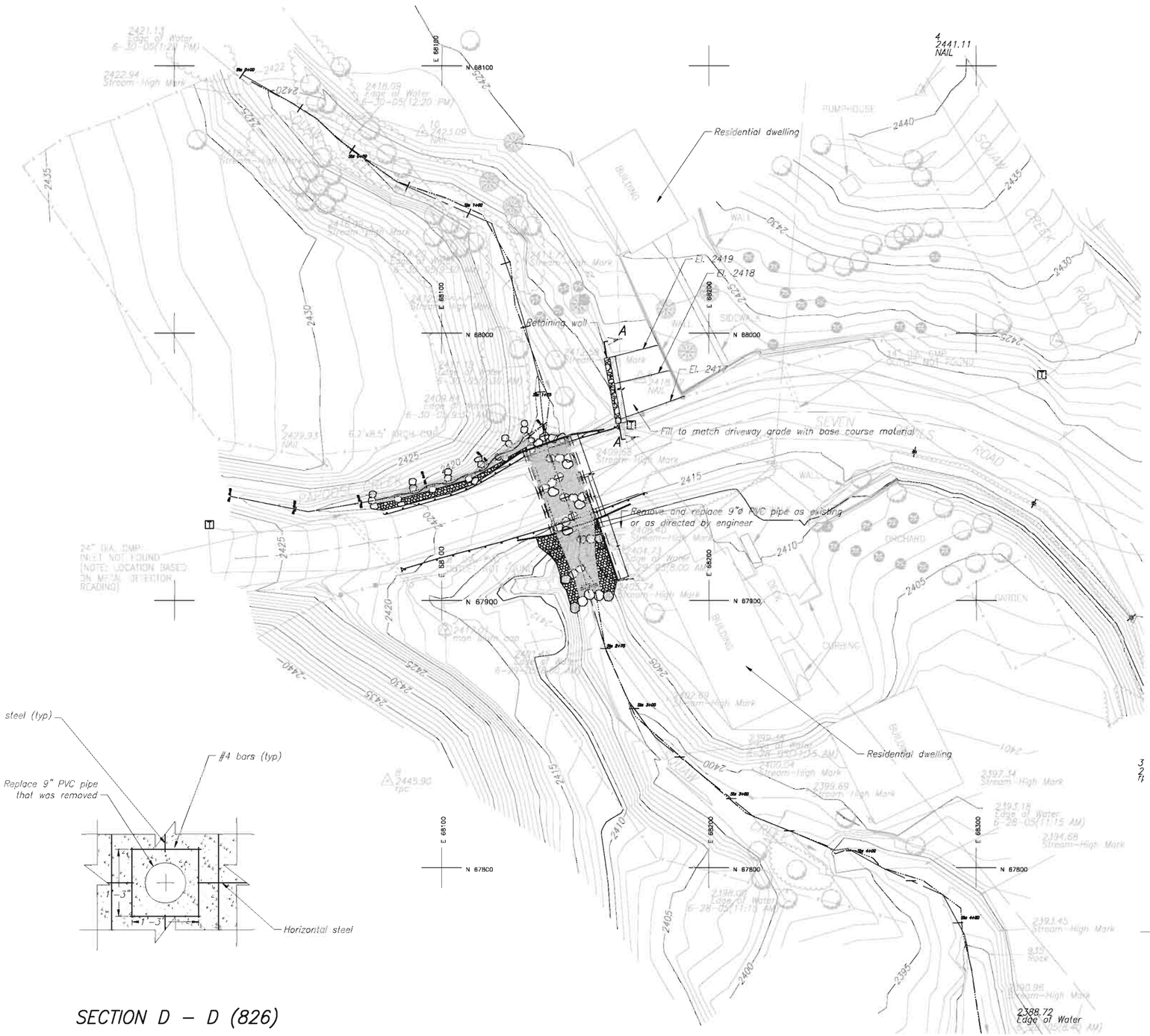

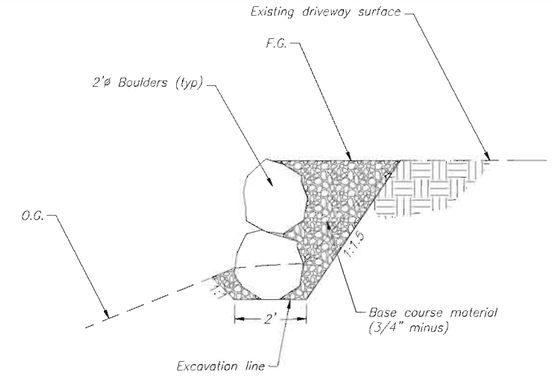

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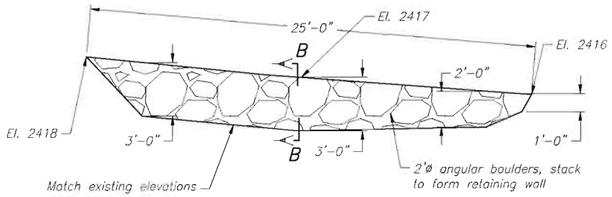

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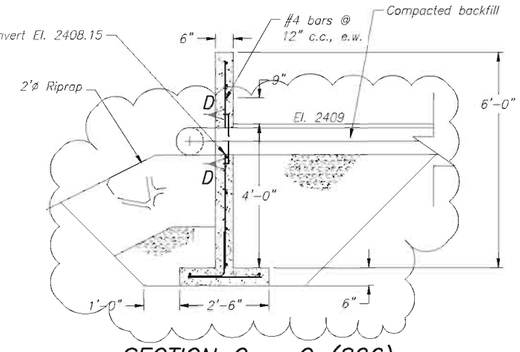

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SCALE OF FEET

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1	2007-03-07 100 – J. Chan	Lowered footing depth by 2.5' and changed bends for PVC pipe to 1 instead of 2

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROJECT

FCRPS HABITAT IMPROVEMENT PROGRAM – LITTLE SALMON SUBBASIN – IDAHO

SQUAW CREEK CULVERT REPLACEMENT

SITE PLAN

DESIGNED _JESSE CHAN, P.E._ CHECKED _EUGENE HUMBLES, P.E._

DRAWN _LELAND B._ TECH. APPR. _JESSE CHAN, P.E._

APPROVED _STEVEN MONTAGUE – ACTING PROGRAM MANAGER_

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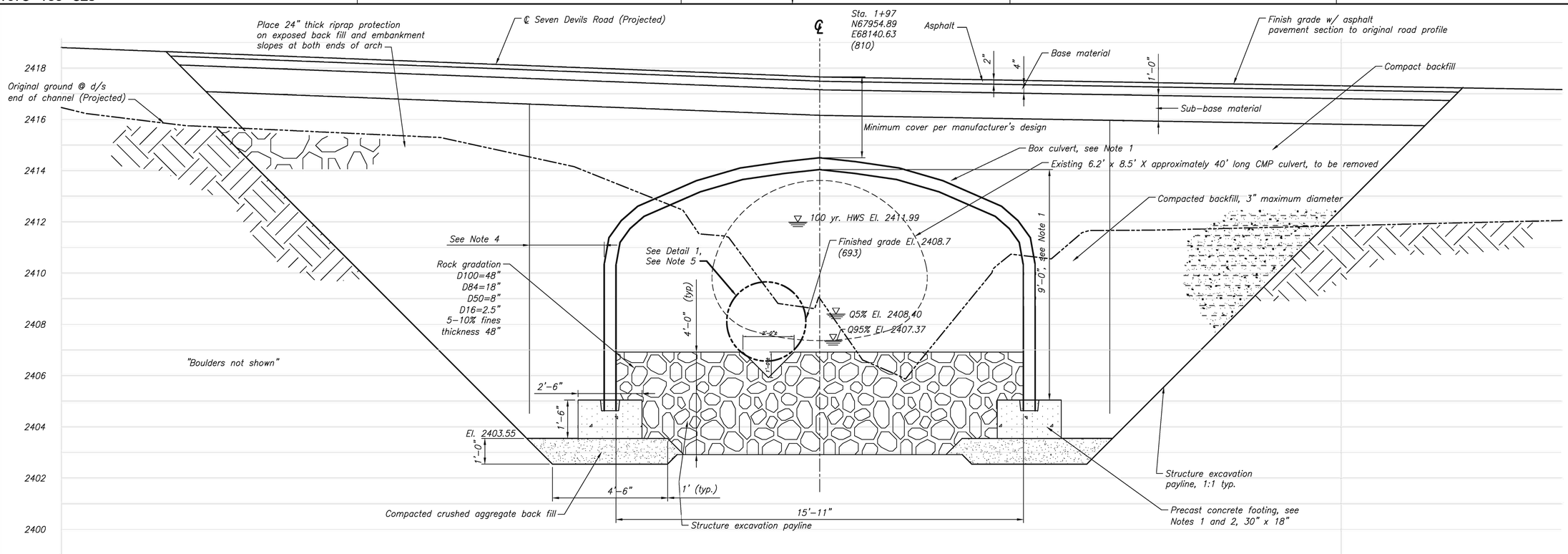

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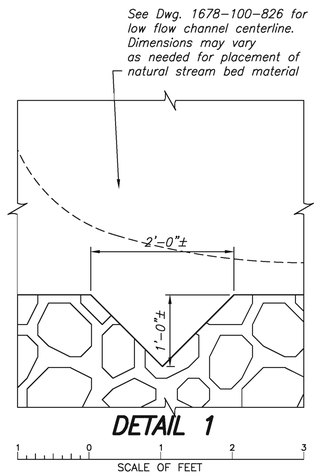
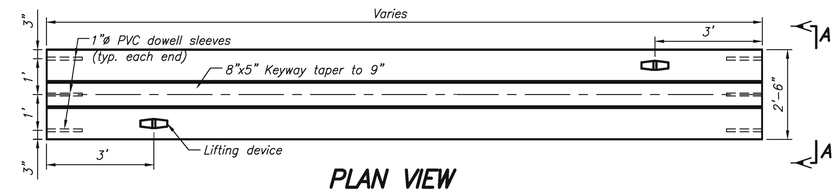


DETAIL 1

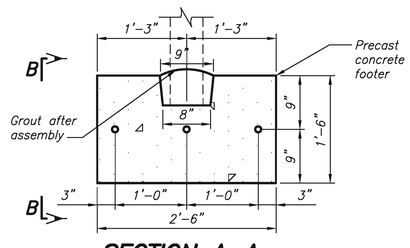
SCALE OF FEET (1 0 1 2 3)



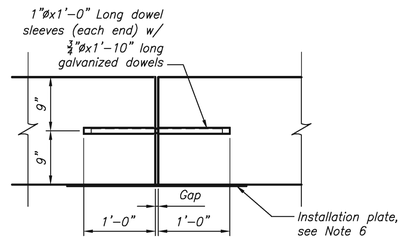
PLAN VIEW

PRECAST CONCRETE FOOTINGS FOR SUPER-COR BOX CULVERTS

SCALE OF FEET (2 0 2 4 6)



SECTION A-A



SECTION B-B

SCALE OF FEET (1 0 1 2 3)

GENERAL NOTES:

1.0 Design
1.1 Design based on footing reactions from AASHTD, 16th ed. (1996) plus interims, structural plate box culverts.
1.2 Live load HS-25 truck, axle=40 kips, AASHTD
1.3 Unit weight of soil=140 lbs/ft3
2.0 Precast Concrete
2.1 All concrete shall be standard weight with 5% minimum air entrainment
2.2 Minimum 28 day compressive strength of concrete=4350 psi
2.3 Maximum aggregate size ¾"
2.4 All reinforcing steel shall conform to ASTM A615, Grade 60
2.5 All reinforcing steel shall have 2" clear cover unless noted otherwise
2.6 Cast-in lifting devices shall be Dayton/Richmond (or approved equivalent) designed for safe working load. Footings shall not be lifted until concrete reachs 4000 psi.
3.0 Foundation
3.1 Footing designs based on founding on undisturbed soil with an assumed minimum net allowable bearing capacity of 4000 psf. Bearing capacity to be confirmed by owner's geotechnical engineer in the field.
3.2 Footing elevation must provide adequate frost and scour protection as determned by owner's geotechnical engineer.
3.3 Any unsuitable foundation material below the footings, as determined by the owner's geotechnical engineer, shall be excavated and replaced with suitable material and compacted as directed by same.
4.0 Intallation
4.1 Footing units to be connected in the field using max. ¾"ø x 1'-0" long galvanized dowels.
4.2 A steel plate may be placed under the ends of the units in the field to facilitate sliding the units together while inserting the dowels.
4.3 Footing keyway to be filled with non-shrik grout after assembly of the super-cor box culvert (prior to backfilling).

NOTES:

1. Design structural plate long span arch of structural plate box culvert for HS20-44 loading; AASTHO Standard Specifications for Highway Bridges, Chapter 12.
2. Design footing for 4000 psf soil bearing pressure.
3. Where directed, over excavate unsuitable in situ material and replace with suitable natural stream bed material.
4. Place granular soil 3' outside of structural plate (3" max size).
5. Construct low flow channel, as directed, to meander 2'± across creek centerline.
6. Steel plate may be placed under ends of footers to aid pushing footer blocks together. Contractor's responsibility to provide and remove plates or leave plates in-place.

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROJECT
FCRPS HABITAT IMPROVEMENT PROGRAM-LITTLE SALMON SUBBASIN-IDAHO

SQUAW CREEK CULVERT REPLACEMENT

SQUAW CREEK

BOTTOMLESS CULVERT
PLAN, SECTIONS, AND DETAIL

DESIGNED JESSE CHAN, P.E. CHECKED EUGENE HUMBLES, P.E.
DRAWN C. HSUE, L. BOEKWEG TECH. APPROVAL JESSE CHAN, P.E.
APPROVAL STEVEN MONTAGUE ACTING
PEER REVIEWER/PROGRAM MANAGER

BOISE, IDAHO 2005-07-29
SHEET 1 OF 1

1678-100-825

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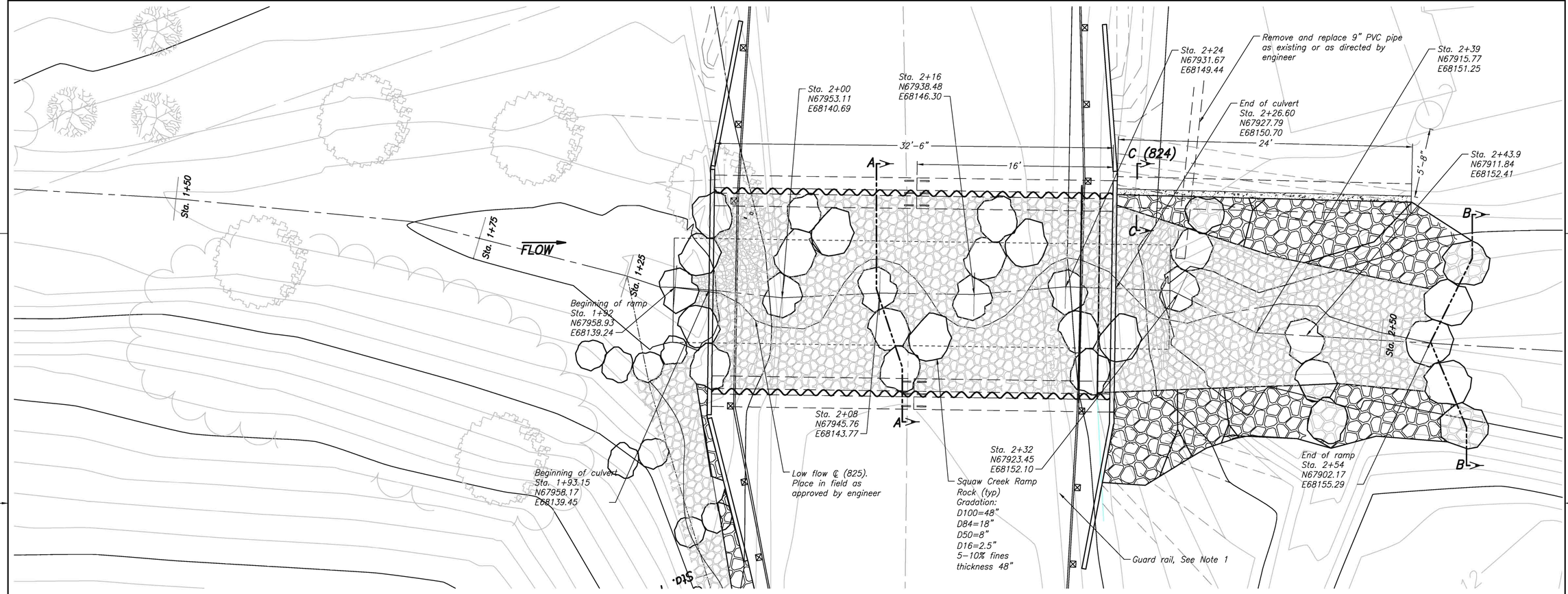
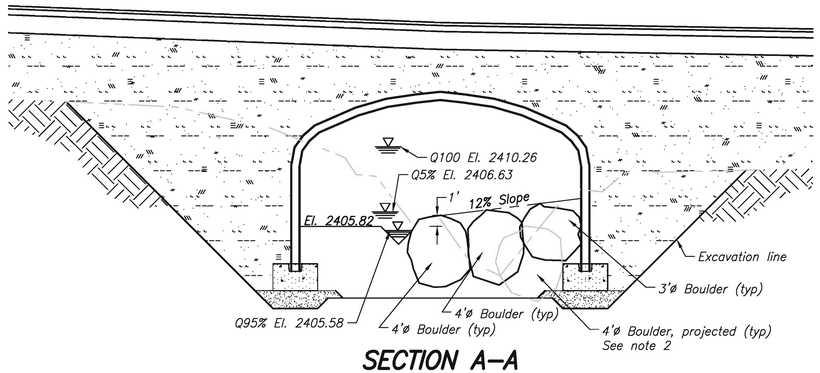


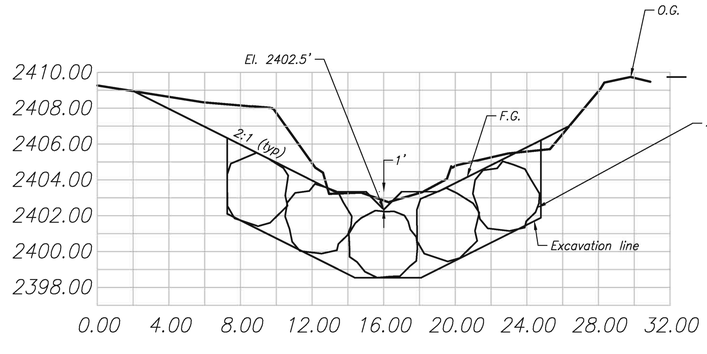
PLAN

SCALE OF FEET (4 0 4 8 12)



SECTION A-A

Sta. 2+08



SECTION B-B

(Grade control weir at u/s end of ramp similar)

NOTE:

1. See Idaho Transportation Department Standard Drawings in App A: G-1-A-1, G-1-B, G-1-L, and G-1-M.
2. Place 4' boulder just downstream of weir such that the boulder supports the two weir boulders nearest to the arch wall.

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FCRPS HABITAT IMPROVEMENT PROGRAM - LITTLE SALMON SUBBASIN - IDAHO

SQUAW CREEK CULVERT REPLACEMENT

SQUAW CREEK
ROCK WEIRS
PLAN AND SECTIONS

DESIGNED JESSE CHAN, P.E. CHECKED EUGENE HUMBLES, P.E.
DRAWN LELAND B. TECH. APPR. JESSE CHAN, P.E.
APPROVED STEVEN MONTAGUE - ACTING PROGRAM MANAGER

BOISE, IDAHO 2005-07-20 SHEET 1 OF 1 1678-100-826

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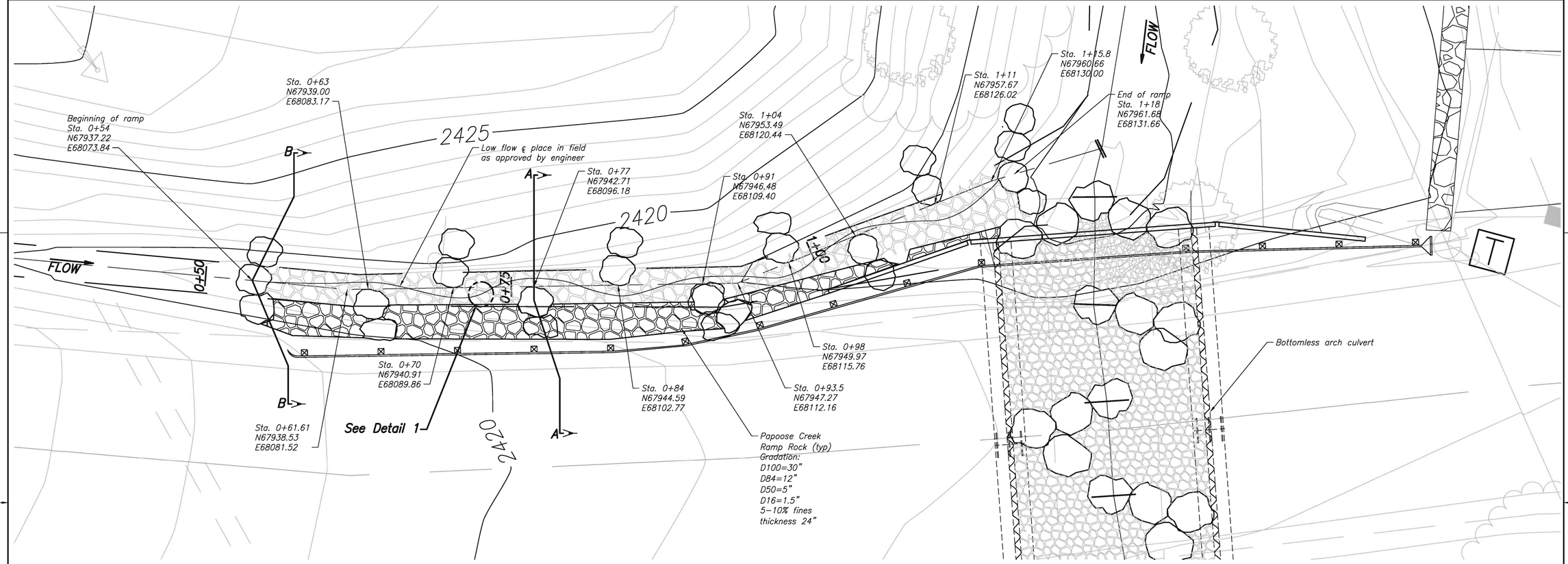
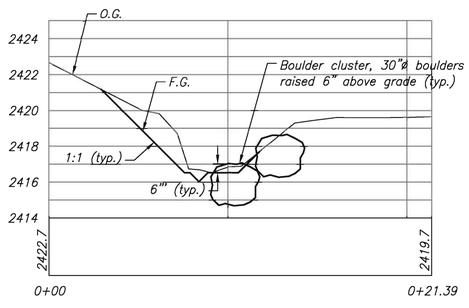
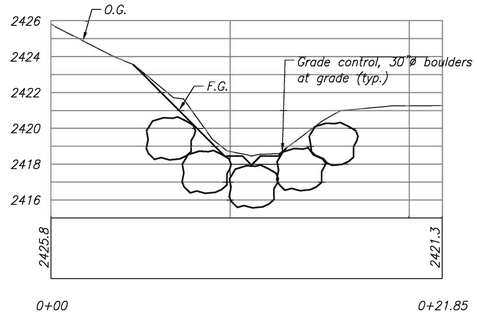


PLAN

4 0 4 8 12
SCALE OF FEET

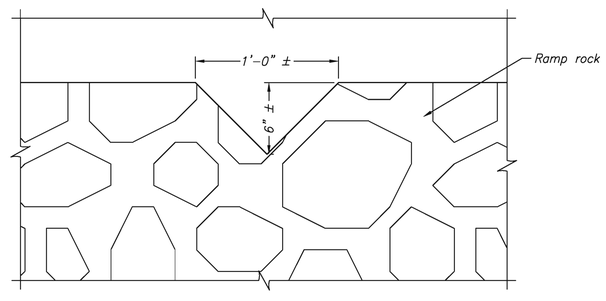


SECTION A-A



SECTION B-B

(Grade control weir at d/s end of ramp similar)



DETAIL 1

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FCRPS HABITAT IMPROVEMENT PROGRAM – LITTLE SALMON SUBBASIN – IDAHO

SQUAW CREEK CULVERT REPLACEMENT

PAPOOSE CREEK
ROCK WEIRS
PLAN AND SECTIONS

DESIGNED JESSE CHAN, P.E. CHECKED EUGENE HUMBLES, P.E.
DRAWN LELAND B. TECH. APPR. JESSE CHAN, P.E.
APPROVED STEVEN MONTAGUE – ACTING PROGRAM MANAGER
BOISE, IDAHO SHEET 1 OF 1 2005-07-20 1678-100-828

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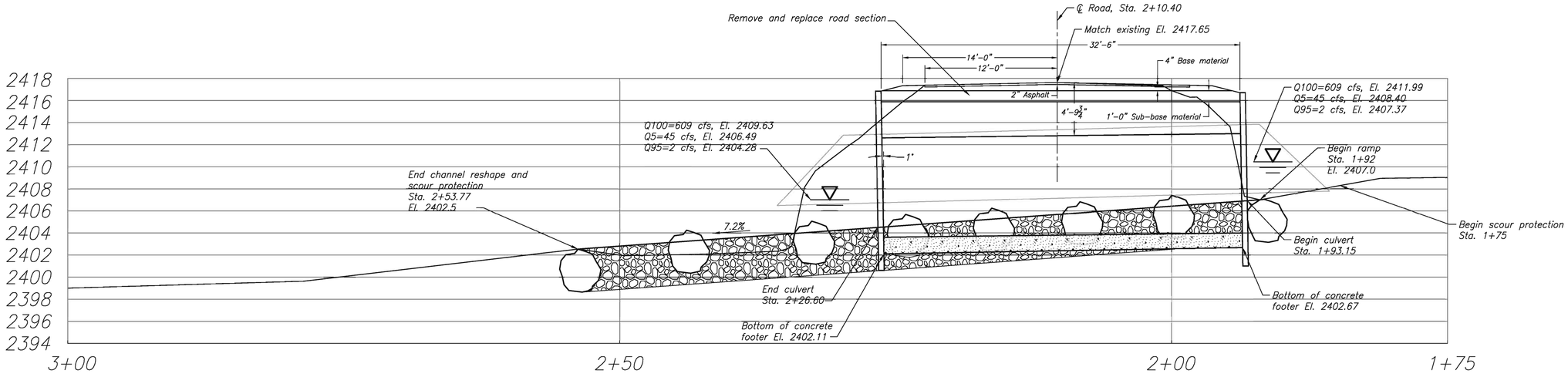
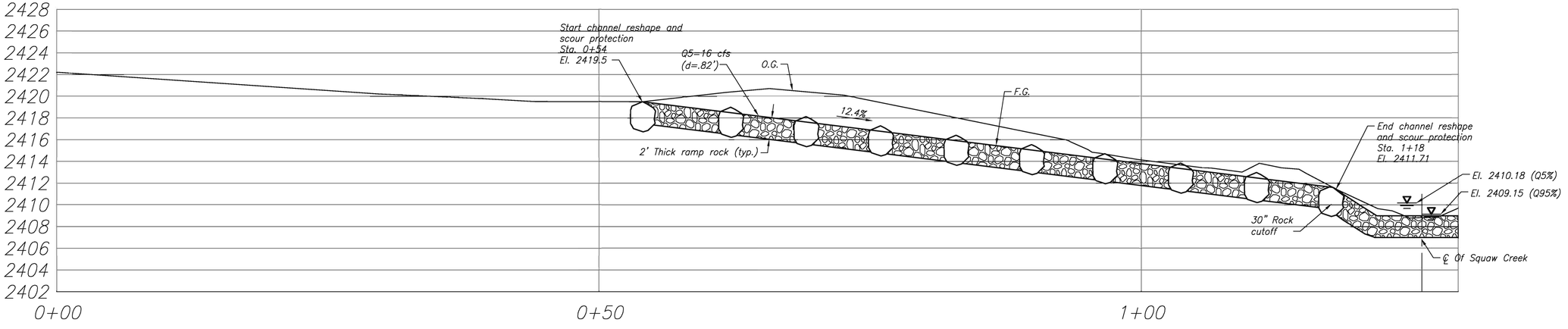


SQUAW CREEK CHANNEL PROFILE



PAPOOSE CREEK CHANNEL PROFILE

5 0 5 10 15
SCALE OF FEET

NOTES:

1. *Intermediate boulders in Pappoose Creek are raised such that the crest of the boulder is 6" above the invert of the creek, at the centerline of the creek, not 6" above the elevation of the lowst part of the low-flow notch.*

2. *Intermediate boulders in Squaw Creek ramp are raised such that the crest of the boulder is 1' above the invert of the creek, at the centerline of the creek.*

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FCRPS HABITAT IMPROVEMENT PROGRAM-LITTLE SALMON SUBBASIN-IDAHO

SQUAW CREEK CULVERT REPLACEMENT

SQUAW AND PAPOOSE CREEK

PROFILES

DESIGNED JESSE CHAN, P.E. CHECKED EUGENE HUMBLES, P.E.
DRAWN LELAND B. TECH. APPR. JESSE CHAN, P.E.
APPROVED STEVEN MONTAGUE - ACTING PROGRAM MANAGER
BOISE, IDAHO 2005-07-29
SHEET 1 OF 1
1678-100-829

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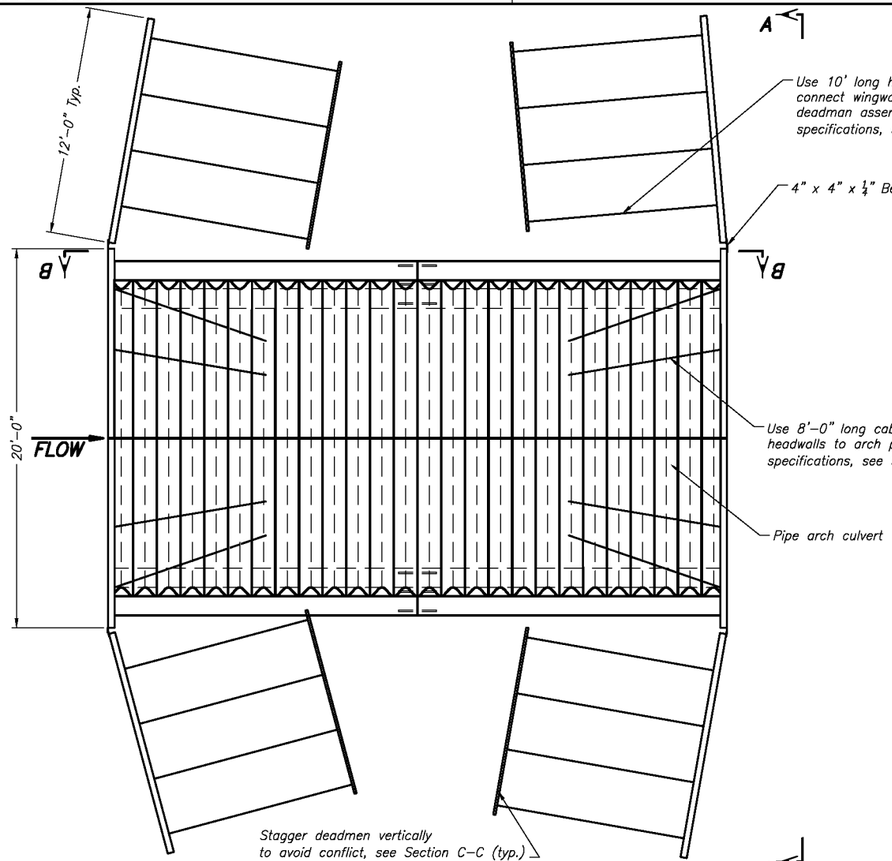
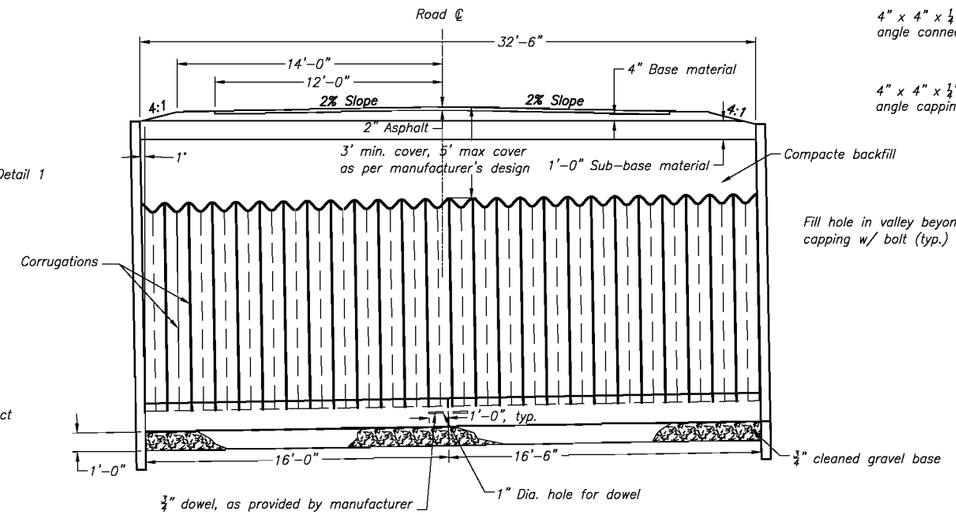


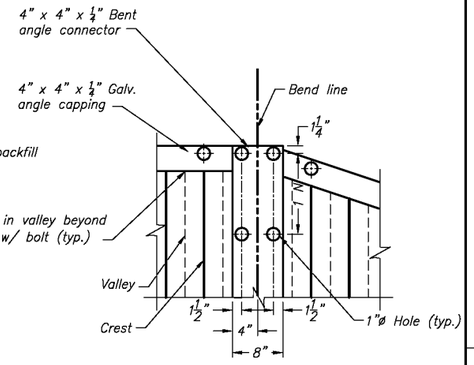
PLAN

SCALE OF FEET: 4 0 4 8 12



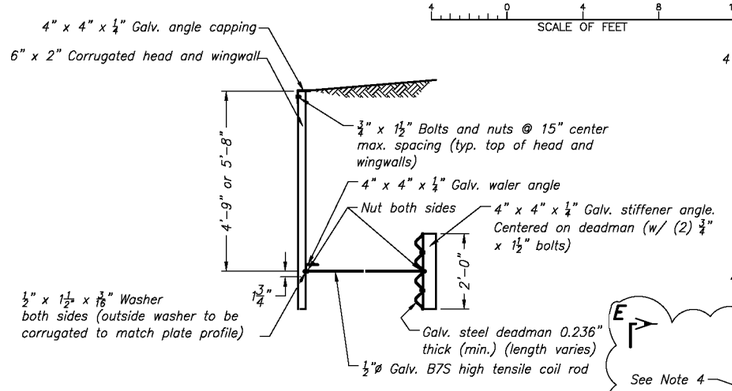
SECTION B-B

SCALE OF FEET: 4 0 4 8 12



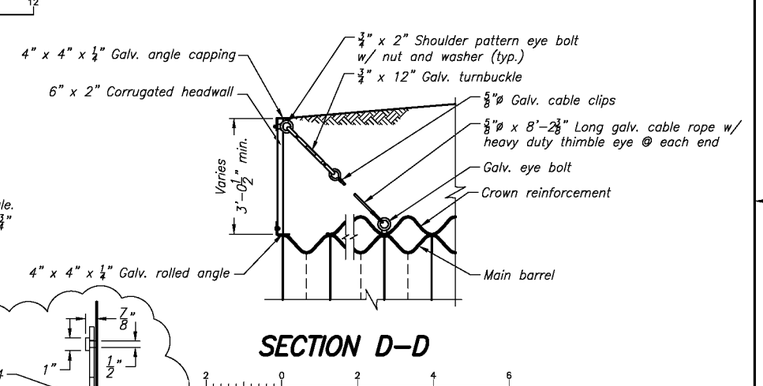
DETAIL 2

SCALE OF FEET: 1 0 1 2 3



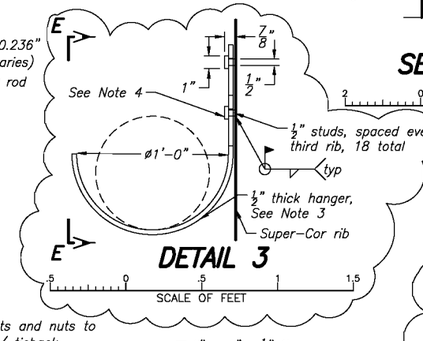
SECTION C-C

SCALE OF FEET: 2 0 2 4 6



SECTION D-D

SCALE OF FEET: 2 0 2 4 6

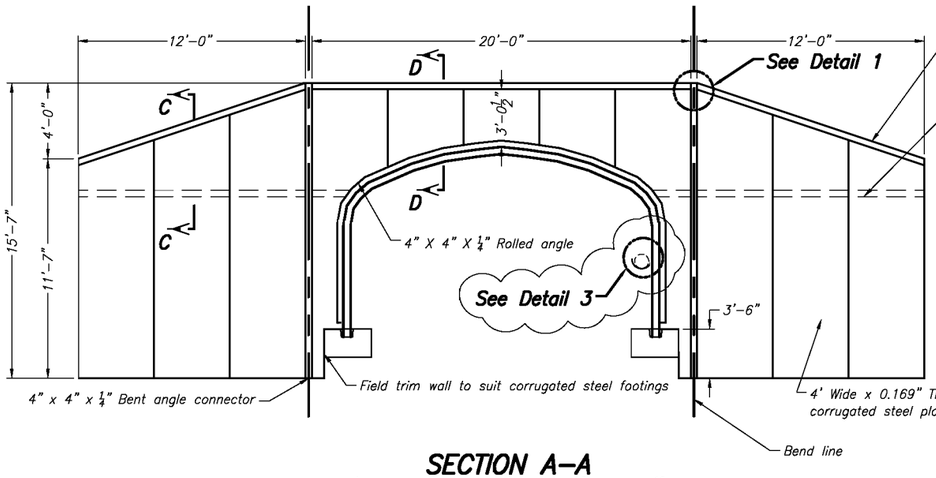


DETAIL 3

SCALE OF FEET: .5 0 .5 1 1.5

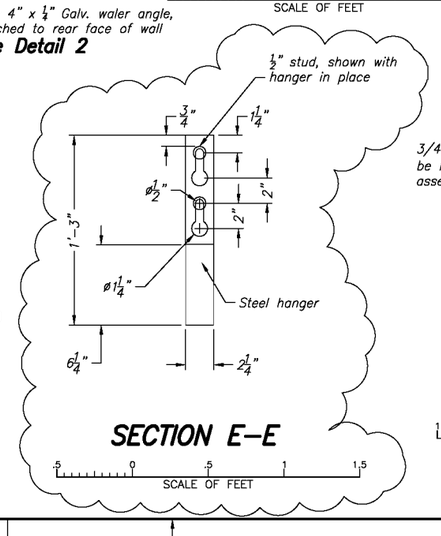
NOTES

1. All material to be hot dip galvanized.
2. Construct to the manufacturer's recommendations.
3. Hanger is removeable. Spray cold galvanizing repair compound on effected areas, Galvanox or something equal. Examples of effected areas are areas of field welding or scratches on Supercor structure.
4. Place studs to elevation as field directed.



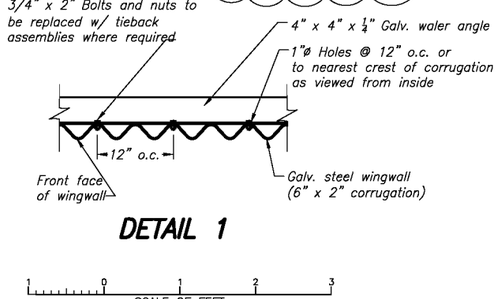
SECTION A-A

SCALE OF FEET: 4 0 4 8 12



SECTION E-E

SCALE OF FEET: .5 0 .5 1 1.5



DETAIL 1

SCALE OF FEET: 1 0 1 2 3

REV NO		
1	2007-03-07 100 – J. Chan	Included steel studs and hanger and added notes to help define location and installation.

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COLUMBIA/SNAKE RIVER SALMON RECOVERY PROJECT
FCRPS HABITAT IMPROVEMENT PROGRAM – LITTLE SALMON SUBBASIN – IDAHO

SQUAW CREEK CULVERT REPLACEMENT

SQUAW CREEK
BOTTOMLESS CULVERT
PLAN, SECTIONS, AND DETAILS

DESIGNED JESSE CHAN, P.E. CHECKED EUGENE HUMBLES, P.E.
DRAWN LELAND B. TECH. APPR. JESSE CHAN, P.E.
APPROVED STEVEN MONTAGUE – ACTING PROGRAM MANAGER

BOISE, IDAHO SHEET 1 OF 1 2005-07-20 **1678-100-830**

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