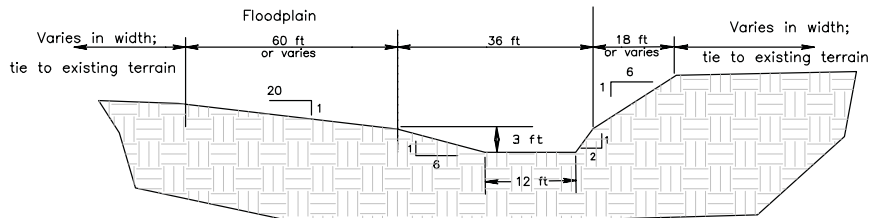
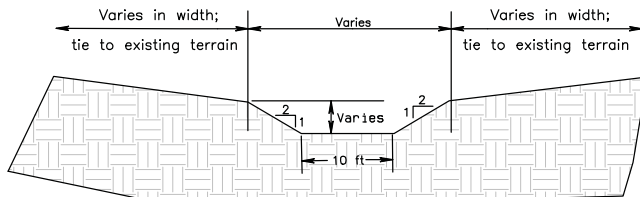


BANKFULL CHANNEL CROSS-SECTION
Riffle Section
(Not to Scale)



BANKFULL CHANNEL CROSS-SECTION
Meander Section
(Not to Scale)

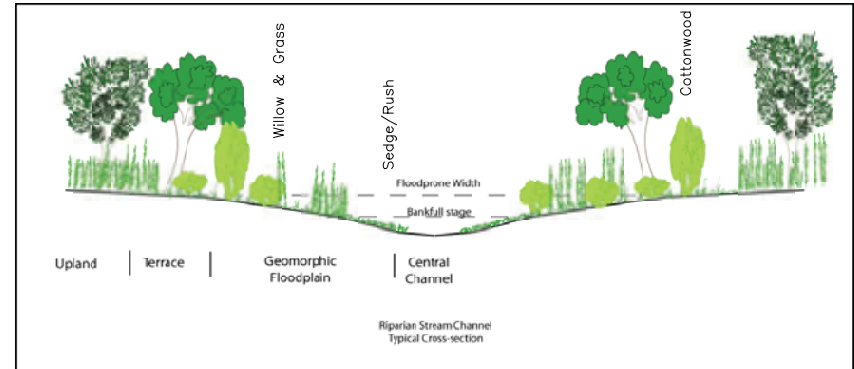


WETLAND OUTLET CHANNEL CROSS-SECTION

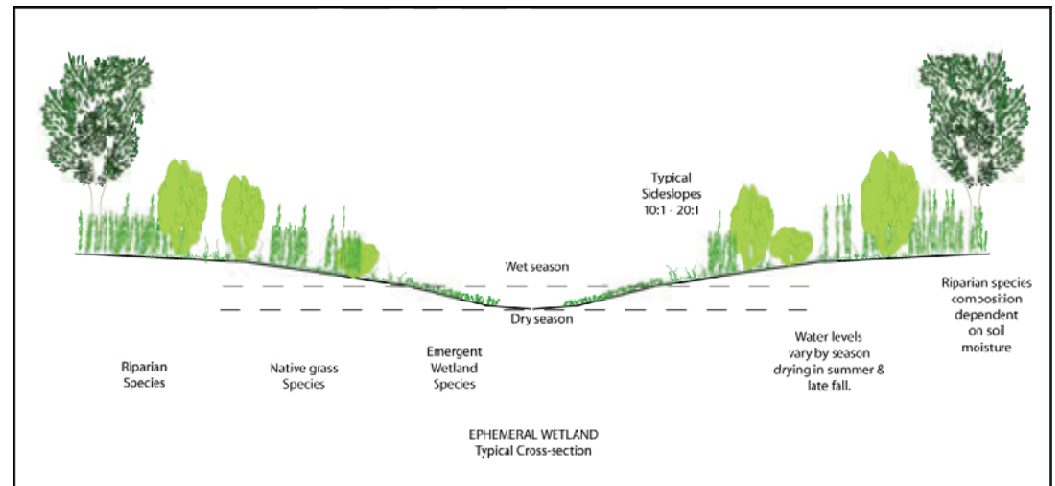
(Not to Scale)



See SHEETS 3 & 4 for Earthwork and Revegetation Construction Specifications



Typical Channel Vegetation Zone Cross-Section



Typical Wetland Vegetation Zone Cross-Section

Natural Channel Design, Inc

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(928) 774-1178

DRAWN BY: M.Wirtanen, S.Yard			
DESIGNED BY: T.Moody, M.Wirtanen, C. Helton			
REV	DATE	BY	REVISION
1	12/10/08	MW	Wetland Outlets
3	1-5-10	MW	As-Built

DETAILS:
Typical Channel & Vegetation X-Sects

Watson Woods Riparian Preserve

Project #: 08-158 WPF



AS-BUILT DRAWINGS
Construction Period
3-2-09 to 4-8-09

FILE NAME: Watson Woods.pro	DATE: December 20, 2008
PROJECT NO: 05-106-01AZ	SHEET: 18 of 22

See SHEET 5 for Construction Specifications

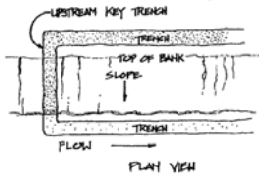
Procedure for Erosion Control Fabric

Seed the streambank with native herbaceous seed and rake in to ensure good seed-soil contact. Slope varies-See "How to Install".



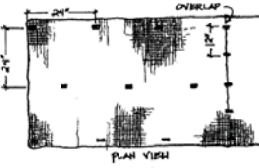
Step One: Seeding

Excavate an upstream key trench perpendicular to flow.



Step Three: Upstream Key Trench

After laying out the blanket, secure the fabric with wedge-shaped wooden stakes according to manufacturer's specs or suggested pattern.



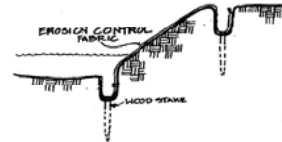
Step Five: Suggested Stake Layout

Excavate two trenches as shown.



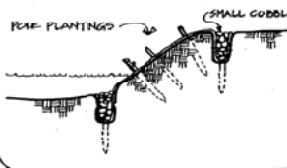
Step Two: Excavate Trench

Place fabric on streambank and in trenches and secure with a wedge-shaped wooden stake.



Step Four: Fabric Placement

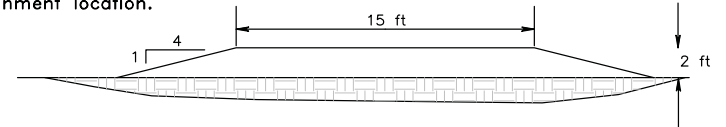
Backfill all trenches with excavated soil or small cobble and compact it.



Step Six: Backfill

INTERAGENCY RIPARIAN/WETLAND PROJECT USDA-NRCS Plant Materials Center Aberdeen, ID 83210

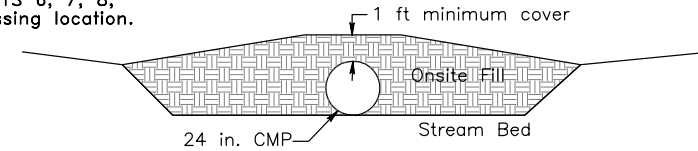
See SHEET 3 for Construction Specifications and SHEETS 6, 7, and 11 for Road Realignment location.



TYPICAL ROAD CROSS-SECTION

(Not to Scale)

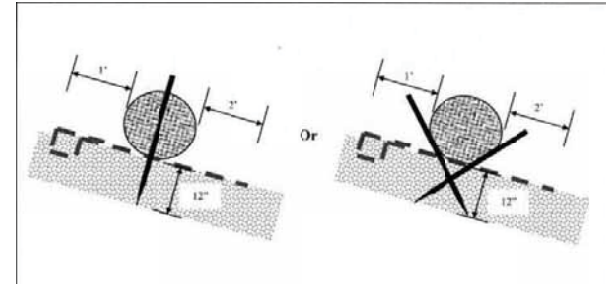
See SHEET 3 for Construction Specifications and SHEETS 6, 7, 8, 11, 13 for Stream Crossing location.



TEMPORARY STREAM CROSSING

(Not to Scale)

EROSION CONTROL LOG INSTALLATION



See SHEET 3 for Construction Specifications and SHEETS 9-17 for Erosion Control Log locations.



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DESIGNED BY:

T.Moody, M.Wirtanen, C. Helton

REV	DATE	BY	REVISION
3	1-5-10	MW	As-Built

DETAILS:

Erosion Fabric & Log, Road Access & Stream Crossing

Watson Woods Riparian Preserve

Project #: 08-158 WPF



Expires 3-31-2011

AS-BUILT DRAWINGS
Construction Period
3-2-09 to 4-8-09

FILE NAME:

Watson Woods.pro

PROJECT NO:

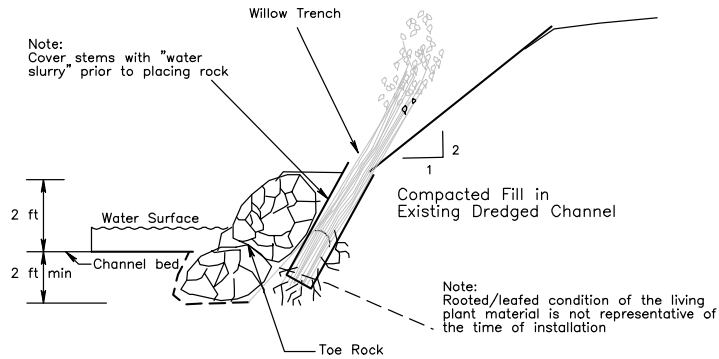
05-106-01AZ

DATE: December 20, 2006

SHEET:

19 of 22

See SHEET 3 for Construction Specifications



TYPICAL TOE ROCK SECTION
(Not to Scale)

SPECIFICATIONS FOR TOE ROCK

Use well-graded, angular rock with bulk specific gravity greater than 1.7

Rock Riprap Rocks: Dmin = 6 in.
D50 = 9 in.
Dmax = 12 in.

TOE ROCK VOLUME

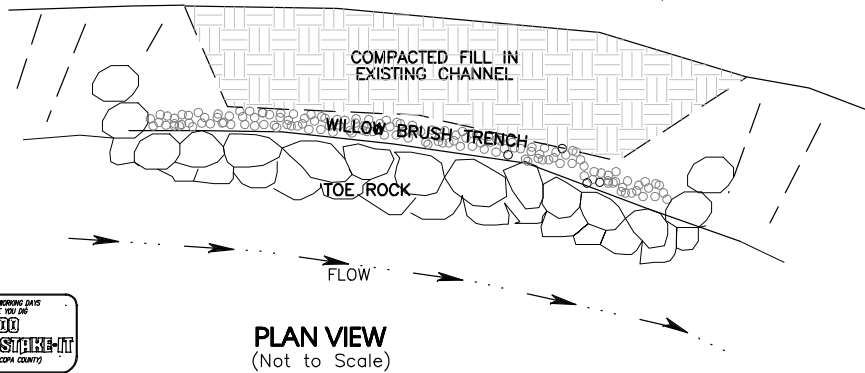
0.5 cubic yards per linear foot
Total Distance = 420 ft

TOTAL VOLUME = 210 CY

TOE ROCK LOCATIONS

STA	DISTANCE
0+25 to 0+85 (left)	80 ft
13+00 to 14+00 (right)	80 ft
16+35 to 17+30 (left)	110 ft
29+25 to 29+90 (left)	80 ft
49+66 to 50+25 (left)	70 ft

NOTE: Toe rock shall be tied a minimum of 5 feet into bank at upstream and downstream ends.

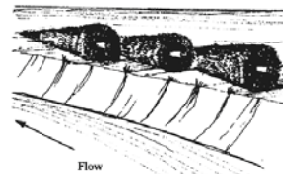


PLAN VIEW
(Not to Scale)

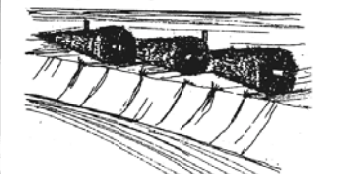


Procedure for Brush or Tree Revetment

Overlap the trunk of one tree into the main branches of the next tree.

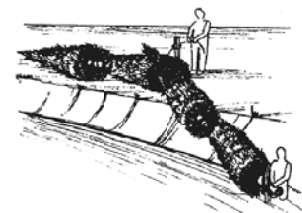


Secure the trees together at the main trunks using wire. Place t-posts along the revetment and secure rope from the posts to the revetment



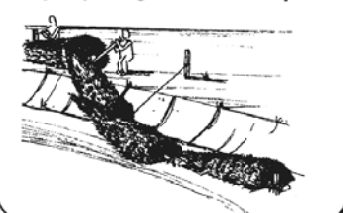
Step One: Harvest & Stage Material

Lower revetment into stream and fasten end of revetment to t-post placed at toe of bank.



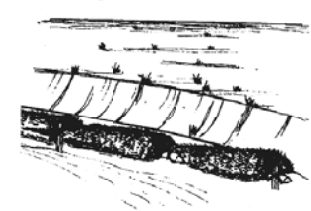
Step Two: Fastening Revetment

Lever the rest of the revetment into the stream, temporarily securing the revetment to the t-posts.



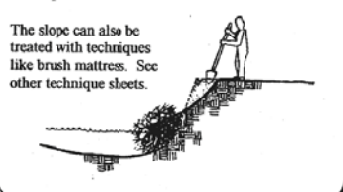
Step Three: Begin Placement

Pound t-posts next to the revetment and secure revetment to posts with wire.



Step Four: Final Placement

Streambank can be knocked down on to the revetment. Slope should be seeded with grass and planted with willows.



Step Five: Final T-post Placement

Step Six: Optional Bank Shaping

INTERAGENCY RIPARIAN/WETLAND PROJECT

USDA-NRCS Plant Materials Center

Aberdeen, ID 83210

Natural Channel Design, Inc

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(928) 774-1178

DRAWN BY: M.Wirtanen, S.Yard			
DESIGNED BY: T.Moody, M.Wirtanen, C. Helton			
REV	DATE	BY	REVISION
3	1-5-10	MW	As-Built

DETAILS:
Toe Rock & Brush Trench, Brush Revetment

Watson Woods Riparian Preserve

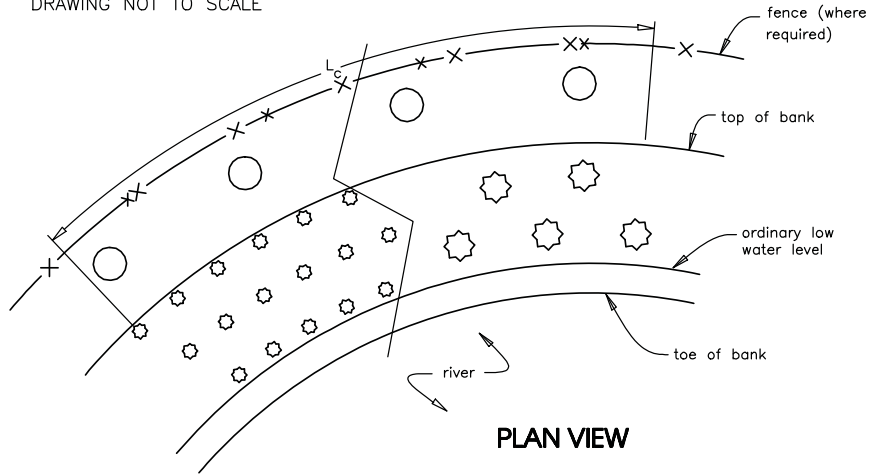
Project #: 08-158 WPF



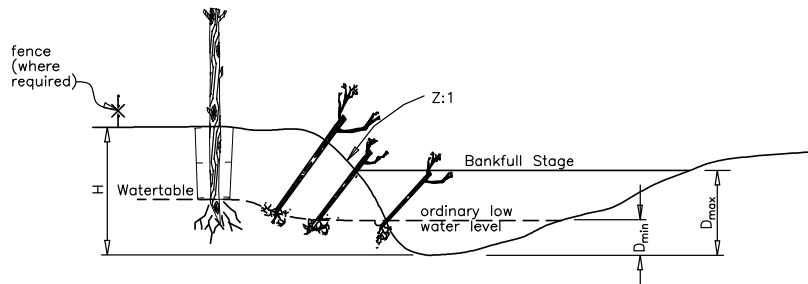
AS-BUILT DRAWINGS
Construction Period
3-2-09 to 4-8-09

FILE NAME: Watson Woods.pro	DATE: December 20, 2006
PROJECT NO: 05-106-01AZ	SHEET: 20 of 22

NOTES:
DRAWING NOT TO SCALE



PLAN VIEW



SECTION VIEW

See SHEETS 4 & 5 for Revegetation Specifications

REFERENCES:
Practical Streambank Bioengineering Guide (1998-NRCS ID PMC)
Streambank and Shoreline Protection, EFH-16 (1996-NRCS)
USDA NRCS Oregon Standard Drawing No. OR-A-533A1
USDA NRCS Oregon Standard Drawing No. OR-A-520A
USDA NRCS Washington Standard Drawing No. WA-BIO-0030

BANK PLANTINGS POLE PLANTINGS

Staggered 4 ft. x 4 ft.
placement of dormant
native stakes or poles.

Species Willows

Dia 3/4 to 2 in.

Length 2 to 4 ft.

POLE CLUSTERS (see also SHEET 22)

Dormant native poles
placed in cluster holes
at 4 ft spacings (8 ft
when planted between
vertical bundles)

Species Willows

Dia 3/4 to 2 in.

Length 2 to 4 ft.

POST PLANTINGS

Native dormant posts
at 10 ft spacings.

Species Cottonwood

Dia 2 to 3 in.

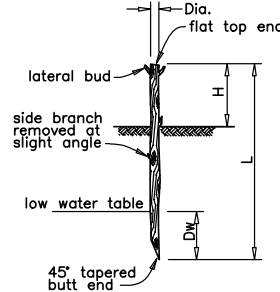
Length 6 to 8 ft.

CRITICAL PLANTING AREAS POLE PLANTINGS

Staggered 50 ft. x 50 ft.
placement of dormant
poles either singly or in
clusters

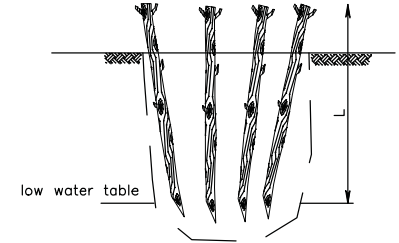
POST PLANTINGS

Staggered 50 ft. x 50 ft.
placement of dormant
poles in clusters of three



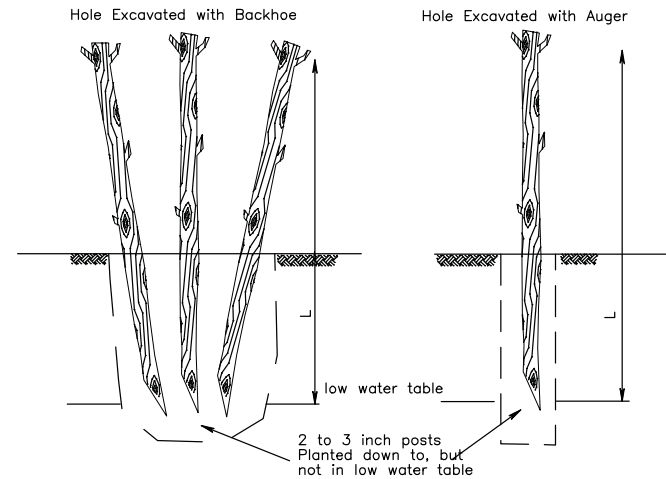
POLE PLANTING DETAIL

NOTES
Use 1/2 to 3/4 in. cuttings
Plant cutting perpendicular to the bank.
Holes around poles filled with dirt/water slurry.



POLE CLUSTER DETAIL

NOTES
Use 1/2 to 3/4 in. cuttings.
In holes excavated with a backhoe, place around 8 to 10
cuttings in hole to maximize sprouting success per effort.
Holes are backfilled with excavated material and watered.



POST PLANTING DETAIL

NOTES:
Use 2 to 3 in. cuttings.
Holes are backfilled with excavated material and watered.

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T.Moody, M.Wirtanen, C. Helton

REV	DATE	BY	REVISION
3	1-5-10	MW	As-Built

3 1-5-10 MW As-Built

DETAILS: Dormant Pole, Cluster, and Post Plantings

Watson Woods Riparian Preserve

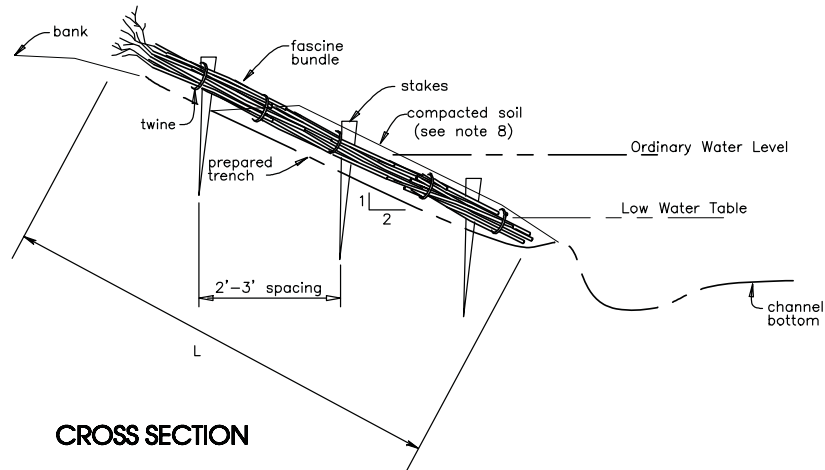
Project #: 08-158 WPF



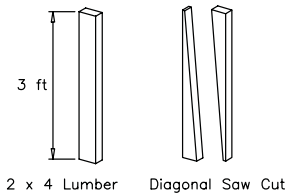
**AS-BUILT
DRAWINGS**
Construction Period
3-2-09 to 4-8-09

FILE NAME:
Watson Woods.pro
PROJECT NO:
05-106-01AZ

DATE: December 20, 2006
SHEET:
21 of 22



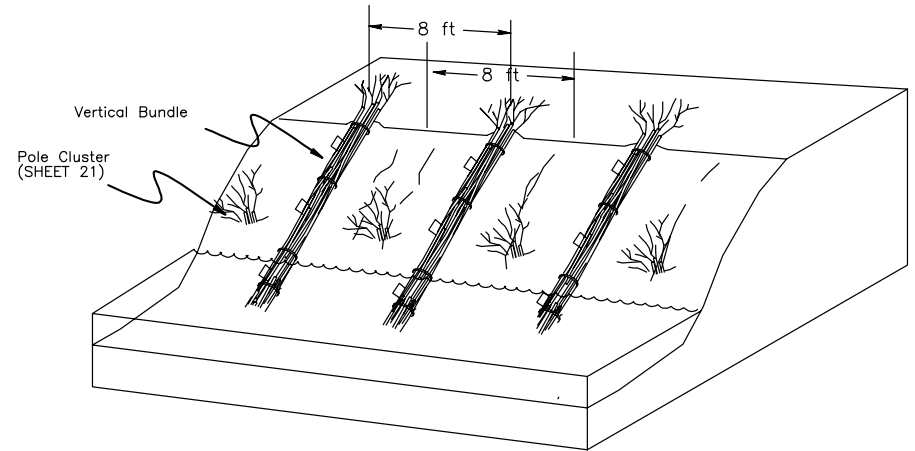
CROSS SECTION



DEAD STOUT STAKES

NOTES

1. Cuttings shall be dormant, stripped of side branches, and soaked 3 to 7 days.
2. Cuttings shall be 3/4 to 2 inches in diameter and typically 3-6 stems per bundle.
3. Bundles shall be tied with untreated twine about every 2 feet.
4. Excavate a vertical trench with a slope of 2:1 or more in the streambank.
5. Make sure the bottom of the trench will still be under water during low flows.
6. The trenches should be excavated on 8 foot centers with pole clusters inserted in between to ensure adequate protection and to encourage rapid growth to fill in between the bundles. (Trenches on 4 foot centers when planted without pole clusters).
7. Place bundle in the trench with the cut ends in the water.
8. Secure bundles to back of trench with wooden stakes at about 3 foot spacings.
9. "Muddy" in bundles with water and soil (covering the bundles 1 to 2 inches deep)
10. Leave approximately 30 percent of upper branches exposed.
10. Tops of cuttings are cut off after placement.



ISOMETRIC VIEW

See SHEETS 4 & 5 for Revegetation Specifications

REFERENCES:
Practical Streambank Bioengineering Guide (1998-NRCS ID PMC)
Streambank and Shoreline Protection, EFH-16 (1996 - NRCS)
USDA NRCS Oregon Standard Drawing No. OR-A-520A
USDA NRCS Washington Standard Drawing No. WA-BIO-0066

DRAWING NOT TO SCALE.
DRAWING MUST BE ADAPTED TO THE SPECIFIC SITE.



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DRAWN BY: M.Wirtanen, S.Yard			
DESIGNED BY: T.Moody, M.Wirtanen, C. Helton			
REV	DATE	BY	REVISION
3	1-5-10	MW	As-Built

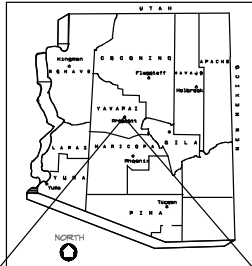
DETAIL:
Vertical Bundles

Watson Woods Riparian Preserve
Project #: 08-158 WPF

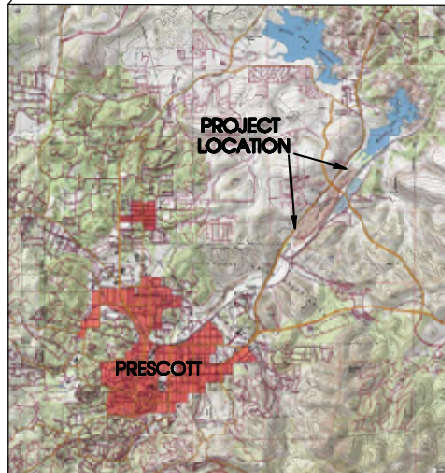


AS-BUILT DRAWINGS
Construction Period
3-2-09 to 4-8-09

FILE NAME: Watson Woods.pro	DATE: December 20, 2006
PROJECT NO: 05-106-01AZ	SHEET: 22 of 22



LOCATION MAP



Sections 23 - 24, T14N, R2W
Prescott, Yavapai County, Arizona

Watson Woods Riparian Preserve Restoration Project Post Flood Repair (January 2010) Arizona Water Protection Fund Project 08-158 WPF

Prepared for: Prescott Creeks
119 Grove Ave
Prescott, AZ 86301

Prepared by: Natural Channel Design, Inc.

AS BUILT DRAWINGS



Granite Creek - Prescott, Arizona

Stream Project Length: 6,000 feet (1.1 sq mi)

INDEX OF DRAWINGS

SHEET NO.	TITLE
1	COVER SHEET: Location, Index, Materials
2	General Notes & Construction Specifications
3	CONSTRUCTION SPECIFICATIONS: Earthwork, Structures and Revegetation Plan
4	CONSTRUCTION SPECIFICATIONS: Revegetation Plan Continued
5	PROJECT SITE: Control, Access, Spoil Areas
6	PLAN VIEW, PROFILE & CROSS SECTIONS: Reach 1
7	PLAN VIEW & CROSS SECTIONS: Reach 2
8	PLAN VIEW & CROSS SECTIONS: Reach 3
9	DETAILS: Willow Plantings
9	DETAILS: Typical Channel Cross Sections, Bank Sloping Coir Log & Erosion Control Fabric Installation
10	DETAILS: Toe Rock & Temporary Stream Crossing
11	DETAILS: Brush Revetment & Log Sill

MATERIAL LIST

REACH 1	
EARTHWORK	
Channel Excavation, Bank Sloping	460 cy
STRUCTURES	
Toe Rock	30 cy
Non-Woven Geotextile	67 sq yd
Log Sills (18-24" logs, 15-20 ft long)	2-30 ft, 2-20 ft 4 ea
VEGETATION	
Willow Cuttings (Aroyo, Coyote)	1224 ea
Seeding	0.6 ac
Erosion Control Fabric -Single Net	9 ea (8'x96' rolls)
Erosion Control Fabric -Double Net	8 ea (8'x96' rolls)
REACH 2	
EARTHWORK	
Mound Excavation	1500 cy
Bank Sloping	65 cy
STRUCTURES	
Toe Rock	40 cy
Non-Woven Geotextile	77 sq yd
Temporary Stream Crossing Culvert	1 ea 24 in x 12 ft CMP
Log Sill (18-24" logs, 30 ft long)	1 ea
VEGETATION	
Willow Cuttings (Aroyo, Coyote)	970 ea
Cottonwood Posts	158 ea
Seeding	0.5 ac
Erosion Control Fabric -Single Net	2 ea (8'x96' rolls)
Erosion Control Fabric -Double Net	6 ea (8'x96' rolls)
REACH 3	
EARTHWORK	
Bank Sloping	250 cy
STRUCTURES	
Toe Rock Repair	1 cy
Coir Log (12"x10' logs)	15 ea
Brush Revetment (1 tree/4 ft, 6 ft trees min)	40 ea
VEGETATION	
Willow Cuttings (Aroyo, Coyote)	250 ea
Seeding	0.5 ac
Erosion Control Fabric -Single Net	2 ea (8'x96' rolls)
Erosion Control Fabric -Double Net	6 ea (8'x96' rolls)



Construction Period: Nov 8 - Dec 8, 2010
Subcontractors: Fann Contracting
American Conservation Experience

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DRAWN BY: M.Wirtanen, R.Lyman			
DESIGNED BY: M.Wirtanen, A.Haden			
REV	DATE	BY	REVISION
1	3-3-11	mw	As-Built

COVER SHEET: Location, Index, Materials

Watson Woods Riparian Preserve Restoration Project
Post Flood Repair (January 2010)
Project #: 08-158 WPF



AS-BUILT DRAWINGS
Construction Period
Nov 8 - Dec 8, 2010

FILE NAME: Feb 10 design.pro	DATE: March 22, 2010
PROJECT NO: 08-158WPF	SHEET: 1 of 11

GENERAL NOTES

- Topographic maps were prepared in 2009 by Vertical Mapping Resources, Inc. with additional topographic survey in February 2010 by Natural Channel Design, Inc.
- Project survey data provides the most accurate representation of site topographic conditions. All existing conditions are to be verified in the field prior to construction. Any adjustments from the drawings to be made as directed by the ENGINEER.
- All stationing refers to base line of construction and is measured horizontal distance.
- No representation is made as to the existence or nonexistence of any utilities, public or private. Absence of utilities on these drawings IS NOT assurance that no utilities are present. The existence, location and depth of any utility must be determined by the contractor prior to any excavation. Call before you dig, 1-800-STAKE-IT.
- Construction activities will be conducted in a manner consistent with all safety regulations and requirements of Sections 404, 401, and 402 of the Clean Water Act (ACOE), and other permitting required by the City of Prescott, Yavapai County (grading permit), etc.
- Installation shall be constructed to the lines and grades as shown on the drawings or as staked in the field by the ENGINEER, recognizing there is variation in nature.

CONSTRUCTION MANAGEMENT

Construction is timed to allow for the driest conditions, the lowest chance of flood flows, to provide the least disturbance to wildlife and the optimum establishment of native plant species. Earthwork and revegetation activities will be completed in as quick a time frame as possible, reducing the time of disturbance and maximizing the healing of disturbed areas and establishment of native vegetation.

Construction Supervision

Supervision shall be provided for the earthwork, structural and revegetation tasks. Supervisory personnel shall have an understanding of the natural channel design as applied to stream and wetland restoration.

Construction Equipment

The following equipment are expected to be utilized during the construction:

- Backhoe/Trackhoe/Excavator with thumb: Channel and wetland excavation, channel filling, bank sloping, and rock installation.
- Backhoe/Front End Loader: Moving structure rock and various fill
- Dozer: Land smoothing, moving fill and wetland excavation
- Dump Truck: Miscellaneous hauling

Permitting Requirements

Ensure necessary permits have been obtained.

PROJECT DESCRIPTION

The project design includes the second years construction and post flood repair of Granite Creek and (re)creating riparian habitats within the Watson Woods Riparian Preserve. Granite Creek experienced a large flood event of approximately 6,200 cfs (40 yr event) in January 2010 that deposited sediments in the existing channel, re-routed the channel alignment, removed sections of toe rock and caused overbank scour.

Construction Sequence

The following is a recommended construction sequence:

- Coordinate with Prescott Creeks for scheduling of construction activities and crews.

- REACH 1: See SHEETS 5 & 6 for Locations
- Excavate new channel alignment in main channel (260 ft) starting from downstream working upstream (SHEET 9 for typical cross section).
 - Install Log Sills on Overflow Channel at STA 3+50 (SHEET 11 for Details)
 - STA 2+60 to 6+40 Remove sediment from Overflow Channel & use spoils to fill between log sills.
 - Repair Toe Rock at STA 0+57 (SHEET 10 for Details)
 - Recontour additional banks as needed or directed. Install revegetation practices (SHEETS 3 & 4 for Specifications and 8 & 9 for Details)
- REACH 2: See SHEETS 5 & 7 for Locations.
- Install temporary channel crossing at STA 14+00 (SHEET 10 for Details)
 - Repair 45 ft of Toe Rock (STA 13+75 to 14+10) (SHEET 10 for Details)
 - Remove mound (left), place unused spoils at Rosser St. Parking Area.
 - Fill in scour downstream from toe rock utilizing mound material (STA 14+10).
 - Reslope cutbank and fill scoured area at STA 16+50 to 17+60.
 - Plant four willow trenches in scoured area. Install other revegetation practices (SHEETS 3 & 4 for Specifications and 8 & 9 for Details)
 - Rehab ingress/egress routes by ripping, smoothing and seeding.

- REACH 3: See SHEETS 5 & 8 for Locations
- Remove abandoned culverts at STA 28+00 and dispose. Smooth approaches of existing road to allow for a low water crossing. Harden road base with cobble/gravel material from on site.
 - STA 27+50 to 29+00 (left & right) Smooth banks and prep for re-vegetation. Install willow clusters and seed; install erosion control fabric. (SHEETS 8 & 9 for Details)
 - STA 29+15. Repair toe rock by replacing rock over a 4 ft section of exposed fabric.
 - STA 32+75 to 34+50 (right) reslope eroding bank. Install coir logs, brush revetments and install revegetation practices (see SHEETS 3 & 4 for Specifications and 8, 9 & 11 for Details)
 - Rehab ingress/egress routes by ripping, smoothing and seeding.

CONSTRUCTION SPECIFICATIONS

POLLUTION CONTROL and RESOURCE PROTECTION

Construction operations shall be carried out in such a manner and sequence that erosion and air and water pollution are minimized and held within legal limits. The measures and works shall include, but are not limited to, the following:

- Diversion:** Standard best management practices will be used to temporarily divert water away from work areas within the active channel. Such diversions shall be temporary and shall be removed and the area restored to its near original condition immediately upon completion of work within the active channel or when permanent measures are installed (i.e. realignment of channels).
- Equipment Access and Staging Areas:** Transportation routes for materials, personnel, and equipment to, from, and within the project area shall be limited to access areas located on the drawings or determined in the field. Equipment access to Reach 1 is from the Fann Contracting yard upstream of project. Access to Reaches 2 & 3 is from the Rosser St. Parking area, following designated routes to each stream reach.
- Revegetation:** Impacts to existing vegetation and habitats shall be minimized. All disturbed areas shall be replanted with native vegetation.
- Stream Crossings:** Stream crossing points shall be minimized and shall be removed and the area restored to its near original condition when crossings are no longer required.
- Equipment Use in Streams:** When stream channel work is necessary, every effort will be made to enter and exit the channel in locations without important vegetation and where impacts do not result in stream bank instability. The use of heavy equipment in the stream will be kept to an absolute minimum.

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DRAWN BY: M.Wirtanen, R.Lyman			
DESIGNED BY: M.Wirtanen, A.Haden			
REV	DATE	BY	REVISION

General Notes & Construction Specifications

Watson Woods Riparian Preserve Restoration Project
Post Flood Repair (January 2010)
Project #: 08-158 WPF



**AS-BUILT
DRAWINGS**
Construction Period
Nov 8 - Dec 8, 2010

FILE NAME: Feb 10 design.pro	DATE: March 22, 2010
PROJECT NO: 08-158WPF	SHEET: 2 of 11

TEMPORARY STREAM CROSSING

A temporary stream crossing shall be constructed near STA 14+00. See SHEET 10 for Details.

- Install one 24-inch diameter culvert in the channel near STA 14+00
- Prior to back-filling, the pipe shall be firmly and uniformly bedded.
- Place excavated material from Mound over culvert to a depth of 1 ft.
- At completion of restoration activities, remove placed material and culvert. Restore to original condition.
- Remove abandoned culverts near STA 28+00 and dispose. Re-establish a low water crossing.

STRUCTURES PLAN

Structures shall consist of installing toe rock, brush revetment, erosion control logs and log sills.

Toe Rock: This structural bank stabilization practice consists of graded angular rock placed along bank sections where flood waters removed rock previously installed. Height of rock is about 3 ft above and 2 ft below the channel bed. See SHEET 10 for Details.

- The work shall consist of excavation, delivery of rock, and installation of rock for rock riprap as shown on the drawings or staked in the field by the authorized representative.
- The rock shall be well graded from a minimum of six inches to a maximum size of 12 inches with greater than 50% by weight being larger than 9 inches.
- The rock shall be angular, dense, sound and free from cracks, seams, or other defects conducive to accelerated weathering. The least dimension of an individual rock shall not be less than one-half the greatest dimension.
- The rock source shall be approved by the ENGINEER or authorized representative and have a bulk specific gravity of not less than 1.7 per ASTM C127.
- See SHEET 10 for Detail.

Erosion Control Logs: These flexible logs are made of Coir, Straw, Aspen Excelsior, or other natural materials are installed to protect the streambank by stabilizing the toe of the slope and by trapping sediment. Cuttings and herbaceous riparian plants can be planted into the log and behind it. Secure the logs with 24 to 36 inch long wedge-shaped stakes at 5 foot intervals. Stakes can be driven through center of log or both sides of log and tied with twine. See SHEET 9 for Details.

Brush Revetment: Revetment is constructed from whole trees that are wired together and anchored by earth anchors or fence posts. Brush or trees are secured to the streambanks to protect the toe of the bank by slowing velocities and diverting the current away from the bank edges. The revetment also traps sediment from the stream. See SHEET 11 for Details.

Log Cutoff Sill: This structural stabilization practice consists of logs placed in the scoured channel for grade stabilization. Two 18 to 24 inch logs will be stacked horizontally and placed to a depth of approximately 1.5 feet below existing ground elevation. Fill will be placed between and around the logs to a height equal to the top of the logs. Willow cluster trenches shall be planted on the far side of the logs. See SHEETS 11 for Details.

EARTHWORK

The earthwork shall consist of channel and mound excavation, channel filling, bank sloping, and floodplain smoothing. See SHEETS 6 through 8 for earthwork locations. Place excess spoil as shown on SHEET 5. See SHEET 9 for Typical Channel Cross Section and Bank Sloping Details.

Excavation

Excavation shall be limited to the channel realignment, wetland and landscaping as shown on the drawings or as staked in the field. All finished surfaces shall be generally smooth and pleasing in appearance. Disturbance of existing native vegetation shall be minimized to the greatest extent possible during excavation.

Excavated material shall be placed in scoured areas on floodplains or designated spoil areas (Parking Area, other) as shown on the drawings, SHEET 5, or as designated in the field. Place excess spoil material outside of jurisdictional areas.

Earthfill

Materials: All fill materials shall be obtained from the required excavations and/or approved borrow sources. Fill shall not contain sod, brush, roots, perishable or frozen materials.

Placement: The placement of fill materials shall follow these guidelines:

- Any vertical bank shall be sloped to a minimum of 1:1 before placement of fill material.
- Material when placed shall contain sufficient moisture so that a sample taken in the hand and squeezed shall remain intact when released.
- The placing and spreading of fill material shall be started at the lowest point and the fill brought up and compacted to obtain a density similar to the surrounding ground. Compacted horizontal layers shall not exceed: six (6) inches of loose fill for wheel compaction and four (4) inches of loose fill for dozer compaction. Construction equipment shall be operated over the areas of each layer of fill to insure that the required compaction is obtained.
- Fill shall not be placed on frozen soil, snow or ice.
- Channels designated for filling and re-contouring shall be filled as close as possible to the historic natural ground surface, and smoothed and shaped to blend with the surroundings.
- All finished surfaces shall be generally smooth and pleasing in appearance and blend into surrounding terrain.

REVEGETATION PLAN

Revegetation Plan includes native grass seeding with fabric and willow plantings. Use local native material where appropriate & feasible. Supplemental irrigation (supplied by existing City of Prescott 12" potable water main) may be needed for several years for plant establishment. Irrigating for at least two years will ensure that all woody species and nursery plants will become established and reach the water table (for cottonwood and willow species), and that seeded species germinate successfully.

PLANT MATERIAL PROCUREMENT and HANDLING

Woody Plant Materials:

All woody species shall be native and collected from designated local sources. Coyote willow (*Salix exigua*) and Arroyo willow (*Salix lasiolepis*) will be planted in the Bank and lower Overbank Zone. Red willow (*Salix laevigata*) will be planted in the upper Overbank Zone. Fremont cottonwood (*Populus fremontii*) will be planted in the upper Overbank Zone. Dormant unrooted hardwood cuttings can be taken after leaf fall and before bud burst in the spring. Never remove more than 1/3 of any single donor plant during harvesting. The best rooting success is from cuttings that are disease-free, green plants that are 2-10 years old. The best diameters for pole planting, vertical bundles, and trenches are 1/2 to 1 inch and 2 to 3 inches for post plantings. Cutting length varies depending on the application. It shall be long enough to reach 6 to 8 inches into the lowest water level of the year and high enough to expose at least two to three buds. Cuts shall be made with clean, sharp tools. The bottom end of the stem cutting shall be cut to a 45-degree angle and the tip end shall be cut square across or horizontal to the stem. Trim off all side branches and the terminal bud (bud at the growing tip) so energy will be rerouted to the lateral buds for more efficient root and stem sprouting. Do not trim terminal bud from cuttings for vertical bundles and willow trench until after planted. Trimmed tip ends shall be sealed by dipping in light-colored latex, water-based paint.

Submerge cuttings in water for 3 to 7 days prior to planting to maximize water retention. Do not allow the roots to emerge from the bark.

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DRAWN BY: M.Wirtanen, R.Lyman			
DESIGNED BY: M.Wirtanen, A.Haden			
REV	DATE	BY	REVISION

CONSTRUCTION SPECIFICATIONS

Earthwork, Structures and Revegetation Plan

Watson Woods Riparian Preserve Restoration Project
Post Flood Repair (January 2010)
Project #: 08-158 WPF



**AS-BUILT
DRAWINGS**
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INSTALLATION OF WOODY PLANTS

Installation of vegetation shall start when the general excavation operations are being completed.

POLE PLANTINGS and POLE CLUSTERS:

Pole cuttings are placed in the ground deep enough to reach the lowest water table of the year and high enough to expose at least two to three buds. Root primordia will develop when good soil-to-stem contact is made and exposed sections of the cutting will sprout stems and leaves. Dormant cuttings can be planted with a digging bar, auger, water-jet, or if the soil is saturated, they may be pushed into the soil. Pole Plantings are planted in the Bank and Overbank Zone and shall be spaced 4 feet apart in the row. In multiple row plantings, spacing between rows shall be staggered with respect to those in adjacent rows. See SHEET 8 for Details.

POST PLANTINGS

This practice involves planting of larger limbs (2 to 3 inches diameter) in clusters of three at 10 foot centers in designated areas. Cottonwood posts will be placed in holes in the Floodplain Zone, excavated to groundwater elevation and backfilled with wet mud.

BRUSH TRENCH

Brush trench uses bundles of willow cuttings in a buried trench along the top of a bank. This willow "fence" filters runoff before it enters the stream and will help to stabilize the filled channel section. Brush trench shall be installed at or above floodplain elevation behind the toe rock and then every 50 feet within a channel fill section. See SHEET 8 for Details.

SEEDING and MULCHING

Disturbed areas will be seeded with native grasses. Prepare seedbed where needed. Seed can be drilled or broadcast by hand. Seed shall be incorporated into the soil, but not more than 1-inch deep. Reseeding may be required for successful plant establishment.

Seed shall be purchased from a reliable supplier. The grass seed mix will consist of the following species as available. The seeding rates below are for broadcast planting. Native grass seed will be applied at a rate of 10 pounds to the acre. Forbs (wildflowers) can be added to seed mix to increase diversity and improve aesthetics. Forbs (wildflowers) that have low maintenance, high survival rate, cold hardy, beautiful colors, and ecologically appropriate (non-invasive) are listed. Estimated area of disturbance is 2 acres.

NATIVE GRASS SEED MIX

Purple three-awn	<i>(Aristida purpurea)</i>	0.5	lb/ac	PLS
Blue grama	<i>(Bouteloua gracilis)</i>	1.5	lb/ac	PLS
Sideoats grama	<i>(Bouteloua curtipendula)</i>	1.5	lb/ac	PLS
Prairie junegrass	<i>(Koeleria macrantha)</i>	0.5	lb/ac	PLS
Alkali sacaton	<i>(Sporobolus airoides)</i>	0.5	lb/ac	PLS
Bottlebrush squirreltail	<i>(Elymus elymoides)</i>	0.5	lb/ac	PLS
Blue wildrye	<i>(Elymus glaucus)</i>	0.5	lb/ac	PLS
Western wheatgrass	<i>(Pascopyrum smithii)</i>	2.0	lb/ac	PLS
Sand dropseed	<i>(Sporobolus cryptandrus)</i>	0.5	lb/ac	PLS
Muttongrass	<i>(Poa fendleriana)</i>	0.5	lb/ac	PLS
Spike dropseed	<i>(Sporobolus contractus)</i>	0.5	lb/ac	PLS
		10.0	lb/ac	PLS

FORBS/HERBS (WILDFLOWERS)

Showy goldeneye	<i>(Helianthus multiflorus)</i>	0.5	lb/ac	PLS
Arroyo lupine	<i>(Lupinus succulentus)</i>	1.0	lb/ac	PLS
Eaton's penstemon	<i>(Penstemon eatonii)</i>	0.5	lb/ac	PLS
Globe mallow	<i>(Sphaeralcea coccinea)</i>	0.25	lb/ac	PLS
Evening primrose	<i>(Oenothera lamarckiana)</i>	0.25	lb/ac	PLS
		2.5	lb/ac	PLS

Erosion Control Fabric

Biodegradable erosion control fabric made of Jute, Coir, Straw, Coconut or other natural material shall be placed over the seed on banks for protection. Fabric is laid and anchored over seeding to reduce soil erosion and provide a good environment for vegetative regrowth. Fabric shall be installed for slope protection and seed germination enhancement along the stabilized bank. Two types of fabric will be installed. Coconut and straw matting (Western Excelsior CS3 or comparable) will be installed along the lower bank. Straw matting (Western Excelsior SR1 or comparable) will be installed above the toe rock and above the coconut straw matting (CS3). See SHEET 9 for fabric installation.

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REV	DATE	BY	REVISION

CONSTRUCTION SPECIFICATIONS

Revegetation Plan Continued

Watson Woods Riparian Preserve Restoration Project
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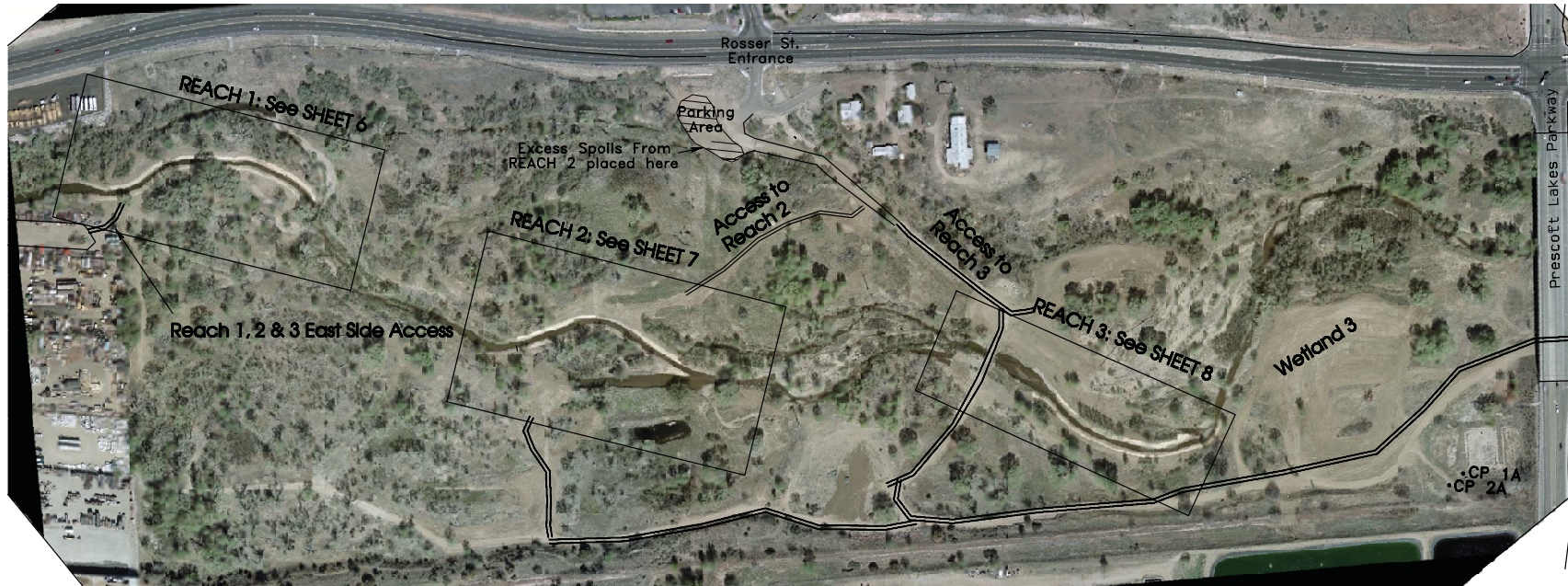


AS-BUILT DRAWINGS

Construction Period
Nov 8 - Dec 8, 2010

FILE NAME: Feb 10 design.pro	DATE: March 22, 2010
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CONSTRUCTION NOTES:

REACH 1: Repair 30 feet of toe rock by reinstalling new rock; reslope/recontour cut banks in old channel as needed and plant willow clusters; install two log sills and four brush trenches; construct 150 feet of new channel to eliminate headcut and install willow clusters.

REACH 2: Remove mound and use spoils as fill for repair further downstream; Reslope cut bank and fill with spoils from mound, install 80 ft of coir logs and plant willow clusters; Plant two rows of willow trenches. Repair upstream toe rock by reinstalling new rock.

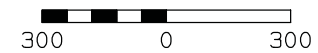
REACH 3: Remove culverts, reslope banks as necessary and plant willow clusters; reslope cutbank at downstream end of reach, install coir logs and plant willow clusters.

CONTROL POINTS

Point	Northing	Easting	Elev.	Description
CP 1A	1300852.5090	545494.2700	5188.91	NCD CAP
CP 2A	1300899.9090	545493.5630	5186.69	NCD CAP

Additional control to be established prior to construction.

HORIZ SCALE: 1" = 300'



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REV	DATE	BY	REVISION

PROJECT SITE Control, Access, Spoil Areas

**Watson Woods Riparian Preserve Restoration Project
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Expires 3-31-2011

**AS-BUILT
DRAWINGS**

Construction Period
Nov 8 - Dec 8, 2010

FILE NAME:

Watson Woods.pro

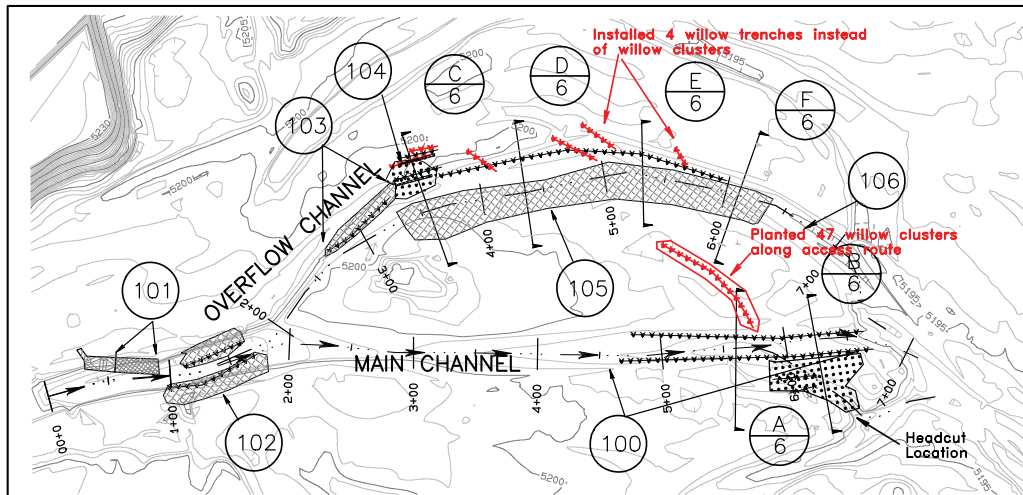
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08-158WPF

March 22, 2010

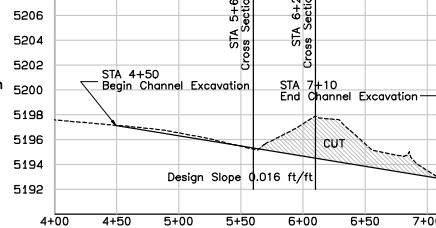
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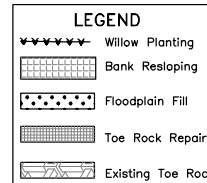


CONSTRUCTION NOTES

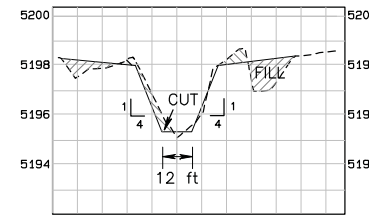
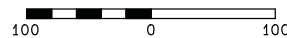
- 100 STA 4+50 to 7+10 (Main Channel). Realign channel to eliminate headcut near STA 6+50. (130 cy). Use spoils to fill channel leading to headcut. Install two 30 ft willow trenches in channel leading to headcut. Plant willow clusters along both banks. Seed and install erosion control fabric (both banks, 440 ft total double and single nets). See SHEET 9 for Typical Channel Cross Section and Fabric Installation; SHEET 8 for Willow Cluster and Trench Details
- 101 STA 0+57 to 0+87 (Main Channel, Left Bank) Repair 30 ft of toe rock (30 cy). See SHEET 10 for Toe Rock details.
- 102 STA 1+00 to 1+75 (Main Channel, up to 100 ft) Reslope/recontour both banks as needed or directed. Plant willow clusters. Seed and install 164 feet of double and single net erosion control fabric. See SHEET 9 for Bank Sloping and Fabric Installation; SHEET 8 for Willow Cluster Details
- 103 STA 2+65 to 3+40 (Overflow channel, left bank) Reslope 65 ft. of cut bank. Plant willow clusters. Seed and install 110 ft of double and single net fabric. See SHEET 9 for Bank sloping and Fabric; SHEET 8 for Willow Cluster Details
- 104 STA 3+50 Install two 30 ft log sills and two 30 ft brush trenches. See SHEET 11 for Log Sill Detail, SHEET 8 for trenches.
- 105 STA 2+60 to 6+40 (Overflow channel) Widen channel to remove 333 cy fill from old channel alignment. Use spoils to fill between the log sills. ~~Install 300 ft single net fabric over right bank. See SHEET 9 for Bank Sloping and Fabric Installation. Install four 20 to 40 foot willow trenches on floodplain adjacent to channel~~
- 106 STA 6+75 (Overflow Channel) Remove Debris Dam and spread over flood plain.



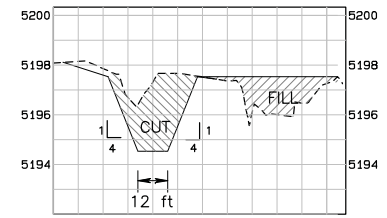
Main Channel Profile
STA 4+00 to 7+10



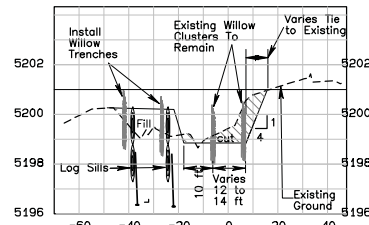
VERT SCALE: 1" = 10'
HORIZ SCALE: 1" = 100'



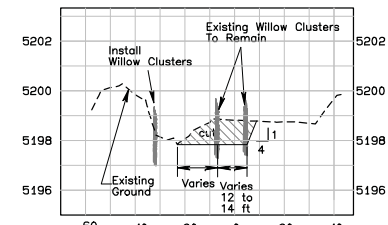
A
6 MAIN CHANNEL CROSS SECTION
STA 5+60



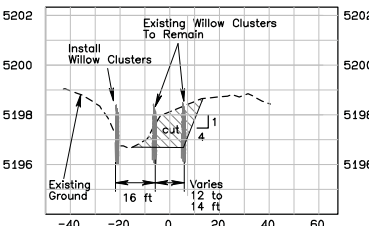
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6 MAIN CHANNEL CROSS SECTION
STA 6+25



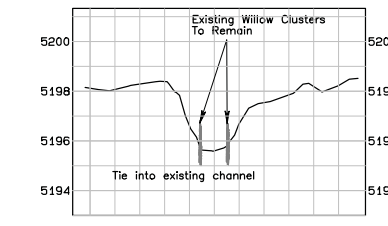
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6 OVERFLOW CHANNEL CROSS SECTION
STA 3+56



D
6 OVERFLOW CHANNEL CROSS SECTION
STA 4+37

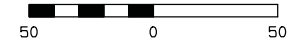


E
6 OVERFLOW CHANNEL CROSS SECTION
STA 5+32



F
6 OVERFLOW CHANNEL CROSS SECTION
STA 6+10

VERT SCALE: 1" = 5'
HORIZ SCALE: 1" = 50'



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REV	DATE	BY	REVISION
1	3-3-11	mw	As-Built

PLAN VIEW, PROFILE & CROSS SECTIONS Reach 1

Watson Woods Riparian Preserve Restoration Project
Post Flood Repair (January 2010)
Project #: 08-158 WPF



Expires 3-31-2011

AS-BUILT DRAWINGS
Construction Period
Nov 8 - Dec 8, 2010

FILE NAME:

Feb 10 Design.pro

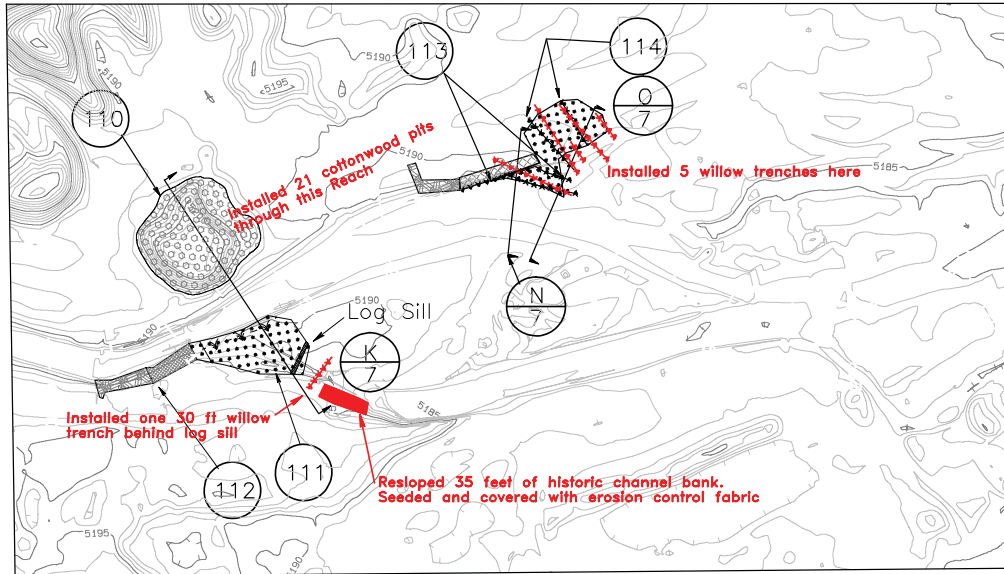
PROJECT NO:

08-158WPF

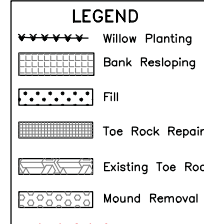
DATE: March 22, 2010

SHEET:

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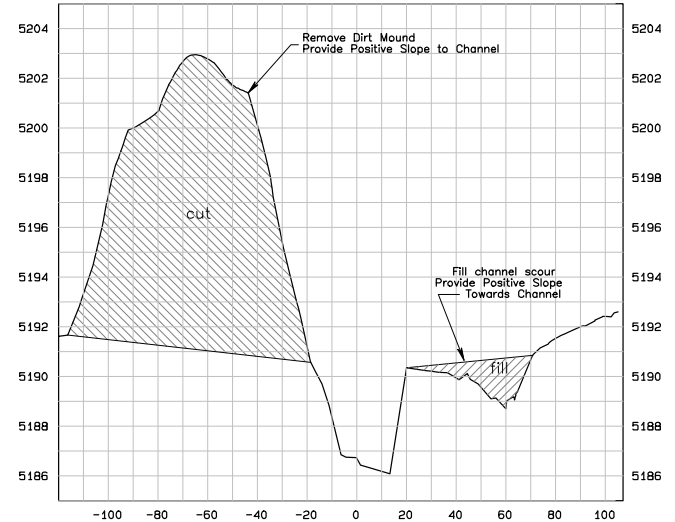


HORIZ SCALE: 1" = 100'

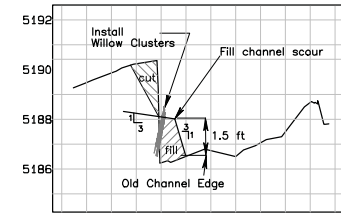


CONSTRUCTION NOTES

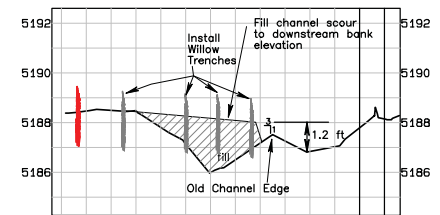
- 110 STA 14+10 to 15+00 (Left) Remove mound (1500 cy) and use spoils as fill at STA 14+10 to 14+80 (right) and 16+80 to 17+60 (left). Excess spoils placed at Rosser Street Parking Area (SHEET 5) Plant Cottonwood Posts on 12 ft spacings. Seed disturbed area with native seed mix. **21 as directed on ground**
- 111 STA 14+50 ~~Install temporary stream crossing with culvert (SHEET 10 for Details) not needed~~ STA 14+10 to 14+80 (Right) Fill scoured area downstream from existing toe rock with approx 125 cy of material from mound. Install one log sill; install willow clusters; seed disturbed area with native seed mix. See SHEET 8 for Willow Cluster Details and SHEET 11 for Log Sill Details **Resloped 35 feet of historic channel bank. Seeded and covered with erosion control fabric**
- 112 STA 13+75 to 14+10 (Right) Install 45 ft toe rock (40 cy) downstream from existing toe rock See SHEET 8 for Toe Rock Details.
- 113 STA 16+50 to 17+60 (Left) Reslope 75 ft of cut bank (63 cy). Plant willow clusters on slope, seed and cover with 50 ft of single and double net erosion control fabric. See SHEET 9 for Bank Sloping and Fabric Installation, SHEET 8 for Willow Cluster/Trench Details
- 114 Fill scoured area with ^{five} ~~four~~ rows of willow trenches (approx 50 ft ea). See SHEET 9 for Fabric Installation, SHEET 8 for Willow Trench Details



(K) MAIN CHANNEL CROSS SECTION AT MOUND
STA 14+70



(N) MAIN CHANNEL CROSS SECTION
STA 17+14



(O) MAIN CHANNEL CROSS SECTION
STA 17+40

VERT SCALE: 1" = 5'
HORIZ SCALE: 1" = 50'



50 0 50

Natural Channel Design, Inc

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REV	DATE	BY	REVISION
1	3-3-11	mw	As-Built

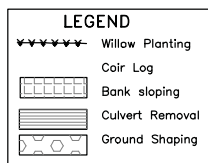
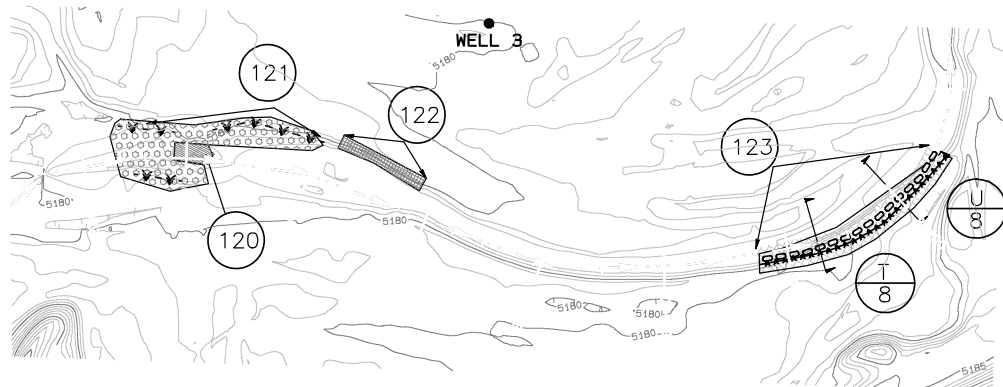
PLAN VIEW & CROSS SECTIONS Reach 2

Watson Woods Riparian Preserve Restoration Project
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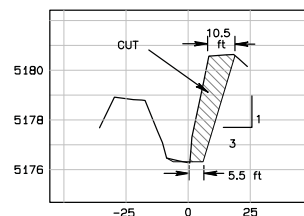


AS-BUILT DRAWINGS
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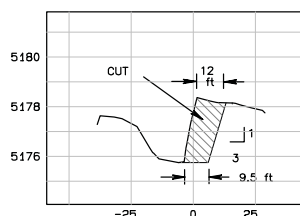
FILE NAME: Watson Woods.pro	DATE: March 22, 2010
PROJECT NO: 08-158WPF	SHEET: 7 of 11



HORIZ SCALE: 1" = 100'



T 8 CHANNEL CROSS SECTION
STA 33+25

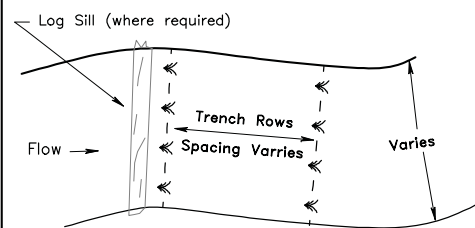


U 8 CHANNEL CROSS SECTION
STA 40+00

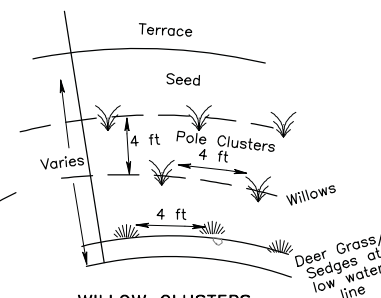
HORIZ SCALE: 1" = 50'
VERT SCALE: 1" = 5'

NOTES

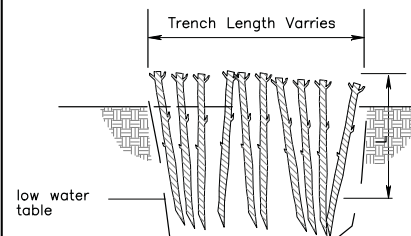
- 120 STA 28+00 Remove four culverts left in stream. Re-establish low water crossing.
- 121 STA 27+50 to 29+00 (170 ft left, 50 ft right) Smooth both banks to eliminate scour marks. Install willow clusters. Seed and install double and single net erosion control fabric. See SHEET 9 for Fabric Details, SHEET 8 for Willow Planting Details.
- 122 STA 29+15 to 29+90 (Left Bank) Repair rock riprap as required (approx 4 linear ft, 1 cy) See SHEET 10 for Details
- 123 STA 32+75 to 34+50 (Right Bank) - ~~175~~ ¹⁹⁰ ft Bank Sloping (SHEET 9 for Bank Sloping Detail)
STA 33+30 to 34+50 - (Right Bank) Install ~~120~~ ¹⁵⁰ ft coir log with brush revegetation. See SHEETS 9 and 11 for Details.
STA 32+75 to 34+50 - (Right Bank) Install Willow Clusters on 4 ft staggered spacings. Seed and install 185 ft of double and single net erosion control fabric. See SHEET 9 for Coir log & Fabric Details, SHEET 8 for Willow Cluster Details.
Spread spoils on disturbed ground ~~at Wetland 3 (See SHEET 2 for Location)~~ ^{on top of bank}



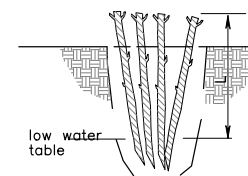
WILLOW TRENCH
PLAN VIEW (Not to Scale)



WILLOW CLUSTERS
PLAN VIEW (Not to Scale)



WILLOW TRENCH DETAIL
(Not to Scale)



POLE CLUSTER DETAIL
(Not to Scale)

NOTES
Use 1/2 to 2 in. cuttings.
Trenches excavated with backhoe or mini-excavator down to watertable elevation. A continuous row of willow cuttings (approx 4/foot) are installed. Trench is then backfilled with excavated material and watered.

NOTES
Use 1/2 to 2 in. cuttings.
In holes excavated with an auger, place approximately 3 to 4 cuttings in hole to maximize sprouting success per effort. Holes are backfilled with excavated material and watered.

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DESIGNED BY:
M.Wirtanen, A.Haden

REV	DATE	BY	REVISION
1	3-3-11	mw	As-Built

PLAN VIEW & CROSS SECTIONS: Reach 3 DETAILS: Willow Plantings

Watson Woods Riparian Preserve Restoration Project
Post Flood Repair (January 2010)
Project #: 08-158 WPF

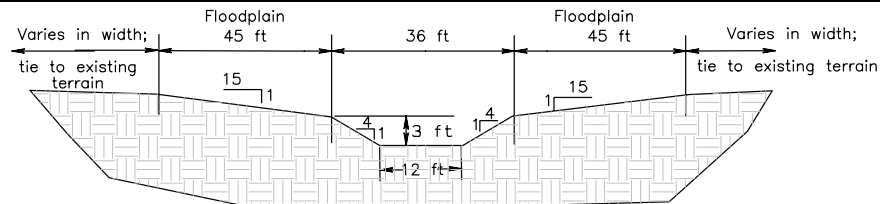


AS-BUILT DRAWINGS
Construction Period
Nov 8 - Dec 8, 2010

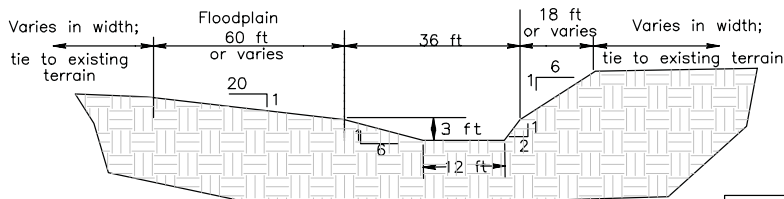
FILE NAME:
Feb 10 design.pro
PROJECT NO:
08-158WPF

DATE: March 22, 2010
SHEET: **8** of **11**

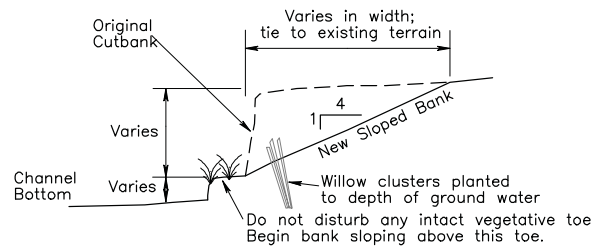




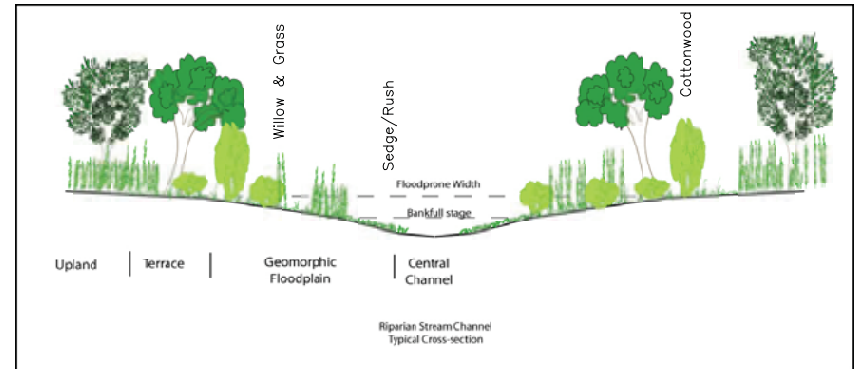
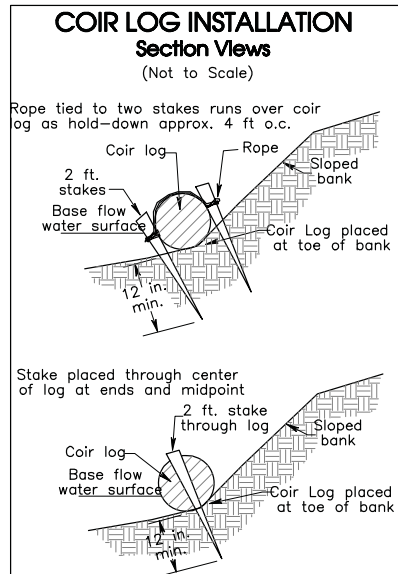
BANKFULL CHANNEL CROSS-SECTION
Riffle Section
(Not to Scale)



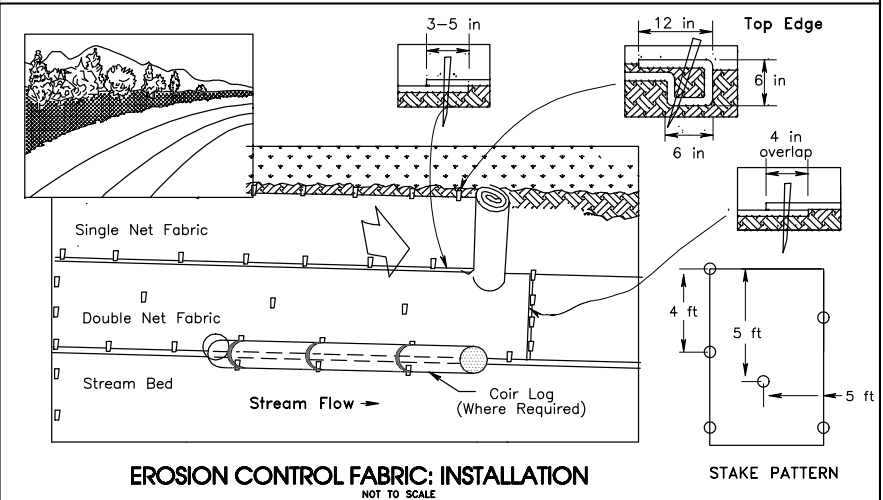
BANKFULL CHANNEL CROSS-SECTION
Meander Section
(Not to Scale)



BANK SLOPING SECTION VIEW
(Not to Scale)



Typical Channel Vegetation Zone Cross-Section



EROSION CONTROL FABRIC: INSTALLATION
NOT TO SCALE

Natural Channel Design, Inc
3410 S. Cocopah Dr.
Flagstaff, Arizona 86001
(928) 774-1178

DRAWN BY: M.Wirtanen, R.Lyman			
DESIGNED BY: M.Wirtanen, A.Haden			
REV	DATE	BY	REVISION

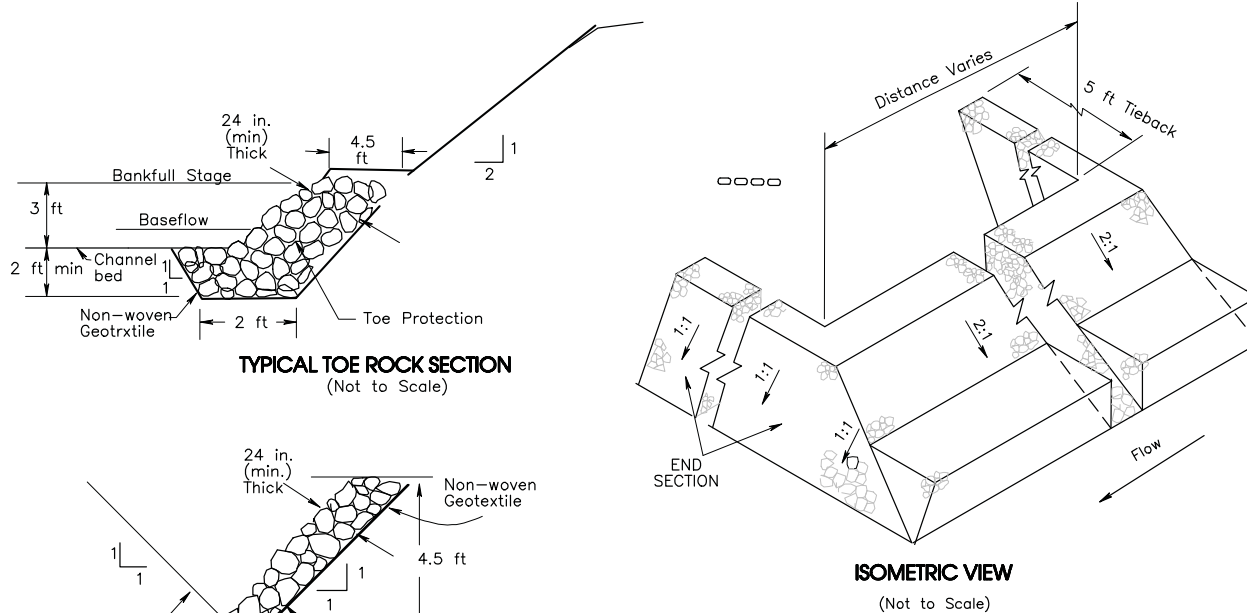
DETAILS: Typical Channel Cross Sections, Bank Sloping Coir Log & Erosion Control Fabric Installation

Watson Woods Riparian Preserve Restoration Project
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AS-BUILT DRAWINGS
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GEOTEXTILE
15 ft wide x 300 ft long rolls
Total Distance = 75 ft
(incl. tiebacks)
TOTAL FABRIC = 0.25 roll

GEOTEXTILE SPECIFICATIONS

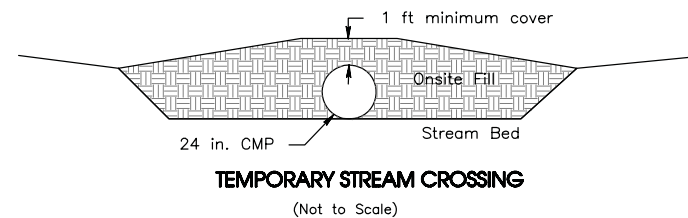
Geotextile shall be a non-woven fabric with a minimum tensile strength of 120 lb, greater than 50% elongation at failure, a minimum of 65 lb puncture strength, and UV resistance of 70%.

Geotextile shall be joined by overlapping a minimum of 18 inches.

Geotextile shall be anchored in a trench with rock along the top edge of bank.

Geotextile shall be secured against the underlying foundation material. Securing pins shall be installed as necessary to prevent undue slippage or movement of the geotextile.

See SHEET 3 SHEET 13 for Stream Crossing location.



ROCK SPECIFICATIONS
Use well-graded, angular rock with bulk specific gravity greater than 1.7
Rock installed @ rate of 0.8 cy/ft

Rock Riprap Rocks: Dmin = 6 in.
D50 = 9 in.
Dmax = 12 in.

RIPRAP ROCK LOCATION & VOLUME		
STA	DISTANCE	VOLUME
REACH 1		
0+57 to 0+87 (left)	35 ft (w/ tieback)	30 cy
REACH 2		
13+75 to 14+10 (right)	45 ft (w/ tieback)	40 cy
REACH 3*		
29+15 (left)	4 ft	1 cy

* Reach 3 rock is intact, but a four foot section requires additional rock on top to recover fabric

Natural Channel Design, Inc

206 S. Elden St.
Flagstaff, Az 86001
928-774-2336

DRAWN BY: M.Wirtanen			
DESIGNED BY: M.Wirtanen, A.Haden			
REV	DATE	BY	REVISION

DETAILS:
Toe Rock & Temporary Stream Crossing

Watson Woods Riparian Preserve Restoration Project
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AS-BUILT DRAWINGS Construction Period Nov 8 - Dec 8, 2010	
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