Swauk Creek Riparian and Floodplain Restoration Project

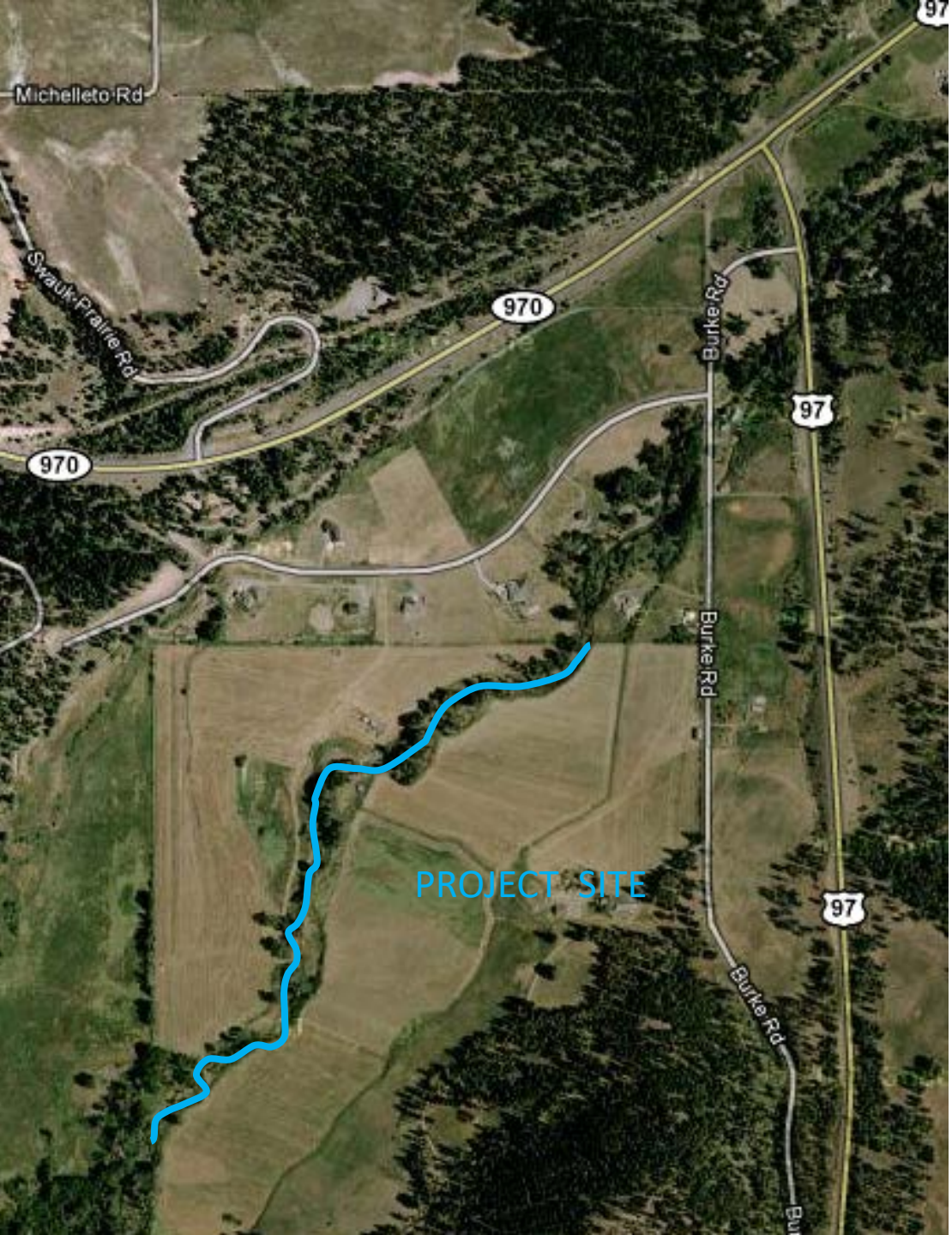
Administered by the Yakama Nation - YKFP

DOE Grant	$249,573
NWCPUD Grant (Northern Wasco County Peoples Utility District) -- McNary Mitigation Fund	$206,000
Yakama Nation & Kittitas Conservation Trust (BPA$):	$285,000
Final Total Project Cost:	$740,573

DOE Project Start Date: January 19, 2010; End Date: July 31, 2013

Actual Construction: Late August to Early November


Located on Private Ownership SW of
Hwy 97 and 970 Junction
Project Site
Cashmere
Sunnyslope
West Wenatchee
Wenatchee
East Wenatchee
Malaga
Cle Elum Lake
Easton
Ronald
Roslyn
Liberty
Cle Elum
South Cle Elum
Bristol
Thorp
Ellensburg
Kittitas
5 mi
10 km
Map data ©2012 Google -
Edit in Google Map Maker



~ 20 miles north of Ellensburg at the base of Blewett Pass, the project occurs along **~0.8 mile of Swauk Creek.**

- Agricultural land
- Narrow Riparian zone
- Entrenched
- Lacks late-season flow
- 303D listed (temperature)
- Owned by a developer

In 2006 the Kittitas Conservation Trust (KCT) received funding from DOE to analyze small storage potential to augment late-season flow by eliminating stream withdrawals.

Storage was cost prohibitive.

Floodplain interaction, bank storage/water depth, riparian shade/cover were considered better options.

Becca Wassell wrote a draft DOE “Clean Water” grant to initiate funding efforts for the project.

Objectives :

- Increase water depth/ gain more floodplain interaction
- More late-season flow -- cooler water
- Better habitat / riparian vegetation = more shade

Project Accomplishments:

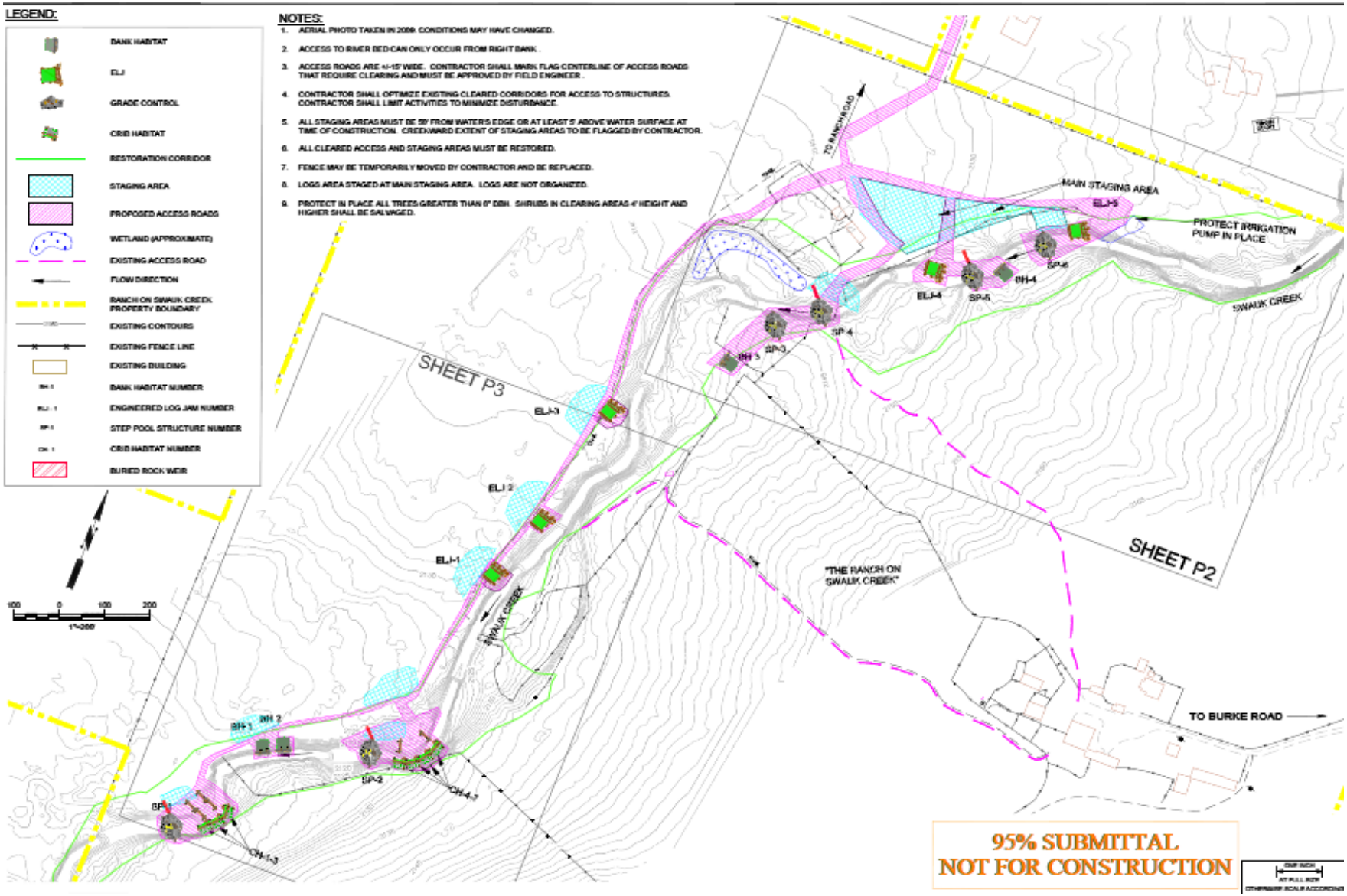
6 Grade controls (step-pool structures)
5 Engineered log jams
7 Crib-habitat structures
4 Bank habitat structures
6 Buried rock weirs
6 Floodplain features

12,000 thousand native riparian plants were planted in an effort to achieve cooler water temperatures and better habitat for fish and wildlife species (0.8 mile project reach).

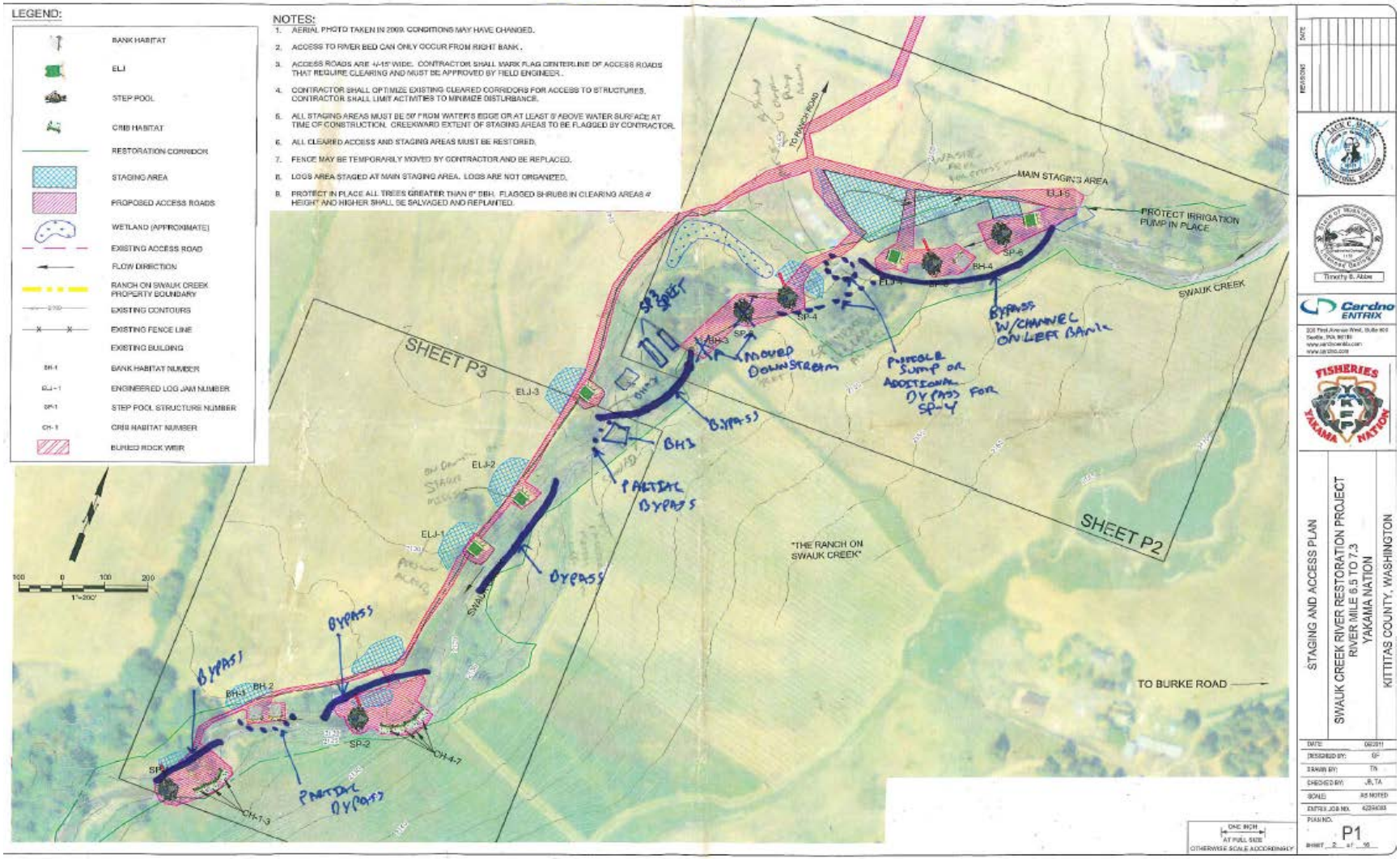
Step Pool Structure

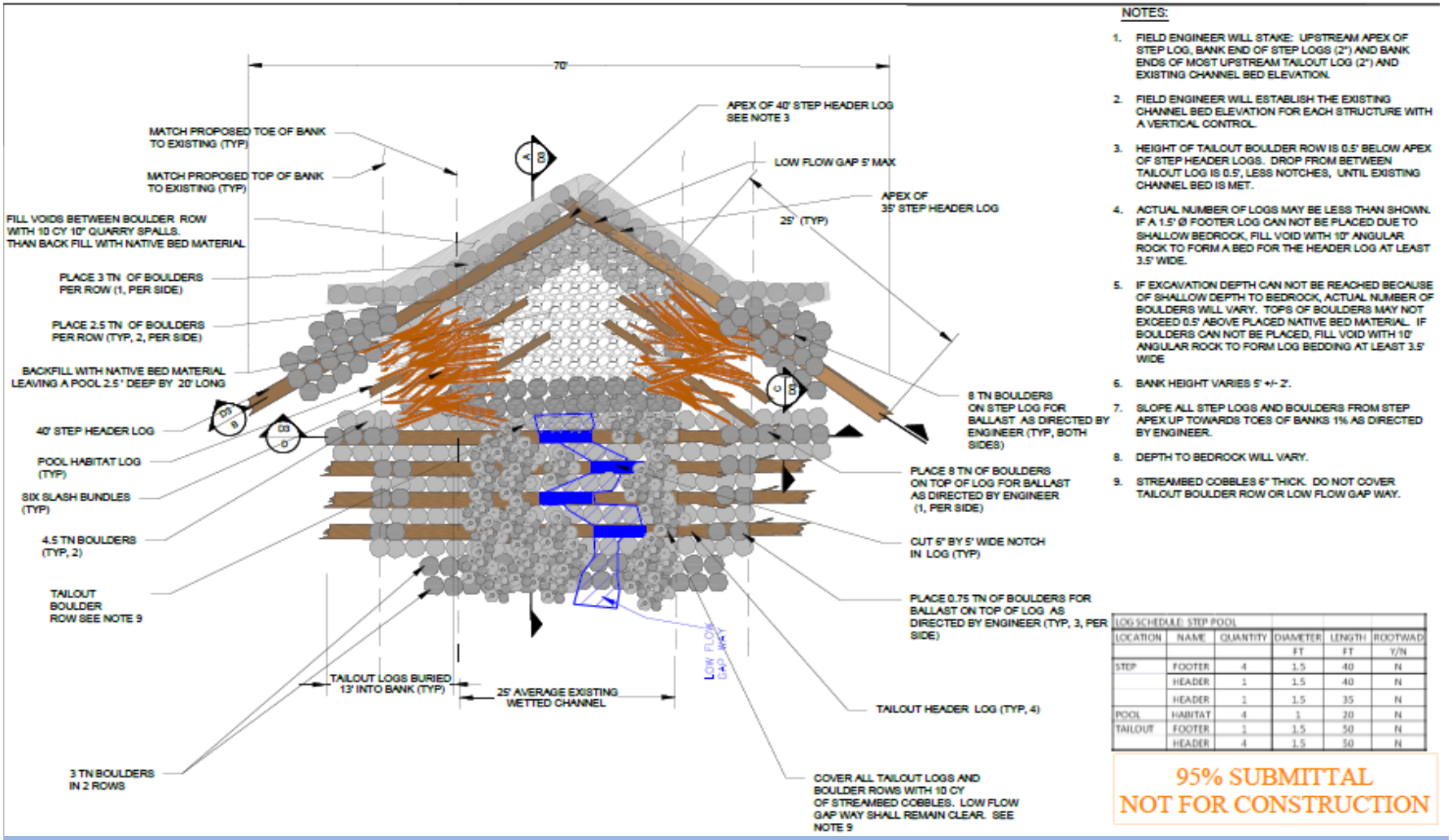
Engineered Logjam

Step Pool Structures (SP) – 6; Engineered Log Jam (ELJ) – 5; Crib Habitat (CH) – 7; Bank Habitat (BH) – 4; Flood Plain Features -- 6; Rock Weir -- 6



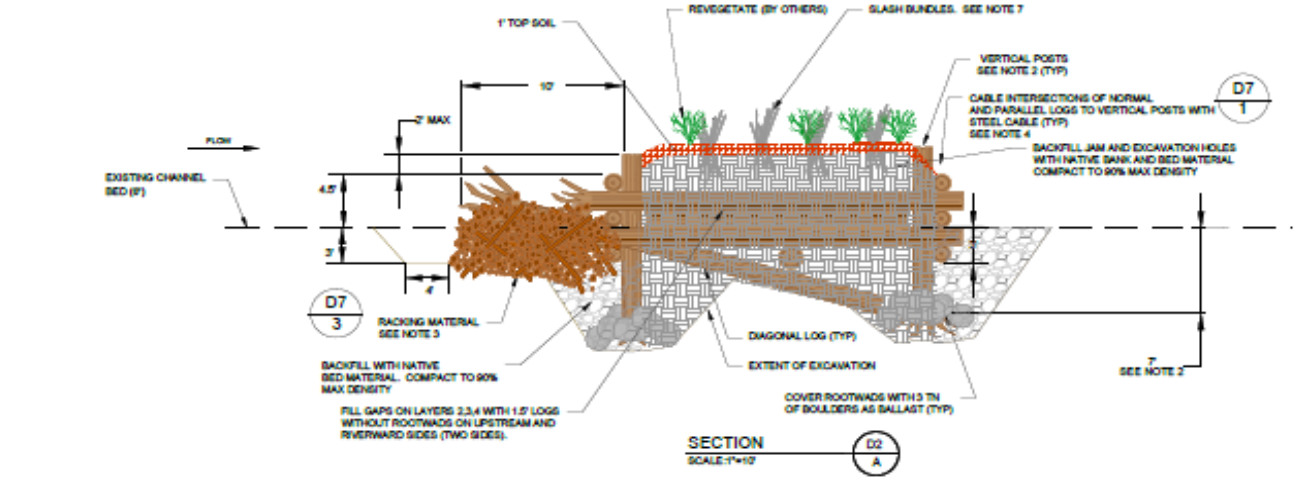
SKETCH I.

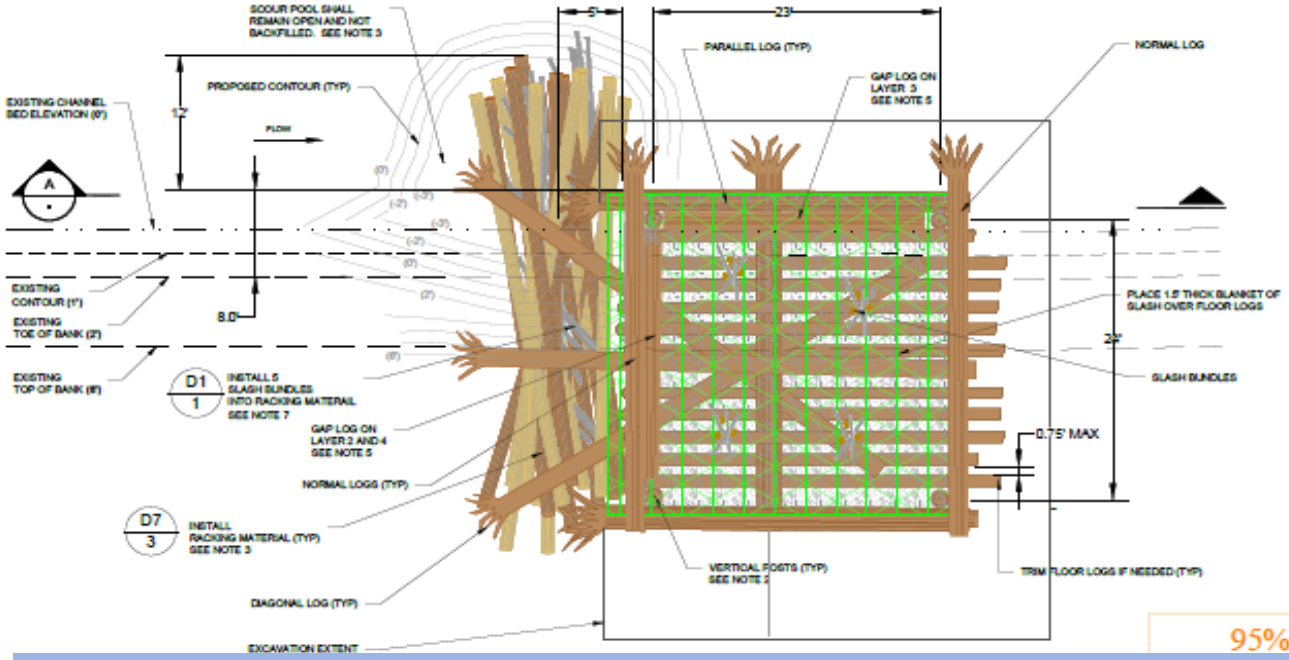

LEGEND:
BANK HABITAT
ELJ
STEP POOL
CRIB HABITAT
RESTORATION CORRIDOR
STAGING AREA
PROPOSED ACCESS ROADS
WETLAND (APPROXIMATE)
EXISTING ACCESS ROAD
FLOW DIRECTION
RANCH ON SWAUK CREEK PROPERTY BOUNDARY
EXISTING CONTOURS
EXISTING FENCE LINE
EXISTING BUILDING
BANK HABITAT NUMBER
ENGINEERED LOG JAM NUMBER
STEP POOL STRUCTURE NUMBER
CRIB HABITAT NUMBER
BURIED ROCK WEIR
NOTES:
1. AERIAL PHOTO TAKEN IN 2009. CONDITIONS MAY HAVE CHANGED.
2. ACCESS TO RIVER BED CAN ONLY OCCUR FROM RIGHT BANK.
3. ACCESS ROADS ARE 10-15' WIDE. CONTRACTOR SHALL MARK FLAG CENTERLINE OF ACCESS ROADS THAT REQUIRE CLEARING AND MUST BE APPROVED BY FIELD ENGINEER.
4. CONTRACTOR SHALL OPTIMIZE EXISTING CLEARED CORRIDORS FOR ACCESS TO STRUCTURES. CONTRACTOR SHALL LIMIT ACTIVITIES TO MINIMIZE DISTURBANCE.
5. ALL STAGING AREAS MUST BE 50' FROM WATER'S EDGE OR AT LEAST 8' ABOVE WATER SURFACE AT TIME OF CONSTRUCTION. CREEKWARD EXTENT OF STAGING AREAS TO BE FLAGGED BY CONTRACTOR.
6. ALL CLEARED ACCESS AND STAGING AREAS MUST BE RESTORED.
7. FENCE MAY BE TEMPORARILY MOVED BY CONTRACTOR AND BE REPLACED.
8. LOGS AREA STAGED AT MAIN STAGING AREA. LOGS ARE NOT ORGANIZED.
9. PROTECT IN PLACE ALL TREES GREATER THAN 6" DBH. FLAGGED SHRUBS IN CLEARING AREAS 4' HEIGHT AND HIGHER SHALL BE SALVAGED AND REPLANTED.
TO RANCH ROAD
MAIN STAGING AREA
ELJ-5
PROTECT IRRIGATION PUMP IN PLACE
SP-5
BH-4
SWAUK CREEK
SP-4
ELJ-4
BYPASS W/CHANNEL ON LEFT BANK
SP3 SHEET
SHEET P3
ELJ-3
MOVED DOWNSTREAM
POSSIBLE SUMP OR ADDITIONAL BYPASS FOR SP-4
BYPASS
BH-3
BH-2
PARTIAL BYPASS
ELJ-2
ELJ-1
SHEET P2
"THE RANCH ON SWAUK CREEK"
BYPASS
BYPASS
BYPASS
BH-1
BH-2
SP-2
CH-4-7
SP-1
CH-1-3
PARTIAL BYPASS
TO BURKE ROAD
100 0 100 200
1"=200'
ONE INCH AT FULL SIZE OTHERWISE SCALE ACCORDINGLY
DATE
REVISIONS
Timothy S. Abbe
Cardno ENTRIX
FISHERIES YAKAMA NATION
STAGING AND ACCESS PLAN
SWAUK CREEK RIVER RESTORATION PROJECT
RIVER MILE 6.5 TO 7.3
YAKAMA NATION
KITTITAS COUNTY, WASHINGTON
DATE: 08/2011
DESIGNED BY: DF
DRAWN BY: TN
CHECKED BY: JR, TA
SCALE: AS NOTED
ENTRIX JOB NO. 4239003
P1
SHEET 2 of 16



•**<u>Step-Pool Structure</u> (SP):** Each structure increased water depth by 1.5 ft. facilitating floodplain interaction (bank storage) while creating optimal conditions for the sorting of spawning gravels.


ELJ - 5
SP - 6
View: Upstream





NOTES:

1. ENGINEER WILL ESTABLISH THE LOCATIONS FOR THE TWO BANKSIDE VERTICAL POSTS AND THE EXISTING CHANNEL BED ELEVATION.
2. IF DESIGN EXCAVATION DEPTH FOR VERTICAL POSTS CAN NOT BE REACHED DUE TO SHALLOW BEDROCK, PLACE ROOTWADS ON BEDROCK AND COVER WITH 2' BOULDERS. TOP OF VERTICAL POSTS CAN NOT EXCEED 2' ABOVE LAYER 5.
3. ACTUAL QUANTITY OF RACKING WILL VARY DEPENDING ON DEPTH TO BEDROCK. IF DESIGN DEPTH CAN NOT BE REACHED, PLACE RACKING MATERIAL ON BEDROCK AND PLACE ON TOP OF ELJ STRUCTURE BEFORE ADDING SOIL.
4. TOTAL OF 8 LASHINGS AT TOE AND BOTTOM, 4 CORNERS.
5. GAP LOGS SHALL FILL OPENING BETWEEN THE ABOVE AND BELOW LAYERS ONLY ON THE RIVER AND UPSTREAM SIDE OF STRUCTURE.
6. AVERAGE BANK HEIGHT IS 7' +/- 2'. IN AREAS WITH LOW BANK HEIGHTS THE REMAINING VOLUME OF MATERIAL REQUIRED TO COMPLETE STRUCTURES SHALL AS DIRECTED BY FIELD ENGINEER AND BANKS SHOULD BE GRADED TO A SMOOTH TRANSITION TO MEET TOP OF MEET TOP OF ELJ.
7. PLACE FOUR SLASH BUNDLES RANDOMLY WHILE BACKFILLING TOP OF ELJ, THESE BUNDLES SHALL EXTEND 2-3' ABOVE PROPOSED SURFACE. INCORPORATE FIVE SLASH BUNDLES BETWEEN RACKING LOGS.

LOG SCHEDULE: ELJ

LAYER	NAME	QUANTITY	DIAMETER	LENGTH	ROOTWA
		#	FT	FT	Y/N
VERTICAL	POSTS	4	1.5	15	Y
LAYER 1	NORMAL	3	1.5	30	N
LAYER 2	PARALLEL	2	1.5	30	Y
	FLOOR	11	1	30	N
	DIAGONAL	2	1.5	30	Y
	GAP LOG	1	1.5	25	N
LAYER 3	NORMAL	2	1.5	30	N
	GAP LOG	1	1.5	25	N
LAYER 4	PARALLEL	3	1.5	30	Y
LAYER 5	NORMAL	2	1.5	30	N
RACKING		60	.25 - 1	20	N
FILL LOGS	PARALLEL	4	1.5	30	N
	RACKING	5	.25-1	20	N
	SLASH LAYER	780 SQUARE FEET			

SUMMARY OF MATERIALS

ITEM	UNIT	TOTAL
SLASH	CY	40
BOULDERS	TONS	30

95% SUBMITTAL

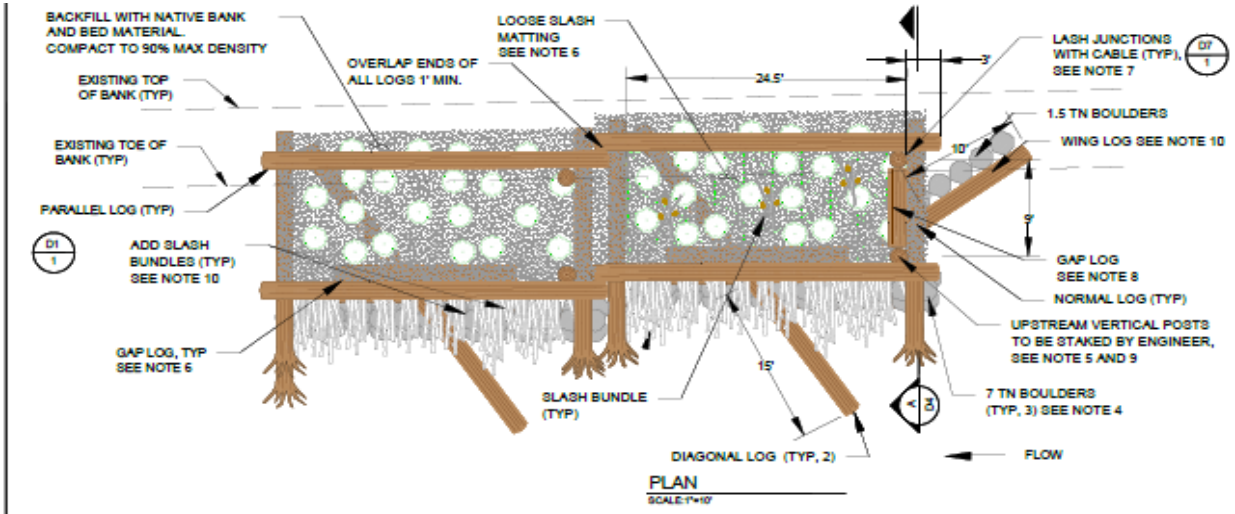
5 0 5 10
1" = 10'
ONE INCH AT FULL SIZE

•**<u>Engineered Log Jam</u> (ELJ):** ELJs promote floodplain complexity and increase local water elevation to engage the floodplain more frequently.


ELJ - 5
SP - 6
View: Upstream


View Downstream
SP - 1
ELJ - 1
ELJ - 2


Snake Bite



LOG SCHEDULE: CRIB HABITAT					
LAYER	NAME	QUANTITY	DIAMETER	LENGTH	ROOTWAD
		#	FT	FT	Y/N
VERTICAL	POSTS	2	1.5	12	Y
LAYER 1	PARALLEL	2	1.5	30	N
	WING	1	1.5	15	N
	GAP	1	1.5	15	N
LAYER 2	NORMAL	2	1.5	20	Y
	DIAGONAL	1	1.5	30	N
	GAP	1	1.5	15	N
	SLASH				
LAYER 3	PARALLEL	2	1.5	30	N
	WINDOW	1	1.5	7	N
	GAP	1	1.5	15	N
LAYER 4	NORMAL	2	1.5	20	Y
	GAP	1	1.5	15	N
LAYER 5	PARALLEL	2	1.5	30	N

STRUCTURE ELEVATION TABLE

CH 1-3 To Be Staked By Engineer			
Structure	Vertical Log 6	Layer 1	Layer 5
CH-1	-6	-3	3
CH-2	-6	-3	3
CH-3	-5	-4	3
Elevation for bottom of element			
Existing CHANNEL Bed Elevation = 0'			

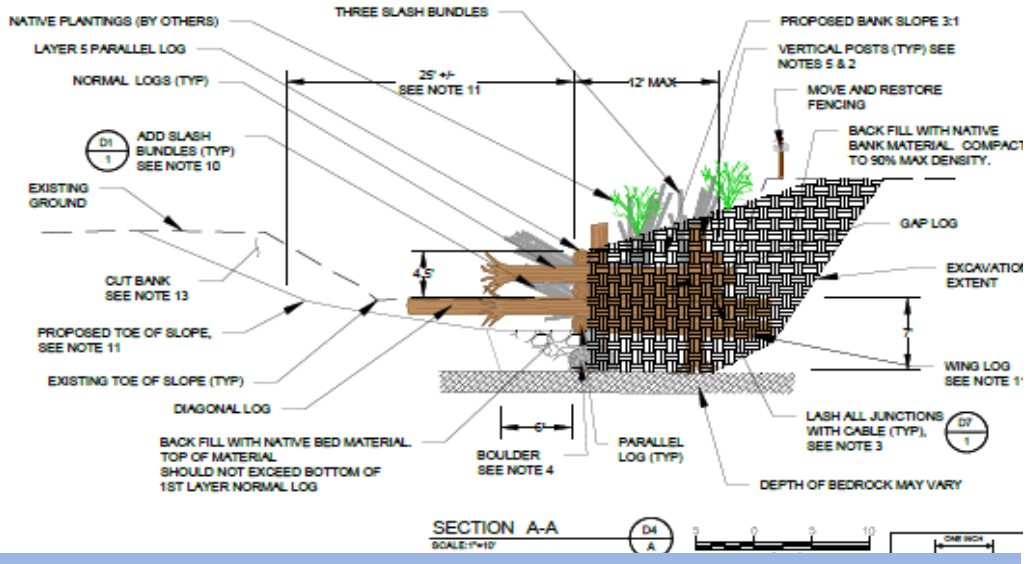
CH 4-7 To Be Staked By Engineer			
Structure	Vertical Log 6	Layer 1	Layer 5
	ft	ft	ft
CH-7	-6	-3	3
CH-6	-6	-3	3
CH-5	-7	-4	2
CH-4	-7	-4	2
Elevation for bottom of element			
Existing CHANNEL Bed Elevation = 0'			

SUMMARY OF MATERIALS		
ITEM	UNIT	TOTAL
SLASH	CY	20
BOULDERS	TONS	22

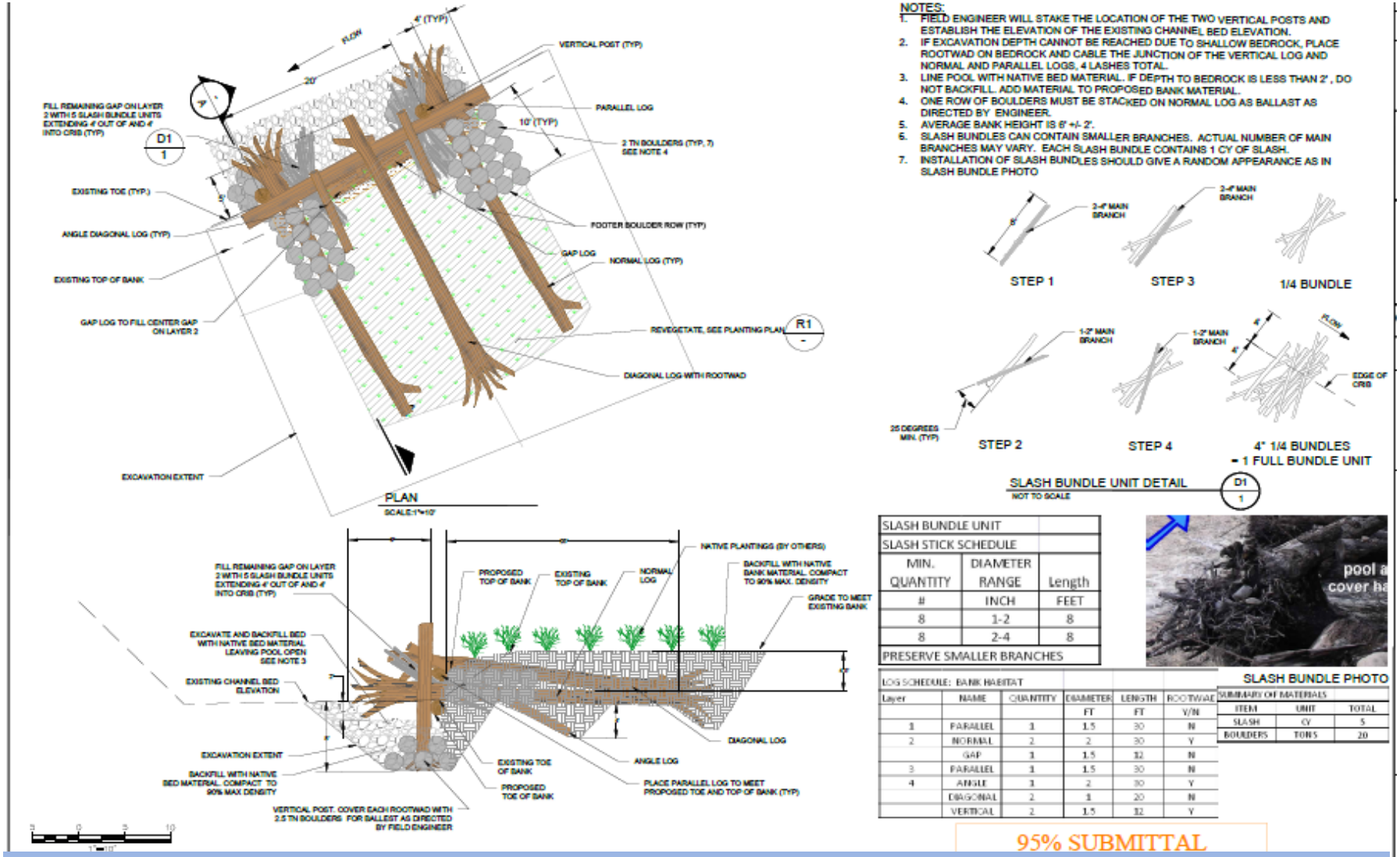
NOTES:

1. PLAN VIEW SHOWS TWO CRIB HABITAT STRUCTURES. NUMBER OF STRUCTURES WILL VARY DEPENDING ON LOCATION.
2. FIELD ENGINEER WILL STAKE LOCATIONS FOR UPSTREAM RIVERWARD VERTICAL POSTS FOR EACH STRUCTURE AND ESTABLISH DATUMS FOR THE EXISTING CHANNEL BED ELEVATION AT BOTH CRIB HABITAT LOCATIONS (SEE SHEETS D5 AND D6).
3. ACTUAL NUMBER OF LOGS MAY VARY DUE TO SHALLOW BEDROCK. TOP OF LAYER 5 LOG MUST NOT EXCEED 4.5' ABOVE EXISTING CHANNEL BED. DIAGONAL LOG MUST BE INSTALLED IN STRUCTURE, PLACE ALL EXTRA LOGS ON BANK OR AS DIRECTED BY ENGINEER.
4. IF EXCAVATION DEPTH CAN NOT BE REACHED BECAUSE OF SHALLOW BEDROCK, ACTUAL NUMBER OF BOULDERS WILL VARY. TOPS OF BOULDERS MAY NOT EXCEED 0.5' ABOVE PLACED NATIVE BED MATERIAL. IF 2' BOULDER CANNOT BE PLACED, FILL VOID WITH 10" ANGULAR ROCK TO FORM LOG BEDDING AT LEAST 3.5' WIDE.
5. LENGTH OF VERTICAL LOG MAY VARY DEPENDING ON DEPTH TO BEDROCK. POST HEIGHT MAY NOT EXCEED 2.0' ABOVE 5TH LAYER OF LOGS. IF DESIGN EXCAVATION DEPTH CAN NOT BE REACHED, PLACE ROOTWAD ON BEDROCK.
6. INTERIOR OF CRIB HABITAT SHOULD BE LINED WITH 1.5' THICK SLASH MATTING AT LAYER 2.
7. ALL JUNCTIONS OF NORMAL AND PARALLEL LOGS ON THE CREEK SIDE OF THE STRUCTURE SHOULD BE CABLED. IF VERTICAL LOG IS PRESENT AT JUNCTION, CABLE NORMAL AND PARALLEL LOGS TO IT. TOTAL OF 12 LASHINGS PER STRUCTURE.
8. PLACE 2 1.5' Ø 7' GAP LOGS ON LAYERS 1 AND 3 ONLY ON THE UPSTREAM SIDE OF THE MOST UPSTREAM STRUCTURE IN SERIES. PLACE GAP LOGS IN GAPS ALONG RIVERSIDE ON LAYER 2 AND 4.
9. FOR EACH STRUCTURE PLACE FOUR SLASH BUNDLES IN GAPS OF LAYERS 2 AND 4 (8 TOTAL). PLACE GAP LOGS OVER BUNDLES. PLACE THREE SLASH BUNDLES RANDOMLY WHILE BACKFILLING SLOPE, THESE BUNDLES SHALL EXTEND 2-3' ABOVE PROPOSED BANK.
10. ON THE UPSTREAM SIDE OF THE MOST UPSTREAM STRUCTURE IN SERIES,ADD WING LOG UNDERNEATH LAYER 1 AND ANGLE(30° +/-15°) BACK INTO BANK. PLACE 1.5 TN BOULDERS ON BANKSIDE OF LOG AS DIRECTED BY ENGINEER.
11. MAINTAIN EXISTING WETTED CHANNEL BOTTOM WIDTH FROM EDGE OF PROPOSED STRUCTURE TO RIGHT TOE OF BANK. SEE SHEETS D5 AND D6.
12. AVERAGE BANK HEIGHT IS 9' +/- 3'.
13. SEE SHEETS D5 AND D6 FOR EXCAVATION EXTENTS, FINAL GRADE AND BACKFILL SOURCE LOCATIONS.

95% SUBMITTAL
NOT FOR CONSTRUCTION



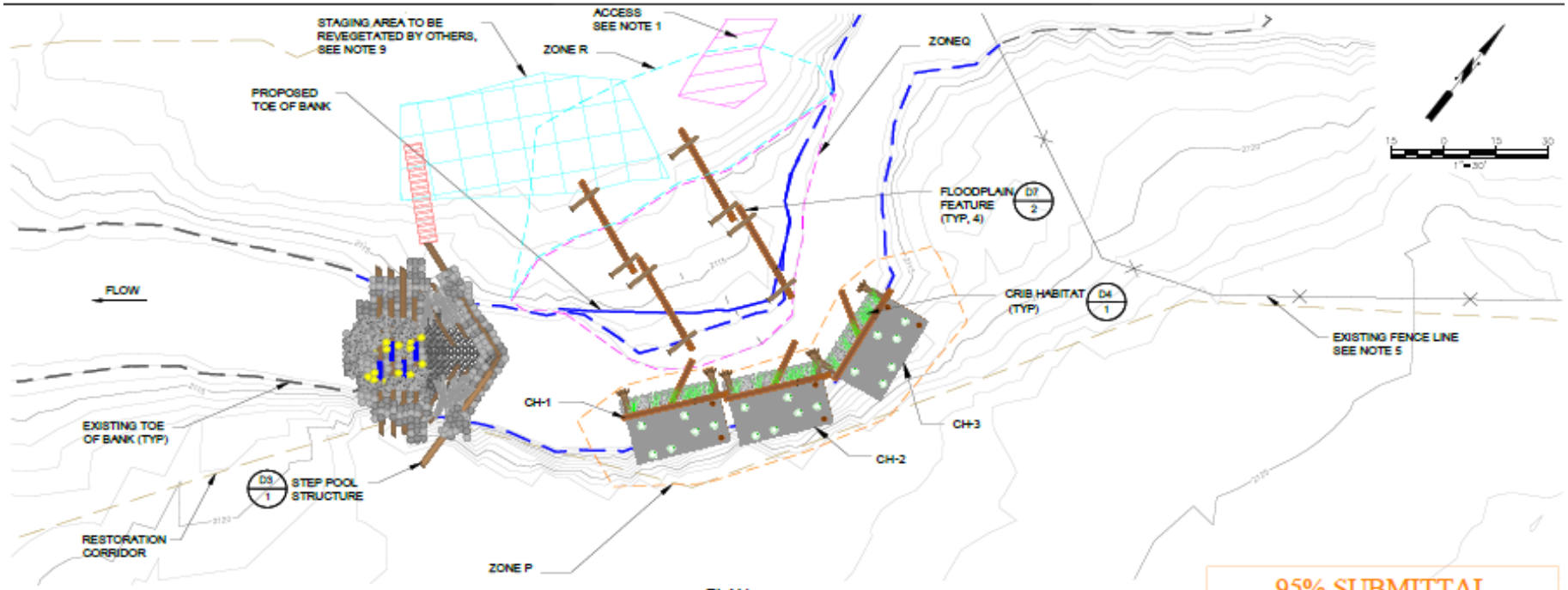
•**<u>Crib Habitat Structure</u> (CH):** CH structures provide stream bank complexity and habitat function along eroding banks.



•**<u>Bank Habitat Structure</u> (BH):** BH structures create pools and shading which provide aquatic habitat while also preventing lateral erosion.


View:
Upstream/Across
BH - 3


View: Upstream
BH - 3

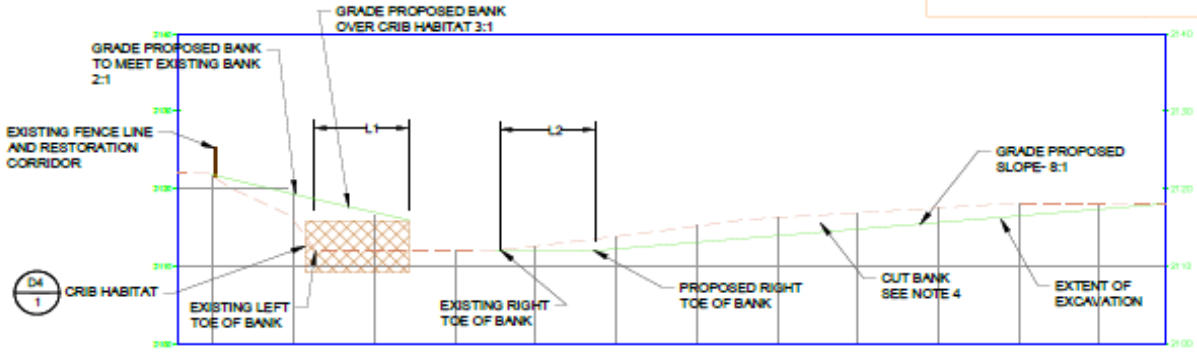


PLAN
SCALE:1"=30'

95% SUBMITTAL
NOT FOR CONSTRUCTION

NOTES:

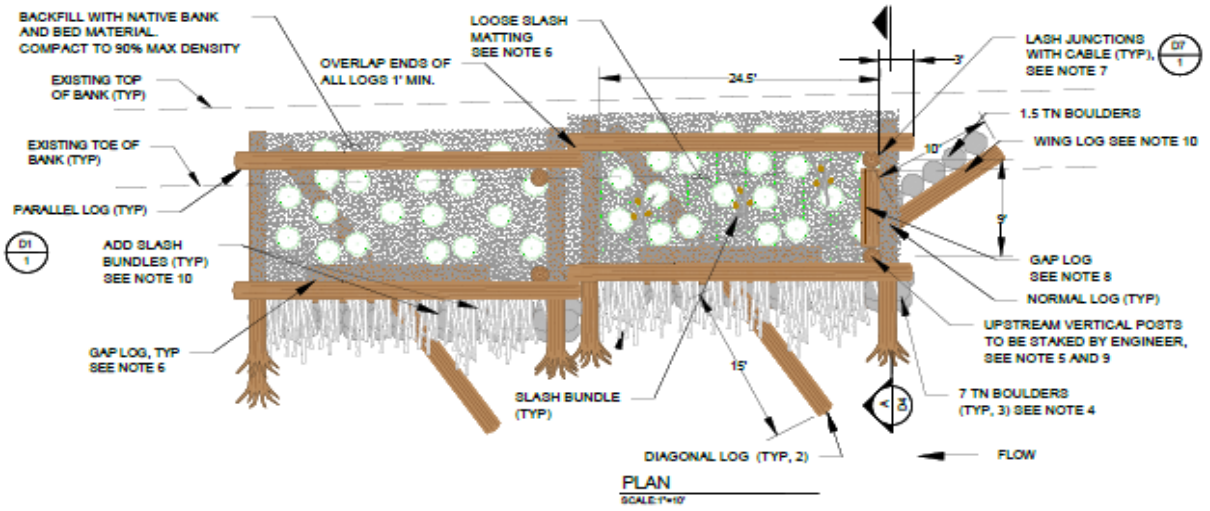
1. ACCESS TO CHANNEL BED CAN OCCUR THE RIGHT BANK.
2. UPSTREAM RIVERWARD VERTICAL POST WILL WILL BE STAKED BY THE ENGINEER.
3. EXTENT OF OF EXCAVATION LIMITS WILL BE DELINEATED BY ENGINEER.
4. THE QUANTITY OF CUT SHOULD EQUAL THE QUANTITY OF FILL REQUIRED TO BACKFILL THREE STRUCTURES. CUT SHALL BE TAKEN FIRST FROM ZONE Q (LEFT BANK 300 CY), THEN FROM ZONE P (RIGHT BANK 200 CY), THEN FROM ZONE R (UPPER RIGHT BANK 200 CY). COMPACT FILL TO 90% MAX DENSITY.
5. REMOVE AND REINSTALL FENCELINE IF APPROVED BY ENGINEER OR OWNER. THIS IS INCIDENTAL TO OTHER PAY ITEMS.
6. ALL WILLOW SHRUBS TO BE SAVED, PRESERVED AND REPLANTED.
7. EXCAVATE RIGHT BANK TO MAINTAIN EXISTING CHANNEL WIDTH AT TOE SO L1 = L2.
8. FULL WATER DIVERSION NEEDED AT THIS LOCATION. SEE PLAN D8.
9. PLANT AREAS AS PER R1. CONTRACTOR NOT RESPONSIBLE FOR PLANTING.



TYPICAL SECTION
NOT TO SCALE

ONE INCH AT FULL SIZE
OTHERWISE SCALE ACCORDINGLY

•**<u>Floodplain Feature</u> (log and rock weirs):** Floodplain features are designed to reduce meander bypass and channel straitening.



PLAN

SCALE:1"=10'

LOG SCHEDULE: CRIB HABITAT					
LAYER	NAME	QUANTITY	DIAMETER	LENGTH	ROOTWAD
		#	FT	FT	Y/N
VERTICAL	POSTS	2	1.5	12	Y
LAYER 1	PARALLEL	2	1.5	30	N
	WING	1	1.5	15	N
	GAP	1	1.5	15	N
LAYER 2	NORMAL	2	1.5	20	Y
	DIAGONAL	1	1.5	30	N
	GAP	1	1.5	15	N
	SLASH				
LAYER 3	PARALLEL	2	1.5	30	N
	WINDOW	1	1.5	7	N
	GAP	1	1.5	15	N
LAYER 4	NORMAL	2	1.5	20	Y
	GAP	1	1.5	15	N
LAYER 5	PARALLEL	2	1.5	30	N

STRUCTURE ELEVATION TABLE

CH 1-3 To Be Staked By Engineer			
Structure	Vertical Log 6	Layer 1	Layer 5
CH-1	-6	-3	3
CH-2	-6	-3	3
CH-3	-5	-4	3
Elevations for bottom of element			
Existing CHANNEL Bed Elevation = 0'			

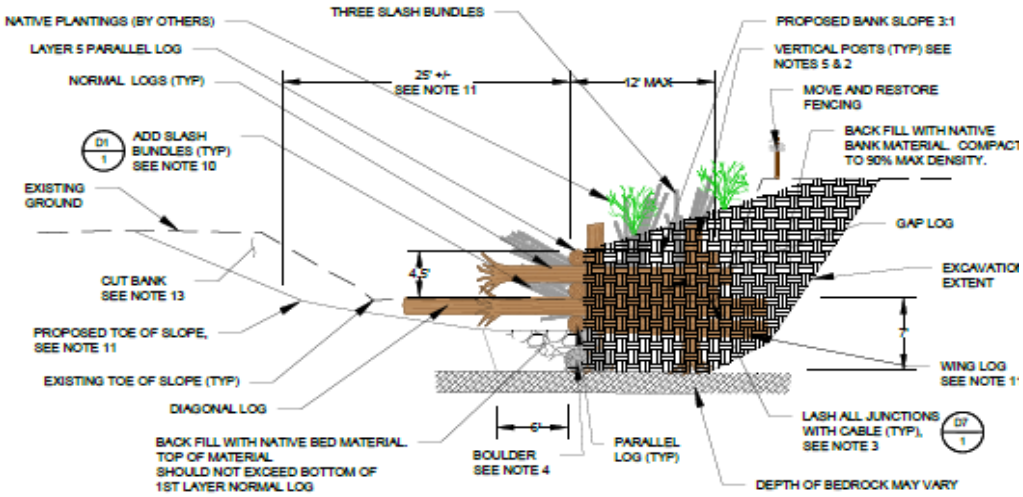
CH 4-7 To Be Staked By Engineer			
Structure	Vertical Log 6	Layer 1	Layer 5
	ft	ft	ft
CH-7	-6	-3	3
CH-6	-6	-3	3
CH-5	-7	-4	2
CH-4	-7	-4	2
Elevations for bottom of element			
Existing CHANNEL Bed Elevation = 0'			

SUMMARY OF MATERIALS		
ITEM	UNIT	TOTAL
SLASH	CY	20
BOULDERS	TONS	22

NOTES:

1. PLAN VIEW SHOWS TWO CRIB HABITAT STRUCTURES. NUMBER OF STRUCTURES WILL VARY DEPENDING ON LOCATION.
2. FIELD ENGINEER WILL STAKE LOCATIONS FOR UPSTREAM RIVERWARD VERTICAL POSTS FOR EACH STRUCTURE AND ESTABLISH DATUMS FOR THE EXISTING CHANNEL BED ELEVATION AT BOTH CRIB HABITAT LOCATIONS (SEE SHEETS D5 AND D6).
3. ACTUAL NUMBER OF LOGS MAY VARY DUE TO SHALLOW BEDROCK. TOP OF LAYER 5 LOG MUST NOT EXCEED 4.5' ABOVE EXISTING CHANNEL BED. DIAGONAL LOG MUST BE INSTALLED IN STRUCTURE, PLACE ALL EXTRA LOGS ON BANK OR AS DIRECTED BY ENGINEER.
4. IF EXCAVATION DEPTH CAN NOT BE REACHED BECAUSE OF SHALLOW BEDROCK, ACTUAL NUMBER OF BOULDERS WILL VARY. TOPS OF BOULDERS MAY NOT EXCEED 0.5' ABOVE PLACED NATIVE BED MATERIAL. IF 2' BOULDER CANNOT BE PLACED, FILL VOID WITH 10" ANGULAR ROCK TO FORM LOG BEDDING AT LEAST 3.5' WIDE.
5. LENGTH OF VERTICAL LOG MAY VARY DEPENDING ON DEPTH TO BEDROCK. POST HEIGHT MAY NOT EXCEED 2.0' ABOVE 5TH LAYER OF LOGS. IF DESIGN EXCAVATION DEPTH CAN NOT BE REACHED, PLACE ROOTWAD ON BEDROCK.
6. INTERIOR OF CRIB HABITAT SHOULD BE LINED WITH 1.5' THICK SLASH MATTING AT LAYER 2.
7. ALL JUNCTIONS OF NORMAL AND PARALLEL LOGS ON THE CREEK SIDE OF THE STRUCTURE SHOULD BE CABLED. IF VERTICAL LOG IS PRESENT AT JUNCTION, CABLE NORMAL AND PARALLEL LOGS TO IT. TOTAL OF 12 LASHINGS PER STRUCTURE.
8. PLACE 2 1.5' Ø 7' GAP LOGS ON LAYERS 1 AND 3 ONLY ON THE UPSTREAM SIDE OF THE MOST UPSTREAM STRUCTURE IN SERIES. PLACE GAP LOGS IN GAPS ALONG RIVERSIDE ON LAYER 2 AND 4.
9. FOR EACH STRUCTURE PLACE FOUR SLASH BUNDLES IN GAPS OF LAYERS 2 AND 4 (8 TOTAL). PLACE GAP LOGS OVER BUNDLES. PLACE THREE SLASH BUNDLES RANDOMLY WHILE BACKFILLING SLOPE, THESE BUNDLES SHALL EXTEND 2-3' ABOVE PROPOSED BANK.
10. ON THE UPSTREAM SIDE OF THE MOST UPSTREAM STRUCTURE IN SERIES,ADD WING LOG UNDERNEATH LAYER 1 AND ANGLE(30° +/-15°) BACK INTO BANK. PLACE 1.5 TN BOULDERS ON BANKSIDE OF LOG AS DIRECTED BY ENGINEER.
11. MAINTAIN EXISTING WETTED CHANNEL BOTTOM WIDTH FROM EDGE OF PROPOSED STRUCTURE TO RIGHT TOE OF BANK. SEE SHEETS D5 AND D6.
12. AVERAGE BANK HEIGHT IS 9' +/- 3'.
13. SEE SHEETS D5 AND D6 FOR EXCAVATION EXTENTS, FINAL GRADE AND BACKFILL SOURCE LOCATIONS.

95% SUBMITTAL
NOT FOR CONSTRUCTION



SECTION A-A

SCALE:1"=10'

D4 A

0 5 10

1" = 10'

ONE INCH AT FULL SIZE


CH 1 - 3
SP -1
View: Downstream


HITACHI
350H

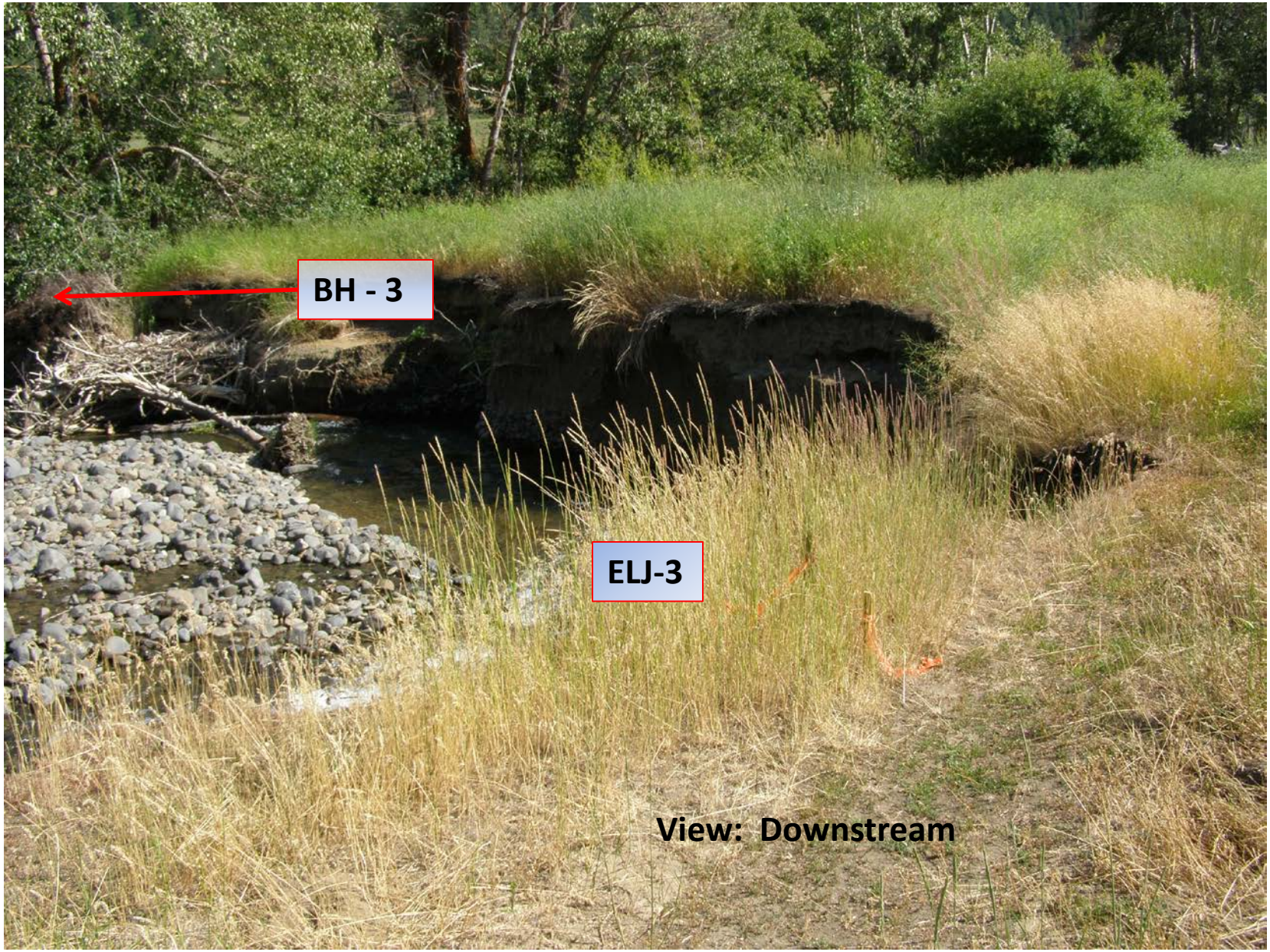

SP – 1 (looking downstream)


View: Downstream
SP -1
CH 1-3


View: Downstream
CH 4 - 7


View: Upstream
CH 4-7
SP - 2


View: Downstream from LB
CH 1-3
CH 4-7
SP - 2


BH - 3
ELJ-3
View: Downstream


View Downstream
SP - 1
ELJ - 1
ELJ - 2


View: Upstream
SP- 3
ELJ - 3
BH - 3


EX350H


View: Upstream
ELJ - 4
SP - 4


View : Upstream
ELJ - 5
SP - 6
BH - 4
SP - 5


View: Upstream
BH - 4
ELJ - 5

Water Quality Improvements

The primary water quality issues addressed under this grant were:

(1) water temperature in general
(2) lack of late season flow.

Lack of flow has the corollary effect of increasing water temperature by more rapid solar heating of both the shallow water and the exposed substrate material. Conversely, greater water depth translates to additional bank storage and more late-season flow – conditions which would decrease the heating effects noted above.

Both the step-pool structures and engineered log jams increase water depth and provide a degree of shade. All of the structures, including the crib habitat and bank habitat structures, provide scour pools in association with their exposed root wads – pools that provide shading at each structure. In addition, all structures and banks exposed during construction were planted to a variety of riparian trees and shrubs that will result in even greater shading in subsequent years.

There were no monitoring components included in the grant deliverables other than the percentage of plants remaining alive one year after planting. It was assumed, going into this project, that the actions undertaken with the grant funding would accomplish lower water temperatures; however, the lack of baseline data precluded an actual comparison of pre and post-project water temperatures.

The Next Step for Continued Success

Adequate watering of plants during the summer/fall of 2012 will be the most significant factor in the overall success of the project from here on. Aside from a viable watering regime, the occurrence of significant flooding may have as much to do with the success of some planted areas as anything else.

Lessons Learned

This project was somewhat larger in scope/scale than initially imagined. In retrospect, the project could have been broken into phases that were more manageable, particularly relative to upcoming plant maintenance during the summer and fall of 2012; however, contracting and budgeting were simplified by getting the project done quickly.

The greatest challenge will be figuring out an efficient way to keep the plantings alive during the hot weather of 2012.

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Cameron Travers:	Jansen, Inc. – equipment contractor
Ernie & crew (planting, etc.)	WCC
Nels Parvi	Environmental Systems (Vetrans)