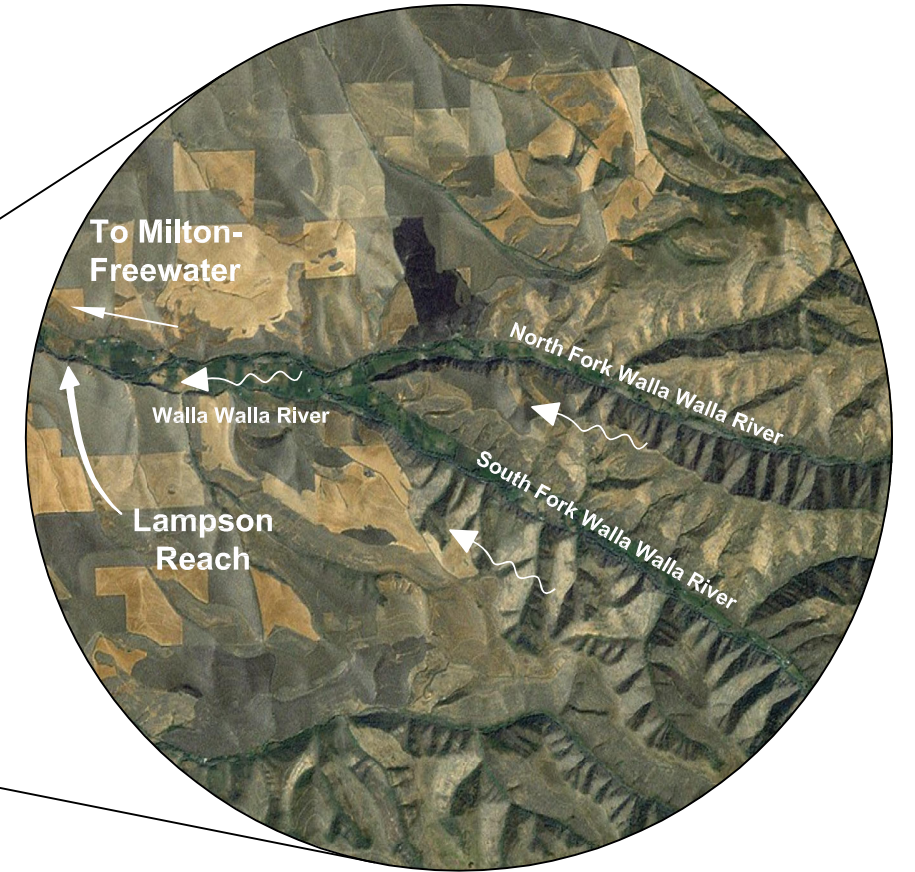
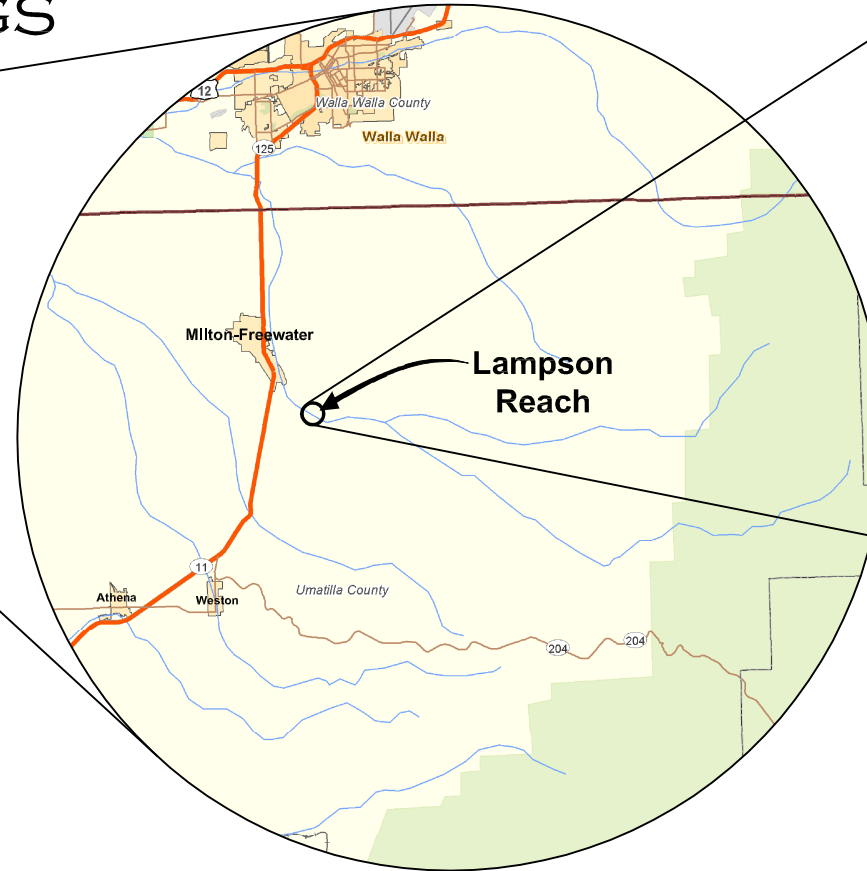


LAMPSON PROPERTY

WALLA WALLA RIVER ENHANCEMENT

CONSTRUCTION DRAWINGS



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S-2	GENERAL NOTES
S-3.1	VISION, GOALS AND OBJECTIVES
S-3.2	GENERAL LEGEND AND TREATMENTS
S-4.1*	EXISTING AERIAL PHOTO (2005)
S-4.2*	EXISTING SOILS
S-4.3	EXISTING TOPOGRAPHY
S-4.4*	EXISTING HABITAT
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S-5.1	PROPOSED CONDITIONS
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SHEET	SHEET TITLE
S-7.6	PROPOSED SIDE CHANNEL PLAN AND PROFILE, STA. 15+50 TO STA. 21+21
S-7.7	PROPOSED SPRING CHANNEL PLAN
S-8.1	TYPICAL CHANNEL GEOMETRY
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S-10.1	PLANTING PLAN
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S-11.3	TYPICAL COFFERDAM AND DIVERSION DAM LAYOUT
S-11.4	CONSTRUCTION SEQUENCING NOTES
S-11.5	TREE QUANTITIES FOR HABITAT STRUCTURES
S-11.6	CONSTRUCTION QUANTITIES

Reference: Aerial image obtained from NAIP, 07/2005, base map obtained from ESRI.

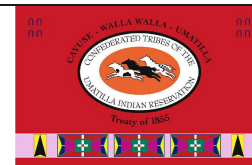
*These Design Drawings were not necessary for construction and have been removed from the Construction Drawings. Refer to 04/08/11 set of Design Drawings for more detailed design information.

**These Design Drawings were not necessary for construction and have been removed from the Construction Drawings. Refer to 06/27/11 set of Design Drawings for more detailed design information.

Revision No:	Date:	Description:	Initials:	Designed:
1	08/01/11	Channel downcut redesign	JJF	Drawn: MGF
				Checked: MKH
				Date: 06/27/11
				Project No: 2698-006-02

APPROVED FOR CONSTRUCTION

Walla Walla River
Umatilla County, Oregon
Confederated Tribes of the
Umatilla Indian Reservation



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Spokane, Washington 99202

Cover Sheet
Lampson Construction Drawings

Sheet
S-1

GENERAL NOTES:

These designs and drawings have been prepared for the exclusive use of the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), and their authorized agents. No other party may rely on the product of our services unless GeoEngineers Inc. (GeoEngineers) agrees in writing in advance of such use.

1. These Lampson Site Walla Walla River enhancement plans represent an engineer-led (design/build) construction effort.
2. These plans are not intended for construction without the direct supervision of a qualified GeoEngineers representative.
3. The drawings contained within should not be applied for any purpose or project except the one specified; specifically the habitat enhancements on the Walla Walla River along the Lampson property as located on Sheet S-1.
4. These designs and drawings are copyrighted by GeoEngineers, Inc. Any use, alteration, deletion, or editing of this document without explicit written permission from GeoEngineers is strictly prohibited. Any other unauthorized use of this document is prohibited.
5. The contractor shall construct the stream enhancement in accordance with the plans stamped "Approved for Construction." These plans will be provided to the contractor by the engineer or project inspector prior to construction. Work shall not be done without the current set of approved construction plans.
6. The enhancement designs depicted herein are approximate and are intended to express the overall design intent of the project. These designs will need to be adjusted in the field during construction in order to meet the specific site conditions and intended function. These stream improvements have been developed with the understanding that a qualified GeoEngineers engineer and/or scientist be on-site to provide construction guidance while the stream enhancements are constructed to ensure the overall intent of the design is met.
7. Geomorphic conditions can change and these designs are based on conditions that existed at the time the design was performed. The results of these designs may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. Always contact GeoEngineers before applying these designs to determine if they remain applicable.
8. All streams, rocks and woody habitat structures are potentially dangerous. This proposed stream enhancement design is intended to address a wide variety of constraints which target more naturally functioning stream systems and habitat; they are inherently dangerous. It is therefore strongly recommended that the CTUIR address the necessary safety concerns appropriately with the landowner. Signs placed along the enhanced stream reaches in prominent locations to warn of the potential hazards should be considered a minimum.
9. The project is located in a detailed Flood Zone AE as identified on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) 410204 0250B for Umatilla County, Oregon (Community Number 410204), dated March 4, 1987. The FEMA CLOMR/LOMR process has not been initiated. This project design does result in a "No Rise" flood condition and a No Rise Certificate from the county has been applied for.
10. In general, the proposed enhancements are intended to result in a more stable streambed, banks and floodplain, while increasing in stream habitat for fish. However, channel erosion, channel migration and/or avulsions can be expected to occur over time. These channel processes are natural and appropriate for these stream systems.
11. These figures were originally produced in color.
12. Refer to GeoEngineers accompanying stream enhancement design report for applicable design and contractual limitations.
13. All elevations are based on the National Geodetic Vertical Datum of 1929. A detailed topographic survey was not performed for this project. All existing and proposed stream features shown are approximate. Topography was obtained from a topographic survey completed by the US Corps of Engineers in 1999.

CONSTRUCTION NOTES:

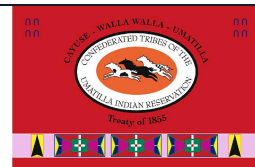
All contractors working within the project boundaries are responsible for compliance with all applicable safety laws. The contractor shall be responsible for all barricades, safety devices and control of traffic within and around the construction area.

1. All material and workmanship furnished on or for the project must meet the minimum requirements of project permits, approving agencies, specifications as set forth herein, or whichever is more restrictive.
2. Contractor shall not work within any wetland area until the owner has obtained a 404 permit from the United States Army Corps of Engineers. All work within or adjacent to any wetland area shall comply with the conditions of the 404 permit.
3. Contractor shall obtain all necessary permits prior to any dewatering and/or river diversion activities on site.
4. The contractor shall install and maintain appropriate sediment control devices throughout the whole project site, including the construction staging area and stockpile area throughout the project's construction. Temporary construction and permanent erosion control measures shall be designed, constructed and maintained in accordance with all applicable local, state and federal regulations.
5. Stream construction shall occur during the fish window for the project area (July 1 - September 30) See sheets S-11 - S-14 for construction sequencing. See sheets S-11.1 - S-11.4 for specifics on fish handling.
6. Fish exclusion shall be conducted in the project area prior to any dewatering activities, or construction within or directly adjacent to the channel.
7. Surface and groundwater shall be drained away from active construction and into a sediment pond/trap to eliminate sediment from flowing into active stream channels.
8. Discharges entering active streams on site shall satisfy all state and federal standards and project permit requirements for contaminants and turbidity.
9. Diverted and controlled streamflow can be used to test and adjust newly constructed stream structures prior to permanently activating new stream segments.
10. Construction shall minimize disturbance to, and maximize reuse of, existing riparian vegetation.
11. All material not used on site shall be disposed of onsite as directed by the CTUIR and landowner or shall be hauled offsite and properly disposed of.
12. Record information (as-built survey) shall be accurately recorded by the contractor and supplied to the owner for future use, reference and monitoring. Submittal of record information is a condition of final acceptance.
13. The Construction Specifications supercede these drawings where discrepancies exist between these drawings and the Construction Specifications.

Revision No:	Date:	Description:	Initials:	Designed: JJF
1	08/01/11	Channel downcut redesign	JJF	Drawn: MGF
				Checked: MKH
				Date: 06/27/11
				Project No: 2698-006-02

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Walla Walla River
Umatilla County, Oregon
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General Notes
Lampson Construction Drawings

**Sheet
S-2**

Vision



Goals



Objectives

Increase and enhance juvenile and adult anadromous fish habitat by targeting limiting habitat factors within the limits of river geomorphology, property ownership, public safety, environmental regulations and project economics.

Increase and Enhance Habitat

Diversify In-Stream Habitat Complexity

- Multiple Habitats Close Together
- Primary Pool Habitat
- Substrate Diversification
- Structure
- Side Channel/Off Channel Habitat
- Floodplain Connectivity

Increase, Enhance Diversify Riparian Habitat

- Diverse Vegetation (Cover, Temperature, Recruitment, Macroinvertebrates)
- Bio-Engineering (Native Plants, Channel, Floodplain and Habitat Stability)

Geomorphic Stability

- Reduces Erosion, Sedimentation, Property Loss
- Self-Sustaining, Self-Maintaining
- Minimize Maintenance
- Cost Effective

Benefits to Other Species (Water fowl, Song Birds, Upland Species)

Treatment Options

In-Stream Habitat Structures

- Woody Habitat Structures
- Roughened Channels, Boulder Structures

Floodplain Connectivity

- Layback Steep Existing Slopes
- Levee Removal and/or Setback
- Floodplain Benching
- Floodplain Excavation

Side Channel / Off Channel Habitat

- Create Spring Channels
- Meander Creation (Side Channel, Main Channel)
- Wetlands
- Backwater Habitat

Preserve, Enhance and Minimize Disturbance to High-Value Resources

Vegetation Plan

Design Practicality

Accommodate Physical, Practical and Regulatory Site Constraints

Practical Design Considerations

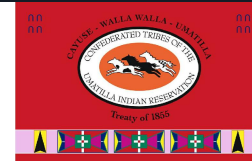
- Public Safety
- Flood Management
- Geomorphic Stability (Minimizes Avulsions, Erosion, Sedimentation, Habitat Destruction)
- Zoning, Easements, Setbacks, Floodplains, Zones
- Property Boundaries
- Landowner Desires
- Neighboring Properties
- Bridges, Utilities, Water Rights
- Grades, Access, Views
- Permits, Schedule, Budget, Maintenance, Constructability
- Economics

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1	08/01/11	Channel downcut redesign	JJF	JJF
				Drawn: MGF
				Checked: MKH
				Date: 06/27/11
				Project No: 2698-006-01

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Vision, Goals and Objectives

Lampson Construction Drawings

Sheet
S-3.1

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Treatments			Benefits ⁽¹⁾												
Symbol ⁽²⁾	Name	Description	Stream Function				Stream & Flood Management			Habitat					
			Dissipates Energy	Maintains Deeper Water	Focuses, Directs or Turns Flow	Promotes Gravel Sorting	Lowers Flood Elevation	Bank and Erosion Protection	Avulsion (Stream Movement) Protection	Fish Holding	Fish Rearing	Fish Cover and Refuge	Fish Food Source	Fish Spawning	Riparian and Upland Habitat Continuity
	Boulders	Boulders placed in stream or at bank toe. Obtained from existing levee.	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		
	Riffle	Boulders, cobbles and large gravel downstream of pools.	✓		✓	✓				✓	✓	✓	✓	✓	
	Pool	Deeper water. Typically on bends or below boulder drops.	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	
Not Shown	Pool Run Out (Run)	Downstream end of pool. Slow, deep, quite water.	✓	✓	✓	✓					✓		✓	✓	✓
Not Shown	Gravel Bar	Gravel on islands, banks or at downstream ends of pools, some with vegetation.				✓					✓		✓	✓	✓
	New Channel	New Channel Meander, Side or Backwater Channel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Woody Habitat Structure	Large trees with or without rootwads buried in banks or in stream.	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	
	Levee Excavation, Regrade Slopes, Retain Select Trees	Selectively excavate levee. Save select trees and riprap for reuse. Bury removed trees in excavated floodplain/bank. Plant	✓					✓	✓				✓		✓
	Spring Channel	Create new off channel stream from spring/irrigation return (Lampson)									✓	✓	✓	✓	✓
	Selective Floodplain Excavation and Grading	Selectively excavate and grade floodplain. Retain 70% to 95% of trees. Plant.	✓					✓	✓	✓			✓	✓	✓
Not Shown	Maintain existing bankfull depth	Where channel banks are lowered, maintain existing channel depth to maintain sediment conveyance.				✓				✓					

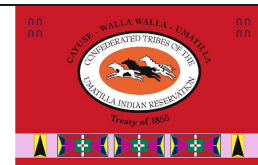
(1) See notes on preceeding sheet.

(2) Symbols noted on this sheet serve as a legend for sheets S-7.1 through S-7.7.

Revision No:	Date:	Description:	Initials:	Designed: JJF
1	08/01/11	Channel downcut redesign	JJF	Drawn: MGF
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General Legend and Treatments

Lampson Construction Drawings

Sheet
S-3.2

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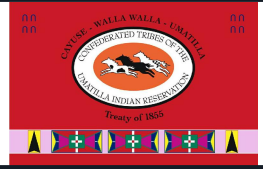


Reference: Aerial obtained from NAIP, 7/25/2005, existing topography based on 1999 US Army Corps of Engineers survey.

Revision No:	Date:	Description:	Initials:	Designed:
1	08/01/11	Channel downcut redesign	JJF	JJF
				Drawn: MGF
				Checked: MKH
				Date: 06/27/11
				Project No: 2698-006-02

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Existing Topography
 Lampson Construction Drawings

Sheet
S-4.3

MKH:MGF

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Reference: Aerial obtained from NAIP, 7/25/2005.

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1	08/01/11	Channel downcut redesign	JJF	Drawn: MGF
				Checked: MKH
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				Project No: 2698-006-02

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 Umatilla County, Oregon
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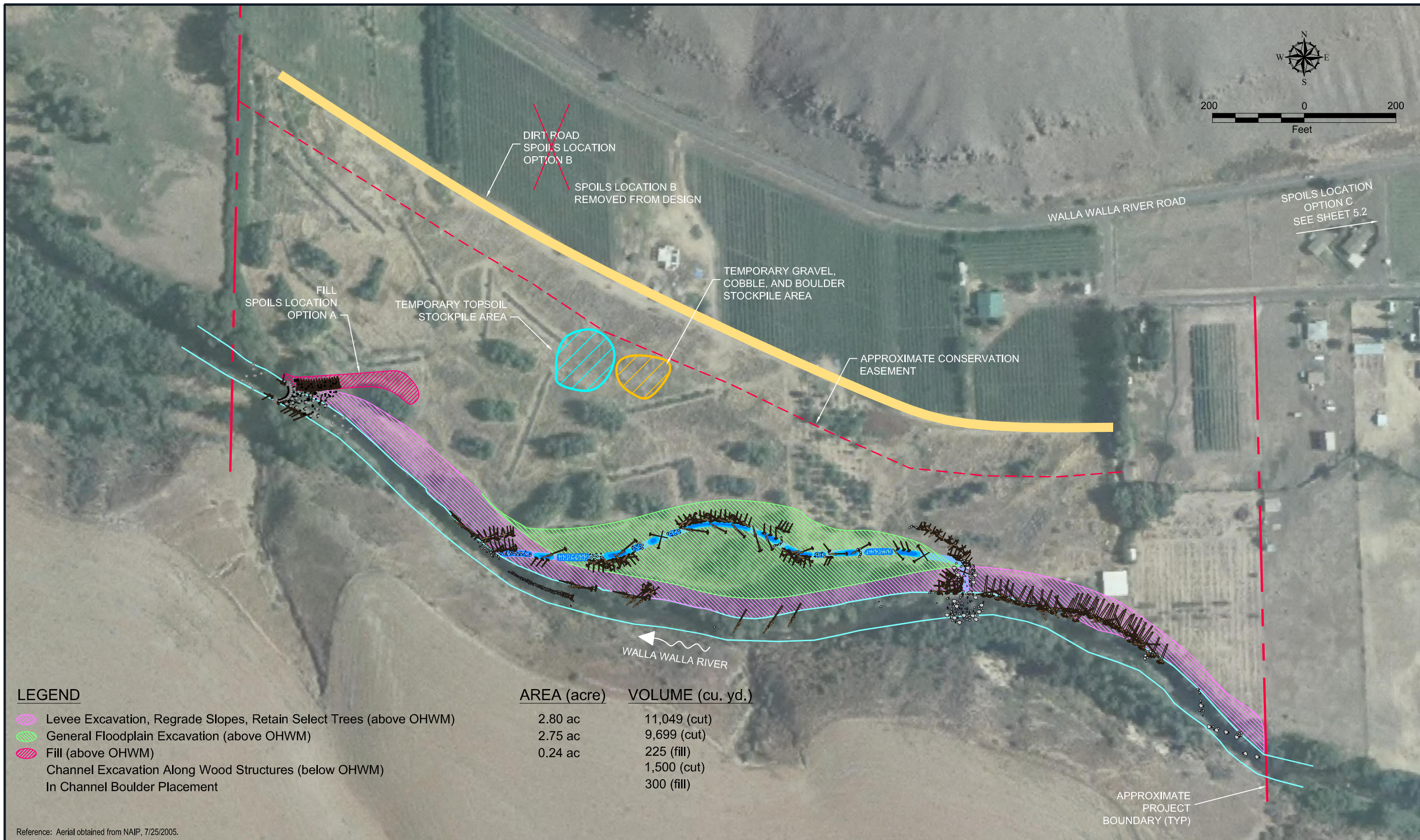
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Proposed Conditions
 Lampson Construction Drawings

Sheet
S-5.1

MKH : MGF

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LEGEND

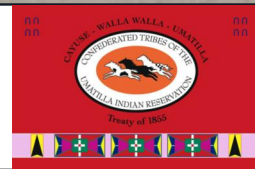
- Levee Excavation, Regrade Slopes, Retain Select Trees (above OHWM)
- General Floodplain Excavation (above OHWM)
- Fill (above OHWM)
- Channel Excavation Along Wood Structures (below OHWM)
- In Channel Boulder Placement

	AREA (acre)	VOLUME (cu. yd.)
	2.80 ac	11,049 (cut)
	2.75 ac	9,699 (cut)
	0.24 ac	225 (fill)
		1,500 (cut)
		300 (fill)

Reference: Aerial obtained from NAIP, 7/25/2005.

Revision No:	Date:	Description:	Initials:	Designed: JJF
1	08/01/11	Channel downcut redesign	JJF	Drawn: MGF
APPROVED FOR CONSTRUCTION				Checked: MKH
				Date: 06/27/11
				Project No: 2698-006-02

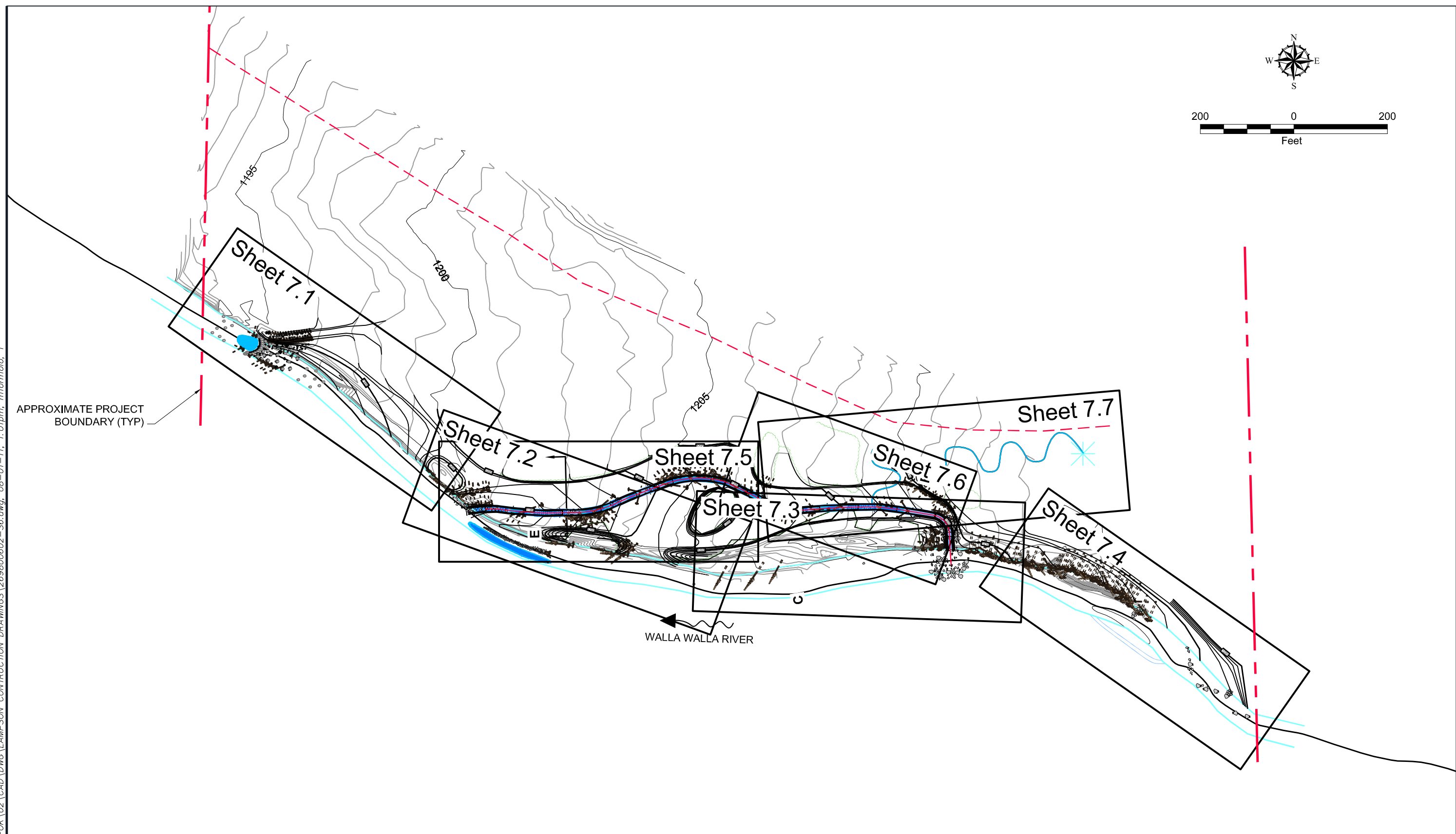
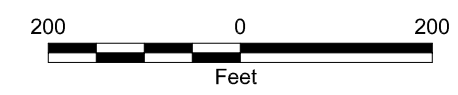
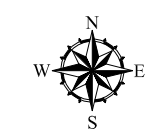
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Excavation, Fill and Stockpiles
Lampson Construction Drawings

Sheet
S-5.3



APPROXIMATE PROJECT BOUNDARY (TYP)

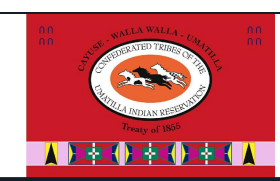
WALLA WALLA RIVER

Reference: Site topography is from US Army Corps of Engineers survey in 1999.

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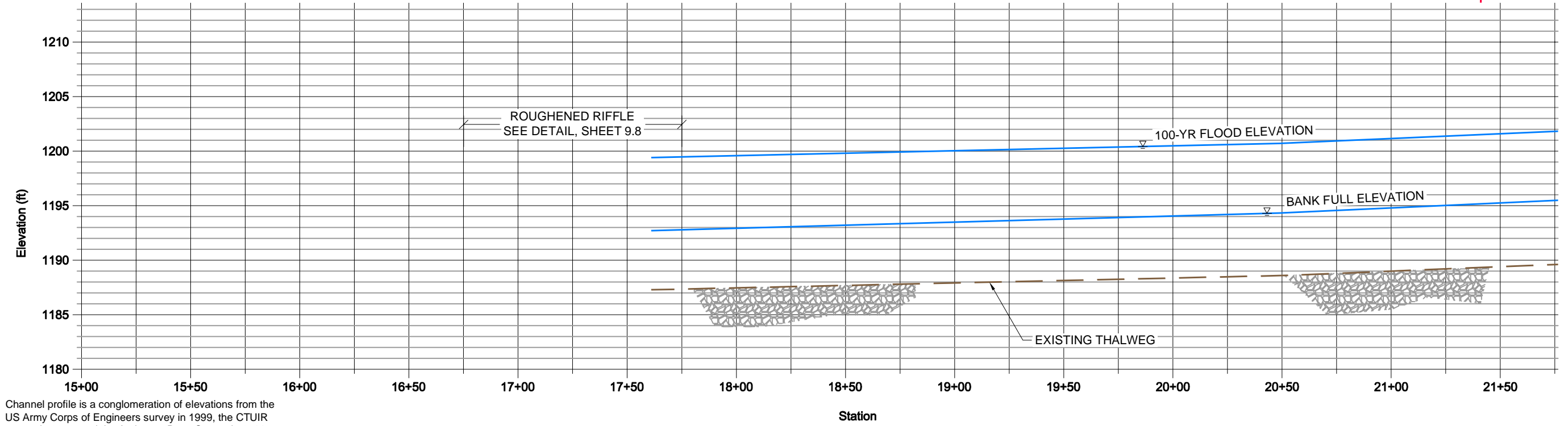
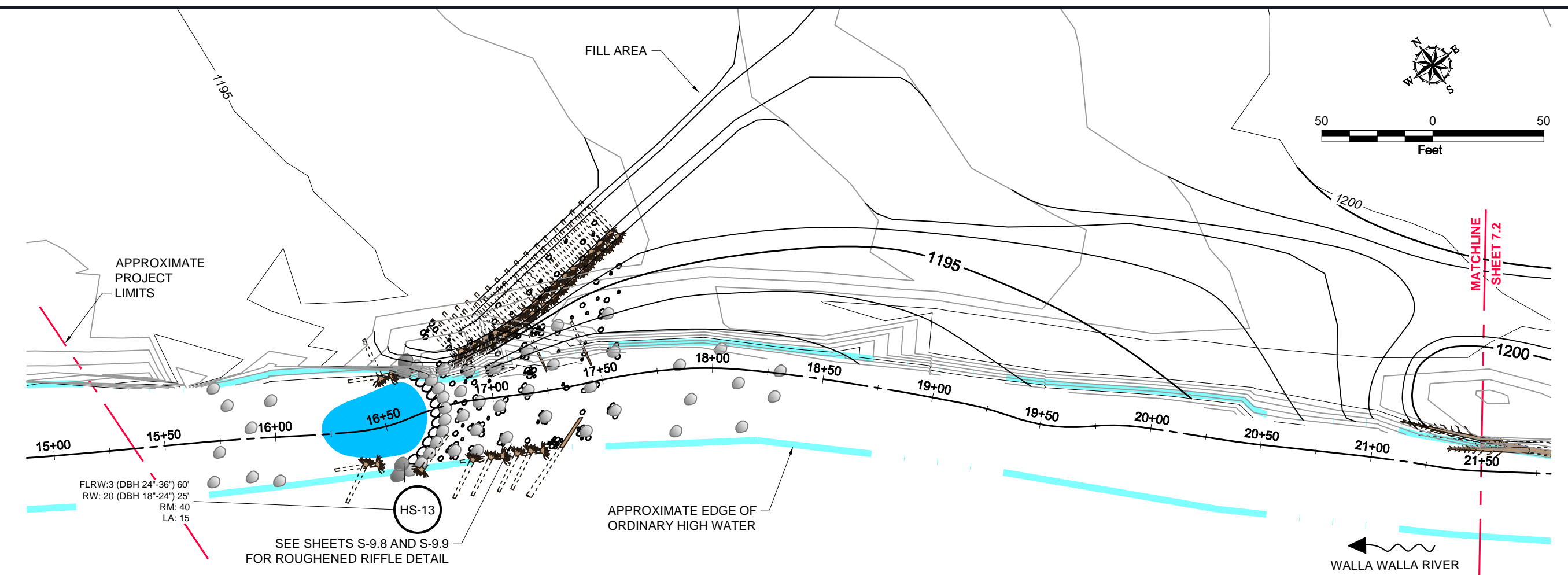
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Sheet Index
 Lampson Construction Drawings

Sheet S-6

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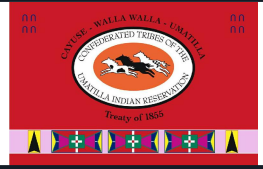


NOTE: Channel profile is a conglomeration of elevations from the US Army Corps of Engineers survey in 1999, the CTUIR survey in 2009, and the Anderson-Perry Survey in 2011.

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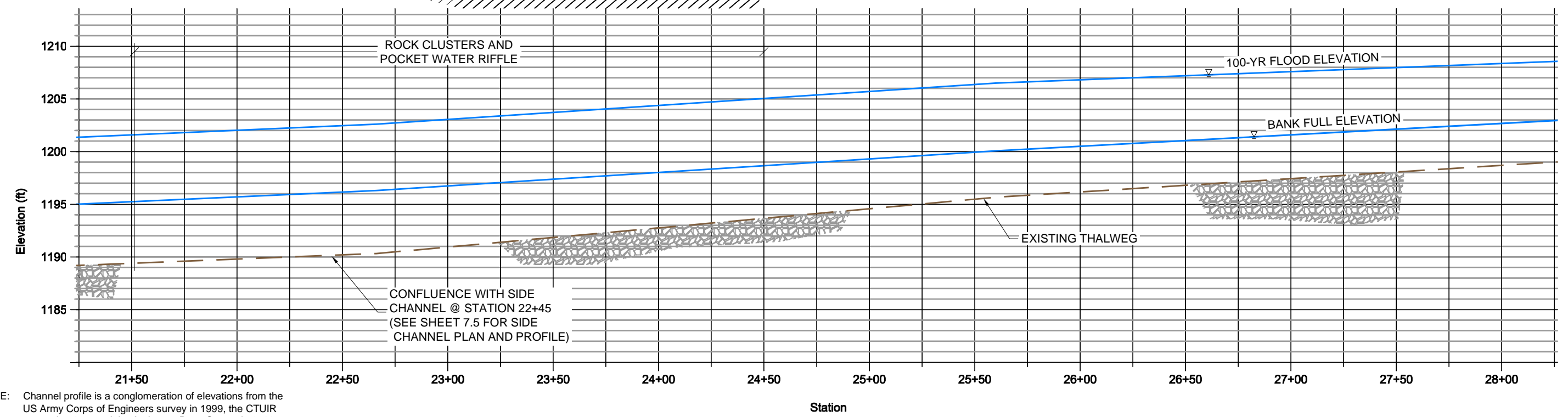
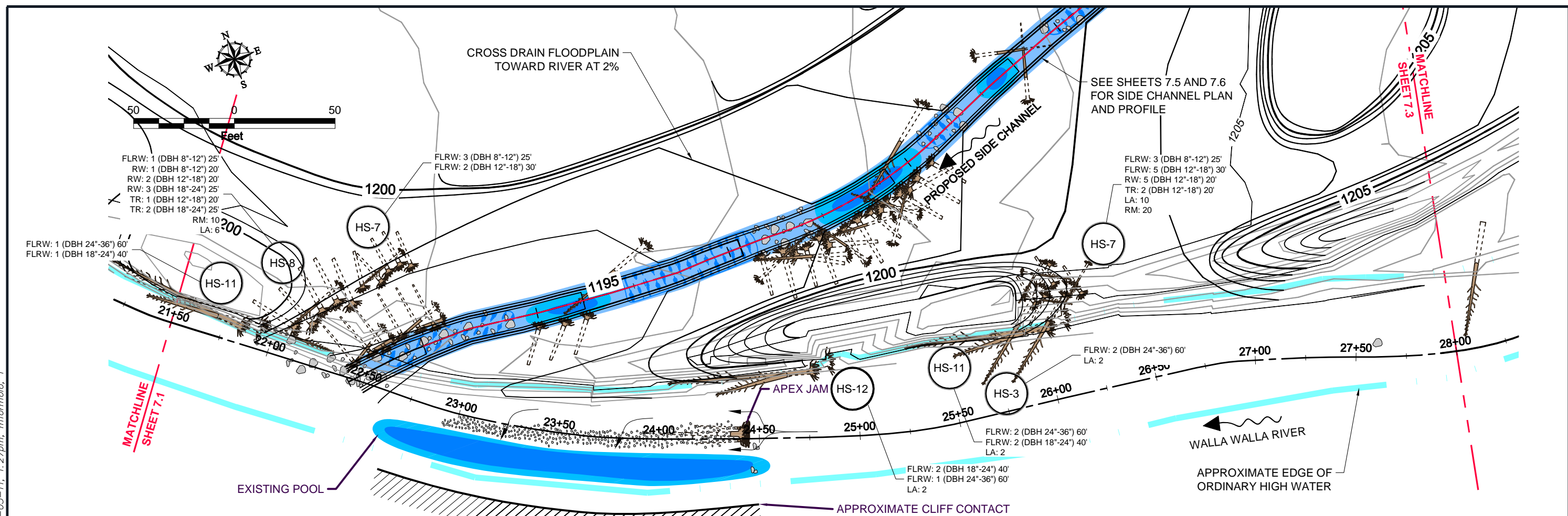


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Proposed Plan and Profile
 Sta. 15+00 to Sta. 21+50
 Lampson Construction Drawings

Sheet
S-7.1

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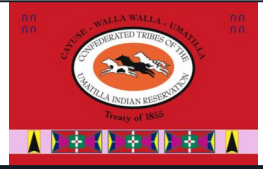


NOTE: Channel profile is a conglomeration of elevations from the US Army Corps of Engineers survey in 1999, the CTUIR survey in 2009, and the Anderson-Perry Survey in 2011.

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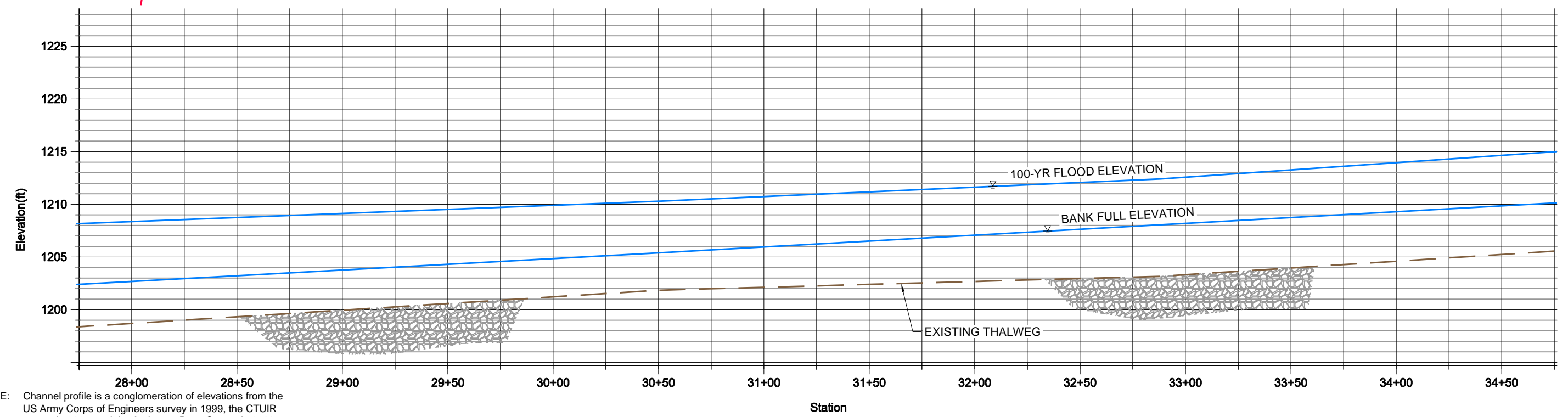
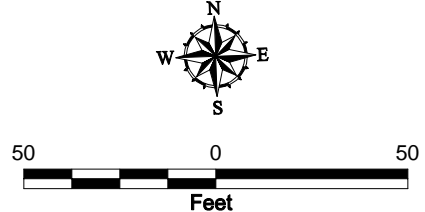
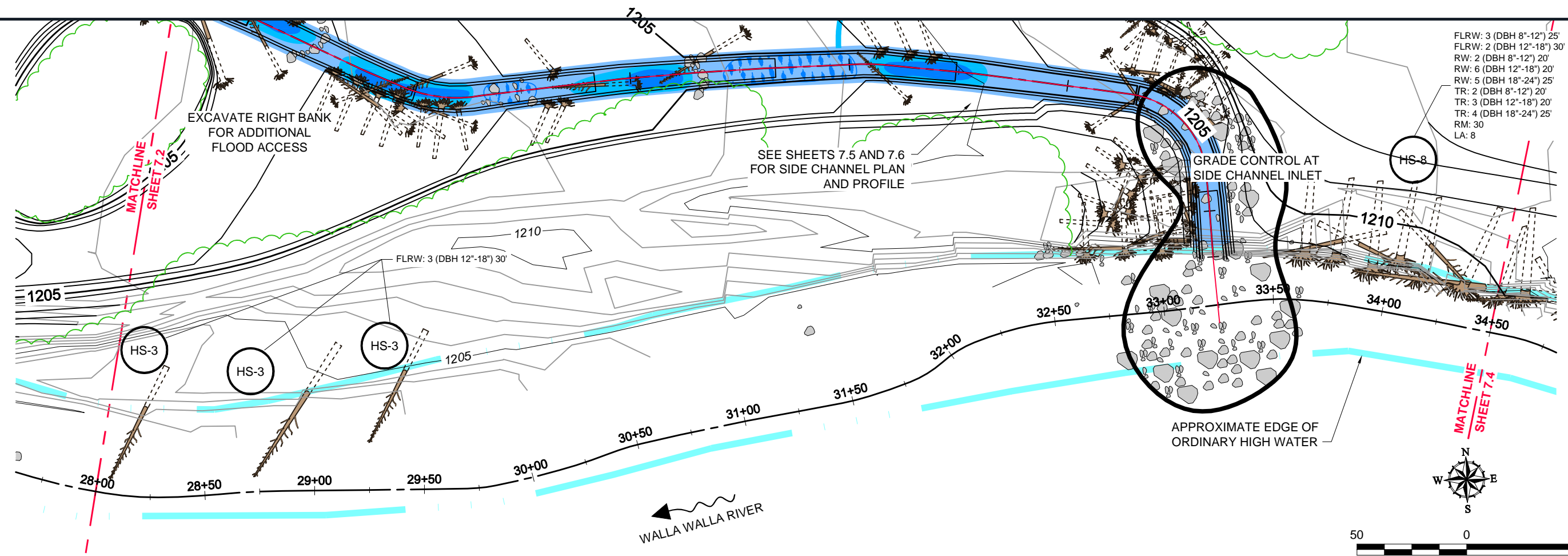


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Proposed Plan and Profile
Sta. 21+50 to Sta. 28+00
Lampson Construction Drawings

Sheet
S-7.2

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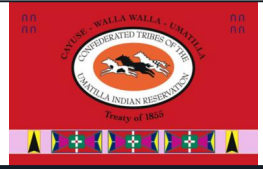


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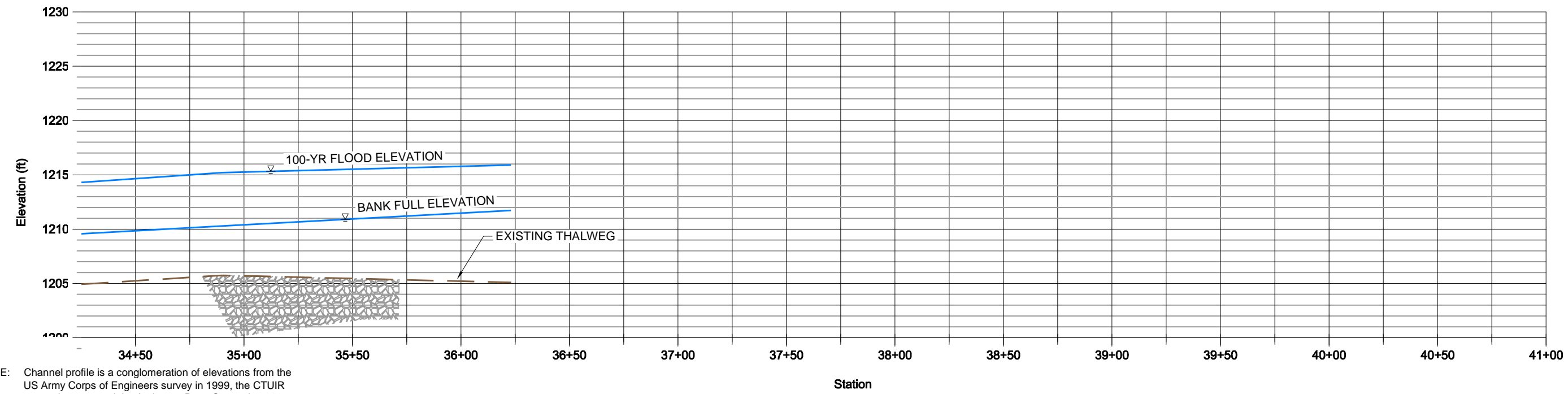
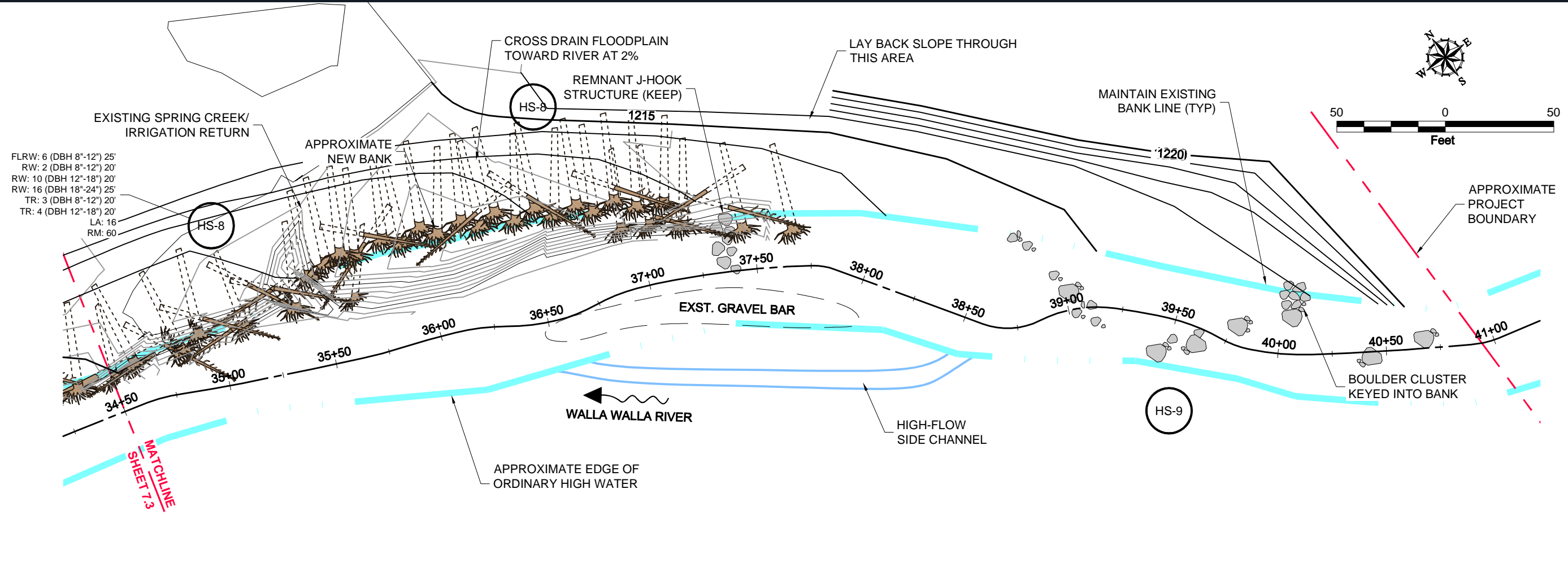
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Proposed Plan and Profile
Sta. 28+00 to Sta. 34+50
Lampson Construction Drawings

Sheet
S-7.3

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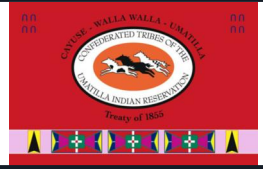


NOTE: Channel profile is a conglomeration of elevations from the US Army Corps of Engineers survey in 1999, the CTUIR survey in 2009, and the Anderson-Perry Survey in 2011.

Revision No:	Date:	Description:	Initials:	Designed:
1	08/01/11	Channel downcut redesign	JJF	JJF
				Drawn: MGF
				Checked: MKH
				Date: 06/27/11
				Project No: 2698-006-02

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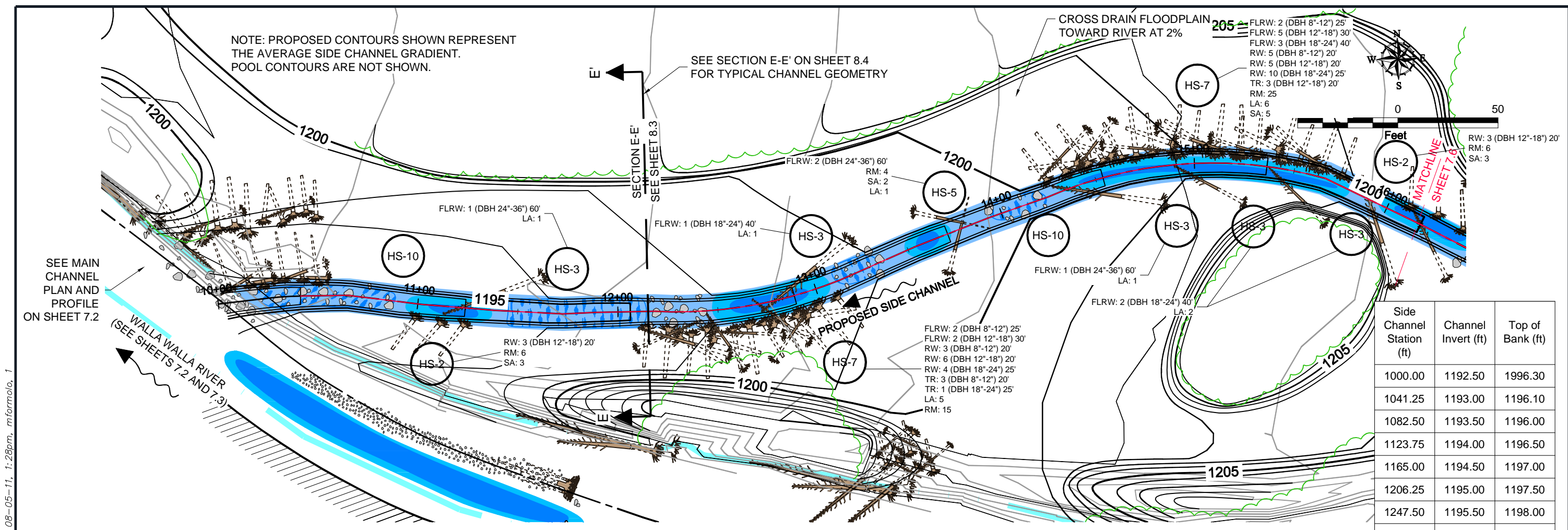
Walla Walla River
 Umatilla County, Oregon
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Proposed Plan and Profile
 Sta. 34+50 to Sta. 41+00
 Lampson Construction Drawings

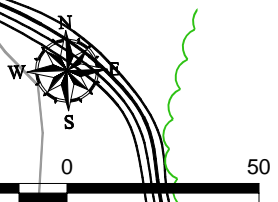
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S-7.4



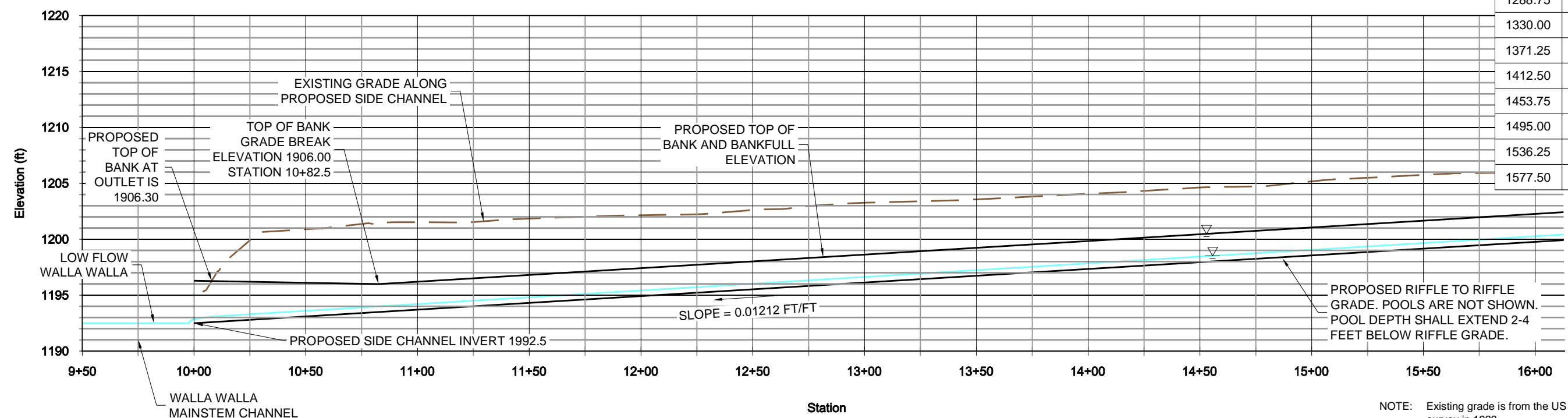
NOTE: PROPOSED CONTOURS SHOWN REPRESENT THE AVERAGE SIDE CHANNEL GRADIENT. POOL CONTOURS ARE NOT SHOWN.

SEE SECTION E-E' ON SHEET 8.4 FOR TYPICAL CHANNEL GEOMETRY

- FLRW: 2 (DBH 8'-12") 25'
- FLRW: 5 (DBH 12'-18") 30'
- FLRW: 3 (DBH 18'-24") 40'
- RW: 5 (DBH 8'-12") 20'
- RW: 5 (DBH 12'-18") 20'
- RW: 10 (DBH 18'-24") 25'
- TR: 3 (DBH 12'-18") 20'
- RM: 25
- LA: 6
- SA: 5



Side Channel Station (ft)	Channel Invert (ft)	Top of Bank (ft)
1000.00	1192.50	1996.30
1041.25	1193.00	1996.10
1082.50	1193.50	1996.00
1123.75	1194.00	1996.50
1165.00	1194.50	1997.00
1206.25	1195.00	1997.50
1247.50	1195.50	1998.00
1288.75	1196.00	1998.50
1330.00	1196.50	1999.00
1371.25	1197.00	1999.50
1412.50	1197.50	2000.00
1453.75	1198.00	2000.50
1495.00	1198.50	2001.00
1536.25	1199.00	2001.50
1577.50	1199.50	2002.00



NOTE: Existing grade is from the US Army Corps of Engineers survey in 1999.

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				Project No: 2698-006-02

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Proposed Side Channel Plan & Profile
Sta. 9+50 to Sta. 16+00
Lampson Construction Drawings

Sheet
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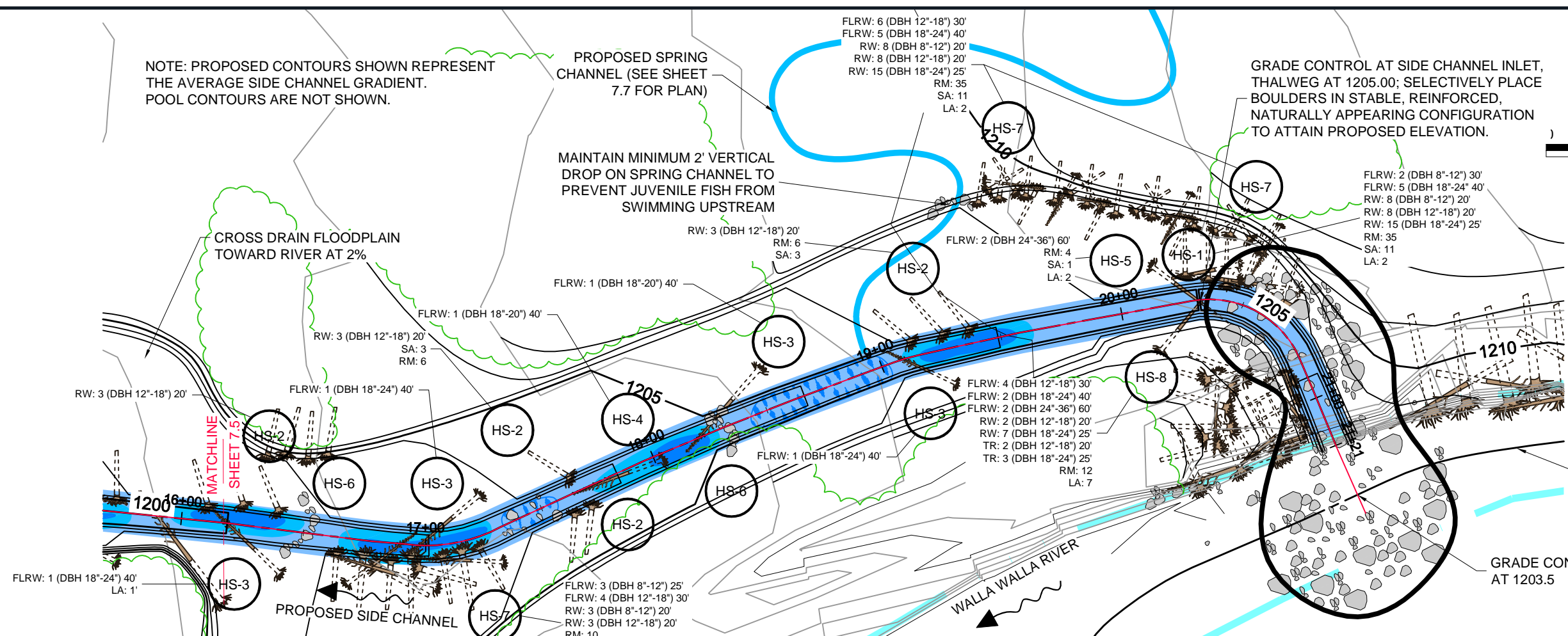
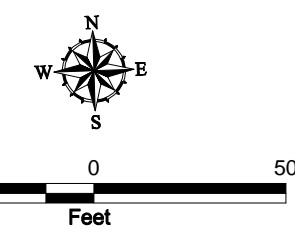
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NOTE: PROPOSED CONTOURS SHOWN REPRESENT THE AVERAGE SIDE CHANNEL GRADIENT. POOL CONTOURS ARE NOT SHOWN.

PROPOSED SPRING CHANNEL (SEE SHEET 7.7 FOR PLAN)

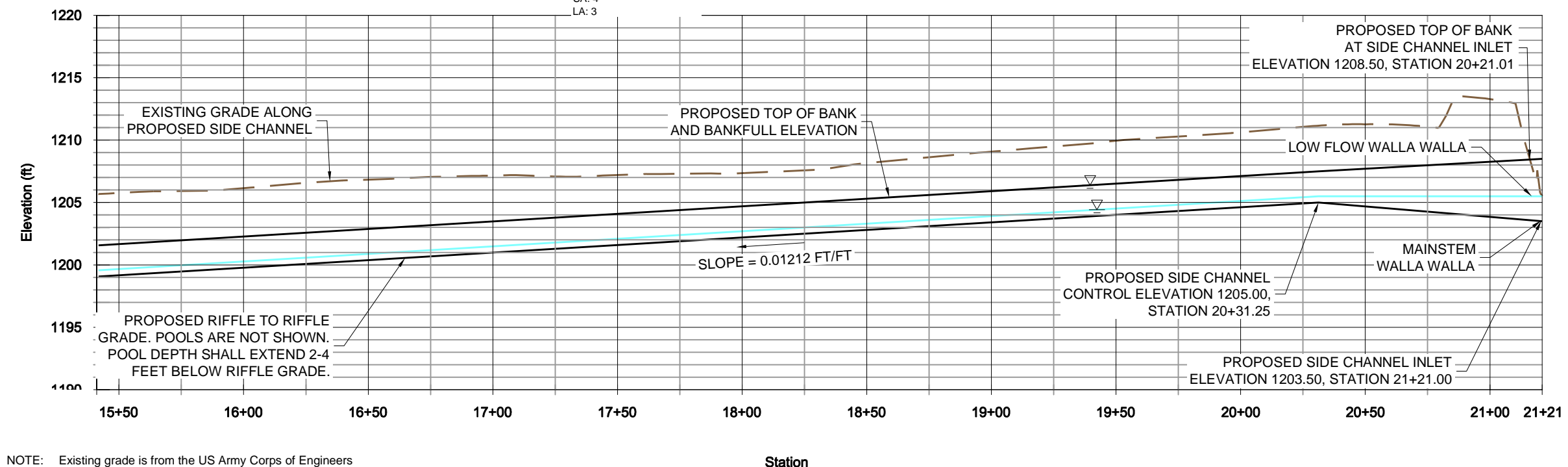
MAINTAIN MINIMUM 2' VERTICAL DROP ON SPRING CHANNEL TO PREVENT JUVENILE FISH FROM SWIMMING UPSTREAM

GRADE CONTROL AT SIDE CHANNEL INLET, THALWEG AT 1205.00; SELECTIVELY PLACE BOULDERS IN STABLE, REINFORCED, NATURALLY APPEARING CONFIGURATION TO ATTAIN PROPOSED ELEVATION.



SEE SHEETS 7.3 AND 7.4 FOR CONTINUATION OF THE MAIN STEM OF THE WALLA WALLA RIVER

GRADE CONTROL ELEVATION AT 1203.5



Side Channel Station (ft)	Channel Invert (ft)	Top of Bank (ft)
1618.75	1200.00	1202.50
1660.00	1200.50	1203.00
1701.25	1201.00	1203.50
1742.50	1201.50	1204.00
1783.75	1202.00	1204.50
1825.00	1202.50	1205.00
1866.25	1203.00	1205.50
1907.50	1203.50	1206.00
1948.75	1204.00	1206.50
1990.00	1204.50	1207.00
2031.25	1205.00	1207.50
2061.00	1204.50	1207.80
2091.00	1204.00	1208.20
2021.00	1203.50	1208.50

NOTE: Existing grade is from the US Army Corps of Engineers survey in 1999.

Revision No:	Date:	Description:	Initials:	Designed:
1	08/01/11	Channel downcut redesign	JJF	JJF
				Drawn: MGF
				Checked: MKH
				Date: 06/27/11
				Project No: 2698-006-02

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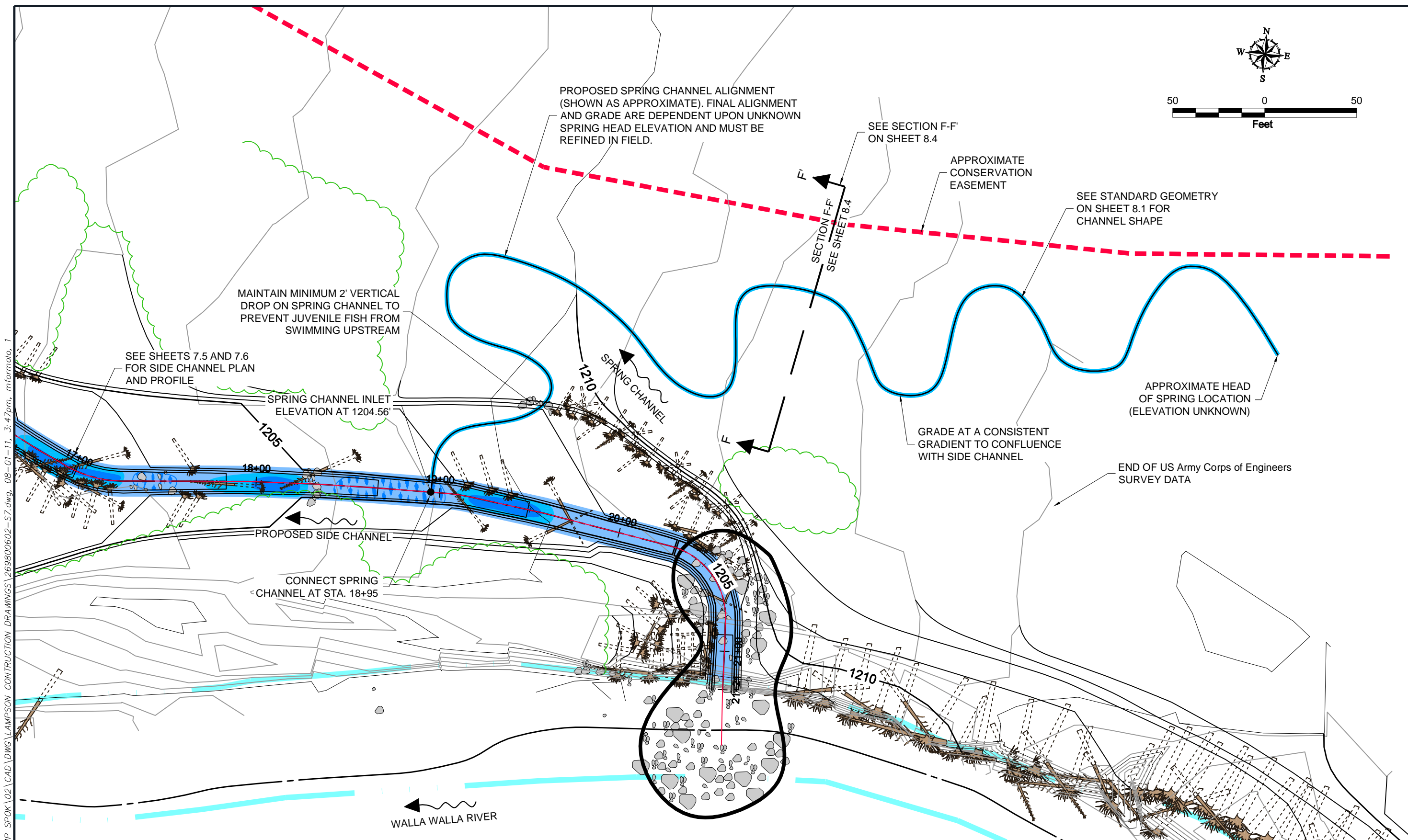
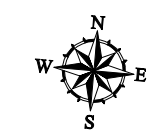
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Proposed Side Channel Plan & Profile
Sta. 15+50 to Sta. 21+21
Lampson Construction Drawings

Sheet
S-7.6



PROPOSED SPRING CHANNEL ALIGNMENT (SHOWN AS APPROXIMATE). FINAL ALIGNMENT AND GRADE ARE DEPENDENT UPON UNKNOWN SPRING HEAD ELEVATION AND MUST BE REFINED IN FIELD.

SEE SECTION F-F' ON SHEET 8.4

APPROXIMATE CONSERVATION EASEMENT

SEE STANDARD GEOMETRY ON SHEET 8.1 FOR CHANNEL SHAPE

MAINTAIN MINIMUM 2' VERTICAL DROP ON SPRING CHANNEL TO PREVENT JUVENILE FISH FROM SWIMMING UPSTREAM

SEE SHEETS 7.5 AND 7.6 FOR SIDE CHANNEL PLAN AND PROFILE

SPRING CHANNEL INLET ELEVATION AT 1204.56'

APPROXIMATE HEAD OF SPRING LOCATION (ELEVATION UNKNOWN)

GRADE AT A CONSISTENT GRADIENT TO CONFLUENCE WITH SIDE CHANNEL

END OF US Army Corps of Engineers SURVEY DATA

PROPOSED SIDE CHANNEL

CONNECT SPRING CHANNEL AT STA. 18+95

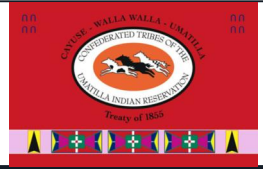
WALLA WALLA RIVER

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Revision No:	Date:	Description:	Initials:	Designed:
1	08/01/11	Channel downcut redesign	JJF	Drawn: MGF
				Checked: MKH
				Date: 06/27/11
				Project No: 2698-006-02

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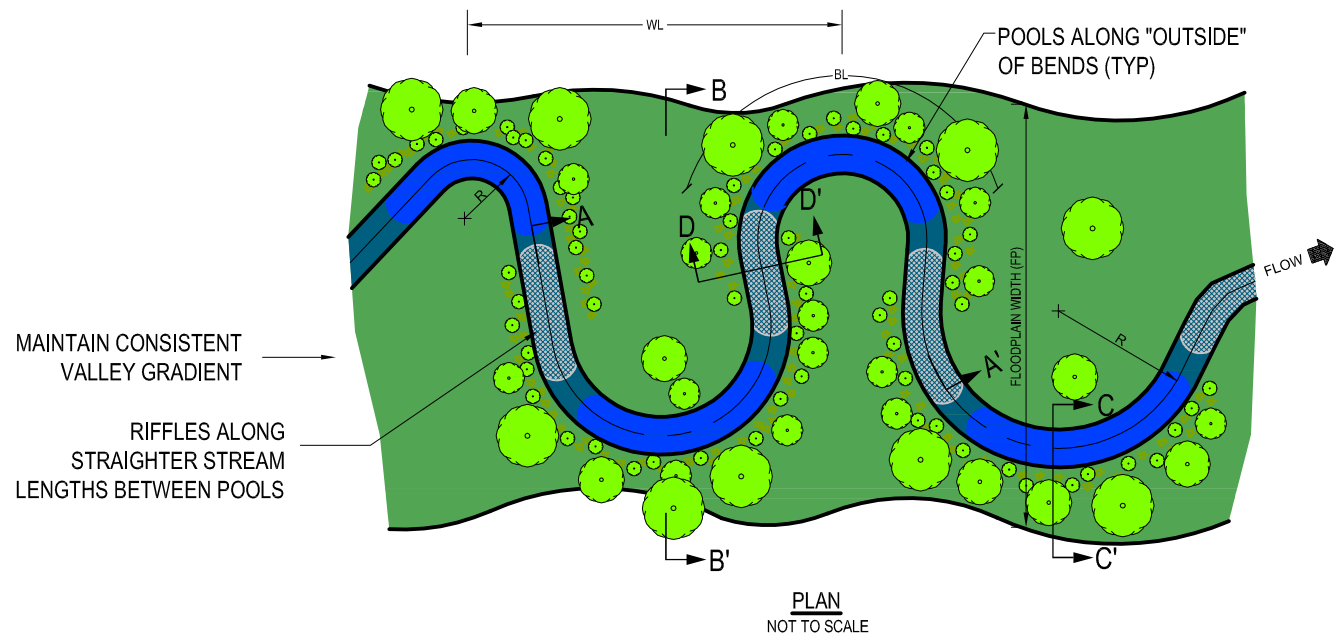


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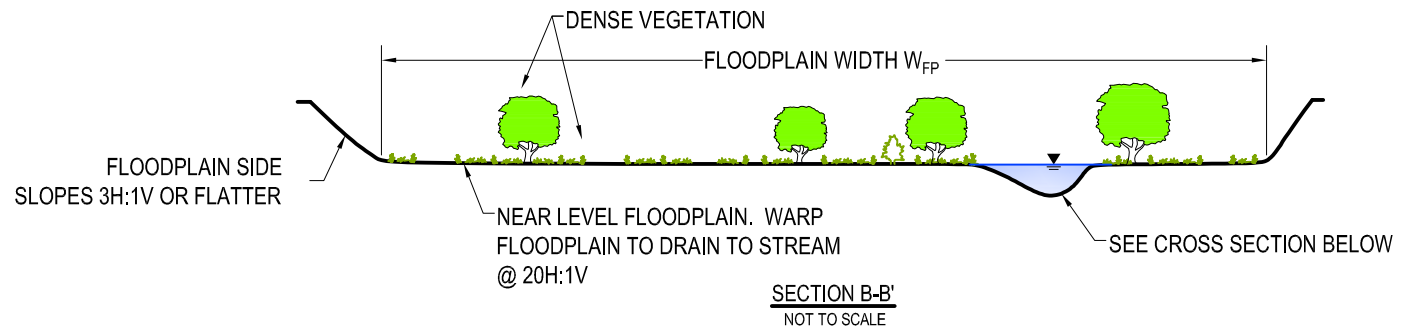
Proposed Spring Channel Plan
Lampson Construction Drawings

Sheet S-7.7

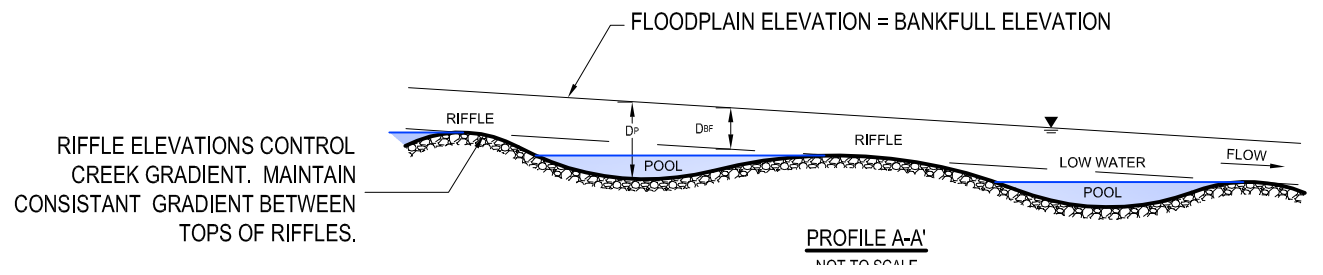
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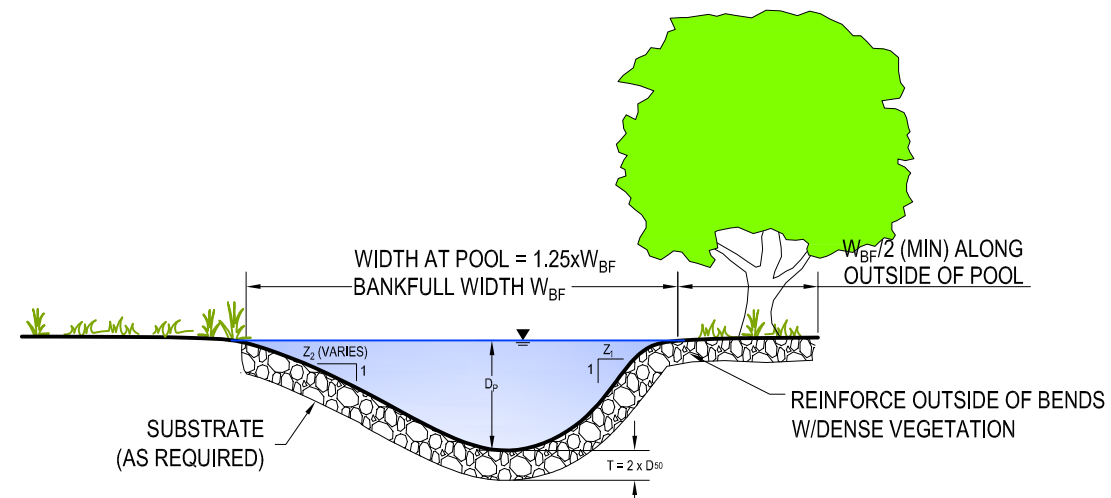
PLAN
NOT TO SCALE



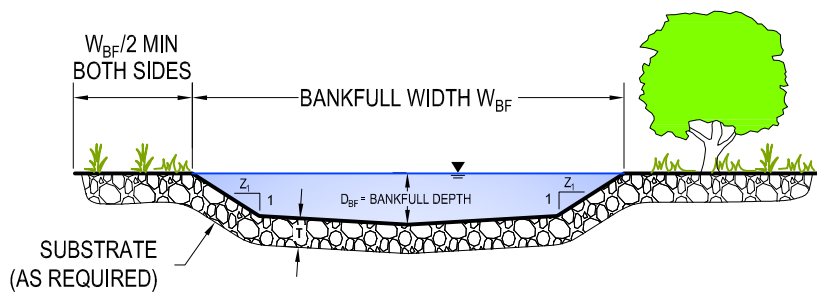
SECTION B-B'
NOT TO SCALE



PROFILE A-A'
NOT TO SCALE



SECTION C-C' (AT POOL)
NOT TO SCALE



SECTION D-D' (AT RIFFLE)
NOT TO SCALE

Side Channel		Spring Channel	Stream Geometry/Parameters
C3			= Rosgen Stream Type
1.12			= Sinuosity
6			= Width / Depth Ratio
21			= Minimum Entrenchment Ratio
0.0101			= Average Valley Gradient (ft/ft)
0.0107			= Average Creek Gradient (ft/ft)
1,000			= Valley Length (ft)
1,119			= Creek Length (ft)
105			= Bankfull Discharge (cfs)
6,232			= 100-Year Flood Discharge (cfs)
3.7			= Average Bankfull Velocity (fps)
15.00			= W _{BF} = Bankfull Width (ft)
2.40			= D _{BF} = Bankfull Depth (At Riffle) (ft)
6.10			= D _p = Pool Depth at Bankfull Flow (ft) (Ranges from 2.0D _{BF} to 3.5D _{BF})
1.25			= Z ₁ = Channel Sideslope (Horizontal Ratio)
2.5			= Z ₂ = Channel Sideslope on Inside of Bend, Approximate (Horizontal Ratio)
3.00			= D ₁₆ = Riffle Substrate Size (in) (16% of material this size or smaller)
6.00			= D ₅₀ = Riffle Substrate Size (in) (50% of material this size or smaller)
8.00			= D ₈₄ = Riffle Substrate Size (in) (84% of material this size or smaller)
9.00			= D ₁₀₀ = Riffle Substrate Size (in) (100% of material this size or smaller)
12.0			= T = Minimum Substrate Layer thickness (in)
130	500		= WL = Range of Acceptable Meander Wavelengths (ft)
85	330		= BL = Range of Bend Length (ft)
70	310		= FP = Range of Acceptable Minimum Floodplain Widths (ft)
25	90		= R = Range of Acceptable Radii of Curvature (ft)
40	250		= P/P = Range of Acceptable Pool To Pool Spacing (ft)

See Typical Section on Sheet 8.4

- NOTES:
1. STREAM AND FLOODPLAIN SHALL BE CONSTRUCTED TO MEET THESE GEOMETRIES.
 2. CONSTRUCT FLOODPLAIN FIRST. MAKE FLOODPLAIN LEVEL FROM SIDE TO SIDE. EXCAVATE BANKFULL SIDE CHANNEL SECOND. PLACE SOIL FROM CHANNEL ON FLOODPLAIN. GRADE FLOODPLAIN TO CREEK AT 20H:1V (MAX) SLOPE. GRADE TO APPEAR NATURAL. GRADE FLOODPLAIN WITH GENTLE HIGH AND LOW SPOTS.
 3. PLANT STREAMBANKS AND FLOODPLAINS AS SPECIFIED IN PLANTING PLAN.
 4. ADD TREES, WOOD HABITAT STRUCTURES TO CREEK TO INCREASE CHANNEL ROUGHNESS.

Revision No:	Date:	Description:	Initials:	Designed: JJF
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				Project No: 2698-006-02

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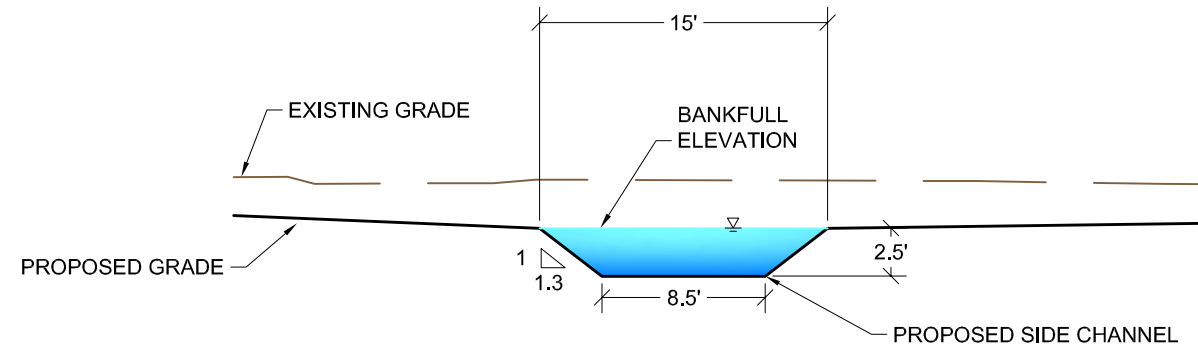
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Typical Channel Geometry
Lampson Construction Drawings

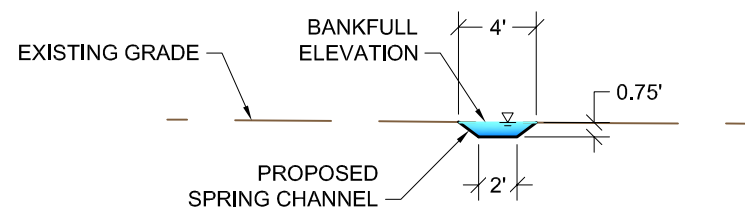
Sheet S-8.1

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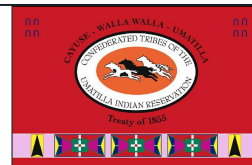
Typical Side Channel Cross Section
NTS



Typical Spring Channel Cross Section
NTS

Revision No:	Date:	Description:	Initials:	Designed: JJF
1	08/01/11	Channel downcut redesign	JJF	Drawn: MGF
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				Date: 06/27/11
				Project No: 2698-006-02

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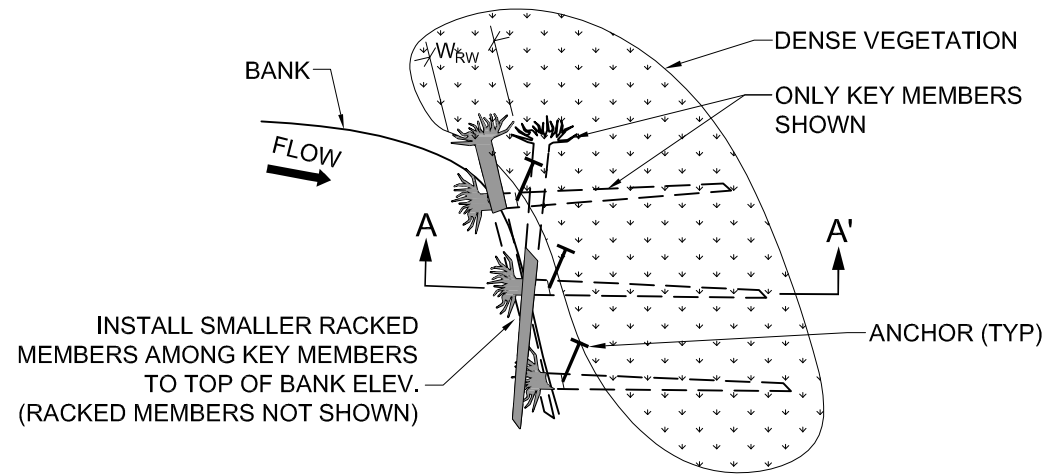
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Typical Sections
Lampson Construction Drawings

Sheet
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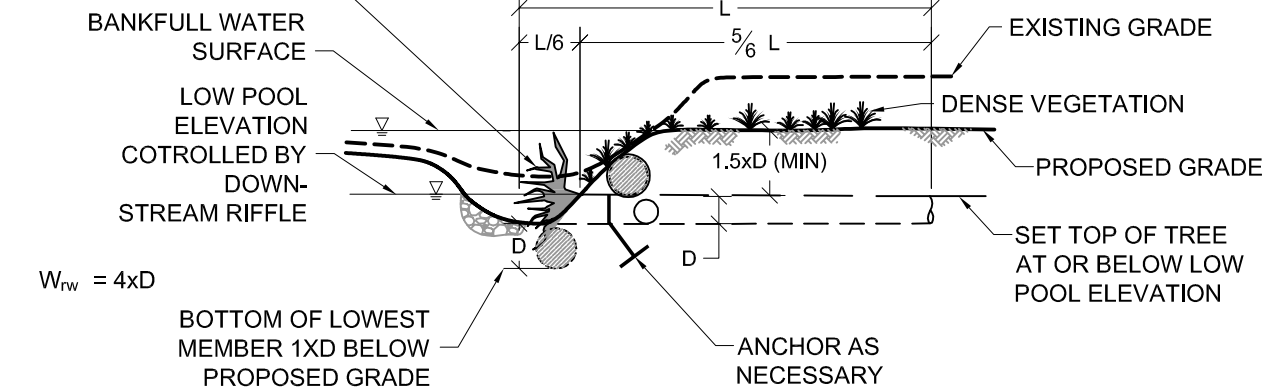
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HS-1 **TYPICAL MEANDER JAM DETAIL PLAN**
NOT TO SCALE

INSTALL SMALLER RACKED MEMBERS AMONG KEY MEMBERS (RACKED MEMBERS NOT SHOWN)



A-A' **TYPICAL MEANDER JAM DETAIL SECTION A-A'**
NOT TO SCALE

NOTES:

Purpose:

- Limit channel migration, protect banks, restore aquatic and riparian habitat.
- Enhances fish habitat: creates large bankside pools for fish holding and sediment sorting.

Design Specifics:

- Top of rootwad (roots) should not extend more than 1/2-ft above top of bank.
- Bottom members shall extend below calculated scour depth. (min 1XD below proposed grade)
- Place along outsides of channel bends.
- Relatively large "Key Members" secured into banks with backfill (and/or anchors).
- Smaller "Racked Members" wedged between Key Members.
- Fill voids along bank w/ slash
- Jam designed to collect more debris over time.
- Backfill with Stream Substrate & plant dense vegetation on top to bank.
- Install vegetation among armoring and root wads while installing members.
- Irrigate vegetation as required.
- 1/2 of key members require anchors.
- See quantity table for member sizes.

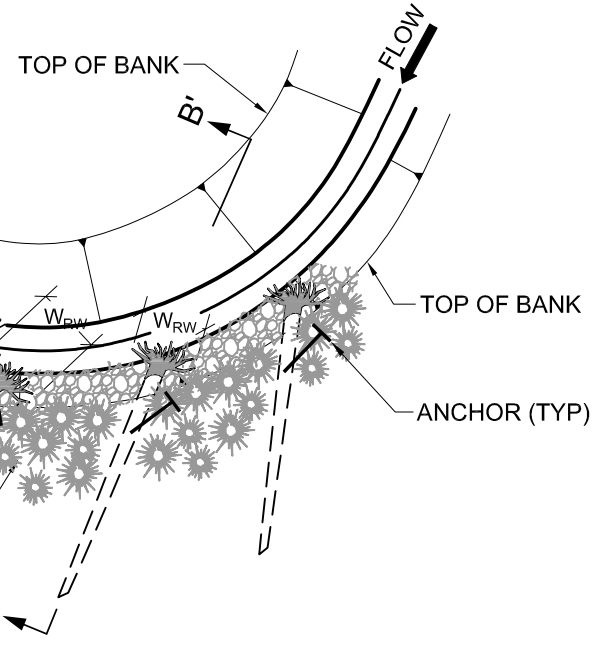
Revision No:	Date:	Description:	Initials:	Designed: JJF
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				Project No: 2698-006-02

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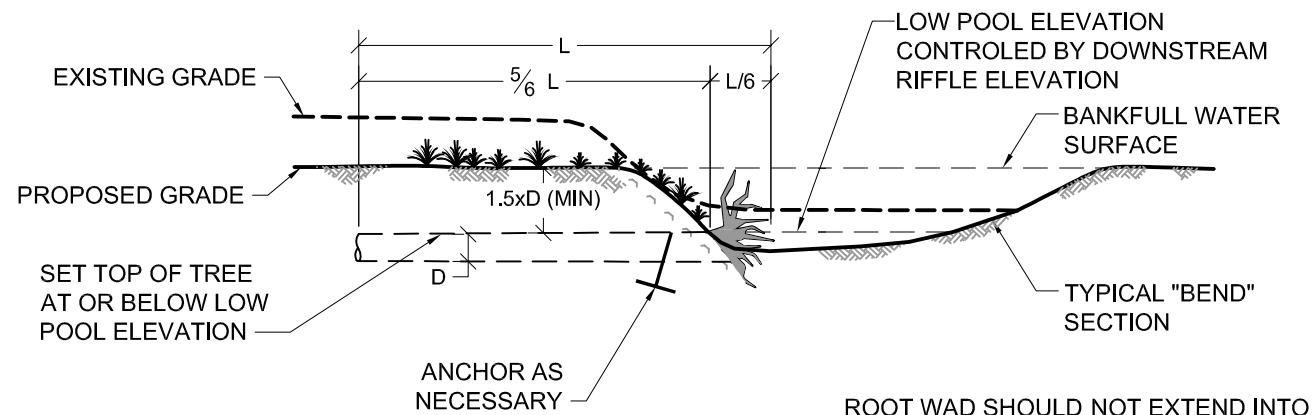
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HS-2 **TYPICAL ROOT WAD DETAIL PLAN**
NOT TO SCALE



B-B' **TYPICAL ROOT WAD DETAIL SECTION B-B'**
NOT TO SCALE

NOTES:

Purpose:

- Increases pool depth.
- Inhibits lateral migration.
- Prevents bank erosion.

Design Specifics:

- Orient root wads so the creek's flow attacks them "head on" as much as possible. Anchors should be oriented towards flow.
- Top of rootwad (roots) should not extend more than 1/2-ft above top of bank.
- Members shall extend below calculated scour depth.
- Place root wads along outside of bends.
- Install vegetation among armoring and root wads while installing root wads.
- Irrigate vegetation as required.
- Rootwad diameter = Pool Depth. If greater than depth, bury deeper.
- All members require anchors.
- See quantity table for member sizes.

ROOT WAD SHOULD NOT EXTEND INTO THE CREEK BEYOND THE TOE OF BANK

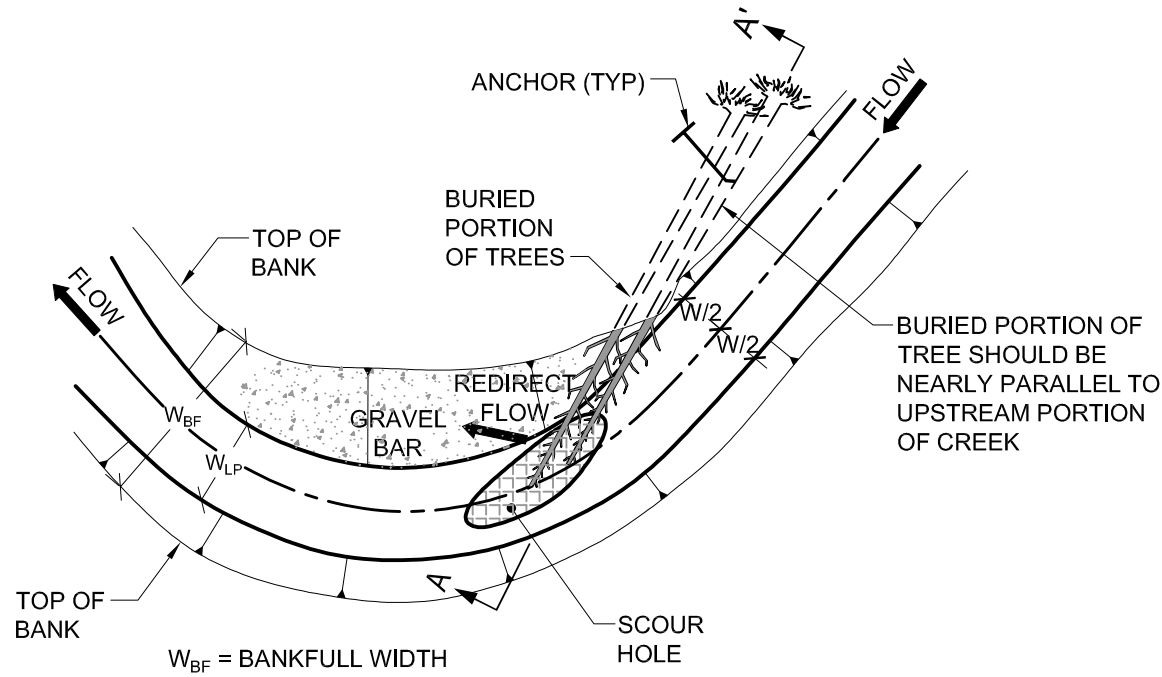
Typical Details

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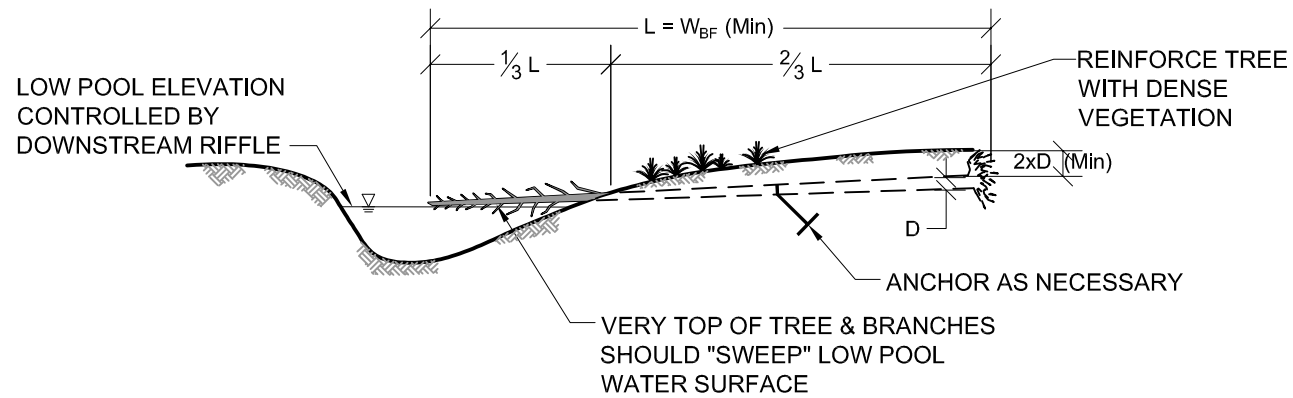
Sheet
S-9.1

MKH : MGF

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HS-3 **TYPICAL SWEEPER DETAIL PLAN**
NOT TO SCALE



A-A' **TYPICAL SWEEPER DETAIL SECTION A-A'**
NOT TO SCALE

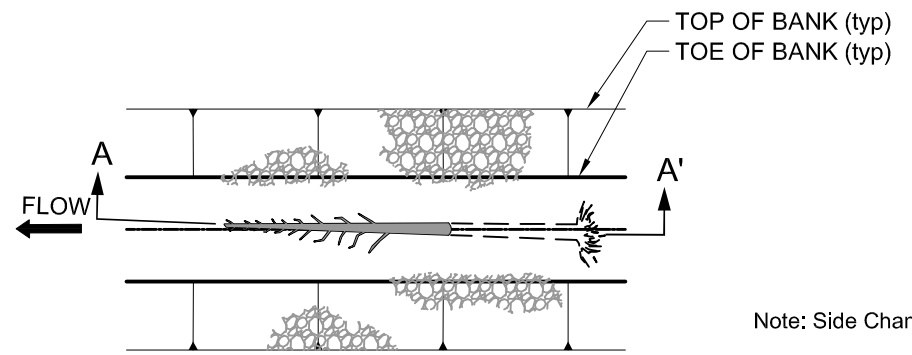
NOTES:

Purpose:

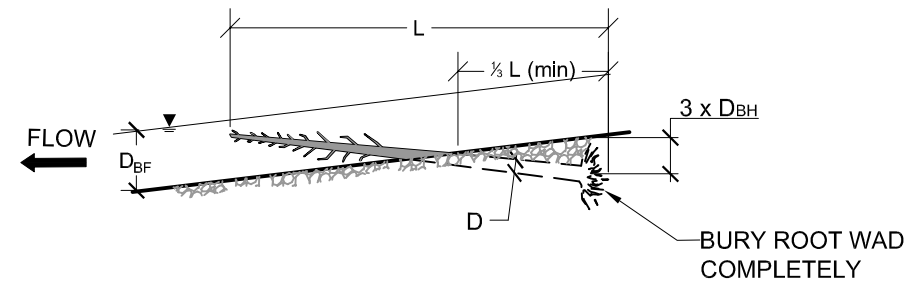
- Redirects flow.
- Creates scour holes.
- Encourages gravel deposition.

Design Specifics:

- Bury at least 2/3 of the tree length and root wad or secure "dry" end of log with anchors.
- Place sweeper at upstream end of bend along smaller streams.
- Trees with branches or multiple trunks preferred.
- All sweepers require anchors.
- See quantity table for member sizes.



HS-4 **TYPICAL BURIED SNAG DETAIL PLAN**
NOT TO SCALE



A-A' **TYPICAL BURIED SNAG DETAIL SECTION A-A'**
NOT TO SCALE

NOTES:

Purpose:

- Slows creek velocity.
- Creates diverse fish habitat.
- Encourages sediment sorting.

Design Specifics:

- Tree length (L) and diameter (D) may vary (smaller snags are acceptable).
- Place/locate snag as shown on plans and/or as directed in field.
- Snags may be parallel or angled to flow.
- Trees with branches and/or multiple trunks preferred.
- Root wads may be placed on top of channel if anchored.
- See quantity table for member sizes.

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				Project No: 2698-006-02

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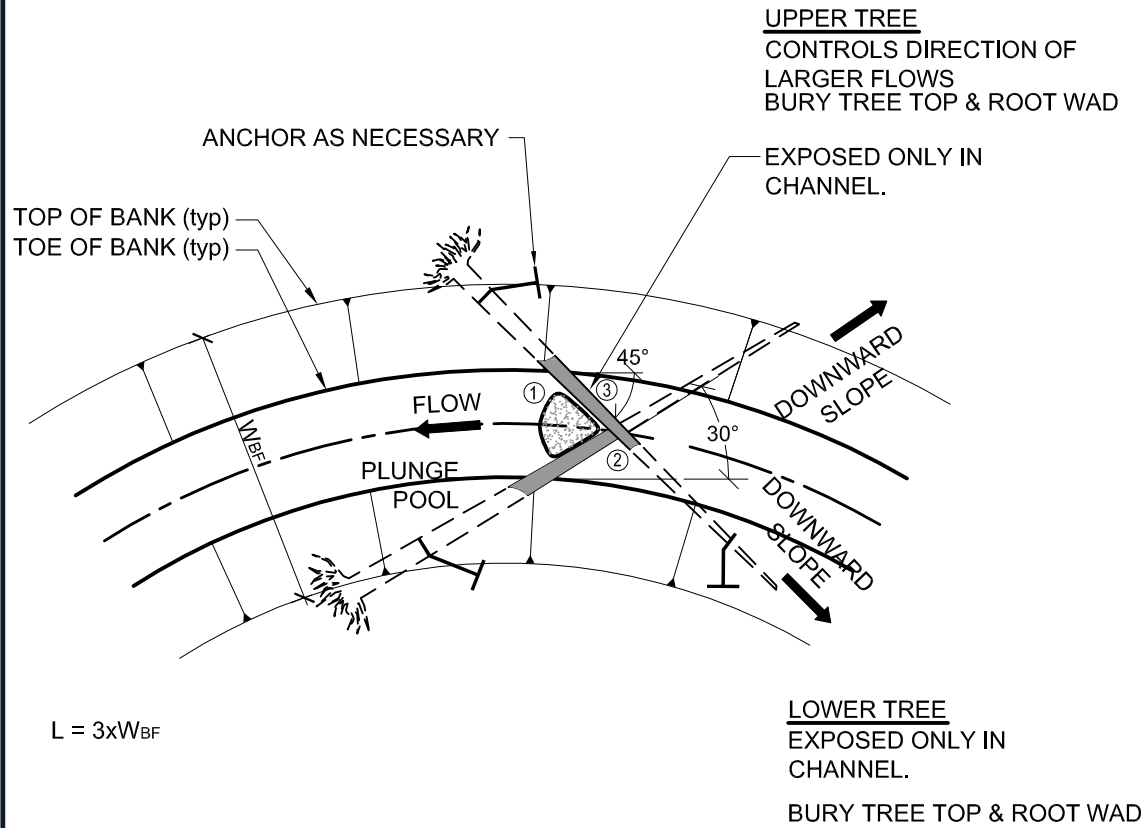
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Typical Details
Lampson Construction Drawings

Sheet
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MKH : MGF

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HS-5 **TYPICAL STEP TURN DETAIL PLAN**
NOT TO SCALE

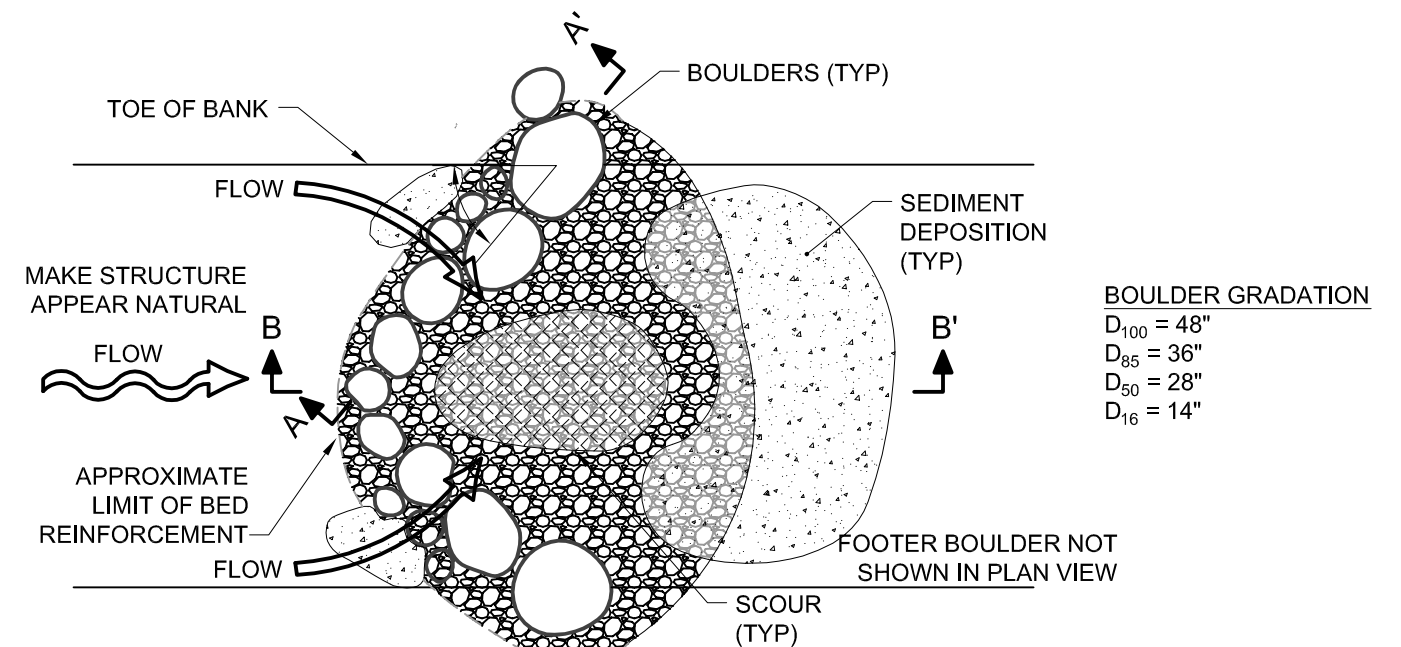
NOTES:

Purpose:

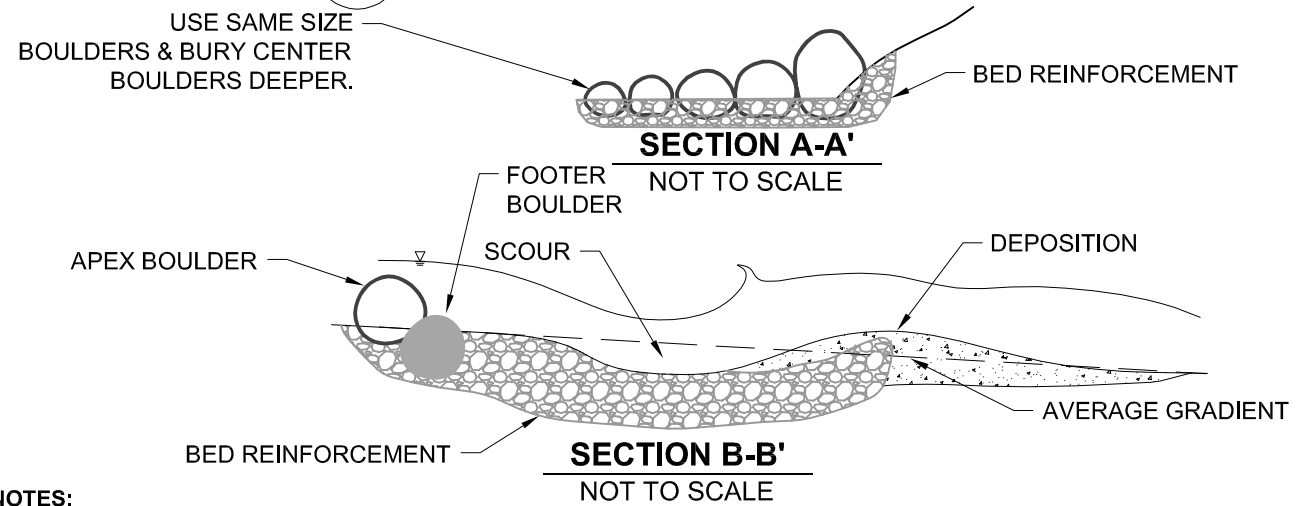
- Redirects flow.
- Creates scour holes.
- Appropriate in steeper reaches.

Design Specifics:

- Step 1 is a plunge pool.
- Step 1 is lower than step 2 (6" max).
- Step 2 is lower than step 3 (6" max).
- Notch intersection of trees and secure with chain (if necessary).
- Exposed portion of tree = 1/4 L (L = tree length).
- Secure trees with anchors, (3 min).
- L = 3 x WBF (min).
- Backfill upstream portions of structure (steps 2 and 3) with larger rock, small trees and branches to prevent flow under trees.
- Maximum total step height = 12"
- Bury upstream portion of trees deeper into channel bed (downward sloping in upstream direction).
- Place turning step at upstream end of pool/bend.
- Use only in small streams or side channels. (side channel only)
- See quantity table for member sizes.



HS-6 **TYPICAL BOULDER CLUSTER DETAIL PLAN**
NOT TO SCALE



NOTES:

Purpose:

- Enhances fish habitat: creates large mid-stream pools, fish holding in eddies and sorts sediment.
- Directs flow for full range of flow.

Design Specifics:

- Generally large, stream-wide structure with center coincident with channel centerline or thalweg.
- Use same size boulders & bury center boulders deeper.
- "Upstream Vee" configuration directs water to center of channel.

- Key largest Boulders into bank so they do not overtop or become "out-flanked" during flood flows.
- Plant dense vegetation along banks.
- Reinforce channel bed with footer boulders and cobbles to prevent scour at/below boulders.
- Place structure upstream of bends or upstream of desired stream-wide pools locations.

Variations:

- Large woody debris may be wedged between boulders. (Jam rootwads between boulders with tree bole hanging downstream as a sweeper for added fish habitat.)
- "Single Vane" structures may be used to direct water away from bank.
- Relatively large but stable cobbles may be used in lieu of boulders in smaller, cobble dominated streams.

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1	08/01/11	Channel downcut redesign	JJF	Drawn: MGF
				Checked: MKH
				Date: 06/27/11
				Project No: 2698-006-02

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Walla Walla River
Umatilla County, Oregon
Confederated Tribes of the
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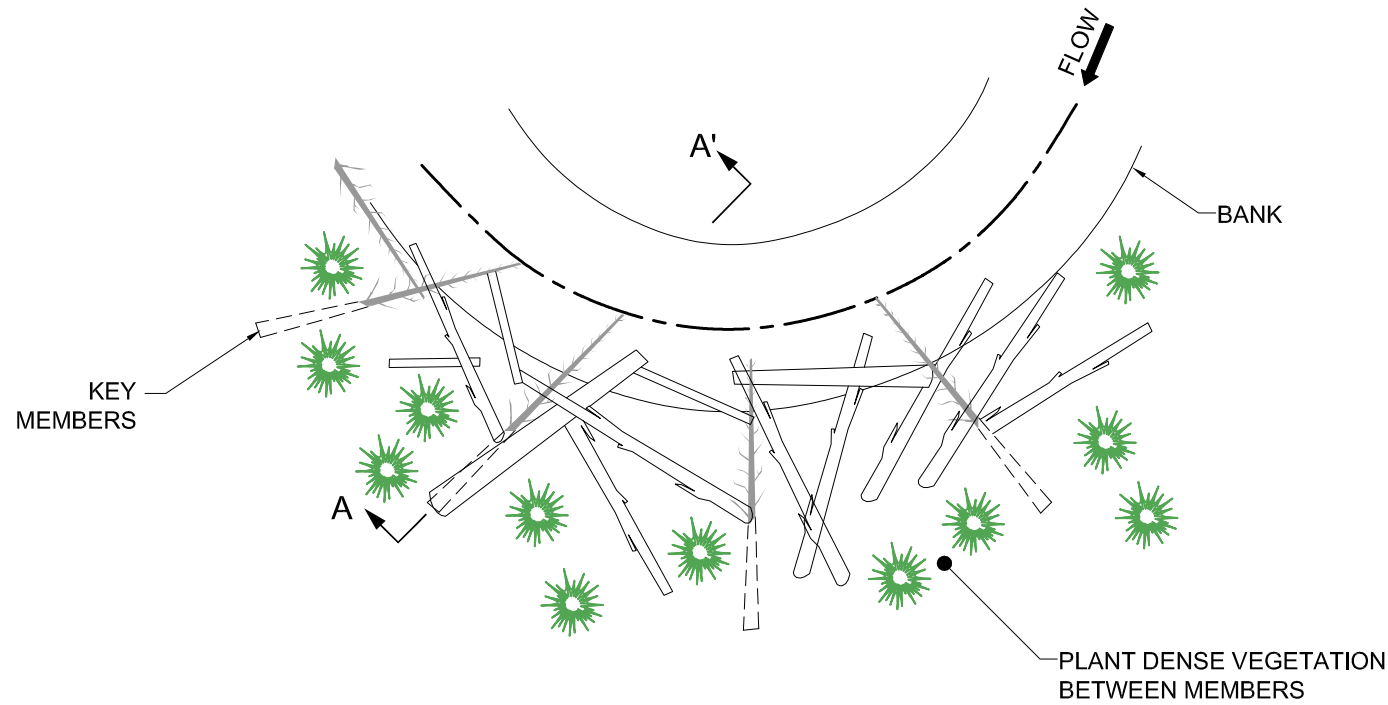
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Lampson Construction Drawings

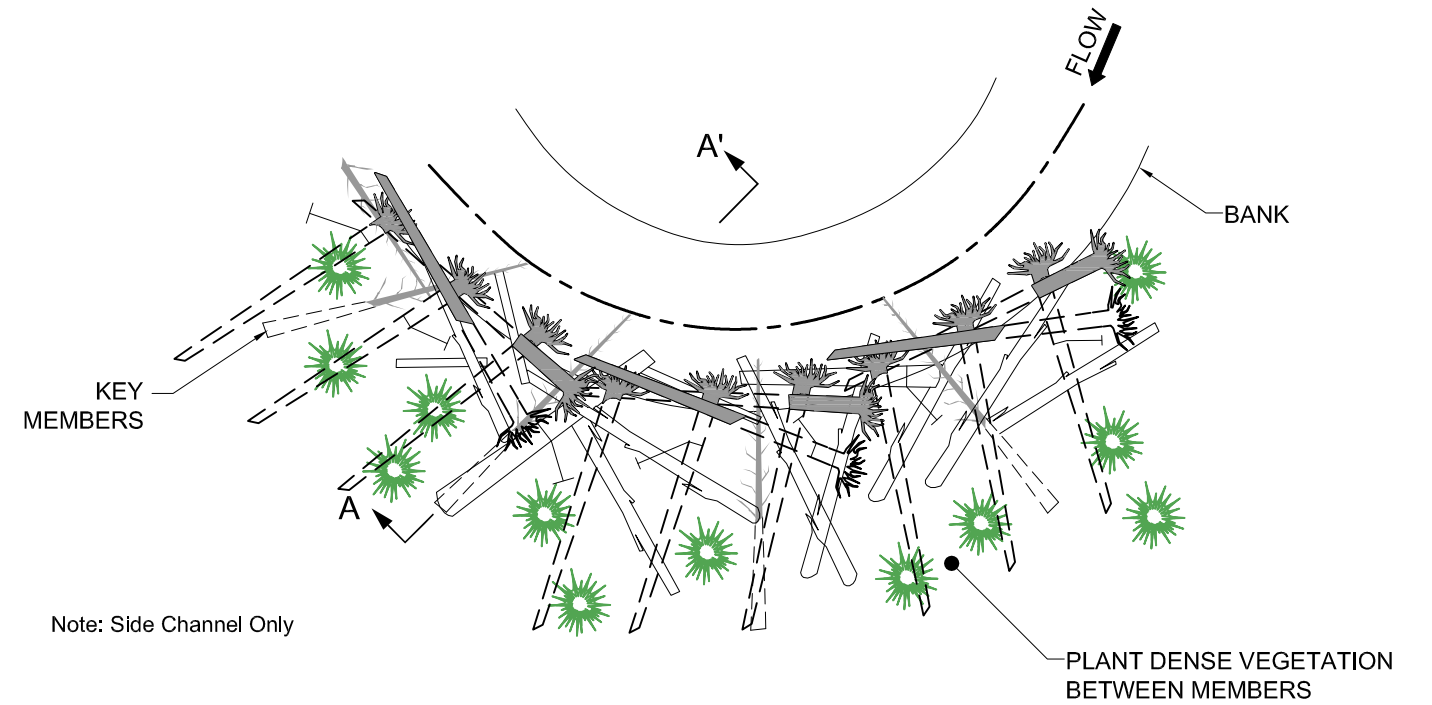
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MKH : MGF

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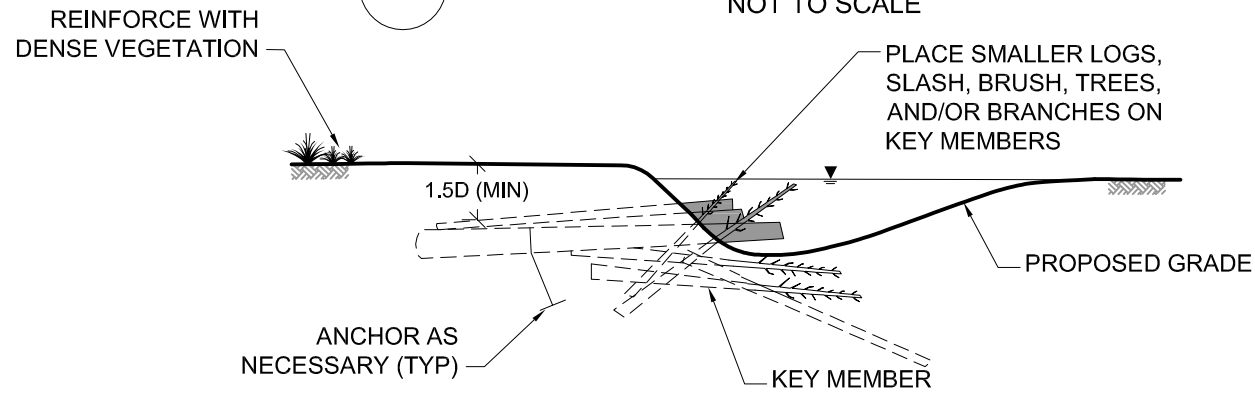


HS-7 TYPICAL SMALL WOODY DEBRIS DETAIL PLAN
NOT TO SCALE

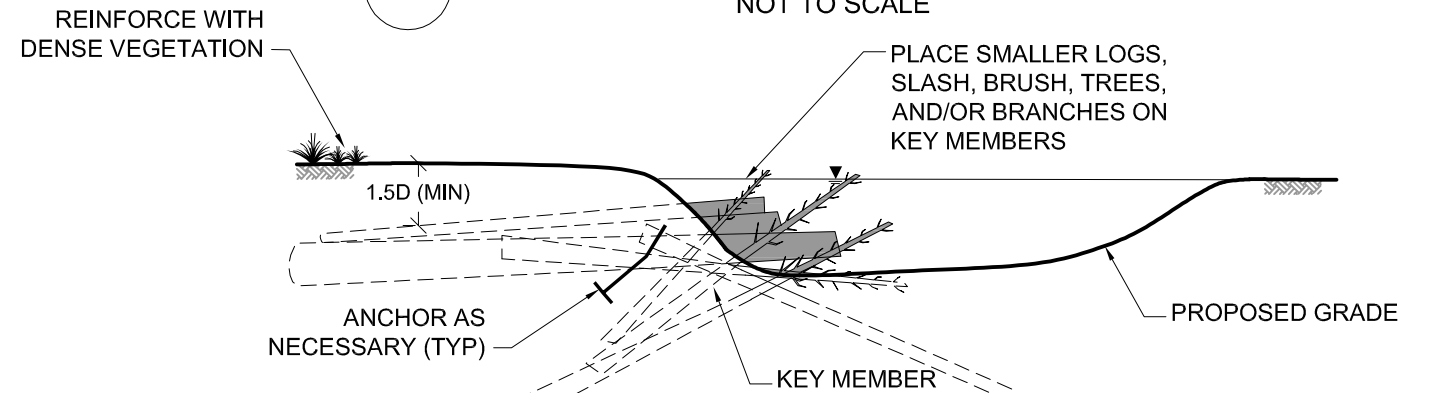


HS-8 TYPICAL LARGE WOODY DEBRIS DETAIL PLAN
NOT TO SCALE

Note: Side Channel Only



A-A' TYPICAL WOODY DEBRIS DETAIL SECTION A-A'
NOT TO SCALE



A-A' TYPICAL WOODY DEBRIS DETAIL SECTION A-A'
NOT TO SCALE

NOTES:

Purpose:

- Increases stream diversity.
- Provides fish habitat and cover.
- Decreases bank erosion.
- Mimics natural stream structures.

Design Specifics:

- Use only in side channel
- Use medium to small logs (8" TO 18" DBH).
- Bury at least 3/4 the length of the key members in the bank.
- Bottom members shall extend below calculated scour depth.
- Place similarly sized logs randomly on and between key members. Members may be tied together with rope.
- Bury brush, slash, branches, and other woody debris among the larger members.
- Reinforce area with dense vegetation between woody debris.
- 1/2 of key members require anchors.
- See quantity table for member sizes.

NOTES:

Purpose:

- Increases stream diversity.
- Provides fish habitat and cover.
- Decreases bank erosion.
- Mimics natural stream structures.

Design Specifics:

- Use large logs (18" TO 30" DBH).
- Bury at least 3/4 the length of the key members in the bank.
- Bottom members shall extend below calculated scour depth.
- Place similarly sized logs randomly on and between key members. Members may be tied together with rope.
- Bury brush, slash, branches, and other woody debris among the larger members.
- Reinforce area with dense vegetation between woody debris.
- 1/2 of key members require anchors
- See quantity table for member sizes.

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				Project No: 2698-006-02

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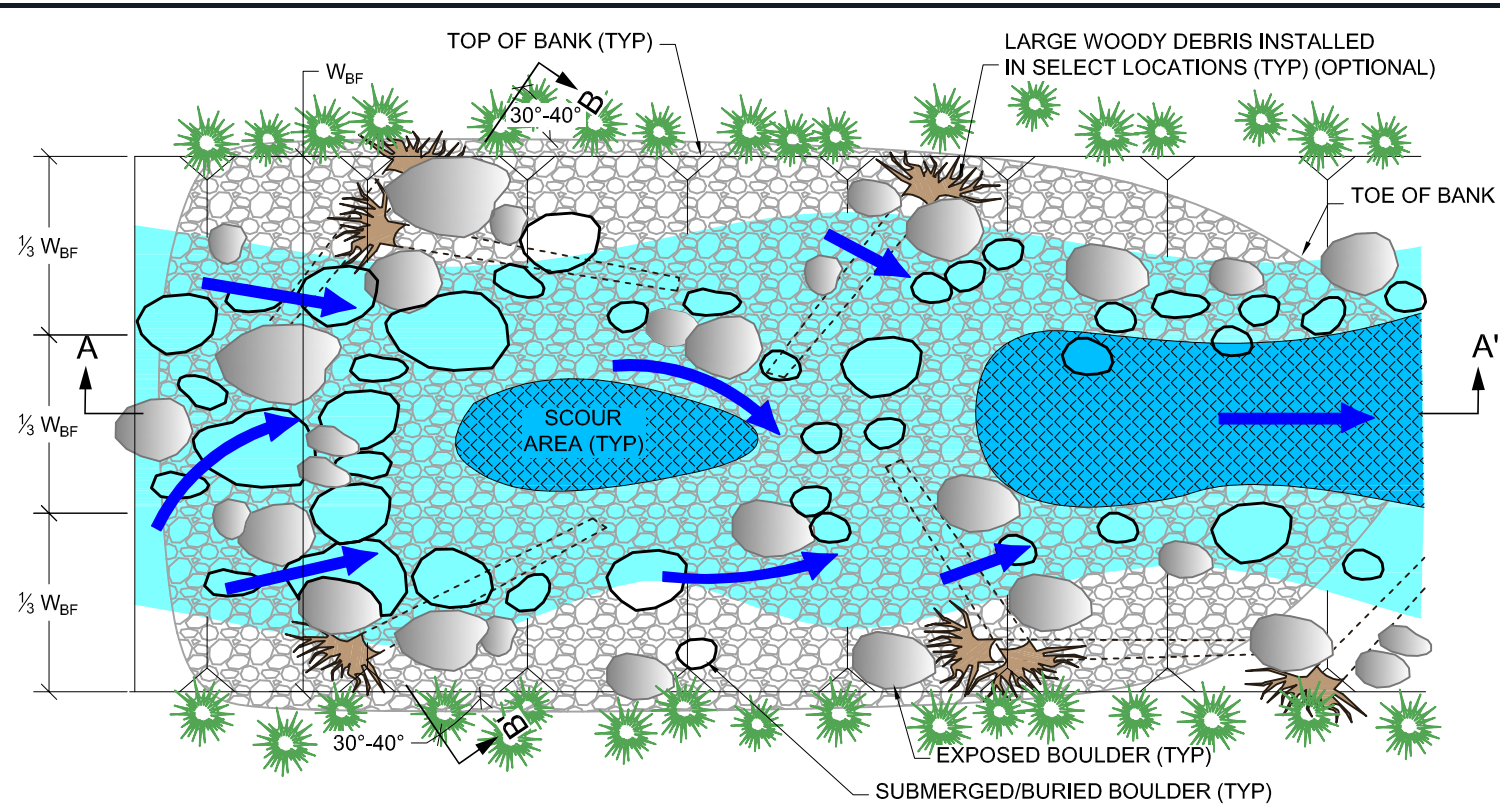
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MKH : MGF

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HS-9 TYPICAL RIVER-WIDE BOULDER PLACEMENT PLAN
NOT TO SCALE

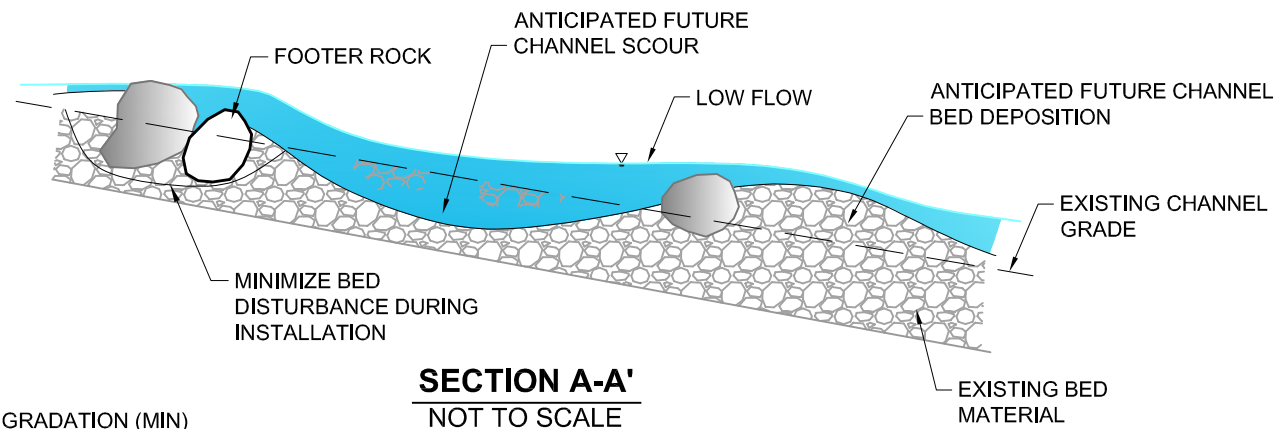
NOTES:

Purpose:

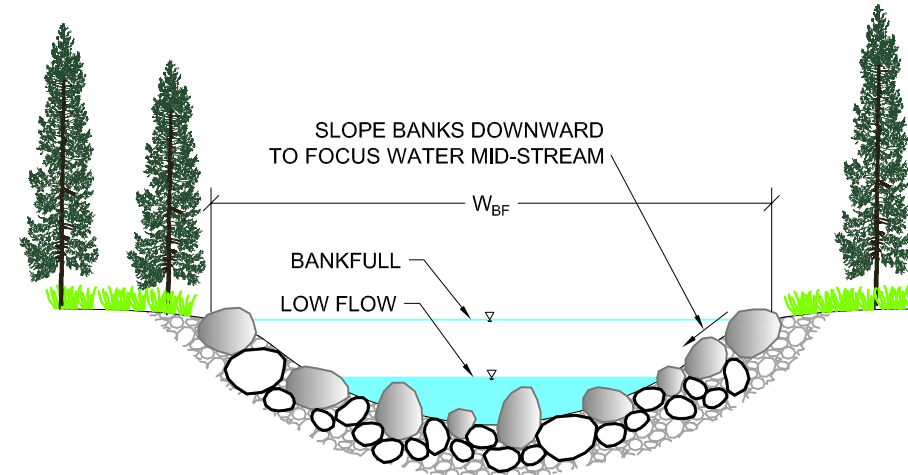
- Enhances fish habitat: creates large mid-stream pools, fish holding in eddies and sorts sediment.
- Protects channel against headcutting.
- Enables upstream fish passage.

Design Specifics:

- Generally large, stream-wide structure with center coincident with channel centerline or thalweg.
- Structures to slope downwards towards center to focus water mid-stream.
- "Upstream Vee" configuration directs water to center of channel.
- Plant dense vegetation along banks.
- Reinforce channel bed with mixture of boulders, cobbles and gravel stabilize channel.
- Install large woody debris throughout channel to direct flow and enhance habitat.
- Grade and place boulders to appear natural.



SECTION A-A'
NOT TO SCALE



SECTION B-B'
NOT TO SCALE

BOULDER GRADATION (MIN)
 D₁₀₀ = 72"
 D₈₅ = 60"
 D₅₀ = 48"
 D₁₅ = 36"
 USE OF EXISTING LEVEE
 RIPRAP ACCEPTABLE

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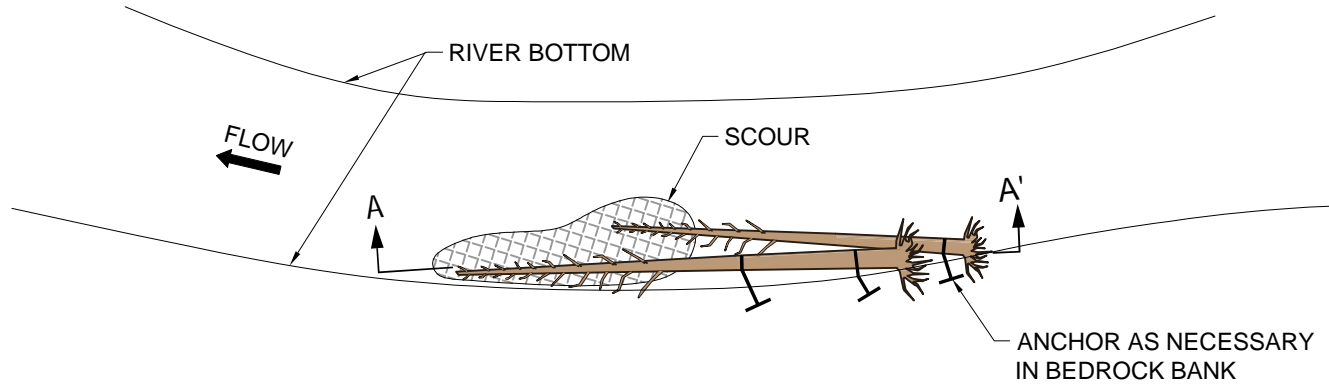
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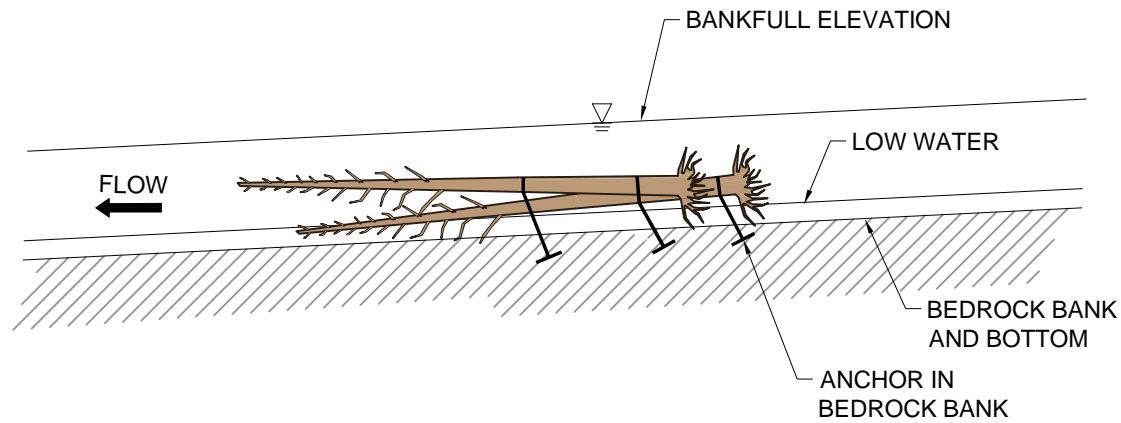
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MKH : MGF

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HS-11 **TYPICAL LONGITUDINAL LOG DETAIL PLAN**
NOT TO SCALE



A-A' **SECTION A-A'**
NOT TO SCALE

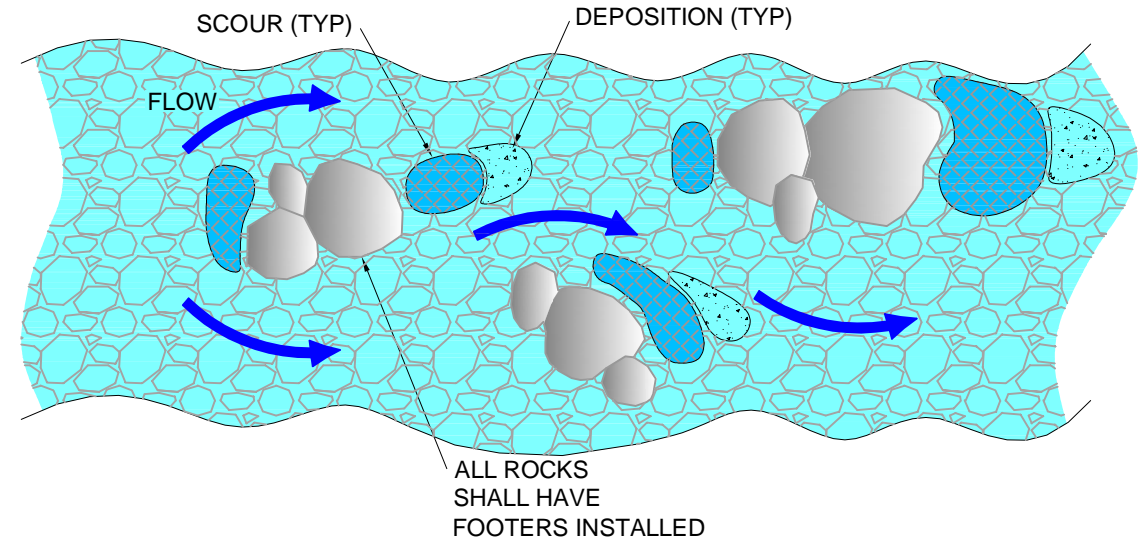
NOTES:

Purpose:

- Creates scour holes.
- Holds gravel upstream.
- Creates diverse fish habitat.
- Provides cover.

Design Specifics:

- Place through straight reaches and along outside of bends on bedrock banks.
- Place root wad on or in stream bed.
- Trees with branches or multiple trunks preferred.
- Minimum DBH shall be 18".
- Trees must be securely anchored to bedrock to prevent loss of structure.
- Drill and grout anchors into bedrock.
- Secure to prevent bouncing of trees during floods.
- See quantity table for member sizes



HS-10 **TYPICAL POCKET WATER DETAIL PLAN**
NOT TO SCALE

NOTES:

Purpose:

- Creates in-stream habitat diversity and complexity by creating local areas of scour, deposition and "Pocket Water" (eddys) in channel.
- Generally increases hydraulic friction and creates variable velocities across channel.
- Enhances habitat for macroinvertebrates and all life stages of fish species.
- Provides habitat enhancement with relatively minimal channel bed disturbance.

Design Specifics:

- Install relatively large boulders in channel either singularly and/or in clusters.
- Ideally, boulders shall be placed in channel under dry conditions.
- If constructed under dry conditions or if channel/water disturbance is acceptable, excavate boulders into channel bed (minimum 1/3 of rock diameter) to prevent rolling. And/or stabilize boulders with partially buried "footer rocks" and/or larger cobble/boulder bed reinforcement.
- If constructed in active channel or if channel/water disturbance is unacceptable, simply place boulders on channel bed. Relatively larger rocks should be used if placed directly on bed to prevent rolling.

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				Project No: 2698-006-02

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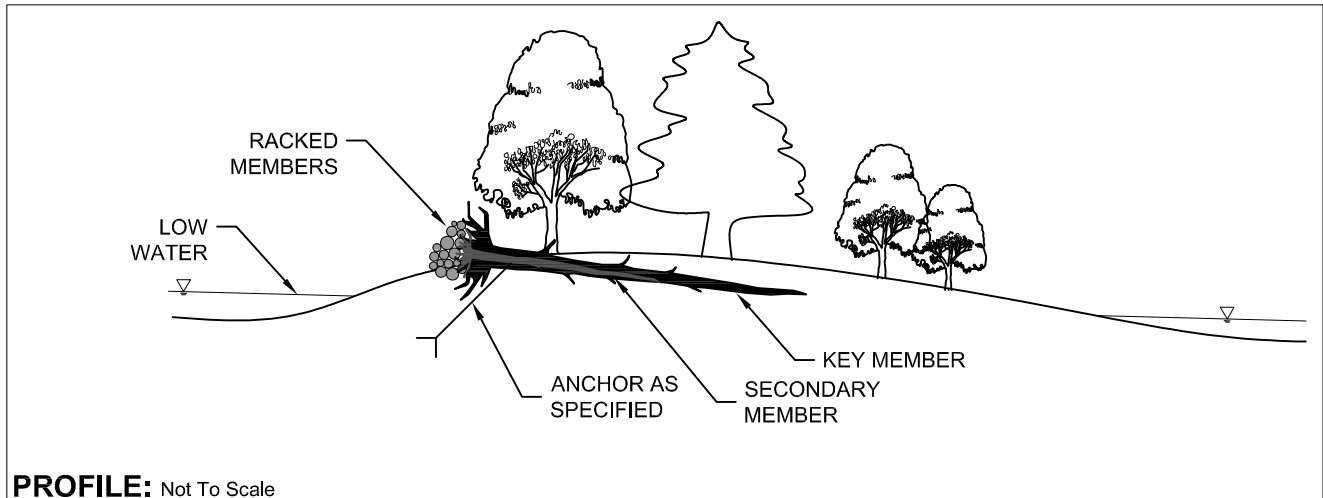
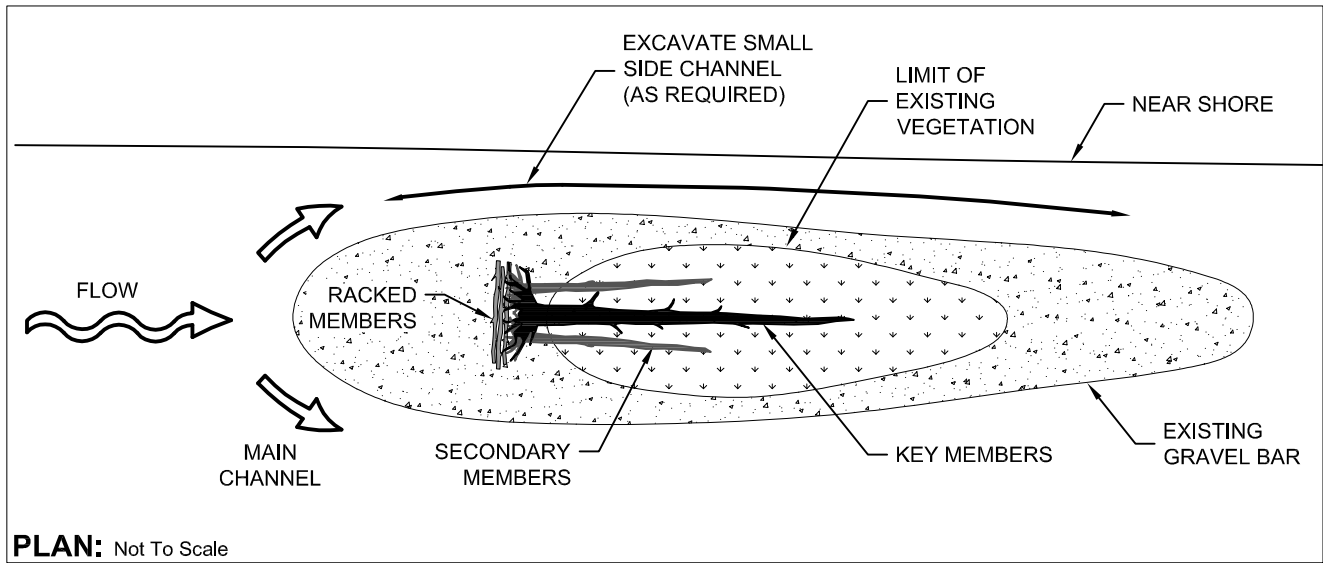
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: MKH, MGF

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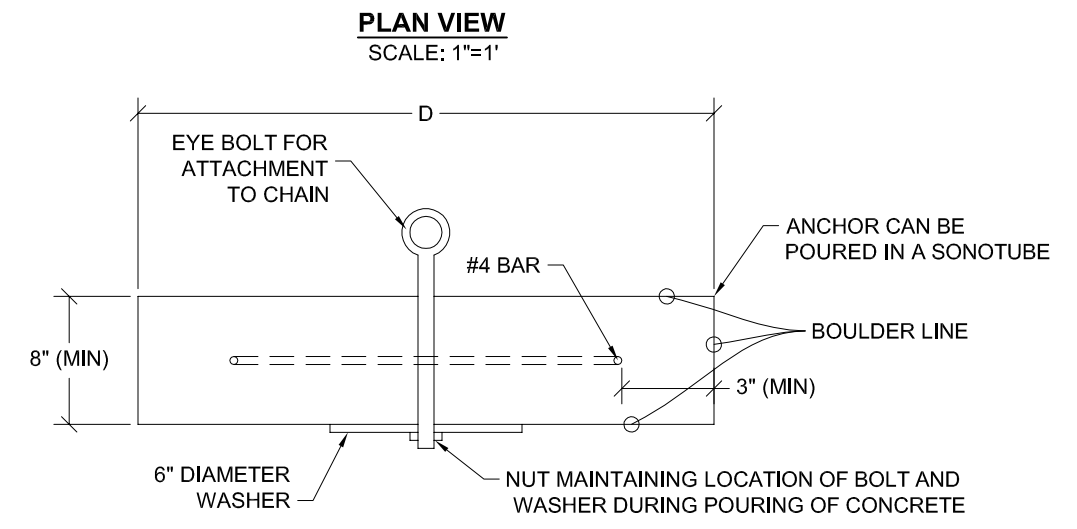
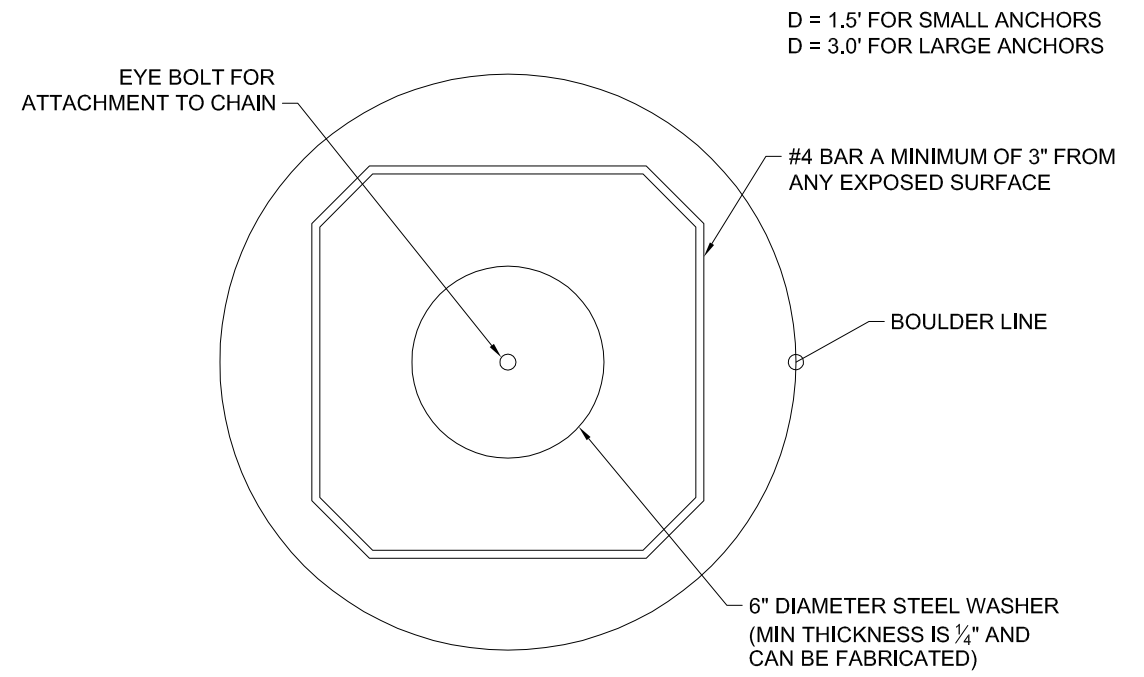
Purpose:

- Creates or enlarges mid-stream gravel bars, diverts flow and creates multiple channels and/or side channels.
- Upstream bar grows as result of slower "backwatered" flow upstream.
- Principal mechanism for formation of anastomosing channel systems.
- Enhances fish habitat by creating multiple channels and pools. Sorts gravel.

Design Specifics:

- Placed on existing (or constructed) mid-stream gravel bars.
- Narrow end of large Key Members, and Secondary Members, are buried into the bar in a downward sloping manner to reinforce structure. Smaller members placed among Key Members.
- Flow though new side channel may be encouraged by excavation.
- Vegetation may not develop depending upon application.

HS-12 TYPICAL APEX JAM



LARGE WOODY DEBRIS HABITAT STRUCTURES NOTES:

1. ANCHORS SHALL BE CONSTRUCTED AS DETAILED ON THIS SHEET.
2. ANCHORS WILL BE ATTACHED WITH CHAINS INSTEAD OF CABLES. IF THE CHAINS ARE BOLTED THROUGH THE TREE, THE BOLT END, NUT AND WASHER WILL BE COUNTERSUNK TO MINIMIZE VISIBILITY. IF THE ANCHOR CHAIN IS LOOPED AROUND THE STRUCTURE, GROOVES SHALL BE CUT INTO THE STRUCTURE AND CHAIN SHALL BE COUNTER SUNK.
3. ALL ANCHORING CHAINS AND LINKAGES SHALL HAVE A MINIMUM DESIGN STRENGTH OF 5000 POUNDS. ALL CHAINS SHALL BE NON-GALVANIZED, NON-STAINLESS SO THEY EVENTUALLY RUST AWAY AFTER STABILIZATION THROUGH VEGETATION.
4. ALL ANCHORS SHALL BE INSTALLED SO THAT THE CHAIN IS TAUT.
5. MINIMUM BURY DEPTH OF ANCHORS IS 5 FEET BELOW BOTTOM OF LOG.
6. ROCK BALLAST MAY BE SELECTIVELY USED IN LIEU OF ANCHORS IF APPROVED BY ENGINEER.

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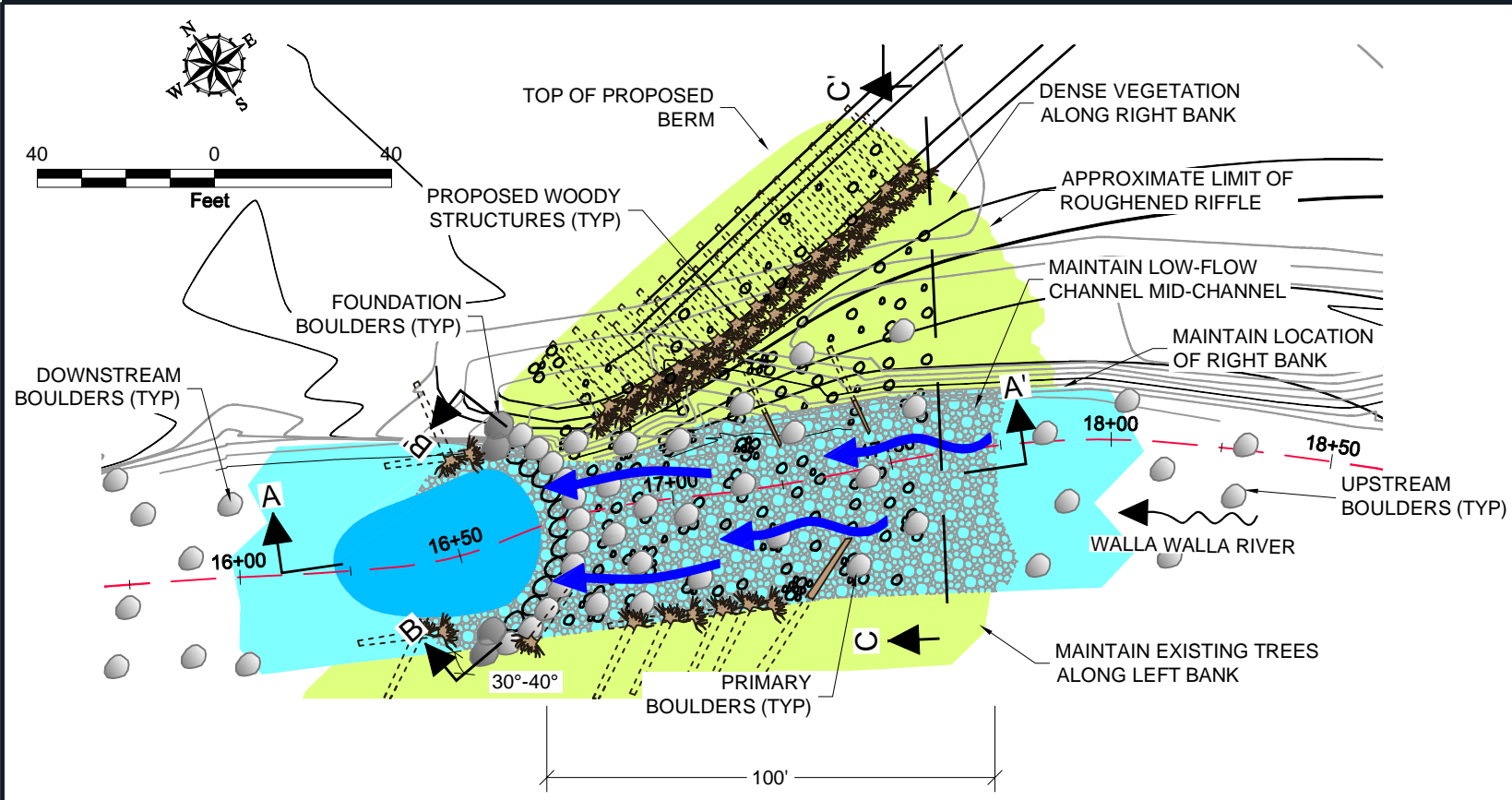


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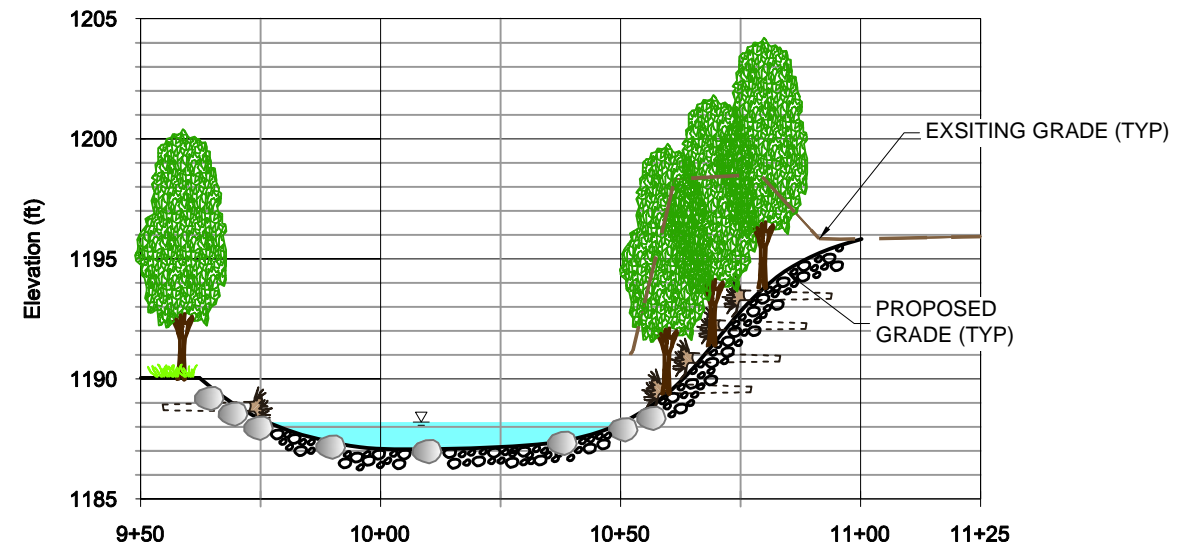
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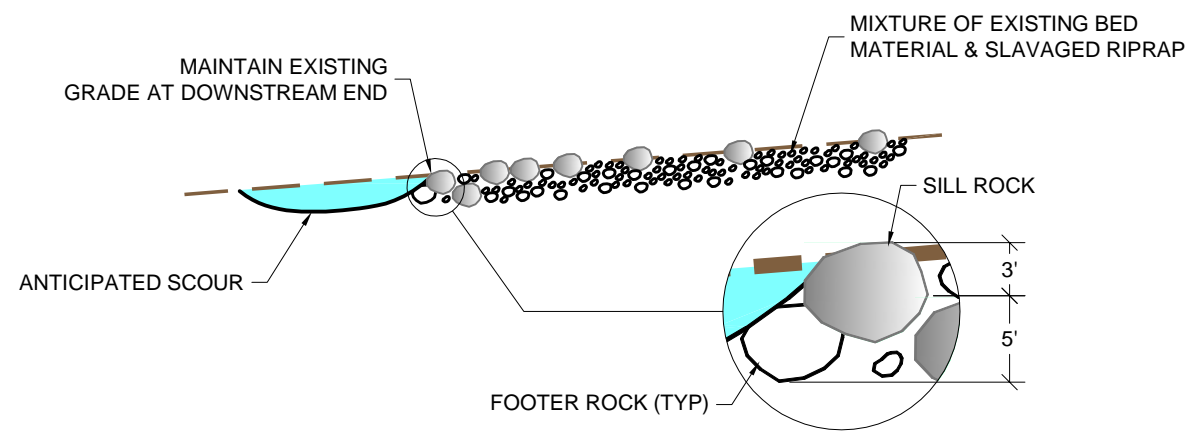
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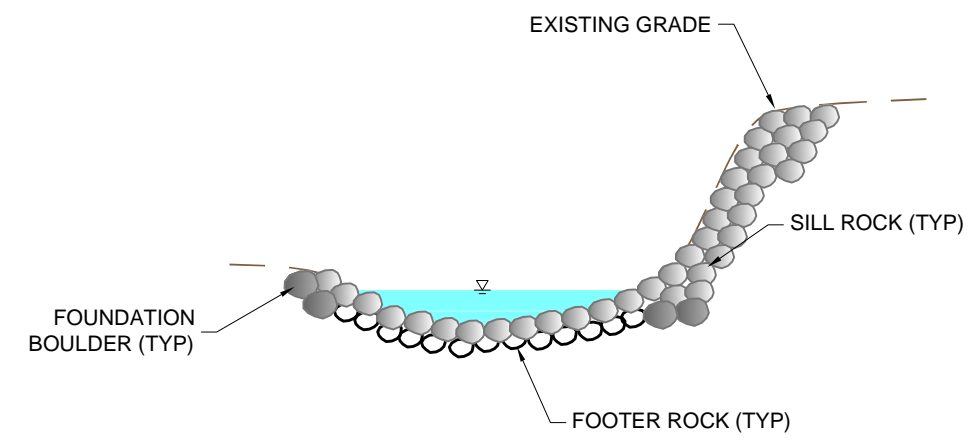
HS-13 TYPICAL ROUGHENED RIFFLE DETAIL PLAN
SCALE: 1"=40'



C-C TYPICAL ROUGHENED RIFFLE DETAIL SECTION A-A'
NOT TO SCALE



A-A' TYPICAL ROUGHENED RIFFLE DETAIL SECTION A-A'
NOT TO SCALE

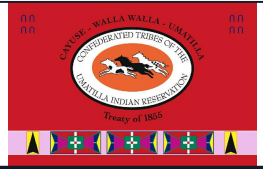


B-B' TYPICAL ROUGHENED RIFFLE DETAIL SECTION A-A'
NOT TO SCALE

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Roughened Riffle Detail
Lampson Construction Drawings

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GENERAL NOTES:

1. During the winter and spring of 2011, high persistent flows in the Walla Walla River caused the channel to degrade as much as 3 vertical feet along this project reach. This headcut is believed to have propagated upstream from where an old dam once existed about ¼ mile downstream. This proposed Roughened Riffle is intended to stabilize the river bed near the downstream end of this river enhancement project.
2. The proposed riffle is located near the downstream end of an existing riffle and where the proposed widened floodplain will return overbank flows to the river. This is a good location to establish and maintain both vertical and horizontal control of the river.

CONSTRUCTION NOTES:

1. At low flow, the water flows along the left (south) bank. To minimize disturbance to the river and water, it is proposed to reduce the width of flow along the left bank using concrete ecology blocks and construct the proposed riffle along the right bank. After the improvements are made along the right, the left portion of the riffle will be constructed.
2. When constructing the left side of the riffle, raise the left bank back up to the top of the eroded bank, which is several feet above the existing low flow channel currently along the left bank. Wood and rocks will be keyed into the left bank. The existing vegetation along the left bank shall remain.
3. Install the Foundation Boulders into and along the banks. Then install the Footer Rocks and Sill Rocks. Do not over excavate anticipated scour downstream of the riffle; allow scour to occur naturally.
4. Construction shall commence downstream and proceed in an upstream direction so all rocks can be supported by downstream rocks. Footer Rocks and Sill Rocks shall also be placed to buttress against the banks.
5. Install Sill Rocks to maintain the existing river grade at downstream end. Sill Rock elevations may vary +/- 1 foot. Install to appear natural.
6. Channel elevations are approximate. The proposed Roughened Riffle shall be "field fit" with the direct supervision of the Engineer.
7. Sill shall create a "U" shape in plan view; angled 30 to 40 degrees to the bank.
8. Sill and whole riffle shall create a gentle "U" shape in cross-section to maintain both low flows and full flood flows near the center of the channel.
9. Upstream of the Sill, install Primary Boulders and Filler Rocks. Excavate rocks into existing bed material and backfill rocks with filler rocks and existing bed material so ¼ to ⅓ of final boulder height is ultimately exposed. All rocks shall be supported by downstream rocks. Backfill in and around these rocks with local bed material.
10. Note there is a greater number of Primary Boulders near the Sill and the number (frequency) of Primary Boulders is reduced as the structure continues upstream. This is done to reduce costs while accommodating erosion and shifting of the whole structure in the future.
11. "Upstream Boulders" shall be installed upstream of the proposed Roughened Riffle. These boulders shall extend upstream to the extent of the existing riffle. These boulders are intended to encourage deposition of bed material delivered from upstream, extend the effective length of the Roughened Riffle and to slightly increase the water surface elevation in the pool immediately upstream.
12. "Downstream Boulders" shall be installed downstream of the Roughened Riffle. These boulders are intended to capture bed material scoured from the downstream end of the Roughened Riffle and to slightly raise the elevation of the pool immediately downstream of the Sill.
13. The volume of the proposed rocks is anticipated to increase the elevation of the river bed approximately 1.5 feet at the upstream end of the riffle.
14. Several of the items for the proposed Roughened Riffle were included in the existing Bid Schedule and should not be considered extras. These items are noted in italics. The other items are considered extras.
15. Large wood shall be placed in the banks and bed as directed by the engineer.
16. The proposed Roughened Riffle shall be constructed to appear and function naturally.

BOULDERS/ROCKS:

1. All proposed rocks shall generally be rounded and shall have similar dimensions along all three axes. Angular rocks are acceptable; however, flat elongated rocks are unacceptable.
2. Rock dimensions noted are minimums and measured along the intermediate axis. Quantities are also minimums. Rock volumes area based on spherical shape.
3. Footer Rocks and Sill Rocks shall be installed as shown. All other rocks shall be buried so 1/4 to 1/3 of the boulder is exposed above the bed.
4. Where boulders are not placed against one another, backfill boulder excavation with Filler Rocks (salvaged riprap) to reduce the likelihood of the boulders scouring down into the channel bed.
5. Foundation Rocks: Quantity = 4. Size = 7-feet. Volume / Rock = 6.6 cubic yard. Total Volume = 26.6 cubic yards.
6. Footer Boulders: Quantity = 15. Size = 6 feet. Volume / Rock = 4.2 cubic yards. Total Volume = 62.8 cubic yards.
7. Sill Rocks: Quantity = 15. Size = 6 feet. Volume / Rock = 4.2 cubic yards. Total Volume = 62.8 cubic yards.
8. Primary Boulders: Quantity = 40. Size = 6 feet. *(25 of the 40 boulders were included in the existing Bid Schedule. Bid Item 3530; Imported Boulders.)* Volume / Rock = 4.2 cubic yards. Total Volume = 167.5 cubic yards.
9. Downstream Boulders: Quantity = 8. Size = 6 feet. Volume / Rock = 4.2 cubic yards. Total Volume = 33.5 cubic yards.
10. Upstream Boulders: Quantity = 8. Size = 5 feet. Volume / Rock = 2.4 cubic yards. Total Volume = 19.4 cubic yards.
11. Filler Rock (From Riprap on Site): Quantity = 200 yards. Size 2 to 5 feet *(This item was included in the existing Bid Schedule. Item 3530; Salvaged Riprap.)*
12. Upstream fish passage will be maintained by channel roughness.

TREES:

1. *These trees and anchors were included in the existing Bid Schedule.*
2. Full Length Trees with Rootwads: Quantity = 5, L = 55-ft, DBH = 2 to 3-ft
3. Trees with Rootwads: Quantity = 20, L = 20-ft, DBH = 1.5 to 2-ft
4. Racking Members: Quantity = 40, L < 20-ft, DBH < 1-ft
5. Large Concrete Anchors: Quantity = 15.

APPROXIMATE EXCAVATION AND FILL VOLUMES (ALL VOLUMES NOTED ARE BELOW THE OHWM):

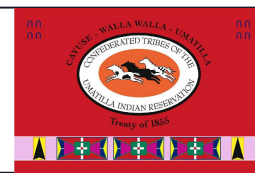
1. Total Rock Fill = 572 cubic yards
2. Total Permanent and Temporary Excavation Below OHWM = 230 cubic yards
3. Total Temporary Excavation (Removal of Existing Bed Material for Boulder Placement) = 190 cubic yards
4. Total Permanent Excavation (North Channel Bank) = 40 cubic yards

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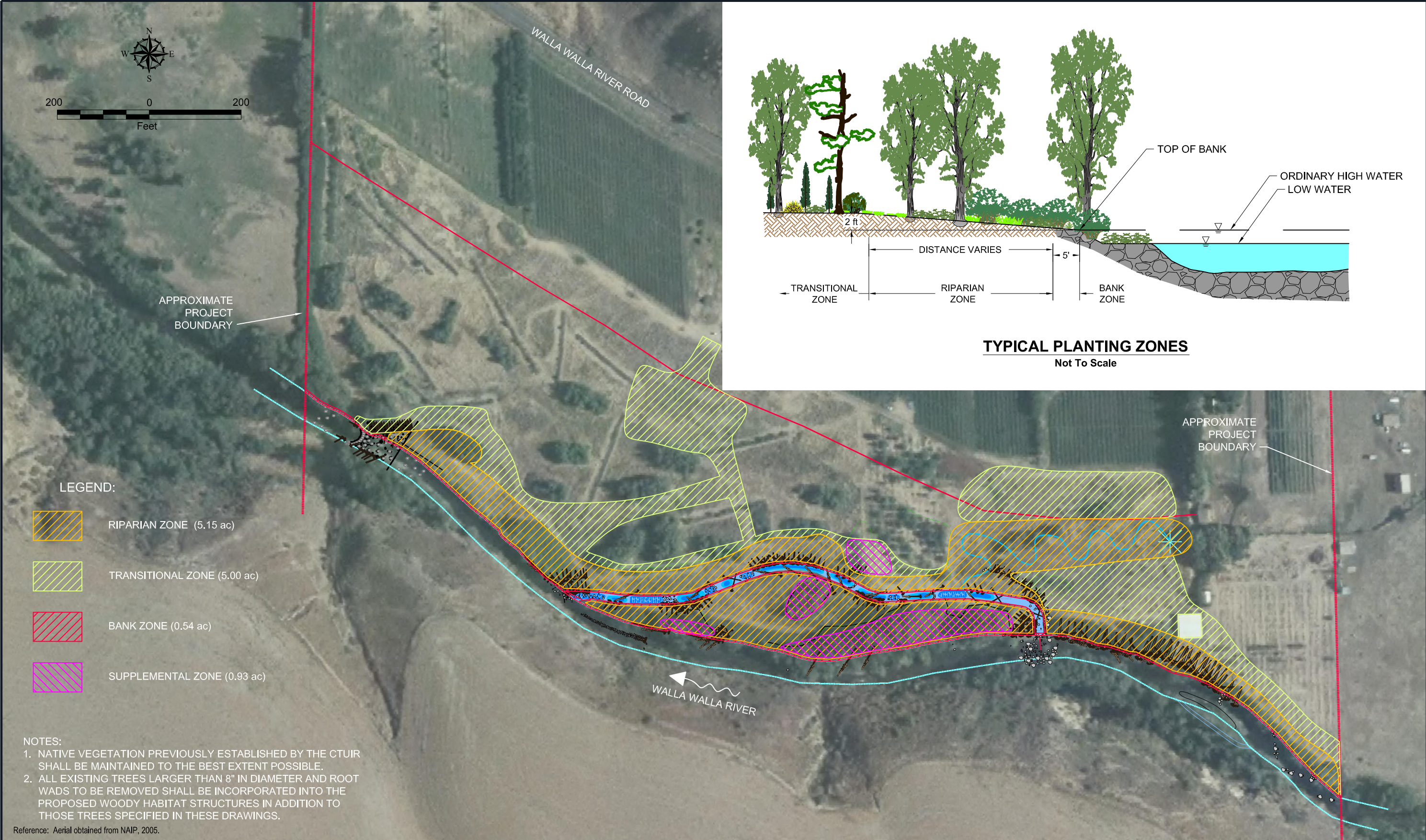


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Roughened Riffle Notes
Lampson Construction Drawings

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LEGEND:

- RIPARIAN ZONE (5.15 ac)
- TRANSITIONAL ZONE (5.00 ac)
- BANK ZONE (0.54 ac)
- SUPPLEMENTAL ZONE (0.93 ac)

- NOTES:**
1. NATIVE VEGETATION PREVIOUSLY ESTABLISHED BY THE CTUIR SHALL BE MAINTAINED TO THE BEST EXTENT POSSIBLE.
 2. ALL EXISTING TREES LARGER THAN 8" IN DIAMETER AND ROOT WADS TO BE REMOVED SHALL BE INCORPORATED INTO THE PROPOSED WOODY HABITAT STRUCTURES IN ADDITION TO THOSE TREES SPECIFIED IN THESE DRAWINGS.

Reference: Aerial obtained from NAIP, 2005.

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Planting Plan
Lampson Construction Drawings

Sheet
S-10.1

Planting Specifications without Costs (Phase 1)

Planting Application	Common Name	Instructions	Scientific Name	Transitional Zone								Riparian Zone ⁽⁸⁾								Bank Zone								Totals		
				Size (gallons)	Size (cuttings-ft)	Spacing (ft on center) Planting Density (lbs/acre)	Percent coverage per zone	Acres	Units	Unit Cost	Total Cost	Size (gallons)	Size (cuttings)	Spacing (ft on center) Planting Density (lbs/acre)	Percent coverage per zone	Acres	Units	Unit Cost	Total Cost	Size (gallons)	Size (cuttings)	Spacing (ft on center) Planting Density (lbs/acre)	Percent coverage per zone	Acres	Units	Unit Cost	Total Cost	Total Units	Total Cost	
1	Grass Seed Mix	Mountain brome	<i>Bromus carniatus</i>	NA	NA	1.2	100%	0.00	0.00			NA	NA	1.2	100%	2.2	3											3		
		Sandberg's bluegrass	<i>Poa secunda</i>	NA	NA	1.6	100%	0.00	0.00			NA	NA	1.6	100%	2.2	4											4		
		Blue wildrye	<i>Elymus glaucus</i>	NA	NA	1.2	100%	0.00	0.00			NA	NA	1.2	100%	2.2	3												3	
		Bluebunch wheatgrass	<i>Pseudoroegneria spicata</i>	NA	NA	2.4	100%	0.00	0.00			NA	NA	2.4	100%	2.2	5												5	
		Idaho fescue	<i>Festuca idahoensis</i>	NA	NA	1.6	100%	0.00	0.00			NA	NA	1.6	100%	2.2	4												4	
Subtotal:						8		0.00					8		2.2															
2	Nursery Stock	Ponderosa pine	<i>Pinus ponderosa</i>	2	NA	40	10%	0.00	0.00																			0.00		
		Snowberry	<i>Symphoricarpos albus</i>	1	NA	18	15%	0.00	0.00			1	NA	12	25%	0.55	166											0.00		
		Blue elderberry	<i>Sambucus nigra</i>	1	NA	30	5%	0.00	0.00			1	NA	30	5%	0.11	5			1	NA	12	5%	0.01	3			0.00		
		Woods rose	<i>Rosa woodsii</i>	1	NA	18	10%	0.00	0.00			1	NA	18	20%	0.44	59											0.00		
		Serviceberry	<i>Amelanchier alnoifolia</i>	1	NA	18	10%	0.00	0.00																			0.00		
		Chokecherry	<i>Prunus virginiana</i>	1	NA	18	15%	0.00	0.00			1	NA	18	10%	0.22	30											0.00		
		Wax currant	<i>Ribes aureum</i>	1	NA	18	5%	0.00	0.00																			0.00		
		Golden currant	<i>Ribes aureum</i>									1	NA	18	10%	0.22	30											0.00		
Subtotal:								0.00						2.2													0.00			
3	Live Cuttings	Black cottonwood	<i>Populus trichocarpa</i>	NA	5	12	30%	0.00	0.00			NA	5	12	30%	0.66	570			NA	1+	10	15%	0.03	15			585		
		Red Alder	<i>Alnus rubra</i>																	NA	1+	10	40%	0.09	40			40		
		Red osier dogwood	<i>Comus serices</i>									NA	5	12	5%	0.11	33			NA	1+	10	40%	0.09	40			73		
Subtotal:								0.00						2.2												0.00				
Total:								0.00						2.2												0.00				

- This table identifies the plant species and quantities for the project noted. Unit costs may be input to calculate cost estimates.
- 1. Seeds measured by pound. Potted plants and cuttings measured by individual piece.
- 2. Cost estimates, if calculated, are approximate. Final costs are dependent upon selected contractor and sources. Costs include acquisition, handling, transportation, storage, and installation.
- 3. Refer to Sheet S-10.1 for typical planting zone designations and locations.
- 4. Planting Applications and Specifications are based on USDA-NRCS technical notes and literature.
- 5. Transplanted materials and live cuttings integral with woody habitat structures shall be installed concurrently with structure placement.
- 6. Native vegetation previously established but the CTUIR shall be maintained to the best extent possible.
- 7. All existing trees larger than 8" in diameter and root wads to be removed shall be incorporated into the proposed woody habitat structures in addition to those trees specified in these drawings.
- 8. Riparian zone (over the total site) shall also include 30, 1 gallon containerized River Birch trees. Trees to be located as directed by Engineer (06/23/11).

Revision No: 1	Date: 08/01/11	Description: Channel downcut redesign	Initials: JJF	Designed: JJF			Planting Specifications (Phase 1) Lampton Construction Drawings	Sheet S-10.2
				Drawn: MGF				
				Checked: MKH				
				Date: 06/27/11				
<div style="border: 2px solid black; padding: 5px; display: inline-block;">APPROVED FOR CONSTRUCTION</div>								
Project No: 2698-006-02								

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Planting Specifications without Costs (Phase 2)

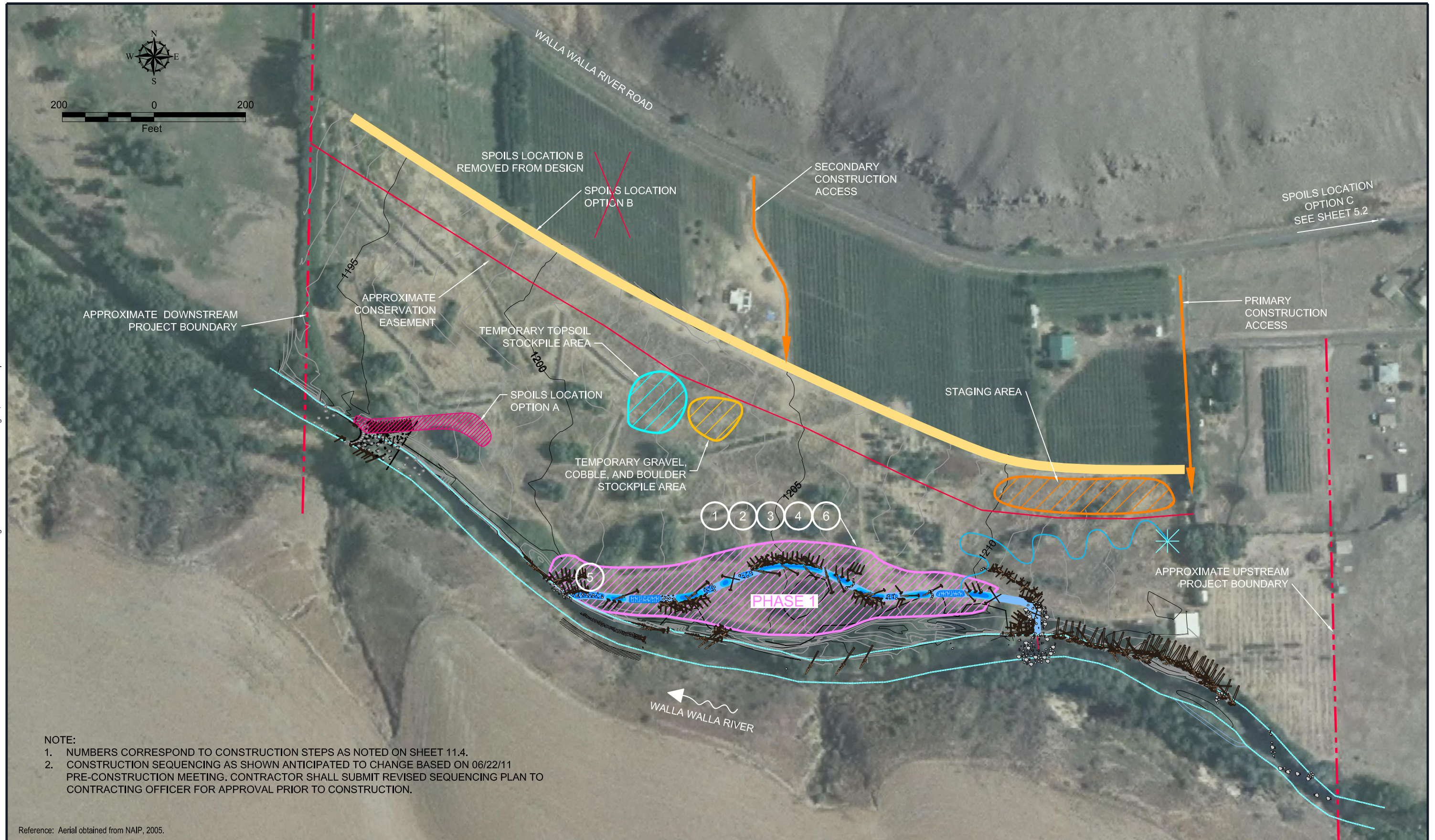
Planting Application	Common Name	Instructions	Scientific Name	Transitional Zone								Riparian Zone ⁽⁸⁾								Bank Zone								Totals				
				Size (gallons)	Size (cuttings-ft)	Spacing (ft on center) Planting Density (lbs/acre)	Percent coverage per zone	Acres	Units	Unit Cost	Total Cost	Size (gallons)	Size (cuttings)	Spacing (ft on center) Planting Density (lbs/acre)	Percent coverage per zone	Acres	Units	Unit Cost	Total Cost	Size (gallons)	Size (cuttings)	Spacing (ft on center) Planting Density (lbs/acre)	Percent coverage per zone	Acres	Units	Unit Cost	Total Cost	Total Units	Total Cost			
1	Grass Seed Mix	Mountain brome	<i>Bromus carinatus</i>	NA	NA	1.2	100%	4.70	5.64			NA	NA	1.2	100%	3.6	4											10				
		Sandberg's bluegrass	<i>Poa secunda</i>	NA	NA	1.6	100%	4.70	7.52			NA	NA	1.6	100%	3.6	6												13			
		Blue wildrye	<i>Elymus glaucus</i>	NA	NA	1.2	100%	4.70	5.64			NA	NA	1.2	100%	3.6	4													10		
		Bluebunch wheatgrass	<i>Pseudoroegneria spicata</i>	NA	NA	2.4	100%	4.70	11.28			NA	NA	2.4	100%	3.6	9													20		
		Idaho fescue	<i>Festuca idahoensis</i>	NA	NA	1.6	100%	4.70	7.52			NA	NA	1.6	100%	3.6	6													13		
Subtotal:						8		4.70				8		3.6																		
2	Nursery Stock	Ponderosa pine	<i>Pinus ponderosa</i>	2	NA	40	10%	0.47	12.80																				12.80			
		Snowberry	<i>Symphoricarpos albus</i>	1	NA	18	15%	0.71	94.78			1	NA	12	25%	0.90	272													94.78		
		Blue elderberry	<i>Sambucus nigra</i>	1	NA	30	5%	0.24	11.37			1	NA	30	5%	0.18	9			1	NA	12	5%	0.02	5					11.37		
		Woods rose	<i>Rosa woodsii</i>	1	NA	18	10%	0.47	63.19			1	NA	18	20%	0.72	97													63.19		
		Serviceberry	<i>Amelanchier alnoifolia</i>	1	NA	18	10%	0.47	63.19																					63.19		
		Chokecherry	<i>Prunus virginiana</i>	1	NA	18	15%	0.71	94.78			1	NA	18	10%	0.36	48														94.78	
		Wax currant	<i>Ribes aureum</i>	1	NA	18	5%	0.24	31.59																					31.59		
		Golden currant	<i>Ribes aureum</i>									1	NA	18	10%	0.36	48													0.00		
Subtotal:								4.70						3.6															371.71			
3	Live Cuttings	Black cottonwood	<i>Populus trichocarpa</i>	NA	5	12	30%	1.41	426.53			NA	5	12	30%	1.08	570			NA	1+	10	15%	0.05	20				1016			
		Red Alder	<i>Alnus rubra</i>																		NA	1+	10	40%	0.12	52				52		
		Red osier dogwood	<i>Comus serices</i>									NA	5	12	5%	0.18	54			NA	1+	10	40%	0.12	52				107			
Subtotal:								4.70						3.6															1175			
Total:								4.70						3.6																		

- This table identifies the plant species and quantities for the project noted. Unit costs may be input to calculate cost estimates.
- 1. Seeds measured by pound. Potted plants and cuttings measured by individual piece.
- 2. Cost estimates, if calculated, are approximate. Final costs are dependent upon selected contractor and sources. Costs include acquisition, handling, transportation, storage, and installation.
- 3. Refer to Sheet S-10.1 for typical planting zone designations and locations.
- 4. Planting Applications and Specifications are based on USDA-NRCS technical notes and literature.
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- 7. All existing trees larger than 8" in diameter and root wads to be removed shall be incorporated into the proposed woody habitat structures in addition to those trees specified in these drawings.
- 8. Riparian zone (over the total site) shall also include 30, 1 gallon containerized River Birch trees. Trees to be located as directed by Engineer (06/23/11).

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Revision No: 1	Date: 08/01/11	Description: Channel downcut redesign	Initials: JJF	Designed: JJF	<p style="text-align: center;">Walla Walla River Umatilla County, Oregon Confederated Tribes of the Umatilla Indian Reservation</p> 	 <p style="text-align: center;">523 East Second Avenue Spokane, Washington 99202</p>	<p style="text-align: center;">Planting Specifications (Phase 2)</p>	<p style="text-align: center;">Lampson Construction Drawings</p>	<p style="text-align: center;">Sheet S-10.3</p>
<div style="border: 2px solid black; padding: 5px; display: inline-block;">APPROVED FOR CONSTRUCTION</div>									
<p>Date: 06/27/11</p> <p>Project No: 2698-006-02</p>									

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NOTE:
 1. NUMBERS CORRESPOND TO CONSTRUCTION STEPS AS NOTED ON SHEET 11.4.
 2. CONSTRUCTION SEQUENCING AS SHOWN ANTICIPATED TO CHANGE BASED ON 06/22/11 PRE-CONSTRUCTION MEETING. CONTRACTOR SHALL SUBMIT REVISED SEQUENCING PLAN TO CONTRACTING OFFICER FOR APPROVAL PRIOR TO CONSTRUCTION.

Reference: Aerial obtained from NAIP, 2005.

Revision No:	Date:	Description:	Initials:	Designed: JJF
1	08/01/11	Channel downcut redesign	JJF	Drawn: MGF
				Checked: MKH
				Date: 06/27/11
				Project No: 2698-006-02

APPROVED FOR CONSTRUCTION

Walla Walla River
 Umatilla County, Oregon
 Confederated Tribes of the
 Umatilla Indian Reservation



GEOENGINEERS
 523 East Second Avenue
 Spokane, Washington 99202

Phase 1 Construction Sequencing
 Lampson Construction Drawings

Sheet S-11.1

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Reference: Aerial obtained from NAIP, 2005.

Revision No:	Date:	Description:	Initials:	Designed: JJF
1	08/01/11	Channel downcut redesign	MKH/MGF	Drawn: MGF
APPROVED FOR CONSTRUCTION			Checked: MKH	Date: 06/27/11
			Project No: 2698-006-02	

Walla Walla River
 Umatilla County, Oregon
 Confederated Tribes of the
 Umatilla Indian Reservation

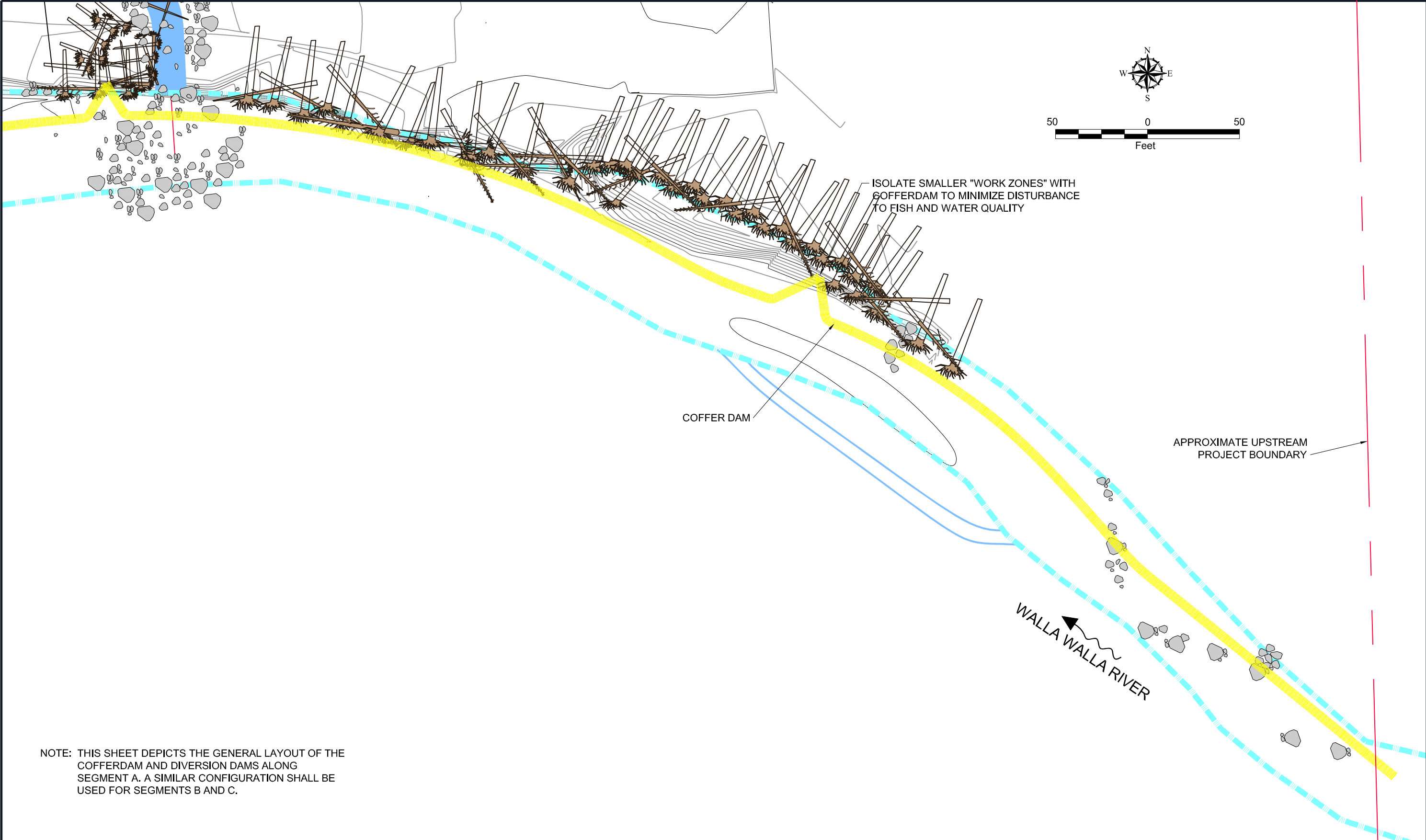


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 523 East Second Avenue
 Spokane, Washington 99202

Phase 2 Construction Sequencing
 Lampson Construction Drawings

Sheet
S-11.2

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NOTE: THIS SHEET DEPICTS THE GENERAL LAYOUT OF THE COFFERDAM AND DIVERSION DAMS ALONG SEGMENT A. A SIMILAR CONFIGURATION SHALL BE USED FOR SEGMENTS B AND C.

Revision No:	Date:	Description:	Initials:	Designed: JJF
1	08/01/11	Channel downcut redesign	MKH/MGF	Drawn: MGF
				Checked: MKH
				Date: 06/27/11
				Project No: 2698-006-02

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Walla Walla River
 Umatilla County, Oregon
 Confederated Tribes of the
 Umatilla Indian Reservation



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 Spokane, Washington 99202

**Typical Cofferdam and
 Diversion Dam Layout**
 Lampson Construction Drawings

**Sheet
 S-11.3**

Construction Sequencing and Fish Management Plan (See note 1 below)

Work in the river below the Ordinary High Water Mark (OHWM) shall only occur during the "Fish Window" between July 1 and September 30, or as otherwise specified in project-specific environmental permits. Work above and beyond the OHWM may occur any time of the year as weather, site conditions and permits allow.

Construction will occur in two (2) general phases as described below. In general; Phase 1 includes work in the side channel areas whereas Phase 2 primarily includes in-channel work along the main stem of the river and the construction of the spring channel. Phases 1 and 2 may be constructed in either a single construction season or in two different construction seasons. Construction shall occur in the following general steps, which correspond numerically to those shown on Sheets 11.1 and 11.2. Refer to the preceding design sheets for specifics regarding the construction of the proposed improvements.

Should Phase 1 and Phase 2 be constructed during the same construction season, it is recommended the construction of the side channel (Phase 1) be postponed until after the construction along the main river (Segments A, B and C in Phase 2) has been completed.

Phase 1

1. General site preparation

- 1.1. Remove blackberry bushes and unnecessary/undesirable underbrush in areas to be disturbed.
- 1.2. Establish survey control.
- 1.3. Establish limits of excavation/fill, stockpile areas, staging areas, haul roads and signage.
- 1.4. Mark all trees to remain.
- 1.5. Install and maintain necessary erosion and sedimentation controls.

2. Excavate and rough grade side channel area

- 2.1. Excavate side channel area. Do not connect to river.
- 2.2. Preserve existing trees where practical to maximize riparian integrity.
- 2.3. Place excavation spoils in fill area near downstream end of project (Spoils Location Option A) on existing dirt road (Spoils Location Option B) or in old quarry up on adjacent hillside (Spoils Location Option C). Grade excavated spoils along existing dirt road to maintain road use during construction.
- 2.4. Temporarily stockpile suitable topsoil and channel bed material (gravel, cobbles & boulders) in specified locations. Stockpiled material will be used in Phase 2. No stockpiled material in temporary stockpile areas shall remain in on site after project is completed.

3. Sculpt side channel (fine grade)

- 3.1. Excavate and sculpt the side channel. This step includes grading the pools and riffles. Place gravel, cobbles and boulders in side channel. Do not connect side channel to river.
- 3.2. Location of Phase 2 crossings and access routes as shown on Sheet S-11.2 do not require final sculpting at this time.

4. Install habitat structures in side channel

- 4.1. Install habitat structures in side channel.
- 4.2. Plant riparian shrubs and trees integral with habitat structures during installation of habitat structures.
- 4.3. Locations of Phase 2 crossings and access routes as shown on Sheet S-11.2 do not require habitat structures at this time.

5. Connect side channel to river at downstream end of side channel

- 5.1. Connect side channel to river at downstream end to allow the side channel to drain, enable the river to backwater into the channel and enable the habitat to mature.
- 5.2. Full connection to river is acceptable only if construction occurs during Fish Window and if Phase 2 is to be constructed immediately after Phase 1. Connect side channel with main channel with minimum 24 inch diameter culvert if construction/connection must occur during non-Fish Window period and/or if Phase 2 is to be constructed during a later construction season.
- 5.3. Install fish exclusion net, flood gates/flap gates and/or other suitable fish screen at downstream end of side channel to prevent fish from entering side channel. Fish shall not be allowed in side channel until Phase 2 is completed and side channel is activated.
- 5.4. Do not connect side channel to river at upstream end of side channel.

6. Plant disturbed areas (If Phase 2 does not immediately follow Phase 1)

- 6.1. Plant disturbed areas with appropriate vegetation. Planting of Phase 1 area may be postponed until after Phase 2 is finalized only if Phase 2 is to be constructed immediately after Phase 1 during the same construction season.
- 6.2. Location of Phase 2 crossings and access routes shall be protected with either temporary grasses or gravel to prevent erosion.
- 6.3. Install and maintain temporary erosion and sedimentation controls to prevent erosion and sediment from entering side channel and/or river.
- 6.4. Irrigate all new vegetation during growing season.

Phase 2

1. Construct Segment A

- 1.1. Excavate Phase 2 area along Segment A down to OHWM. Slope back steep slopes and remove portions of the levee down to OHWM, grade around existing trees to remain. Maintain viable existing root structure along bank to the greatest extent possible/practicable. Stockpile riprap/rock from levees near river for future placement of rock into river.

NOTE: Numbers correspond to construction steps as noted on sheet 11.2.

- 1.2. Place excavation spoils in fill area near downstream end of project (Spoils Location Option A) on existing dirt road (Spoils Location Option B) or in old quarry up on adjacent hillside (Spoils Location Option C). Grade excavated spoils along existing dirt road to maintain road use during construction. Stockpile large rocks/riprap removed from levee for future use or resale by owner.
- 1.3. Excavate, stockpile and irrigate trees to be transplanted. Or transplant trees in final location to the extent possible.
- 1.4. Segment A may be divided into smaller sub-segments or "work zones" in the active river (below the OHWM) if desirable and less disruptive to water quality, proposed enhancements and fish health.
- 1.5. Construction of work zones shall commence at the upstream end of the project area and proceed downstream.
- 1.6. Install a cofferdam in the river along north bank beyond area immediate area of disturbance in work zone. Cofferdam is intended to isolate clean river water from turbid water in active work zone (it's not intended to dry up construction zone). Cofferdams may consist of seclusion fencing, floating booms, sand bags, inflatable bladders and/or other suitable means. Cofferdams should include plastic liner or fine mesh silt fence to reduce the amount of fines entering the free flowing portion of the river.
- 1.7. Working from upstream to downstream, the isolated work zone shall be seined by a qualified crew of fish biologists, as designated by CTUIR and/or ODFW. The river channel can be seined in smaller lengths, if necessary, and as determined in the field. The CTUIR is responsible for performing and overseeing the fish removal and obtaining the appropriate fish collection permits. (Actual physical removal of fish is excluded from contractor's responsibilities.)
- 1.8. Fish shall be pushed/seined out of active work zone.
- 1.9. Establish and maintain temporary construction access to the river from the bank in a manner that minimizes disturbance.
- 1.10. Construct work zones; installing woody habitat structures, excavating deeper pool areas immediately adjacent to wood structures and planting woody vegetation in and around woody habitat structures. Do not allow flow into proposed side channel. Disturbance of channel bed should be minimized to the extent possible.
- 1.11. Remove cofferdam after segment is constructed.
- 1.12. Install in-stream rocks and rock structures along Segment A using stockpiled riprap and rocks or imported rock. Construction equipment may be operated in the active river channel to place rock provided disturbance to the river bottom and water quality is minimized. Rock structures will primarily be constructed by placing rocks on existing river bed and excavation of existing bed shall be minimized.
- 1.13. Remove and stabilize temporary constriction access sites.
- 1.14. Monitor and adjust wood and rock structures as necessary.
- 1.15. Plant woody vegetation, hydroseed and mulch disturbed areas throughout Segment A. Irrigate as necessary.

2. Construct Segment B

- 2.1. Construct Segment B using procedure and sequence indicated for Segment A.

3. Connect side channel to river

- 3.1. Isolate work zone around upstream end of side channel.
- 3.2. Construct/install woody habitat structures in upstream end of side channel. Maintain river flow through Segment B. Minimize flow through side channel until activation of side channel becomes absolutely necessary.
- 3.3. Using bed excavation, gravel/cobble push up dam or other suitable, minimally disruptive means; divert water into side channel. Gradually connect side channel to river at a rate of approximately 10 cubic feet per second (cfs) per hour per to reduce large sediment entrainment in the main channel. Enable flow in side channel to be regulated to facilitate testing and adjustments of side channel.
- 3.4. Monitor and adjust side channel and side channel structures as necessary.

4. Construct Segment C

- 4.1. Construct Segment C using same procedures and sequence indicated for Segment A.
- 4.2. Remove cofferdams.

5. Adjust and fine tune all structures

- 5.1. Adjust and fine tune all habitat structures in river and side channel.

6. Construct spring channel

- 6.1. Excavate and shape spring channel.
- 6.2. Fine grade spring channel area.
- 6.3. Plant woody vegetation, hydroseed and mulch disturbed areas. Irrigate as necessary.

7. Fine grade remaining disturbed areas

- 7.1. Remove all stockpiled soil, gravel cobble, rock and/or riprap from site.

8. Plant, transplant, hydroseed, mulch and irrigate disturbed areas as per vegetation plan

9. Remove and dispose of properly all debris from site, demobilize

10. Monitor, Irrigate and maintain

MKH : MGF

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Revision No:	Date:	Description:	Initials:	Designed: JJF
1	08/01/11	Channel downcut redesign	JJF	Drawn: MGF
				Checked: MKH
				Date: 06/27/11
				Project No: 2698-006-02

APPROVED FOR CONSTRUCTION

Walla Walla River
Umatilla County, Oregon
Confederated Tribes of the
Umatilla Indian Reservation



GEOENGINEERS
523 East Second Avenue
Spokane, Washington 99202

Construction Sequencing Notes
Lampson Construction Drawings

Sheet
S-11.4

Tree Quantities for Habitat Structures

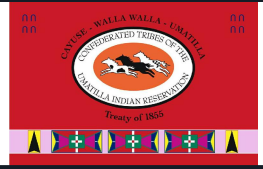
Main Channel																	
Structure ID	Structure Name	# Of Proposed Structures Per Channel	# Of Small Concrete Anchors Per Channel	# Of Large Concrete Anchors Per Channel	Racking Members	Full Length Tree With Rootwad and Top				Tree With Rootwad				Tree Without Rootwad			
						DBH < 8" L < 20'	DBH = 8 - 12" L = 25'	DBH = 12" - 18" L = 30'	DBH = 18" - 24" L = 40'	DBH = 24" - 36" L = 60'	DBH = 8 - 12" L = 20'	DBH = 12" - 18" L = 20'	DBH = 18" - 24" L = 25'	DBH = 24" - 36" L = 40'	DBH = 8 - 12" L = 20'	DBH = 12" - 18" L = 20'	DBH = 18" - 24" L = 25'
HS-1	Typical Meander Jam	3		40	100	10	20			5	20	30		5	5	5	
HS-2	Typical Root Wad																
HS-3	Typical Sweeper	5		5					5								
HS-4	Typical Buried Snag	3						3									
HS-5	Typical Step Turn																
HS-6	Typical Boulder Cluster																
HS-7	Typical Small Woody Debris																
HS-8	Typical Large Woody Debris	2		30	100	10				5	20	30		5	10	20	
HS-9	Typical River-Wide Boulder Placement Plan																
HS-10	Typical Pocket Water																
HS-11	Typical Longitudinal Log (1)	3						3	3								
HS-12	Apex Jam	1		2				2	1								
Subtotal			0	75	200	20	20	8	9	10	40	60	0	10	15	25	0
Side Channel																	
HS-1	Typical Meander Jam																
HS-2	Typical Root Wad	12	12		24						12						
HS-3	Typical Sweeper	8		8				4	4								
HS-4	Typical Buried Snag																
HS-5	Typical Step Turn	2	3	3	8				4								
HS-6	Typical Boulder Cluster																
HS-7	Typical Small Woody Debris	3	20	20	80	5	15	10		15	15	30					
HS-8	Typical Large Woody Debris								3								
HS-9	Typical River-Wide Boulder Placement Plan																
HS-10	Typical Pocket Water																
HS-11	Typical Longitudinal Log (1)																
HS-12	Apex Jam																
Total			35	31	112	5	15	14	11	15	27	30	0	0	0	0	0
Whole Project																	
Total:	Main Channel and Side Channel		35	106	312	25	35	22	20	25	67	90	0	10	15	25	0

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Revision No:	Date:	Description:	Initials:	Designed: JJF
1	08/01/11	Channel downcut redesign	JJF	Drawn: MGF
				Checked: MKH
				Date: 06/27/11
				Project No: 2698-006-02

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Walla Walla River
Umatilla County, Oregon
Confederated Tribes of the
Umatilla Indian Reservation



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523 East Second Avenue
Spokane, Washington 99202

Tree Quantities For Habitat Structures
Lampson Construction Drawings

Sheet
S-11.5

Bid Schedule

Item #	Item Description	Units	Unit Cost (\$)	No. of Units		Cost (\$)	
				Phase 1 + 2	Phase 1 + 2	Phase 1 + 2	Phase 1 + 2
Division 1	General Requirements	Lump Sum		1			
2100	Environmental Controls	Lump Sum		1			
2110	Cultural Resources	Lump Sum		1			
2200	Protection of Existing Installations	Lump Sum		1			
2300	Cleaning	Lump Sum		1			
3110	Mobilization and Demobilization	Lump Sum		1			
3120	Construction Staking	Day		10			
3130	Traffic Control and Management	Lump Sum		1			
3210	Clearing, Grubbing, Stockpiling and Disposal	Acre		4.00			
3220	Topsoil Stripping, Stockpiling and Reuse	Acre		4.00			
3230	Tree and Plant Protection and Salvage	Lump Sum		1			
3240	Dewatering	Lump Sum		1			
3310	Levee Excavation	CY		11,300			
3320	Floodplain, Side Channel and Spring Channel Excavation and Grading	CY		9,700			
3330	Fill and Grading (Spoils Area A)	CY		400			
3330	Fill and Grading (Spoils Area B) (N/A, 06/23/11)	CY		17,100 0			
3330	Fill and Grading (Spoils Area C) (Changed, 06/23/11)	CY		3,000 20,100			
3340	Haul to Spoils Location C	CY		3,000			
3410	Cofferdams	LF		2,100			
3520	Woody Habitat Structures	Lump Sum		1			
3530	Rock Structures (Imported Boulders)	Each		50			
3530	Rock Structures (Salvaged Riprap)	Each		600			
3530	Rock Structures (Cobbles and Gravel)	CY		500			
3620	Seeding and Planting	Lump Sum		1			
3630	Transplanting Trees and Shrubs	Lump Sum		1			
3700	Haul and Disposal of Excavated Material	CY		0			
3800	Site Cleanup and Repair	Lump Sum		1			
TOTAL CONSTRUCTION COST							

MKH : MGF

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Revision No:	Date:	Description:	Initials:	Designed: JJF
1	08/01/11	Channel downcut redesign	JJF	Drawn: MGF
				Checked: MKH
				Date: 06/27/11
				Project No: 2698-006-02

APPROVED FOR CONSTRUCTION

Walla Walla River
Umatilla County, Oregon
Confederated Tribes of the
Umatilla Indian Reservation



GEOENGINEERS
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Construction Quantities
Lampson Construction Drawings

Sheet
S-11.6