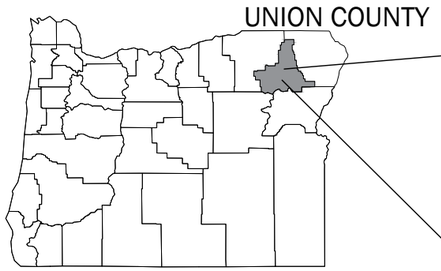
AIWOHI DRY CREEK

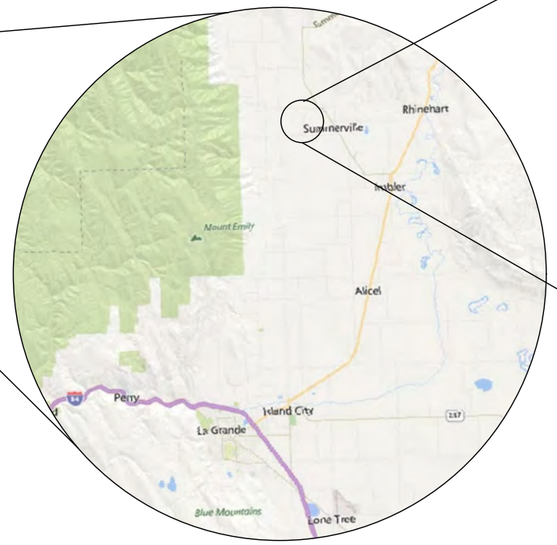
HABITAT RESTORATION

15% CONCEPTUAL DESIGN



PROJECT LOCATION

THE PROJECT SITE IS LOCATED APPROXIMATELY 14 MILES NORTH OF LA GRANDE, OREGON. TO GET TO THE PROJECT SITE FROM LA GRANDE TAKE OR-82 E TO N MCALISTER RD. TURN LEFT ONTO N MCALISTER RD AND FOLLOW FOR 9.6 MILES. CONTINUE ONTO HUNTER ROAD. TURN RIGHT ONTO MCKENZIE LN AND CONTINUE FOR 0.9 MILES. TURN LEFT ONTO SLACK ROAD AND CONTINUE FOR APPROXIMATELY 0.5 MILES. THE PROJECT SITE WILL BE ON THE LEFT.



Not to Scale

Not to Scale

Sheet Index	
Sheet Number	Sheet Title
1.1	Cover Sheet
1.2	Project Goals and Objectives
1.3	Legend and Notes
2.1	Existing Conditions Overview
2.2	Existing Plan and Profile
2.3	Existing Plan and Profile
3.1	Proposed Conditions Overview
4.1	Valley Sections
5.1	Typical Details

CONTACT INFORMATION

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AIWOHI DRY CREEK HABITAT RESTORATION
15% CONCEPTUAL DESIGN
LA GRANDE, OREGON

COVER SHEET

DRAWN: BHM	PROJ NO: 19369-002-00
DESIGN: TPH	SHEET 1 OF 9
CHECKED: RSC	DATE: 10.31.2017
SHEET NO. 1.1	

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Aiwohi Dry Creek Restoration Design

Limiting Factor[1]	NOAA Ecological Concern[2]	Aiwohi Dry Creek Restoration Objectives[3]	Action Types[4]	Metric Categories
Large Wood Deficiency	4.2 LWD Recruitment 6.2 Instream Structural Complexity	Increased quantity of large wood Increased quantity and quality of habitat diversity Increased juvenile rearing habitat	Large wood placement Channel reconstruction: pool, riffle, meander	Mapping large wood abundance and location Channel geometry metrics Mapping juvenile rearing habitat
Lack of Shade	4.1 Riparian Condition 5.2 Floodplain Condition	Increased riparian function Increased floodplain connectivity	Riparian planting, fencing, and non-native plant removal Floodplain reconnection: topography and vegetation	Mapping riparian plant community Channel and floodplain geometry metrics Mapping floodplain inundation
High Summer Water Temperatures	4.1 Riparian Condition 8.1 Temperature	Increased in-stream thermal diversity year-round Increased riparian function	Riparian planting, fencing, and non-native plant removal Floodplain reconnection: topography and vegetation Side-channel/off-channel hyporheic restoration	Mapping riparian plant community Channel and floodplain geometry metrics Mapping floodplain inundation Quantify hyporheic hydraulic gradients
Elevated Sediment and Nutrient Inputs	7.2 Increased Sediment Quantity 8.4 Turbidity	Improved sediment sorting and routing Increased riparian function Increased adult spawning habitat	Channel reconstruction: pool, riffle, meander Riparian planting, fencing, and non-native plant removal Floodplain reconnection: topography and vegetation	Quantify grain-size distributions Channel and floodplain geometry metrics Mapping riparian plant community Mapping adult spawning habitat
Loss of Wetlands	5.1 Side Channel and Wetland Conditions	Increased riparian function Site-appropriate native vegetation Increased quantity and quality of habitat diversity	Wetland, alcove, and secondary channel construction Floodplain reconnection: topography and vegetation	Channel and floodplain geometry metrics Mapping riparian plant community Mapping habitat availability
Stream Channelization	5.1 Side Channel and Wetland Conditions 5.2 Floodplain Condition 6.1 Bed and Channel Form 6.2 Instream Structural Complexity	Increased channel complexity Channel morphology closer to fully functional form Increased quantity and quality of habitat diversity Increased quantity of pools Increased stream velocity diversity Increased juvenile and adult habitat Increased floodplain connectivity	Channel reconstruction: pool, riffle, meander Large wood placement Floodplain reconnection: topography and vegetation Wetland, alcove, and secondary channel construction	Channel and floodplain geometry metrics Mapping floodplain inundation Mapping large wood abundance and location Mapping riparian plant community Mapping habitat availability
Stream Flow Depletion	9.2 Decreased Water Quantity 9.3 Altered Flow Timing	Increased channel complexity Increased floodplain connectivity	Side-channel/off-channel hyporheic restoration Floodplain reconnection: topography and vegetation Wetland, alcove, and secondary channel construction	Quantify hyporheic hydraulic gradients Channel and floodplain geometry metrics Mapping floodplain inundation

1. Limiting Factors as defined by Grande Ronde Model Watershed (2001) and applicable to project reach
2. NOAA Ecological Concerns Sub-Category Definitions
3. Union Soil and Water Conservation District
4. BPA Atlas Planning Process

Project Goal:
Enhance and increase natural channel function and processes that improve habitat suitability for spawning and rearing Chinook salmon, and other native fish and wildlife resources

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AIWOHI DRY CREEK HABITAT RESTORATION
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LA GRANDE, OREGON

PROJECT GOALS AND OBJECTIVES

DRAWN: BHM	PROJ NO: 19369-002-00
DESIGN: TPH	SHEET 2 OF 9
CHECKED: RSC	DATE: 10.31.2017
SHEET NO. 1.2	

GENERAL NOTES:

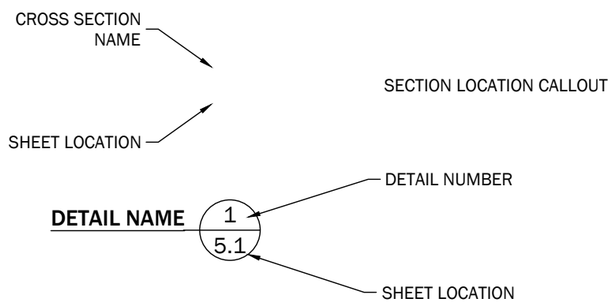
1. These designs and drawings have been prepared for the exclusive use of the Union Soil and Water Conservation District (USWCD) and their authorized agents. No other party may rely on the product of our services unless GeoEngineers Inc. (GeoEngineers) agrees in writing in advance of such use.
2. The drawings contained within should not be applied for any purpose or project except the Dry Creek Project Reach as shown in the Project Area located on Sheet 1.1.
3. These designs and drawings are copyrighted by GeoEngineers, Inc. Any use, alteration, deletion, or editing of this document without explicit written permission from GeoEngineers, Inc. is strictly prohibited. Any other unauthorized use of this document is prohibited.
4. USWCD is advised to contact and to obtain the necessary permits and approvals from all appropriate regulatory agencies (local, state, and federal) prior to construction.
5. 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.
6. All rivers, streams, rocks and woody habitat structures are potentially dangerous. These proposed creek improvements are intended to address a wide variety of constraints which target more naturally functioning stream systems and habitat; they are inherently dangerous to people in or around the pond and stream crossing. USCWD and the property owner should address safety concerns appropriately.
7. Potential regulatory changes to flood elevations and flood extents resulting from the proposed enhancements have not been addressed by GeoEngineers as part of this project.
8. In general, the proposed enhancements are intended to result in more stable streambeds, banks and floodplains. 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.
9. Design specifics for structures shall be confirmed and/or verified by a qualified engineer prior to or during construction at each proposed structure location.
10. These figures were originally produced in color.

GENERAL CONSTRUCTION NOTES:

1. These plans are conceptual and not for construction.

ABBREVIATIONS:

WSEL	WATER SURFACE ELEVATION
TYP	TYPICAL
FT	FEET
ELEV	ELEVATION
Horiz.	HORIZONTAL
Vert.	VERTICAL
MIN	MINIMUM
MAX	MAXIMUM
NTS	NOT TO SCALE
AC	ACRES
℄	CHANNEL THALWEG (SECTION VIEW)
ACW	ACTIVE CHANNEL WIDTH
OHW	ORDINARY HIGH WATER
SQ-FT	SQUARE FEET
CY	CUBIC YARDS



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AIWOHI DRY CREEK HABITAT RESTORATION
15% CONCEPTUAL DESIGN
LA GRANDE, OREGON

LEGEND AND NOTES

DRAWN: BHM	PROJ NO: 19369-002-00
DESIGN: TPH	SHEET 3 OF 9
CHECKED: RSC	DATE: 10.31.2017
SHEET NO. 1.3	

Plotted: 10/30/2017, 14:59 | bmiller P:\19\19369002\CAD\00\Channel Design\R00 (15% Design)\19369002_Channel Design_S03_Legend and Notes.dwg

NOTES:

1. Sheets are projected in Oregon State Plane, North, International feet. North American Vertical Datum of 1988 (NAVD88).
2. Existing topography provided by RSI, October 2017.
3. Aerial imagery provided by RSI, October 2017.

LEGEND

EXISTING DRY CREEK ALIGNMENT

VIEWPORT

N

0 30 60

SCALE IN FEET

SHEET 2.2

SHEET 2.3

DRY CREEK

10+00 10+50 11+00 11+50 12+00 12+50 13+00 13+50 14+00 14+50 15+00 15+50 16+00 16+50 17+00 17+50 18+00 18+50 19+00 19+50 20+00 20+50 21+00 21+45

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AIWOHI DRY CREEK HABITAT RESTORATION
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EXISTING CONDITIONS OVERVIEW

DRAWN: BHM	PROJ NO: 19369-002-00
DESIGN: TPH	SHEET 4 OF 9
CHECKED: RSC	DATE: 10.31.2017

SHEET NO.

2.1

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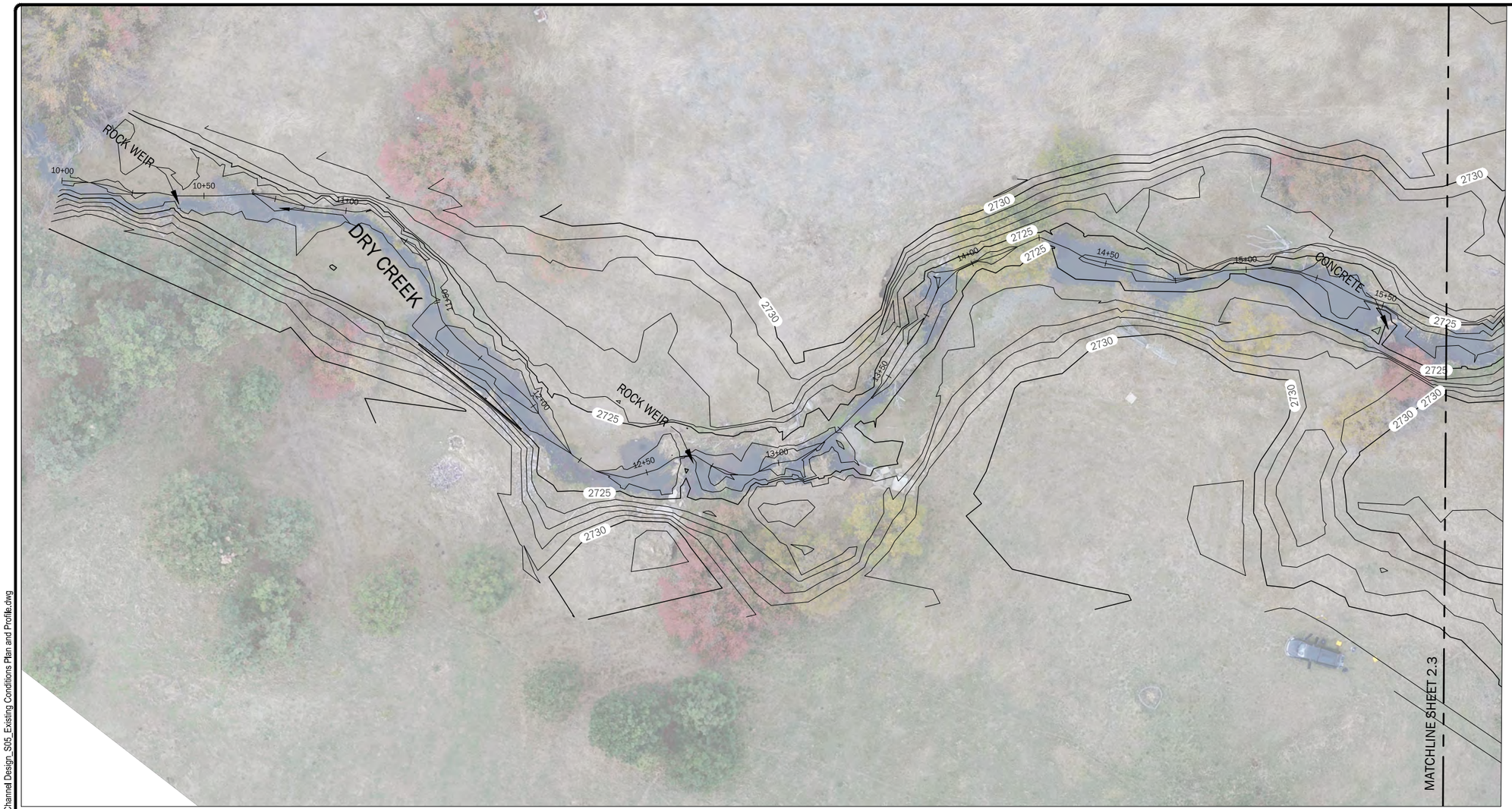
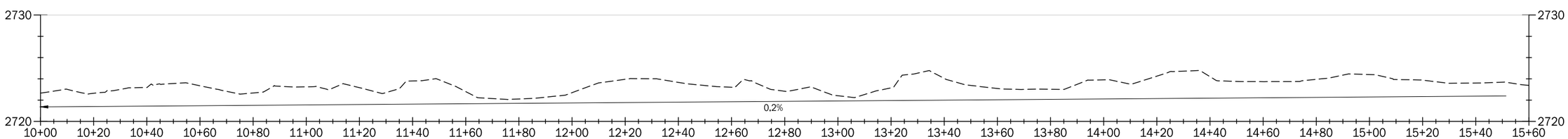


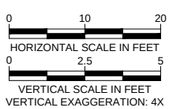
LEGEND

- CONTOUR LINE - MAJOR (5-FOOT)
- CONTOUR LINE - MINOR (1-FOOT)
- EXISTING DRY CREEK ALIGNMENT

NOTES:

1. Sheets are projected in Oregon State Plane, North, International feet. North American Vertical Datum of 1988 (NAVD88).
2. Existing topography provided by RSI, October 2017.
3. Aerial imagery provided by RSI, October 2017.





EXISTING THALWEG PROFILE

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EXISTING PLAN AND PROFILE

DRAWN: BHM	PROJ NO: 19369-002-00
DESIGN: TPH	SHEET 5 OF 9
CHECKED: RSC	DATE: 10.31.2017
SHEET NO. 2.2	

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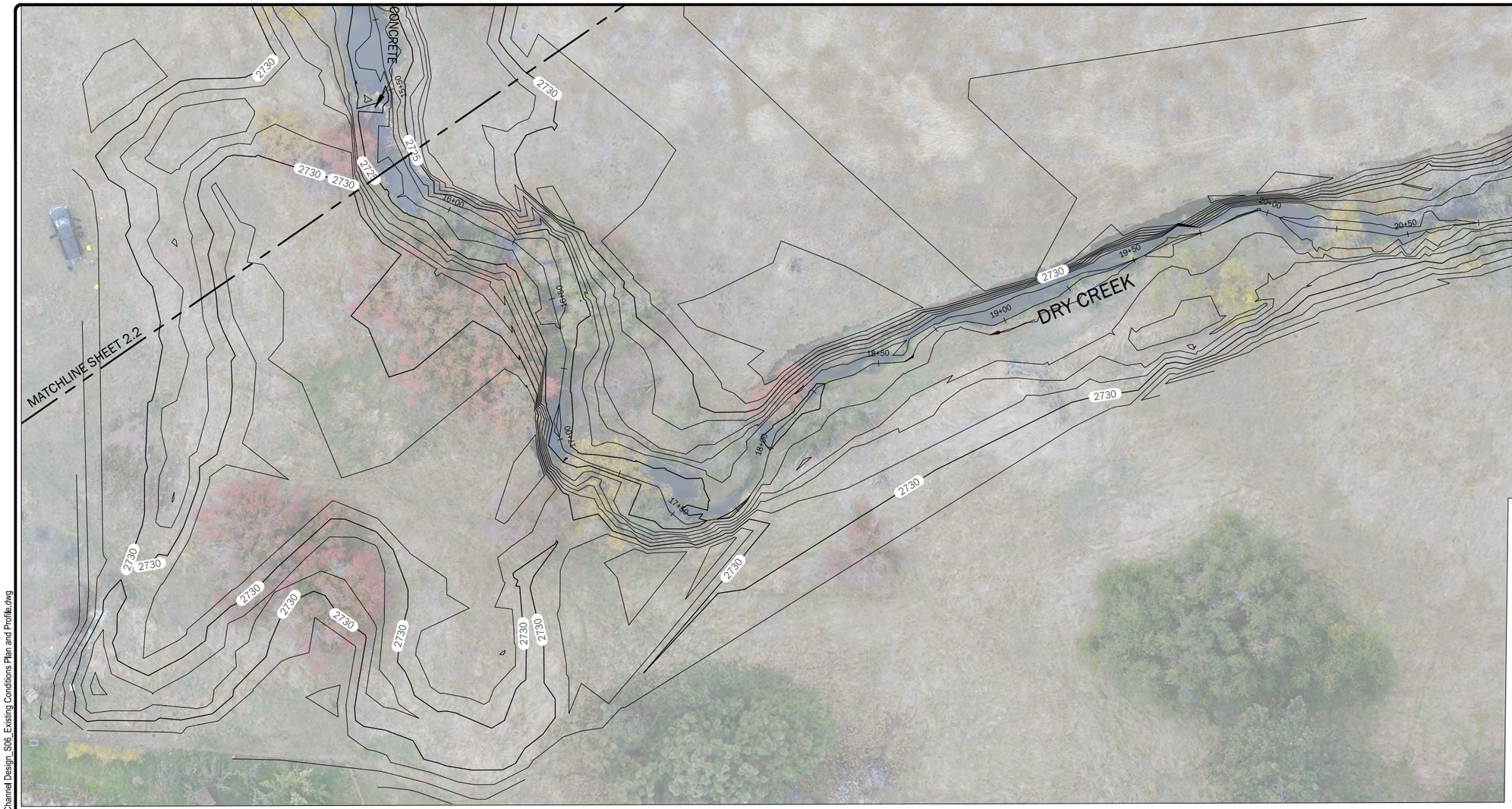


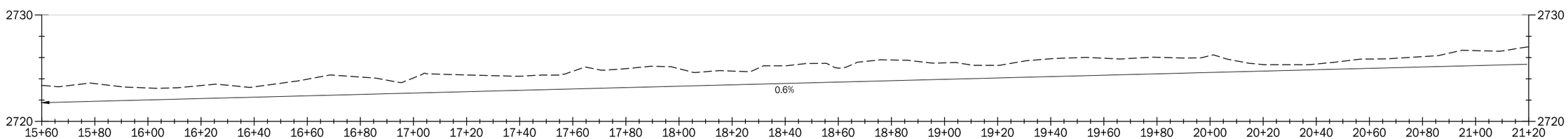
0 20 40
SCALE IN FEET

LEGEND

- CONTOUR LINE - MAJOR (5-FOOT)
- CONTOUR LINE - MINOR (1-FOOT)
- EXISTING DRY CREEK ALIGNMENT

NOTES:

1. Sheets are projected in Oregon State Plane, North, International feet. North American Vertical Datum of 1988 (NAVD88).
2. Existing topography provided by RSI, October 2017.
3. Aerial imagery provided by RSI, October 2017.



0 10 20
HORIZONTAL SCALE IN FEET
0 2.5 5
VERTICAL SCALE IN FEET
VERTICAL EXAGGERATION: 4X

EXISTING THALWEG PROFILE

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EXISTING PLAN AND PROFILE

DRAWN: BHM	PROJ NO: 19369-002-00
DESIGN: TPH	SHEET 6 OF 9
CHECKED: RSC	DATE: 10.31.2017
SHEET NO. 2.3	

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Plotted: 10/30/2017, 15:00 | bmiller P:\19\19369002\CAD\00\Channel Design\R00 (15% Design)\19369002_Channel Design_S06_Existing Conditions Plan and Profile.dwg

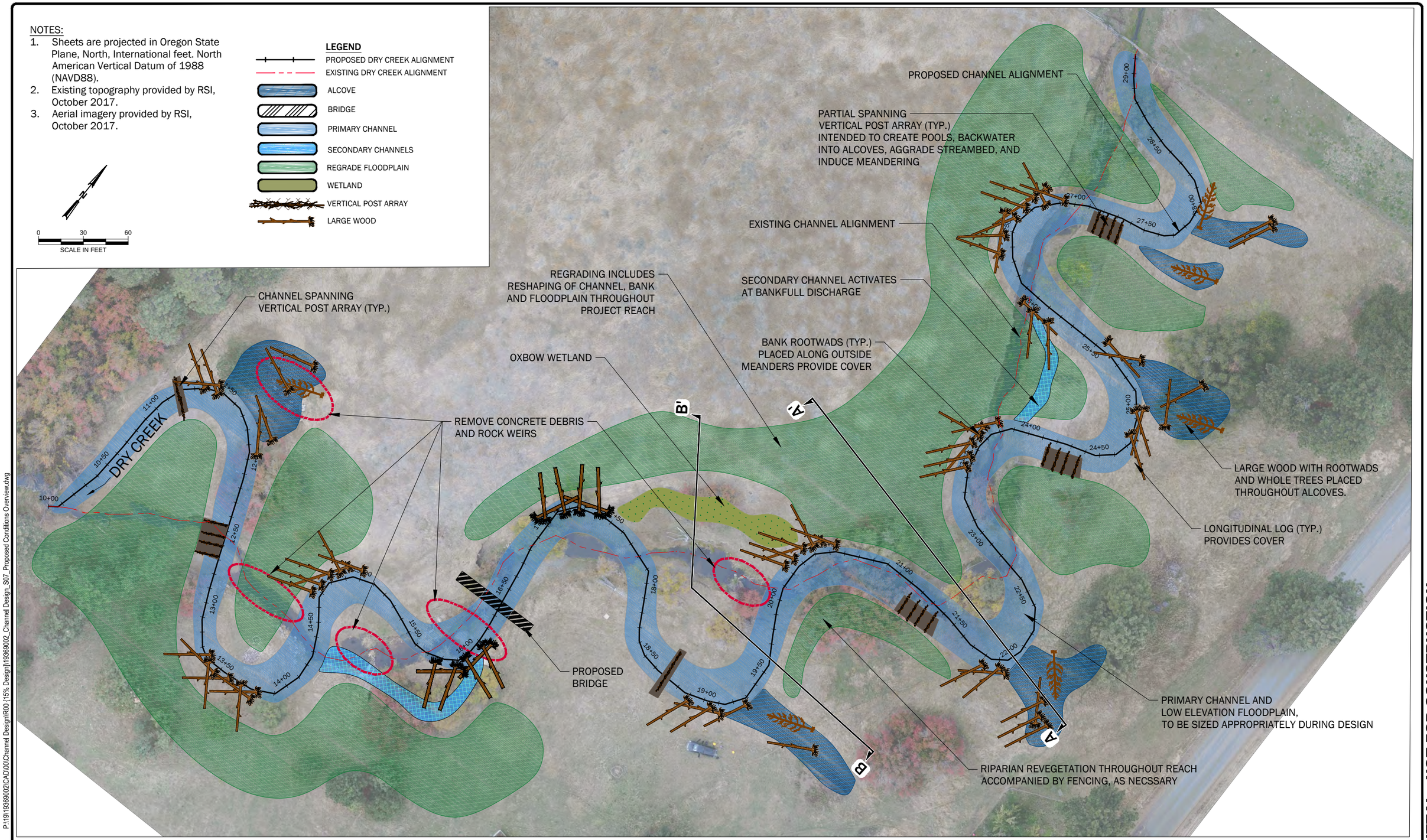
NOTES:

1. Sheets are projected in Oregon State Plane, North, International feet. North American Vertical Datum of 1988 (NAVD88).
2. Existing topography provided by RSI, October 2017.
3. Aerial imagery provided by RSI, October 2017.

LEGEND

- PROPOSED DRY CREEK ALIGNMENT
- EXISTING DRY CREEK ALIGNMENT
- ALCOVE
- BRIDGE
- PRIMARY CHANNEL
- SECONDARY CHANNELS
- REGRADE FLOODPLAIN
- WETLAND
- VERTICAL POST ARRAY
- LARGE WOOD

0 30 60
SCALE IN FEET



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PROPOSED CONDITIONS OVERVIEW

DRAWN: BHM	PROJ NO: 19369-002-00
DESIGN: TPH	SHEET 7 OF 9
CHECKED: RSC	DATE: 10.31.2017
SHEET NO. 3.1	

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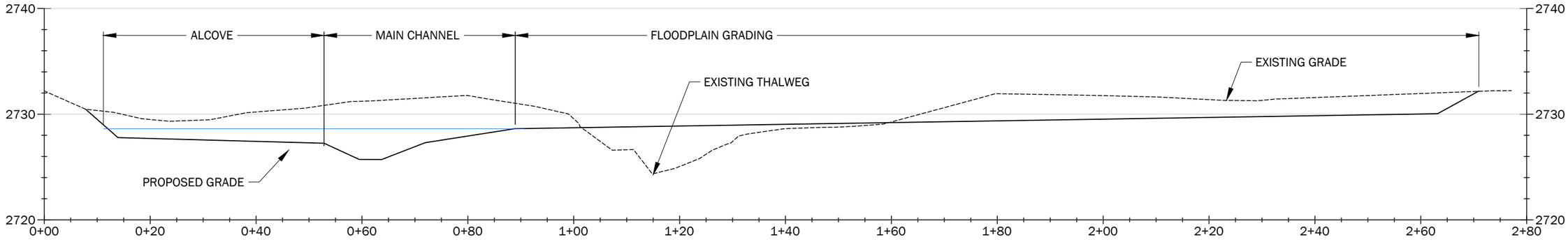
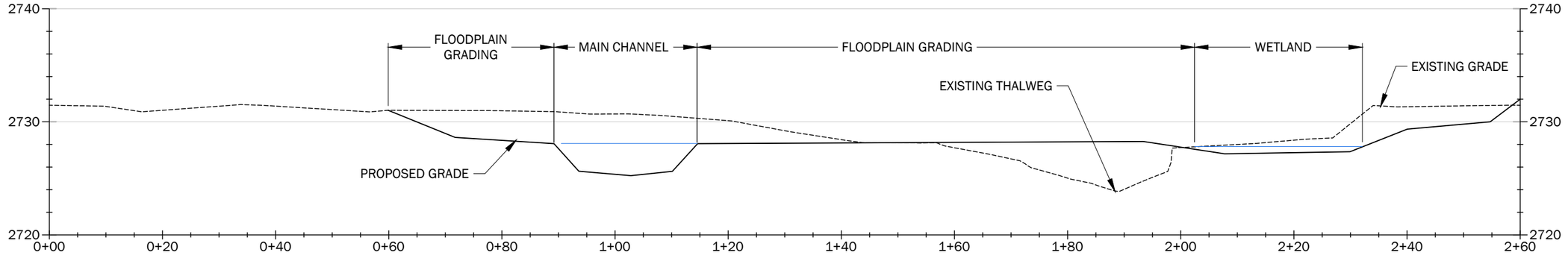
Plotted: 10/30/2017, 15:00 | bmiller
P:\19\19369002\CAD\00\Channel Design\R00 (15% Design)\19369002_Channel Design_S07_Proposed Conditions Overview.dwg

NOTES:
1. Sheets are projected in Oregon State Plane, North, International feet. North American Vertical Datum of 1988 (NAVD88).
2. Existing topography provided by RSI, October 2017.
3. Cross Section face downstream, stationing increases from right to left.
4. Vertical Exaggeration = 2X.



SECTION A-A'



SECTION B-B'

0 10 20
HORIZONTAL SCALE IN FEET
0 5 10
VERTICAL SCALE IN FEET

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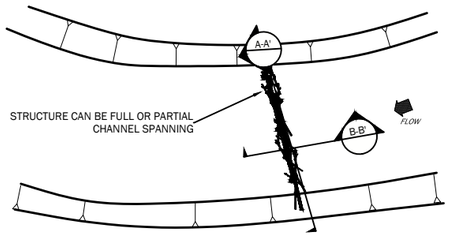
LA GRANDE, OREGON

VALLEY SECTIONS

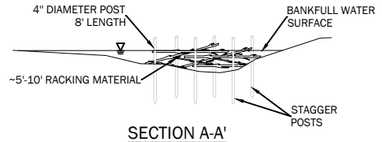
DRAWN: BHM	PROJ NO: 19369-002-00
DESIGN: TPH	SHEET 8 OF 9
CHECKED: RSC	DATE: 10.31.2017
SHEET NO. 4.1	

DRAFT SUBMITTAL - NOT FOR CONSTRUCTION

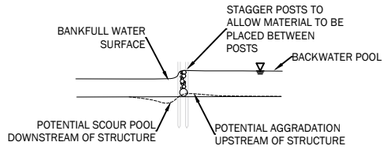
Plotted: 10/30/2017 15:00 | bmiller
P:\19\19369002\CAD\00\Channel Design\R00 (15% Design)\19369002_Channel Design_S08_Valley Sections.dwg



VERTICAL POST ARRAY



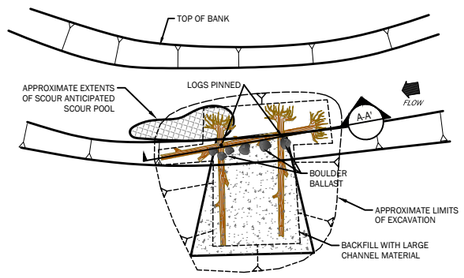
SECTION A-A'



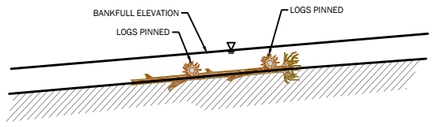
SECTION B-B'

PURPOSE:
- MIMICS FUNCTIONALITY OF A BEAVER DAM
- USE IN SIDE CHANNELS TO CREATE BACKWATER CONDITIONS, INCREASED FLOODPLAIN INUNDATION AND HYPORHEIC EXCHANGE

DESIGN SPECIFICS:
- USE 4" DIAMETER POSTS ~8' LONG AT 3' SPACING
- STAGGER POSTS SO THEY ARE NOT IN A STRAIGHT LINE
- DRIVE POSTS ~4' BELOW GROUND SURFACE
- WEAVE RACKING MATERIAL BETWEEN POSTS
- CAN INCLUDE LARGE WOOD, 12"-18" DBH, ~6'-8' LENGTH
- STRUCTURE SPANS 40-100% OF THE CHANNEL
- ADDITIONAL DEBRIS IS EXPECTED TO COLLECT OVER TIME



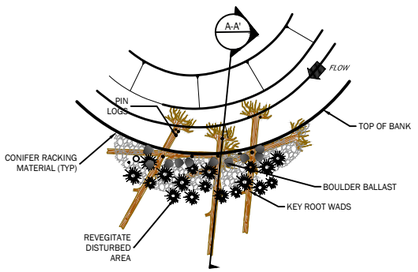
LONGITUDINAL LOG



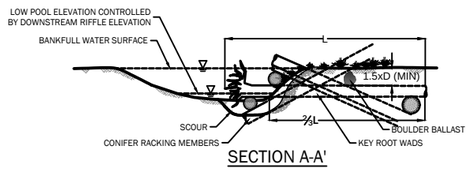
SECTION A-A'

PURPOSE:
- CREATES LATER SCOUR POOL.
- PROMOTES GRAVEL BAR FORMATION.
- CREATES DIVERSE FISH HABITAT.
- PROVIDES COVER.

DESIGN SPECIFICS:
- PLACE AS INDICATED ON HABITAT PLANS.
- PLACE ROOT WAD ON OR IN STREAM BED.
- TREES WITH BRANCHES OR MULTIPLE TRUNKS PREFERRED.
- SECURE KEY MEMBERS BY PINNING TO PREVENT BOUNCING OF TREES DURING FLOODS.
- BALLAST SHALL BE INSTALLED ON KEY MEMBERS BURIED INTO BANK.



BANK ROOTWADS



SECTION A-A'

NOTES:

PURPOSE:
- INCREASES POOL DEPTH.
- SLOWS LATERAL MIGRATION.
- PREVENTS BANK EROSION.

DESIGN SPECIFICS:
- TOP OF ROOTWAD SHOULD NOT EXTEND MORE THAN ½-FT ABOVE TOP OF BANK. (BANKFULL)
- MEMBERS SHALL EXTEND BELOW CALCULATED SCOUR DEPTH.
- PLACE ROOT WADS ALONG OUTSIDE OF BENDS.
- INSTALL RACKING MEMBERS AND VEGETATION AMONG ROOT WADS WHILE INSTALLING ROOT WADS.
- IRRIGATE VEGETATION AS REQUIRED.
- ALL KEY MEMBERS REQUIRE BALLAST. BALLAST SHALL MEET SIZE AND QUANTITY IDENTIFIED ON THE QUANTITIES TABLE.

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AIWOHI DRY CREEK HABITAT RESTORATION
15% CONCEPTUAL DESIGN
LA GRANDE, OREGON

TYPICAL DETAILS

DRAWN: BHM	PROJ NO: 19369-002-00
DESIGN: TPH	SHEET 9 OF 9
CHECKED: RSC	DATE: 10.31.2017
SHEET NO. 5.1	

Plotted: 10/30/2017 - 15:01 | bmiller P:\19\19369002\CAD\00\Channel Design\R00 (15% Design)\19369002_Channel Design_S09_Typical Details.dwg