HIP III

BASIS OF DESIGN REPORT

PROJECT NAME
LOCATION

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PREFACE

GENERAL PROJECT DATA SUMMARY REQUIREMENTS (GPDSR);

Planning and design documentation of conservation practices should effectively communicate that appropriate planning, analysis, design and resulting construction documentation are met. The project documentation should provide other persons the means of quickly following the rationale used in determining all features of a design including the design objective(s), data, criteria, assumptions, procedures, and decisions used in design and resulting construction plans, specifications and details. The GPDSR serves as the design submittal framework that is needed to assess and evaluate the adequacy of the proposed project.

The GPDSR criteria were developed using the River Restoration Analysis Tool and address the 16 overarching questions proposed within the RiverRAT Framework.

The BPA RRT will review submitted GPDSR documents to determine if the technical deliverables provided are adequate for *functionality (adherence to HIP 3 Conservation Measures)* and technical quality (competent execution of design and project plans – contract documents).

For the Channel Reconstruction activity category a project specific Monitoring and Adaptive Management Plan must be included.

PROJECT REVIEW JUNCTURES;

15% RRT Review: Project Sponsor will notify BPA at the 15% project concept completion stage and coordinate a site visit to review project concepts, goals, and objectives and confirm the direction and planning for subsequent phases of project design. The site visit will include the review of limiting factors and any pertinent studies or reports that document restoration targets for implementation and draft project concepts. Additional data that may be presented and reviewed include other data sources e.g. high resolution aerial photography, topographic maps, geology – soils, GIS – CAD data layers or other resource data. BPA will clarify technical documentation requirements with the Sponsor at this stage. BPA will provide functional and technical comments after the site review to be addressed as the project advances to 30% completion.

Submit 30% Design for RRT Review: Sponsor will notify BPA at the 30% project preliminary design completion stage. The 30% project drawings and preferred project alternatives will be submitted for RRT functional and technical review. The 30% design shall demonstrate incorporation of technical comments and recommendations provided at the 15% project review. The 30% design submittals should include preliminary drawings and specifications including overall site locations, site plans, profiles, cross sections, details, preliminary quantities and provisional technical analyses as summarized in a draft Basis of Design Report using the GPDSR outline. BPA will perform functional and technical review of the 30% submittal and provide comments back to the Sponsor to be addressed as the project advances to 80% completion.

Submit 80% Design for RRT Review: Sponsor will notify BPA at the 80% project concept completion stage. The 80% project drawings will be submitted for RRT functional and technical review. The 80% design should demonstrate *complete* incorporation of functional and technical review comments and recommendations developed at the 30% project review. The 80% design submittals should include near final drawings and specifications including specific site locations, site plans, profiles, cross sections, details, construction quantities, implementation resource plans and design technical analyses as summarized in a Basis of Design Report addressing the GPDSR requirements. BPA will perform functional and technical review of the 80% submittal and provide comments back to the Sponsor to be addressed as the project advances to completion after which the sponsor will submit the final design for BPA's records.

1.1 NAME AND TITLES OF SPONSOR, FIRMS AND INDIVIDUALS RESPONSIBLE FOR DESIGN.

XXX - Project Sponsor
XXX - Design Firm
XXX - Engineering Firm

1.2 LIST OF PROJECT ELEMENTS THAT HAVE BEEN DESIGNED BY A LICENSED PROFESSIONAL ENGINEER.

- Engineered log jam (LWD) to maintain channel divergence

1.3 IDENTIFICATION AND DESCRIPTION OF RISK TO INFRASTRUCTURE OR EXISTING RESOURCES.

There is no risk to infrastructure within impact range of the project. The primary risk to existing resources within the impact range of the project is associated with unanticipated debris collecting on the engineered log jam at the channel divergence. Debris collection and resulting blockages could result in unpredicted distribution of instream flows between the secondary channels located within the project area.

1.4 EXPLANATION AND BACKGROUND ON FISHERIES USE (BY LIFE STAGE - PERIOD) AND LIMITING FACTORS ADDRESSED BY PROJECT.

The project area is designated critical habitat for Chinook, steelhead, and bull trout. Bull trout, rainbow/steelhead trout, Chinook, and westslope cutthroat trout have been surveyed by IDFG upstream and downstream of the project site (pers. comm. Mike Biggs, IDFG 5/20/16). In 2015, Chinook redds were aerially surveyed by IDFG within the project site (pers. comm. Mike Biggs, IDFG 2/10/16). No Chinook redds were surveyed in the project area in 2016 (IDFG data shared by Windy Davis, 12/7/16). Other fish species that may be in the project area include mountain whitefish, brook trout, suckers, dace, and sculpins.

Riparian condition and increased sediment are both listed as the second most limiting factor in the project area as identified by the Federal Columbia River Power System 2012 Expert Panel (FCRPS) for Chinook salmon, with bed and channel form listed as the third, and habitat quantity-competition listed as the eighth most limiting factor. For Snake River Steelhead, riparian condition is listed as the fourth limiting factor, with sediment, and bed and channel form, both listed as the fifth most limiting factor.

This project will address habitat quantity, increased sediment, riparian condition, and bed and channel form in the Pahsimeroi River for both steelhead and Chinook salmon. Large wood structures at a main/side channel split will both create fish habitat and maintain the side channel for habitat quantity. Bioengineered bank rehabilitation will eliminate a sediment input, and produce fish habitat by creating roughness, reducing near-bank velocity, and supporting development of riparian vegetation.

1.5 LIST OF PRIMARY PROJECT FEATURES INCLUDING CONSTRUCTED OR NATURAL ELEMENTS.

- Bank treatment using terrace grading/sloping, clump willows, and sod mats
- Pool bed feature
- Floodplain/bankfull bench
- Engineered log jam (LWD) to split flow at channel divergence
- Root wad placement for habitat enhancement
- Log barb
- Riparian exclosure fence
- Maintenance of split flow configuration (to provide both main channel and side channel habitat)

1.6 DESCRIPTION OF PERFORMANCE / SUSTAINABILITY CRITERIA FOR PROJECT ELEMENTS AND ASSESSMENT OF RISK OF FAILURE TO PERFORM, POTENTIAL CONSEQUENCES AND COMPENSATING ANALYSIS TO REDUCE UNCERTAINTY.

The primary project objective is to maintain split flow conditions at a channel divergence on the Pahsimeroi River. Between 2006 and 2011, a meander cutoff channel formed, enlarged, and captured the majority of flows in the river. The meander cutoff channel has less length than the historic alignment, and is correspondingly higher in gradient. The relatively steep newer channel provides quality fish habitat, but the quality of habitat provided by the abandoned channel continues to decline as the newer channel continues to enlarge. Project treatments are designed to maintain split flow conditions, to reduce sediment inputs to the drainage by increasing bank stability, to increase the diversity of aquatic habitat by installing instream wood structure, and to increase riparian vegetation. The performance criteria of proposed project treatments include maintenance of split flow conditions, reduction in the length of exposed raw river bank, and establishment of installed vegetation. The risks of nonperformance include a return to pre-project conditions with reduced habitat values in the historic channel alignment and ongoing bank erosion. In order to reduce uncertainty of performance, project treatments were designed using measures that have been implemented successfully during previous projects in the region.

1.7 DESCRIPTION OF DISTURBANCE INCLUDING TIMING AND AREAL EXTENT AND POTENTIAL IMPACTS ASSOCIATED WITH IMPLEMENTATION OF EACH ELEMENT.

The recommended in-stream work window for the Pahsimeroi River below Hooper Lane is the first week of July through the third week of August (*Upper Salmon Basin Watershed Project. 2005. Upper Salmon River Recommended Instream Work Windows and Fish Periodicity. USBWP interagency Technical Advisory Committee*). In-stream work for this project is scheduled to occur during this time and therefore no variance will be requested.

In order to reduce potential impacts from sediment to ESA-listed and resident fish species, two worksites will be isolated and dewatered to the extent possible. All active stream flow

will be diverted into the northeast side channel prior to construction on the southwest channel. If streamflow is low and manageable, temporary cofferdams will consist of Aqua-Barrier water filled barriers with internal baffles for stability. A pump may be used in the event water seeping into the project site needs to be removed for project actions. The pump will be required to have a screen which meets NOAA fish screen criteria. Pump water will be delivered into upland or a riparian area where it will have time to filter sediment before re-entry into the river. Worksite isolation of the southwest channel will dewater 478 feet. The main channel will need to be dewatered for approximately two weeks.

After construction is complete on the southwest channel, the cofferdam will be re-located to isolate the worksite on the northeast channel. The northeast channel construction site is approximately 40 linear feet and will need to be isolated from streamflow for one to two days. Aqua-Barrier water filled barriers with internal baffles for stability will be temporarily placed in order to provide enough room for log structure placement. A pump may be used in the event water seeping into the project site needs to be removed for project actions. As engineering plans become finalized, this dewatering/worksite isolation plan may change to include dewatering the entire side channel, or to installing the log structures in the wet.

In conjunction with dewatering and work site isolation, the Salmon Region IDFG fisheries staff will provide fish salvage operations using appropriate electrofishing methodologies.

2. RESOURCE INVENTORY AND EVALUATION.

2.1 DESCRIPTION OF PAST AND PRESENT IMPACTS ON CHANNEL, RIPARIAN AND FLOODPLAIN CONDITIONS.

The project area reach of the Pahsimeroi River is located within agricultural lands used primarily for cattle ranching and hay production.

Primary channel impacts within the project include the relatively recent formation of a meander cutoff channel that continues to enlarge through mobilization of bed material and erosion of river banks. Enlargement of the channel results in reduced hydrologic support for the historic channel alignment, and reduced quantity of fish habitat in the reach. Rock rip rap has been placed within both the meander cutoff channel and the historic channel alignment.

Riparian vegetation is confined to the area encompassed within the existing exclosure fence; riparian areas located beyond existing fences are utilized for agricultural operations and vegetation communities have converted from riparian types to hay meadow composition.

The Pahsimeroi River floodplain has been altered by grading activities associated with agricultural operations (irrigation water conveyance and application) and residential development.

2.2 INSTREAM FLOW MANAGEMENT AND CONSTRAINTS IN THE PROJECT REACH.

The hydrologic regime of the Pahsimeroi River is characterized by peak flows in the winter and seasonally low flows in the summer due to upstream irrigation diversion withdrawals. Ongoing water use and management activities result in seasonally low flows during the desired project implementation period (July 1 to August 21). The project has been designed to achieve project objectives under the current hydrologic regime, which is characterized by typical peak flows of around 300 cfs in the fall and winter and typical low flows of around 100 cfs in the spring and summer.

2.3 DESCRIPTION OF EXISTING GEOMORPHIC CONDITIONS AND CONSTRAINTS ON PHYSICAL PROCESSES.

The Pahsimeroi River is a highly sinuous meandering system located in a broad alluvial valley. The system generally has a high width/depth ratio single thread channel form, although isolated sub-reaches of braided channels separated by vegetated floodplain islands are evident. The hydrologic regime of the system is highly altered as a result of irrigation withdrawals that eliminate any surge of spring snow melt driven peak flows. As a result, the current sediment transport regime is dominated by winter peak flow rates and is anticipated to be highly altered from the historic sediment transport regime that would have been driven by large magnitude spring peak flows. Land use encroachment on the riparian corridor has diminished woody vegetation extent. The combination of reduced riparian vegetation and altered sediment transport regime have resulted in widespread bank erosion and lateral channel migration.

A meander cutoff channel recently formed within the project area, and now conveys a majority of river flows through a relatively short and steep sub-reach. The steep meander cutoff channel has enlarged through the entrainment of alluvium and river bank materials into the basin. Enlargement of the new relatively short channel alignment has resulted in reduced hydrologic support for the longer historic channel alignment, and a reduction in the quantity of fish habitat within the reach.

2.4 DESCRIPTION OF EXISTING RIPARIAN CONDITION AND HISTORICAL RIPARIAN IMPACTS.

Impacts to riparian area conditions have resulted from land uses that have encroached in to riparian vegetation and limited the lateral extent of riparian vegetation. Riparian vegetation is now essentially absent from several sub-reaches of river bank in the project area. The loss of riparian vegetation and root mass has resulted in bank instability and erosion that have been addressed by landowners through installation of rock rip rap. Installed rip rap has transferred issues of bank instability to adjacent downstream river reaches by enabling high flow velocities to persist in the near bank zone. The high flow velocities and near bank shear stress result in continued bank erosion and loss of riparian vegetation.

2.5 DESCRIPTION OF LATERAL CONNECTIVITY TO FLOODPLAIN AND HISTORICAL FLOODPLAIN IMPACTS.

Historic floodplain impacts along the Pahsimeroi River are associated with agricultural land uses and removal of riparian vegetation, residential development, and rural roadway crossings of the watercourse. The river demonstrates hydraulic connectivity to an observed and active inset floodplain, which is activated at a peak flow (bankfull) discharge rate of about 300 cfs (cubic feet per second).

3 TECHNICAL DATA.

3.1 INCORPORATION OF HIPIII SPECIFIC ACTIVITY CONSERVATION MEASURES FOR ALL INCLUDED PROJECT ELEMENTS.

The Pahsimeroi River project includes HIP III specific activity conservation measures associated with Action Category 2: River, Stream, Floodplain and Wetland Restoration including the following:

- Improvement of secondary channel habitat;
- Streambank protection using bioengineering methods;
- Installation of habitat forming natural material instream structures (large wood); and
- Riparian vegetation planting.

3.2 SUMMARY OF SITE INFORMATION AND MEASUREMENTS (SURVEY, BED MATERIAL, ETC.) USED TO SUPPORT ASSESSMENT AND DESIGN.

Geomorphic field surveys were conducted using professional grade GPS base and rover equipment, and the effort included measurement of bankfull indicators, ordinary high water mark, water surface elevation, thalweg elevations, floodplain and top of bank elevations, channel geometry, local slope, and planform. Collected data were used to generate longitudinal profiles, quantify channel geometry, and to assess channel planform attributes.

3.3 SUMMARY OF HYDROLOGIC ANALYSES CONDUCTED, INCLUDING DATA SOURCES AND PERIOD OF RECORD INCLUDING A LIST OF DESIGN DISCHARGE (Q) AND RETURN INTERVAL (RI) FOR EACH DESIGN ELEMENT.

The U.S. Geological Survey (USGS) maintains a stream gaging station about 2 miles downstream of the project area (#13302005). The gage has a 31-year period of record spanning from 1985 to the present. Gage data reflect the significant hydrologic alteration that irrigation water diversions have on the Pahsimeroi River hydrology. From May through September, diversion withdrawals influence river flows such that the annual hydrograph is characterized as having lowest flow rates during the summer and peak flows in the winter. Figure 1 depicts the average, maximum, and minimum annual mean daily discharge hydrographs at the gage location.

Morphologic channel surveys conducted within the project area identified and recorded the elevation of local bankfull indicators, channel geometry, and channel profile. The project

reach generally has a bankfull channel width of about 54 ft, hydraulic radius of about 1.4 ft, and cross sectional area of about 77 sq ft. The bankfull discharge determined from open channel flow modeling of the surveyed channel form is about 300 cfs (cubic feet per second). Analysis of stream flows from the USGS gage period of record indicate that the bankfull discharge has a return interval of about 1.2 years. Flow duration analysis indicates that the bankfull discharge occurs on average for about 14% of the time in a given year, or for about 50 days per year.

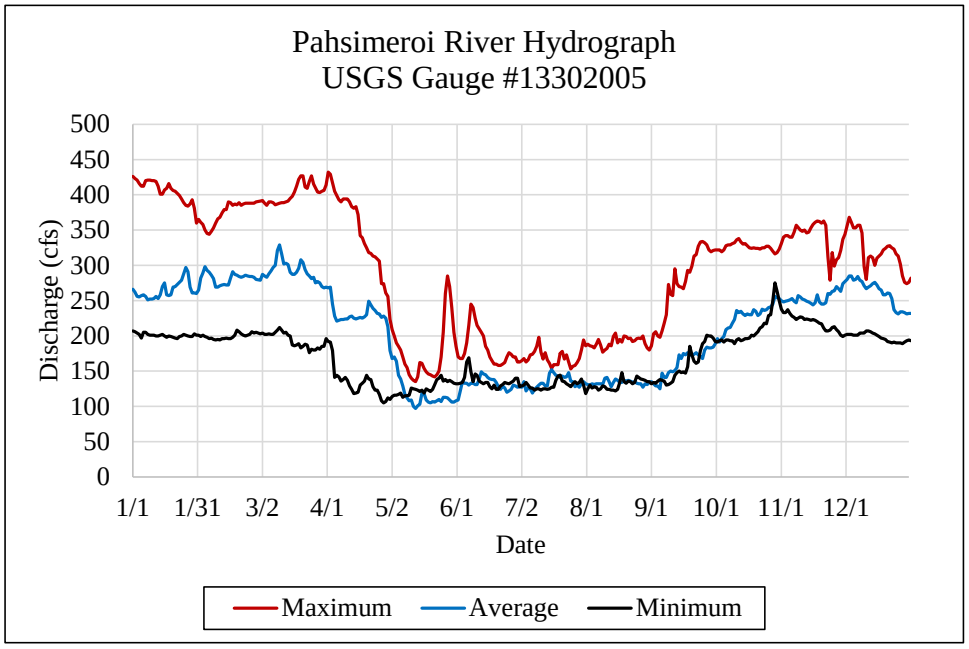

Figure 1. Pahsimeroi River hydrograph, USGS gage #13302005.

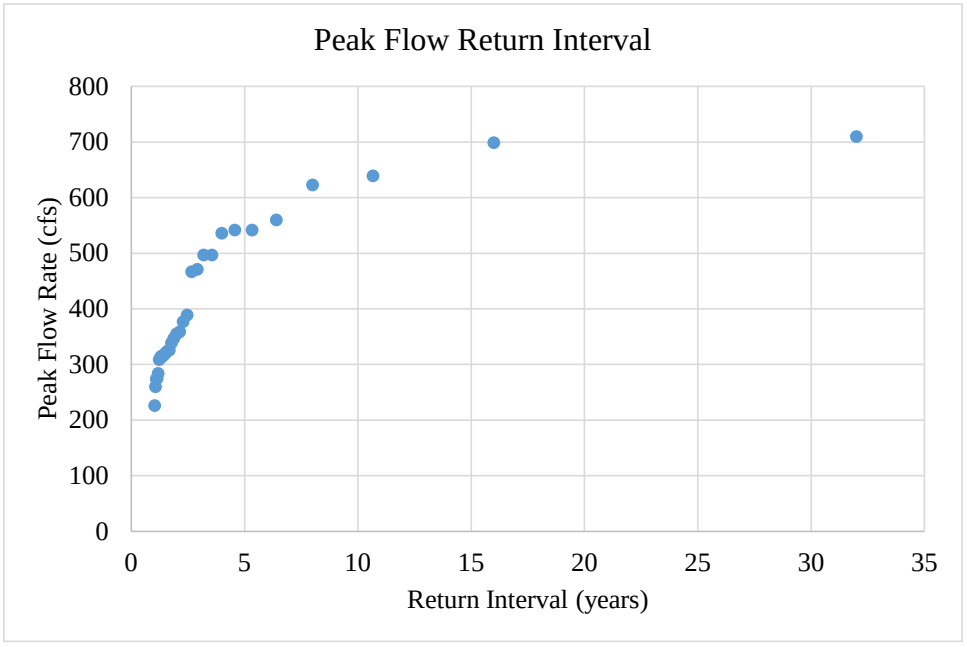

Figure 2. Pahsimeroi River peak flow return intervals calculated from period of record at the proximate USGS stream gage (#13302005).

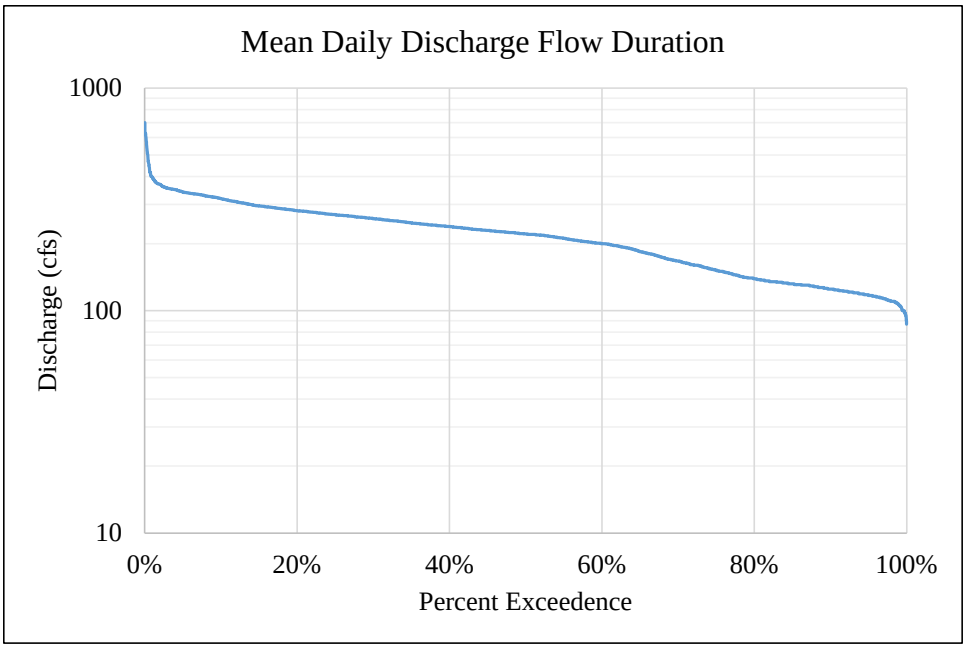

Figure 3. Pahsimeroi River flow duration curve derived from period of record at the proximate USGS stream gage (#13302005).

3.4 SUMMARY OF SEDIMENT SUPPLY AND TRANSPORT ANALYSES CONDUCTED, INCLUDING DATA SOURCES INCLUDING SEDIMENT SIZE GRADATION USED IN STREAMBED DESIGN.

The subject Pahsimeroi River project objectives include bank stabilization using bioengineering treatments and stabilization of a split flow channel configuration using an engineered log jam. Sediment transport analyses were not conducted to inform design treatments.

3.5 SUMMARY OF HYDRAULIC MODELING OR ANALYSES CONDUCTED AND OUTCOMES – IMPLICATIONS RELATIVE TO PROPOSED DESIGN.

Hydraulic modeling was completed (results attached) to identify the design discharge. Morphologic channel surveys conducted within the project area identified and recorded the elevation of local bankfull indicators, channel geometry, channel profile, and local water surface elevation. Survey data were used in conjunction with real-time flow data from the USGS stream gauge to calculate hydraulic roughness (or n-value) using the Manning's equation for open channel flows. Surveyed bankfull channel cross sections were then used to calculate the bankfull discharge based upon calculated hydraulic roughness (n-value) and surveyed cross sectional area, hydraulic radius, and bankfull channel slope. Open channel flow hydraulics and the identified bankfull discharge were then used during the design process to quantify local bankfull stage, to identify proposed floodplain bench elevations, to validate peak flow capacity of project area side channels, and to assess bank stabilization treatments in the context of anticipated flow velocity and shear stress.

3.6 STABILITY ANALYSES AND COMPUTATIONS FOR PROJECT ELEMENTS, AND COMPREHENSIVE PROJECT PLAN.

Stability analyses (attached) for project elements focused on determining proper channel dimensions at the channel divergence to promote a 70/30 percent split in flow rate between the river left and river right channels during low flow periods, and a 55/45 percent in flow rate between the river left and river right channels during peak flow conditions. An engineered log jam with specific morphology was developed to accomplish split flow objectives. The channel geometry established by the engineered log jam was used to calculate flow velocity and shear stress near the engineered log jam. Bank key-in depths and the incorporation of log pilings to secure exposed wood members were utilized to promote stability of the log structure.

Open channel flow hydraulics (discussed in Section 3.5) were used to calculate peak flow velocity and shear stress within side channel treatment areas. The bank stabilization treatment was developed to withstand the anticipated shear stress (0.3 to 0.4 lbs/sqft) and flow velocities (3.6 to 4.2 ft/s) using native organic materials (willow clump transplants, herbaceous vegetation sod mats, and establishment of appropriate bank slope).

3.7 DESCRIPTION OF HOW PRECEDING TECHNICAL ANALYSIS HAS BEEN INCORPORATED INTO AND INTEGRATED WITH THE CONSTRUCTION – CONTRACT DOCUMENTATION.

Construction activities and earthwork contracting for the subject project will be supervised and directed by the design team that completed the technical project design analyses.

3.9 FOR PROJECTS THAT ADDRESS PROFILE DISCONTINUITIES (GRADE STABILIZATION, SMALL DAM AND STRUCTURE REMOVALS): A LONGITUDINAL PROFILE OF THE STREAM CHANNEL THALWEG FOR 20 CHANNEL WIDTHS UPSTREAM AND DOWNSTREAM OF THE STRUCTURE SHALL BE USED TO DETERMINE THE POTENTIAL FOR CHANNEL DEGRADATION.

The subject project does not address profile discontinuities, but instead intends to establish specific cross sectional geometry at a channel divergence in order to maintain split flow conditions, and to install bank stabilization treatments to address local severe bank loss.

3.10 FOR PROJECTS THAT ADDRESS PROFILE DISCONTINUITIES (GRADE STABILIZATION, SMALL DAM AND STRUCTURE REMOVALS): A MINIMUM OF THREE CROSS-SECTIONS – ONE DOWNSTREAM OF THE STRUCTURE, ONE THROUGH THE RESERVOIR AREA UPSTREAM OF THE STRUCTURE, AND ONE UPSTREAM OF THE RESERVOIR AREA OUTSIDE OF THE INFLUENCE OF THE STRUCTURE) TO CHARACTERIZE THE CHANNEL MORPHOLOGY AND QUANTIFY THE STORED SEDIMENT.

The subject project does not address profile discontinuities, but instead intends to establish specific cross sectional geometry at a channel divergence in order to maintain split flow conditions, and to install bank stabilization treatments to address local severe bank loss.

4. CONSTRUCTION – CONTRACT DOCUMENTATION.

4.1 INCORPORATION OF HIPIII GENERAL AND CONSTRUCTION CONSERVATION MEASURES

The Pahsimeroi River project includes HIP III specific construction conservation measures including the following:

- Work area isolation and fish salvage;
- Improvement of secondary channel habitat;
- Streambank protection using bioengineering methods;
- Installation of habitat forming natural material instream structures (large wood); and
- Riparian vegetation planting.

4.2 DESIGN – CONSTRUCTION PLAN SET INCLUDING BUT NOT LIMITED TO PLAN, PROFILE, SECTION AND DETAIL SHEETS THAT IDENTIFY ALL PROJECT ELEMENTS AND CONSTRUCTION ACTIVITIES OF SUFFICIENT DETAIL TO GOVERN COMPETENT EXECUTION OF PROJECT BIDDING AND IMPLEMENTATION.

See attached project design drawings.

4.3 LIST OF ALL PROPOSED PROJECT MATERIALS AND QUANTITIES.

Treatment Description	Quantity	Area (sq ft)	Volume (cy)
Engineered Log Jam at Channel Divergence			
Pile Logs	7		
Footer Logs	2		
Pinning Logs	11		
Racking Logs	as needed		
Engineered Log Jam on Penninsula			
Pile Logs	4		
Footer Logs	2		
Pinning Logs	7		
Racking Logs	as needed		
River Left Channel			
Rip rap removal	104 ft		-25
Bank Stabilization	236 ft		
Floodplain Bench Creation	236 ft	1,232	45
Pool Excavation	n = 1	1,550	-57
Root wad habitat structures	n = 4		
Log barb	n = 1		
River Right Channel			
Rip rap removal	160 ft		-40
Bank Stabilization	125 ft		
Floodplain Bench Creation	125 ft	740	27
Root wad habitat structures	n = 4		
Total Discharge			**72**
Total Excavation (alluvium)			**-57**
Total Excavation (rip rap)			**-65**

4.4 DESCRIPTION OF BEST MANAGEMENT PRACTICES THAT WILL BE IMPLEMENTED AND IMPLEMENTATION RESOURCE PLANS INCLUDING:

1. SITE ACCESS STAGING AND SEQUENCING PLAN.

See attached project design drawings.

2. WORK AREA ISOLATION AND DEWATERING PLAN.

See attached project design drawings.

3. EROSION AND POLLUTION CONTROL PLAN.

See attached project design drawings.

4. SITE RECLAMATION AND RESTORATION PLAN.

See attached project design drawings.

5. LIST PROPOSED EQUIPMENT AND FUELS MANAGEMENT PLAN.

Proposed project activities will be completed using a moderately sized metal tracked excavator (CAT 320 or similar) operating with support equipment (loader or skid steer), de-watering pumps, and labor. Modifications to this equipment configuration may be suggested by the earthwork contractor selected to implement the project. Equipment will be fueled from pickup trucks in upland locations.

4.5 CALENDAR SCHEDULE FOR CONSTRUCTION/IMPLEMENTATION PROCEDURES.

Construction of instream project components will be completed between July 1 and August 21, 2017. Revegetation and planting will be completed after plants enter dormancy, anticipated to be around October, 2017.

4.6 SITE OR PROJECT SPECIFIC MONITORING TO SUPPORT POLLUTION PREVENTION AND/OR ABATEMENT.

The project will follow the BPA Conservation Methods for pollution prevention and abatement as put forth in the two biological opinions issued by the United States Fish and Wildlife Service and the National Marine Fisheries Service on the effects of BPA's Habitat Improvement Program (*National Marine Fisheries Service. 2013. Endangered Species Act Section 7 Formal Programmatic Biological and Conference Opinion, Letter of Concurrence, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Bonneville Power Administration's Habitat Improvement Program III (HIP III) KEC-4, U.S. Fish and Wildlife Service. 2013. Formal section 7 programmatic consultation on BPA's Columbia River Basin Habitat Improvement Program. Oregon Fish and Wildlife Office, Portland, Oregon. TAILS no. 01EOFW00-2013-F-0199*).

5 Monitoring and Adaptive Management Plan.

5.1 INTRODUCTION

The Sponsor will monitor this project from pre-construction, during and post construction. The Sponsor will hold a 20 year contract with the landowners where they cannot disturb the construction footprint or the fence and they must maintain that fence during this time. Photo-points will be taken for the life of the project along with aerial video and photos.

5.2 EXISTING MONITORING PROTOCOLS

Turbidity during project construction will be monitored and reported as put forth in the HIP III handbook, version IV.

5.3 PROJECT EFFECTIVENESS MONITORING PLAN

Implementation and compliance monitoring will be conducted before, during, and after construction to ensure that the project was implemented as intended and designed. A pre-construction aerial video/photos will be taken

to document the baseline condition prior to construction. This flight path and aerial photo points will be repeated post-project in fall 2017 and one year after implementation in fall 2018. Newly planted vegetation will be checked for survivability in spring 2018, and will be re-planted if necessary. The split flow structure will be observed for two years, and will be adjusted to accomplish the split flow goals if necessary.

5.4 PROJECT REVIEW TEAM TRIGGERS

This question to be completed by BPA.

5.5 MONITORING FREQUENCY, TIMING, AND DURATION

BASELINE SURVEY

See 5.3 above.

AS-BUILT SURVEY

MONITORING SITE LAYOUT

POST-BANKFULL EVENT SURVEY

FUTURE SURVEY (RELATED TO FLOW EVENT)

5.6 MONITORING TECHNIQUE PROTOCOLS

PHOTO DOCUMENTATION AND VISUAL INSPECTION

See 5.3 above.

LONGITUDINAL PROFILE

HABITAT SURVEY

SURVIVAL PLOTS

CHANNEL AND FLOODPLAIN CROSS-SECTIONS

FISH PASSAGE

5.7 DATA STORAGE AND ANALYSIS

5.8 MONITORING QUALITY ASSURANCE PLAN

6 References

7 APPENDICES

7.1 PROJECT PLAN SHEETS

See attachment for 30% designs.

7.2 CONCEPT PLANTING PLAN

The planting plan will mimic what was completed for the lower pahsimeroi river restoration (2008-603-00, 73707, we I) in fall 2016. This project is located just across the river and has had high survivability through spring of 2017. Species and setback from water's edge will likely include:

waterline-overbank 0-20'

Drummond willow
Booth willow-
Geyer willow-
Water birch

transitional 20-35'

Black currant
Black cottonwood

waterline-transitional 0-35'

Coyote willow
Dogwood
Woods rose

7.3 OTHER SUPPORTING REPORTS