APPENDIX H

Design Report and Cost Estimate

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Table of Contents

1. INTRODUCTION 1
1.1 Project Background 1
1.2 Objectives 1
2. RESTORATION SITES 3
2.1 Mainstem Willamette River 3
2.2 Columbia Slough 3
2.3 Tryon Creek 3
3. SURVEYING AND MAPPING 5
4. DESIGN CRITERIA 7
4.1 Fish Passage 7
4.2 Fish, Turtle, and Native Vegetation Habitat 8
5. RECOMMENDED RESTORATION PLAN AND DESIGN ELEMENTS 9
5.1 Alternative Development 9
5.2 Invasive Removal and Revegetation 9
5.3 Bank Grading, Floodplain Reconnection, and Side Channels 10
5.4 Large Woody Debris and Boulders 10
5.5 Culvert Replacement for Fish Passage 11
6. HAZARDOUS, TOXIC, AND RADIOLOGICAL WASTES EVALUATION 13
7. GEOTECHNICAL ENGINEERING 15
8. STRUCTURAL, ELECTRICAL, AND MECHANICAL ENGINEERING 17
9. CONSTRUCTION PROCEDURES 19
10. OPERATIONS AND MAINTENANCE REQUIREMENTS 21
11. COST ESTIMATE 23
12. REFERENCES 27

List of Tables

Table 1. Revegetation areas by habitat type for each restoration site 9
Table 2. Elevation range for riparian plantings at Mainstem Willamette River and Columbia Slough restoration sites 9
Table 3. Minimum elevation for restoration sites with Bank Grading, Floodplain Reconnection, and Low Flow Side Channel Habitat Features 10
Table 4. Site specific design elevations for LWD and boulder elements 11
Table 5. Sites that Include Large Woody Debris and Boulder Habitat Features 11

List of Figures

Figure 1.1. Proposed restoration site project locations 2

List of Appendices

Appendix A – Draft 35% Design
Appendix B – Draft Plant List
Appendix C – Preliminary Construction Cost Estimates
Appendix D – MCACES Cost Estimate

1. Introduction

1.1 Project Background

The U.S. Army Corps of Engineers (USACE), Portland District, in partnership with the City of Portland and the Port of Portland, is proposing to restore numerous sites in the Lower Willamette River as part of the Lower Willamette River Ecosystem Restoration Project. The USACE and its partners prepared the *Lower Willamette River Ecosystem Restoration General Investigation Study - Conceptual Restoration Plan* (Tetra Tech 2008), which formulated, evaluated, and screened potential solutions to significant ecosystem degradation in the Lower Willamette watershed. In that document, conceptual restoration plans were prepared for a total of 31 sites. After screening and preparation of a cost effectiveness/incremental cost analysis, this group of 31 sites was narrowed down to 23 distinct sites.

The next phase of this project was designed to determine the data that would be needed to assess the feasibility of the proposed project and to evaluate the availability of this data. The *Lower Willamette River Ecosystem Restoration General Investigation Study: Feasibility Work Plan* (Tetra Tech 2009) summarized the background information available for each of the recommended project sites. Since the development of that report, collaboration with the Port of Portland and further investigation of existing sites has reduced the number of sites to five. The remaining sites are located along the mainstem Willamette River, Columbia Slough, and Tryon Creek. This report documents the methods used to develop feasibility (35%) level design (Appendix A), draft planting list (Appendix B), and cost estimates (Appendix C) for the five proposed ecosystem restoration sites on the Lower Willamette River, Columbia Slough, and Tryon Creek. Appendix D contains the MCACES cost estimates for the recommended plan.

1.2 Objectives

Preparation of a feasibility study report for ecosystem restoration alternatives in the Lower Willamette River basin requires, based on Engineering Regulation 1110-2-1150 (USACE 1999), the development of feasibility level (35%) design for the recommended restoration plan and construction cost estimates. The documentation contained within this report meets the requirements of Section 13.2.3, Establishment of the Preliminary Design, covered within Engineering Regulation 1110-2-1150 (USACE 1999). The plan set associated with this report will provide the foundation for the intermediate and final designs and specifications for this project.

This report describes each of the restoration sites, surveying and mapping data used to develop the designs, criteria for function of design elements, and the recommended design of elements for the sites. Additionally, this report describes information required by Engineering Regulation 1110-2-1150 (USACE 1999) including Hazardous Toxic and Radiological Wastes (HTRW) evaluation; geotechnical engineering; structural, electrical, and mechanical engineering; construction procedures; operations and maintenance requirements; and cost estimates for the restoration sites. The design makes use of hydraulic and hydrologic analyses detailed in a separate appendix to the Feasibility Study (Appendix C of the Feasibility Study) and the geomorphic analyses detailed in Appendix B of the Feasibility Study. The location for each of the proposed project sites is shown in Figure 1.1. Appendix A includes the 35% design and cost estimates for each restoration site are included in Appendix C.



Figure 1.1. Proposed restoration site project locations

2. Restoration Sites

2.1 Mainstem Willamette River

Two of the restoration project sites are predominately influenced by the hydrology and hydraulics of the Willamette River. The restoration sites characterized as within the Mainstem Willamette River area are:

- Kelley Point Park
- Oaks Crossing/Sellwood Riverfront Park

Restoration measures at these sites include developing side channels or backwater areas, reducing bank steepness, and revegetating with native species.

2.2 Columbia Slough

The Columbia Slough is a remnant channel of the Columbia River, and historically was dominated by an extensive wetland system between the mouths of the Sandy River and the Willamette River. Development of the surrounding land and construction of an extensive levee system has eliminated much of the wetlands and enabled development of the floodplain. Two proposed restoration project sites are adjacent to the banks of the lower end of the Columbia Slough. The slough typically is tidally influenced, but does not experience the high flows, velocities, and shear stresses observed in the Willamette River. The restoration sites in Columbia Slough are:

- City of Portland Bureau of Environmental Services (BES) Treatment Plant Banks
- Kenton Cove

Restoration measures at these sites involve reshaping and restoring banks and/or side slough areas, adding large woody debris (LWD), and revegetating with native species.

2.3 Tryon Creek

Tryon Creek flows generally southeast for about 7 miles from its headwaters near Multnomah Village to its confluence with the Willamette River in Lake Oswego. While the watershed is entirely within an urbanized area, more than 20% of the land within the watershed has been preserved in Tryon Creek State Natural Area (TCSNA). The restoration site in the Tryon Creek watershed is:

- Tryon Creek Highway 43 Culvert Replacement

The existing culvert is an 8 foot by 8 foot box culvert that was constructed in the 1920's and extended in 1955. The culvert has a total length of 401 feet, of which the upper 100 feet are sloped at 5.94% and the lower 301 feet are sloped at 2.94%. The design drawing for the culvert (ODOT 1955) indicates that the culvert alignment does not follow the natural Tryon Creek channel alignment, but rather is straightened, resulting in a loss of approximately 40-50 ft of stream length (City of Portland 2005). The straightened portion of the alignment was constructed through bedrock (ODOT 1955).

In 2005, the Oregon Department of Transportation identified the Highway 43 culvert as a high priority for fish passage improvement. Subsequently two projects were designed and constructed in 2008 to address initial concerns. One of these projects repaired and modified the baffles inside of the culvert to provide holding water within the culvert for fish passage; the other project created a roughened chute downstream

of the culvert that was designed to increase the water surface elevation during low flow conditions such that fish could swim into the culvert entrance rather than requiring fish to jump.

The restoration measures proposed for the Highway 43 culvert by this Feasibility Study include removal of the existing 8 foot by 8 foot box culvert and replacement with an open bottom arch culvert with a span of 30 feet, and creation of a natural stream channel within the culvert that provides fish passage meeting the Oregon Department of Fish and Wildlife criteria for the stream simulation option (OAR 2013a). Providing a fish passable culvert at this location will provide access for adult steelhead trout and coho salmon to the upper portion of the watershed.

3. Surveying and Mapping

The ground surface data used in development of the 35% design were based on bare earth Light Detection and Ranging (LiDAR) data sets collected from the Oregon Department of Geology and Mineral Industries (DOGAMI), including the 2004 Portland Pilot LiDAR coverage, the 2005 Columbia River/Portland Hills LiDAR coverage, and the 2007 Portland/Mt. Hood LiDAR coverage (DOGAMI 2007). The LiDAR data set has a 3-meter resolution and is projected to the North American Datum of 1983 (NAD83), State Plane Oregon North in units of International Feet and using the North American Vertical Datum of 1988 (NAVD88).

Existing ground cross sections and profiles were measured at selected locations. Cross sections were measured with a survey grade Differential Global Positioning System (DGPS) and the coordinates corrected using the Oregon Real-time GPS Network (ORGN).

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4. Design Criteria

4.1 Fish Passage

Fish passage criteria in the State of Oregon are detailed in Oregon Administrative Rule 635-412 (OAR 2013a). This rule describes the criteria for fish passage at road-stream crossing structures and is relevant for culvert replacement at the Highway 43 on Tryon Creek included for analysis in the Feasibility Study. This rule provides two different methods, discussed below, for meeting the requirements:

- the stream simulation option, and
- the alternative option.

In general, the stream simulation option calls for crossing structures with natural substrate and stream widths that exceed that of the active channel. In stream simulation, the culvert bottom must be sloped to match the adjacent upstream and downstream channel profile, have a minimum vertical clearance of 3 feet from the active channel width elevation to the top of the structure, maintain depths and velocities similar to the adjacent channel, and have mechanically-placed natural and stable bed material.

The alternative option allows for analysis of a crossing solution relative to local hydraulic conditions and consideration of adult fish performance for the design species, which include steelhead trout and coho salmon. This analysis typically includes advanced hydraulic modeling and consultation with state fish biologists to determine the most applicable fish performance data set for the local condition.

The design elements for each site included in the Feasibility Study are assessed for their ability to provide fish passage for species of concern, including steelhead trout and coho salmon. The minimum criteria applicable to the open-bottomed culvert replacement design for the Highway 43 culvert on Tryon Creek based on the stream simulation option are:

- **Velocities and depths:** Maintain average water depth and velocities that simulate those in the surrounding stream channel
- **Width**: Equal to or greater than the active channel width, as determined by the OAR (2013a and 2013b), and conservative guidance (ODOT 2011)
- **Minimum vertical clearance**: 3 vertical feet from the active channel width elevation to the inside top of the structure
- **Maximum jump height**: 6 inches
- **Minimum jump pool depth**: Greater of 2 feet or 1.5 times the jump height
- **Slope**: Equal to the slope of, and at elevations continuous with, the surrounding long-channel streambed profile
- **Streambed Material:** Composed of material that is maintained through time, is either similar in size of composition as the surrounding stream or supplemented to address site specific needs that may include bed retention and hydraulic shadow, contain partially-buried over-sized rock since the road-stream crossing structure is greater than 40 feet in length, is mechanically placed during structure installation,

- **Debris Passage**: Active channel shall not be obstructed by trash racks or other debris accumulation structure so as to allow passage of wood and other large debris

4.2 Fish, Turtle, and Native Vegetation Habitat

Some of the restoration elements designed for the Lower Willamette restoration sites are specifically intended to enhance existing fish habitat. These restoration elements include placement of LWD and boulders for in-stream cover, restoration of native riparian and wetland vegetation that will grow to provide overhanging cover, floodplain reconnection, and the grading of artificially steepened banks to provide additional shallow water habitat at higher flows, and creation or restoration of side channels for off-channel rearing and foraging habitat.

The target species/lifestage for development of all restoration features except culvert replacement is juvenile (post-emergent juveniles to pre-smolt) Chinook and chum salmon. These species utilize side channel habitats for crucial life history behaviors, such as resting, rearing, feeding, and predator avoidance (Healey 1991). The target species for culvert fish passage is specified in OAR 635-412 (OAR 2013a) and addressed in the 35% design and future designs of the fish passage structures.

Design criteria for these restoration habitat features include the following:

- Floodplain reconnection, bank grading, and side channel connections: Set side channel minimum elevation to provide a minimum 6 inches of depth during median winter flow.
- Placement of LWD for fish habitat: Provide, at a minimum, in-stream cover during the median winter flow. For Willamette River side channels, LWD should be placed with the center of the root ball at an elevation of 1 foot or less above the water surface elevation of the median winter flow, except as otherwise noted.
- Placement of boulders and LWD for turtle habitat: Provide a minimum of 1 foot of exposed surface during the median summer flow for basking habitat.
- Native riparian vegetation shall be planted to an elevation of 3.5 feet above the median winter water surface elevation.

5. Recommended Restoration Plan and Design Elements

5.1 Alternative Development

Individual alternatives were not developed for each of the sites in this general investigation. The intent is for the sites to be "bundled" together to develop a range of alternatives for restoration in the Lower Willamette River.

5.2 Invasive Removal and Revegetation

Non-native, invasive species have become problematic in the Lower Willamette watershed (City of Portland 2006). Invasive species have the ability to out compete native species and affect the form and function of the habitat. Non-native, invasive plants will be removed from the restoration site project areas through mechanical methods where possible. Chemical applications to some invasive species, such as Japanese knotweed, may be necessary. Methodology for removal will follow protocols based on the best available science.

Revegetation of the restoration site project areas will utilize native plants specific to the habitat type. Wetland plant species will be used at Kelley Point Park, BES Treatment Plant Banks, Kenton Cove, and Oaks Crossing/Sellwood Riverfront Park at elevations starting just below the median winter water surface elevation. Riparian plant species will be used at elevations extending 3.5 feet above the median winter water surface elevation at all sites, including areas outside of the replacement Highway 43 culvert on Tryon Creek. A diversity of native plants will be used to ensure that the form and function of that habitat type has been restored. A draft plant list is presented in Appendix B. Revegetation areas are presented for each site in Table 1.

Table 1. Revegetation areas by habitat type for each restoration site

Site	Wetland Revegetation Area (acres)	Riparian Revegetation Area (acres)
BES Treatment Plant Banks	0	0.67
Kelley Point Park	0	10.89
Kenton Cove	0	3.22
Oaks Crossing/Sellwood Pk.	2.7	4.5
Highway 43 Culvert	0	1.24

The elevation range for riparian plantings at each of the Mainstem Willamette River and Columbia Slough sites are provided in Table 2.

Table 2. Elevation range for riparian plantings at Mainstem Willamette River and Columbia Slough restoration sites

Site	Minimum Elevation (ft NAVD88)	Maximum Elevation (ft NAVD88)
BES Treatment Plant Banks	9.7	13.2
Kelley Point Park	9.7	13.2

Site	Minimum Elevation (ft. NAVD88)	Maximum Elevation (ft. NAVD88)
Kenton Cove	9.7	13.2
Oaks Crossing/Sellwood Pk.	9.9	13.4

Elevation ranges for channel riparian revegetation at the Tryon Creek Highway 43 Culvert site vary for the channel banks upstream and downstream of the culvert and will be specified at a later design phase.

5.3 Bank Grading, Floodplain Reconnection, and Side Channels

Over time, the bank elevations along the mainstem Willamette River within the City of Portland have been raised by the placement of dredge spoils and earth fill, and also stabilized by the placement of rock riprap (City of Portland 2001). These past bank modifications have eliminated or limited fish access to side channels, off-channel areas, and floodplains that provide important rearing habitat, areas for predator avoidance, and velocity refugia during high flows. For this reason, the recommended restoration plan includes bank grading, and the creation of side channels and egress to off-channel habitat.

For the mainstem Willamette River and Columbia Slough restoration sites, the target bank grading slope is 5H:1V. This target slope will foster the establishment of riparian vegetation and will limit erosion. The slope is steepened in areas when structures, property lines, and topography make a 5H:1V slope untenable or not cost-effective.

The minimum elevation for bank grading, floodplain reconnection and side channel thalwegs is determined by the median winter water surface elevation and a minimum desired 6 inches of depth for this condition. Details of a typical channel cross section are shown in Appendix A. Table 3 presents the minimum elevations for each of the sites with this habitat restoration feature. The extent of the grading is shown on the site plan for each site, and typical cross sections are shown in the profile sheet for each site.

Table 3. Minimum elevation for restoration sites with Bank Grading, Floodplain Reconnection, and Low Flow Side Channel Habitat Features

Site Name	**Minimum Elevation (ft NAVD88)**
Kelley Point Park	9.2
BES Treatment Plant Banks	9.2
Oaks Crossing/Sellwood Pk.	9.4

5.4 Large Woody Debris and Boulders

Boulders and LWD provide key habitat for fish and reptiles in rivers and lakes. Fish utilize wood and large rocks for velocity refugia, holding and feeding areas, and protection from predators. The sites selected for boulder placement as habitat elements are side channel or backwater areas that do not experience high velocities. Reptiles such as the Western pond turtle, a species native to the Lower Willamette River basin, utilize rocks and wood for haul-outs and basking in lakes and ponds. The design and placement of LWD and boulders identified as haul-out and basking habitat should be placed so that the top of the element is at least one foot above the median summer water surface elevation specified for

each site and to provide fish habitat the center of the topmost log in each LWD element is specified for a maximum of one foot below the median winter water surface elevation (Table 4).

Table 4. Site specific design elevations for LWD and boulder elements

Site Name	Maximum Elevation of Center of Rootwad for topmost log in LWD element (ft NAVD88)	Minimum Elevation of Top of LWD and Boulder Elements (ft NAVD88)
Kelley Point Park	8.7	10.3
BES Treatment Plant Banks	8.7	10.3
Kenton Cove	8.7	10.3
Oaks Crossing/Sellwood Pk.	8.9	10.6

Placement of these habitat elements is intended to withstand shear forces resulting from high flows. Construction methods for root wads include burying 75-80% of the root wad stem into the bank. To accomplish this, the bank would be excavated no less than 2 feet. Large rocks will be placed with the root wad stems to protect the root wad burial from scour during high flows. After placement of the LWD, the banks will be backfilled to the design grade. Typical LWD construction details are shown on the construction plan set. Table 5 presents the sites that include this habitat restoration feature. The locations of proposed LWD and boulders are shown on the plan sheets for each site.

Table 5. Sites that Include Large Woody Debris and Boulder Habitat Features

Site Name	No. Pieces of Large Wood	No. of Boulders
Kelley Point Park	50	14
BES Treatment Plant Banks	35	14
Kenton Cove	16	0
Oaks Crossing/Sellwood Pk.	8	0

5.5 Culvert Replacement for Fish Passage

Analyses presented in the Hydrology and Hydraulics Technical Memorandum (Appendix C of the Feasibility Study) evaluated the proposed design for the replacement Tryon Creek Highway 43 culvert. The replacement project is intended to improve fish passage by meeting the State of Oregon's fish passage design criteria for stream simulation (OAR 2013a). The fish passage criteria require the culvert to span the active channel width, which was determined from the bankfull elevations (OAR 2013b) determined by HEC-RAS modeling of the 2-year recurrence discharge for the existing channel geometry upstream of the culvert. The active channel width was determined as 20.2 feet. Chapter 6 of the ODOT Hydraulics Manual (2011) further specifies culvert spans to be larger than the active channel width to provide an engineering factor of safety to pass lower frequency high discharge events. The method described by Case 2 (ODOT 2011) determines the conservative culvert span as 125% of the active channel width plus 2 feet, which results in a minimum design span of 27.25 feet. In order to provide a more cost conscious and construction efficient preliminary design for the Feasibility Study, a pre-cast arch culvert is recommended for evaluation in the subsequent design phases for this project. The pre-cast

arch culvert size presented here was selected as readily available size large enough to accommodate the conservative width of 27.25 feet, and has a width of 30 feet with a rise of 12.3 feet (CONTECH 2013).

The selected pre-cast arch culvert was evaluated by modifying the HEC-RAS model with a cross section representative of the proposed streambed within the culvert. This streambed will be composed of oversized rock and have a substrate that will be maintained through time to meet the State of Oregon's design requirements. Streambed grade control features will be constructed of oversized rock to ensure stability. Debris passage is unobstructed for the proposed culvert design, and no trash racks or other debris accumulation structures are specified for the culvert.

The proposed cross section was tested for its ability to provide a minimum vertical clearance of 3 feet between the active channel width elevation and the inside top of the structure, and it was determined to exceed this requirement. The design specifies the culvert inlet and outlet invert elevations to match those of the existing channel to provide continuous slope between the surrounding stream and the culvert entrance and exit. The culvert slope is specified as a constant 3.4% to reduce the steeper 5.94% of the upper portion of existing culvert and more closely match the previous and overall natural channel slope of 3.5%.

An incipient motion analysis was conducted utilizing the HEC-RAS results for the proposed culvert that are presented in the Hydrology and Hydraulics Technical Memorandum (Appendix C of the Feasibility Study). This analysis determined that the minimum rock sizes that will resist movement within the channel were 11 inches for the 100-year and 8 inches for the 2-year discharge conditions. Providing a factor of safety to the maximum determined size of 11 inches resulted in a specification of 18-20 inch rock to be placed for stream grade control within the culvert structure. This rock size meets the State of Oregon's fish passage design criteria for oversized rock placement within the streambed.

Additional work is recommended for future design phases for the replacement culvert. A scour analysis should be performed to determine the appropriate culvert footing elevation. The extent of bedrock around the existing culvert should be determined through a geotechnical investigation to better understand constraints on constructability. Additional upstream survey data should be obtained to better delineate the active channel width and construction quantities. This data was recently acquired by BergerABAM on behalf of the City of Portland's Tryon Creek Trunk Sewer Upgrade project, but is not yet available for distribution. Construction issues related to possible need to realign the trunk sewer to accommodate the replacement culvert, and preliminary analysis of traffic control and temporary bypasses for both road and railroad traffic should be considered.

The design plans (Appendix A) provide plan, profile, and cross section drawings for the proposed culvert, and also includes details for the streambed grade control and boulder clusters.

6. Hazardous, Toxic, and Radiological Wastes Evaluation

Hazardous, Toxic, and Radiological Waste (HTRW) data have been collected by performing database searches and field site visits. None of the sites are known to have significant problems concerning hazardous, toxic, or radiological waste. The complete details of the HTRW evaluation are presented in Appendix E of the Feasibility Study.

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7. Geotechnical Engineering

Geotechnical borings and soil profiles were not performed for the 35% design at the study sites. While soil profiles are recommended for all sites in future stages of design, geotechnical data are not needed at the sites where only bank grading, floodplain reconnection, or low flow channel excavation would be performed. For the future phases of design, geotechnical data should be collected at the Tryon Creek Highway 43 Culvert site to better understand design constraints and constructability of the proposed culvert alignment, including shoring and stability measures, and possible utility realignment.

Tetra Tech obtained a geotechnical study that was performed in support of seismic upgrades to an elevated pipeline section at the City of Lake Oswego's Tryon Creek Sewage Treatment Plant (Shannon & Wilson 2009), and also obtained the ODOT design drawing for the existing Highway 43 Culvert (ODOT 1955) and a summary of conditions by the City of Portland (2005). According to borings conducted by Shannon & Wilson, the site is underlain by bedrock with 1 to 4 feet of clayey silt alluvium and 2 to 12 feet of variable fill above. The ODOT plans (1955) and summary by the City of Portland (2005) indicate that the existing culvert alignment was constructed through bedrock. The elevation and alignment of Highway 43 and the railroad have been modified since the date of original construction, and the existing roadway is at an approximate elevation of 85 feet NAVD88 and indicating that about 45 feet of fill is placed above the existing culvert alignment (City of Portland 2005).

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8. Structural, Electrical, and Mechanical Engineering

The Tryon Creek Highway 43 Culvert site includes elements that require structural engineering design guidance, including culverts, footings, and headwalls. Electrical and mechanical engineering is not indicated for the current design measures.

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9. Construction Procedures

For constructability and cost estimating purposes, material sources for rock, gravel, wood, and fill material are assumed to originate within a 10-mile radius of the project sites. Disposal sites for clean soils and demolished concrete, asphalt, and other structural materials are also assumed to be within a 10-mile radius of the project site. The disposal site for contaminated soils is assumed to be the Waste Management Hillsboro Landfill in Hillsboro, Oregon. The procedure for culvert construction assumes culvert fabrication and delivery; installation; construction of footings, headwalls and wingwalls; placement of bed materials; and restoration of the adjacent streambed and banks. Vegetative restoration assumes invasive plant removal by spraying and mowing, and planting materials from locally sourced nurseries.

Other construction procedures, including direction on rock placement, dewatering and erosion control, site earthwork and grading, and environmental protection are presented in the 35% design plan set (Appendix A). The following construction sequence details the steps for construction completion at each of the sites:

1. Award Construction Contract
2. Notice to Proceed
3. Contractor Submit Bonds
4. Contractor Provide Pre-Construction Submittals
5. Conduct Pre-construction Kick-off Meeting
6. Contractor Mobilize to Site
7. Contractor Install Erosion Control Best Management Practices (BMPs) and Create Staging Work Area
8. Improve Access, Only as Necessary
9. Begin Clearing and Grubbing
10. Remove Invasives (can go on while other actions are occurring)
11. Isolate In-Water Work Areas and Remove Fish
12. Conduct Onsite Grading
13. Remove Debris/Concrete/Riprap
14. Excavate Connector Channels Outside of In-Water Work Areas, including Side Channel and Backwater Areas
15. Install Temporary Bridge or Access Route for Wood and Boulder Placement
16. Isolate In-Water Wood and Boulder Work Areas and Remove Fish
17. Construct Wood and Boulder Structures
18. Remove In-Water Isolation Measures When Work is Complete (Grading or Wood/Boulders)
19. Remove Temporary Bridge or Access Route for Wood and Boulders
20. Isolate In-Water Work Area for River Channel Connections and Remove Fish

21. Excavate Final In-Water Channel Connections, including Side Channel, Backwater Areas, and Confluence/Mouth Areas
22. Remove Final Water Isolation Measures
23. Grade Site for Plantings
24. Remove Staging Area and Access Routes as Appropriate
25. Install Erosion Control Seeding/Mulch at each Grading Completed Location
26. Install Plants
27. Remove Erosion Control Features after Seeding has Grown to Minimum 1-inch

Additional construction procedures are necessary for the culvert replacement at Highway 43 on Tryon Creek to address:

- Temporary highway and railroad traffic control and re-route as needed for the duration of project,
- Temporary water management for bypass of flow around work area,
- Placement arch span culvert, streambed material, and streambed grade control features,
- Abandon existing 8 foot by 8 foot box culvert in place or dispose offsite,
- Potential relocation of sewer trunk line and other utilities,
- Placement of fill, and
- Resurfacing of highway and railroad as needed.

10. Operations and Maintenance Requirements

The intent of the proposed site restoration designs is to create favorable conditions for natural habitat feature development; therefore, it is expected that some of the installed or constructed elements will self-adjust in response to actual conditions, or will require adjustment to attain best performance. It is expected that the most significant maintenance actions will occur during the first 5 years. Primary maintenance actions will include control of invasive species during and following construction and ensuring the survival of the planted species. Additionally, monitoring and maintenance should be performed to remove obstructions and aggradation at side channel inlets and outlets, so that the connection points for these sites remain open. The replacement culvert at Highway 43 on Tryon Creek should occasionally be monitored to ensure it is working properly, the streambed material is stable, and to remove debris.

The preliminary cost estimate for each site generally considers general markup costs that include annual operations and maintenance (O&M) costs at 10% of the overall cost for planning, engineering, and construction. At future levels of design, a more specific estimate of O&M costs will be developed individually for each restoration site, using Micro-Computer Aided Cost Estimating System (MCACES) software.

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11. Preliminary Cost Estimate

Following design of the restoration elements, each site was evaluated for general construction costs. The cost estimates account only for construction costs, and include site preparation and general markups. These costs are specified in Appendix C.

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APPENDIX A

DRAFT 35% DESIGN DRAWINGS

US Army Corps
of Engineers
Portland District

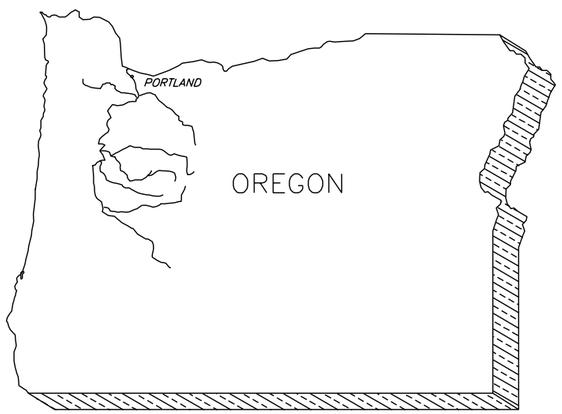
LOWER WILLAMETTE RIVER

ECOSYSTEM RESTORATION PROJECT

(35% SUBMITTAL)

PORTLAND, OREGON

PROJECT LOCATION
IN OREGON



LOCATION MAP



INDEX TO DRAWINGS

SHEET NO.	DRAWING DESCRIPTION
01	TITLE SHEET AND LOCATION MAPS
02	ABBREVIATIONS, NOTES, AND LEGEND
03	NORTH MAINSTEM WILLAMETTE LOCATION MAP
04	COLUMBIA SLOUGH LOCATION MAP
05	SOUTH MAINSTEM WILLAMETTE LOCATION MAP
06	TRYON CREEK LOCATION MAP
07	TYPICAL CROSS SECTION
08	LWD DETAILS
09	KELLEY POINT PARK – SITE PLAN
10	KELLEY POINT PARK – CROSS SECTION & PROFILE
11	BES TREATMENT PLANT BANKS – SITE PLAN
12	BES TREATMENT PLANT BANKS – CROSS SECTION & PROFILE
13	KENTON COVE – SITE PLAN
14	KENTON COVE – CROSS SECTION
15	OAKS CROSSING – SITE PLAN
16	OAKS CROSING – PROFILE & CROSS SECTION
17	TRYON CREEK/HWY 43 CULVERT – SITE PLAN
18	TRYON CREEK/HWY 43 CULVERT – PROFILE
19	TRYON CREEK/HWY 43 CULVERT – DETAILS

US Army Corps
of Engineers
Portland District

MARK	DESCRIPTION	DATE	APPR.

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U.S. ARMY CORPS OF ENGINEERS
PORTLAND DISTRICT
PORTLAND, OREGON

Tetra Tech, Inc
1020 SW Taylor Street
Suite 530
Portland, OR 97205

DESIGNED BY: JK
DWN BY: TS,KX,MR
SUBMITTED BY: SM
CKD BY: WF,MM
PLOT SCALE: AS STATED
SIZE: ANSI D
PLOT DATE: (SEE STAMP)
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SOLICITATION NO.: W911KB-09-2-0009
CONTRACT NO.: W912EP-10-D-0003
TASK ORDER NO.:
FILE NUMBER:

LOWER WILLAMETTE RIVER
ECOSYSTEM RESTORATION PROJECT

TITLE SHEET & LOCATION MAP

Multnomah County, Oregon

SHEET IDENTIFICATION
01
SHEET 01 OF 19

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ABBREVIATIONS

AC	ASPHALT
AC-FT	ACRE FEET
AGG	AGGREGATE
ALIGN	ALIGNMENT
APPROX	APPROXIMATE
AVG	AVERAGE
B.M.	BENCH MARK
BES	BUREAU OF ENVIRONMENTAL SERVICES CITY OF PORTLAND
BOT	BOTTOM
BW	BOTTOM WIDTH
C-C	CENTER-TO-CENTER
CL	CENTERLINE, CONTROL LINE
CFS	CUBIC FEET PER SECOND
CHNL	CHANNEL
CJ	CONSTRUCTION JOINT
CLR	CLEAR
CONC	CONCRETE
COR	CONTRACTING OFFICER REPRESENTATIVE
CP	CONTROL POINT
CULV	CULVERT
D	DEGREE, DEGREE OF CURVATURE
DBH	DIAMETER BREAST HEIGHT
DD°MM'SS"	DEGREES, MINUTES, SECONDS
DEPT	DEPARTMENT
DIA, Ø	DIAMETER
DS	DOWNSTREAM
E	EAST
EA	EACH
EG	EXISTING GRADE
EL,ELEV	ELEVATION
EOP	EDGE OF PAVEMENT
ETC	ET CETERA (AND THE LIKE)
EX	EXISTING
FG	FINISHED GRADE
FTF	OOT OR FEET
GB	GRADE BREAK
HMA	HOT MIX ASPHALT
HORZ	HORIZONTAL
HVF	HIGH VISIBILITY FENCE
HVY	HEAVY
HWY	HIGHWAY
IN	INCH OR INCHES
INV	INVERT
L	LENGTH OF CURVE
LB,LBS	POUND OR POUNDS
LT	LEFT
LWD	LARGE WOODY DEBRIS
MAX	MAXIMUM
MI	MILE
MIN	MINIMUM
MISC	MISCELLANEOUS
MUTCD	MANUAL UNIFORM TRAFFIC CONTROL DEVICES
N	NORTH
NAD	NORTH AMERICAN DATUM
NAVD	NORTH AMERICAN VERTICAL DATUM
NTS	NOT TO SCALE
NO	NUMBER
NOAA	NATIONAL OCEANIC ATMOSPHERIC ADMINISTRATION
OC	ON CENTER
OHWM	ORDINARY HIGH WATER MARK
PC	POINT OF CURVATURE
PERF	PERFORATED
PI	POINT OF INTERSECTION
PIP	PROTECT IN PLACE
POB	POINT OF BEGINNING
POE	POINT OF ENDING
PL	PLATE
PROP	PROPOSED
PT	POINT OF TANGENCY
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PVC	POLYVINYL CHLORIDE
R	RANGE
RAD	RADIUS
RDWY	ROADWAY
REF	REFERENCE
REQ'D	REQUIRED
RT	RIGHT
ROW	RIGHT OF WAY
S	SOUTH; SLOPE
SCH	SCHEDULE
SHLDR	SHOULDER
SHT	SHEET
SP	STANDARD PLAN
SPEC	SPECIFICATION
SS	SIDESLOPE
STA	STATION
STD	STANDARD
STL	STEEL
SQ	SQUARE
T	TANGENT OF CURVE
TBD	TO BE DEVELOPED
TESC	TEMPORARY EROSION AND SEDIMENT CONTROL
TEMP	TEMPORARY
TH	THICK
TOB	TOP OF BANK
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
US	UPSTREAM, UNITED STATES
VAR	VARIES; VARIABLE
W	WEST
W/	WITH
WSE	WATER SURFACE ELEVATION
W/O	WITHOUT
°	DEGREE
@	AT
#	NUMBER
?	DELTA ANGLE

EXISTING LEGEND

- MONUMENT FOUND AS NOTED
- POWER POLE
- 100 — MAJOR CONTOURS
- MINOR CONTOURS
- GROUNDLINE
- X — FENCE
- S — SANITARY SEWER
- STORM LINE
- W — WATER LINE
- OH — OVERHEAD UTILITY LINE
- Neutral — ELECTRICAL NEUTRAL LINE
- GAS — GAS LINE
- POWER LINE
- PROPERTY LINE

DESIGN LEGEND

- 100 — MAJOR CONTOUR
- MINOR CONTOUR
- WORK LIMITS
- STRUCTURE
- STREAMLINE/CENTERLINE
- HIGH FLOW CHANNEL
- LOW FLOW CHANNEL
- CROSS SECTION LINE
- FOOT BRIDGE
- BRIDGE
- PROP CULVERT
- TEMPORARY CONSTRUCTION ACCESS BRIDGE
- WETLAND PLANTING
- RIPARIAN VEGETATION
- GRAVELLY SAND
- WETLAND & RIPARIAN VEGETATION
- BOULDERS
- TYPE 1 LWD
- TYPE 2 LWD
- TYPE 3 LWD
- TEMPORARY CONSTRUCTION STAGING
- TEMPORARY CONSTRUCTION ACCESS

CONSTRUCTION NOTES

GENERAL NOTES

1. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS, INCLUDING REQUIREMENTS SET FORTH IN THE PERMITS OBTAINED FOR THIS PROJECT. THE CONTRACTOR SHALL MAINTAIN A COPY OF ALL PERMITS ONSITE DURING CONSTRUCTION.
2. ALL CONSTRUCTION WORK AFFECTING AREAS BELOW THE OHWM MUST BE CONDUCTED DURING THE APPROVED FISH WINDOW, GENERALLY JUNE 1 TO OCTOBER 31; UNLESS AN EXTENSION IS RECEIVED FROM THE OREGON DEPARTMENT OF FISH AND WILDLIFE AND NOAA – FISHERIES.
3. THE CONTRACTOR IS RESPONSIBLE FOR JOB SITE CONDITIONS AND THE SAFETY OF HUMAN LIFE DURING THE COURSE OF CONSTRUCTION. THIS REQUIREMENT SHALL APPLY CONTINUOUSLY DURING THE PERIOD OF CONSTRUCTION AND NOT LIMITED TO NORMAL WORKING HOURS.
4. THE CONTRACTOR SHALL KEEP JOB SITE AREA CLEAN, HAZARD-FREE, AND PROPERLY DISPOSE OF ALL DEBRIS, RUBBISH, AND CONSTRUCTION WASTE. ALL DISTURBED AREAS ARE TO BE REHABILITATED TO PRE-CONSTRUCTION CONDITIONS OR PER PLANTING PLAN, TO BE PROVIDED SEPARATELY.
5. THE CONTRACTOR SHALL VISIT THE JOB SITE AND CONFIRM THAT THE WORK MAY BE ACCOMPLISHED AS SHOWN PRIOR TO PROCEEDING WITH CONSTRUCTION.
6. THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY INDICATED OTHERWISE.

SURVEY CONTROL AND CONSTRUCTION LIMITS

1. 5'-CONTOUR TOPOGRAPHIC SURVEY BY METRO. DIGITAL ORTHOPHOTO BY METRO 2006. BATHYMETRIC DATA BY CORPS OF ENGINEERS, MARCH AND DECEMBER, 2006.
2. 2009 PARCEL DATA FROM METRO.
3. ALL MAPPING IS PROJECTED TO NAD 83 HARN, STATE PLANE OREGON NORTH. UNITS ARE U.S. INTERNATIONAL FEET. REPRESENTATIONS OF TRUE NORTH SHALL NOT BE USED TO IDENTIFY OR ESTABLISH THE BEARING OF TRUE NORTH AT THE JOB SITE.
4. ALL ELEVATIONS ARE RELATIVE TO NAVD 88 IN UNITS OF FEET.
5. ALL STATIONING REFERS TO CENTERLINE OF CONSTRUCTION AND IS THE MEASURED HORIZONTAL DISTANCE.
6. CONSTRUCTION LIMITS, CENTERLINE AND OFFSET STAKING TO BE PERFORMED BY OTHERS.
7. ALL CONSTRUCTION ACTIVITY, INCLUDING HAUL ROUTES, STAGING AND STOCKPILING, SHALL BE CONFINED TO THE PARCEL AS SHOWN IN THESE PLANS. CONTRACTOR SHALL ADHERE TO CONSTRUCTION LIMITS. CONTRACTOR IS RESPONSIBLE FOR ESTABLISHING AND MAINTAINING REQUIRED DATUM, BENCHMARKS, CONTROL LINES AND LEVELS. DO NOT DISTURB, EXCAVATE OR WORK BEYOND PROJECT LIMITS WITHOUT PERMISSION FROM COR. UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND IN SOME CASES HAVE NOT BEEN SURVEYED. CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING OREGON UTILITY NOTIFICATION CENTER AT 800.332.2344 PRIOR TO COMMENCEMENT OF CONSTRUCTION WORK. CONTRACTOR IS RESPONSIBLE FOR DAMAGE TO ABOVE-GROUND AND BELOW-GROUND UTILITIES.

ROCK

1. ALL STREAMBED MATERIAL (GRAVELS AND COBBLES) WITH A MEAN DIAMETER OF LESS THAN 6" TO BE PLACED AS CULVERT SUBSTRATE SHALL BE RIVER RUN, NOT ANGULAR.
2. ALL STREAMBED MATERIAL WITH A MEAN DIAMETER EXCEEDING 6" AND RIPRAP SHALL BE PROVIDED BY A SOURCE THAT IS APPROVED BY THE COR. ROCK MATERIAL WITH A MEAN DIAMETER EXCEEDING 6" SHALL BE ANGULAR IN NATURE AND BE OF SUFFICIENT HARDNESS TO RESIST WEATHERING AND SHALL BE FREE OF CRACKS AND OTHER BLEMISHES. POROUS OR SOFT ROCK SHALL NOT BE ALLOWED FOR USE AS STABILIZATION ROCK.
3. GEOTEXTILE SHALL BE PLACED OVER THE PREPARED SUBGRADE AND BENEATH ROCK MATERIAL AS SHOWN IN THESE PLANS. SUBGRADE SURFACES SHALL BE PREPARED TO BE REASONABLY SMOOTH, FREE OF MOUNDS, DIPS, CUTS OR OVERHANGING SECTIONS AND FREE OF DEBRIS.

CONSTRUCTION NOTES, CONT

ENVIRONMENTAL PROTECTION

1. THE CONTRACTOR SHALL MINIMIZE ENVIRONMENTAL POLLUTION AND DAMAGE THAT MAY OCCUR AS THE RESULT OF CONSTRUCTION OPERATIONS.
2. THE CONTRACTOR IS RESPONSIBLE FOR IMPLEMENTING AND UTILIZING BEST MANAGEMENT PRACTICES (BMPS) TO PREVENT STORMWATER RUNOFF AND WATER POLLUTION DURING CONSTRUCTION ACTIVITIES. CONTRACTOR SHALL SUBMIT SWPPP FOR APPROVAL BY CONTRACTING OFFICER'S REPRESENTATIVE.
3. IF POTENTIAL HAZARDOUS MATERIALS ARE ENCOUNTERED, THE MANAGER SHOULD BE CONTACTED IMMEDIATELY. ALL CONSTRUCTION SPOILS AND WASTE SHALL BE DISPOSED OF AT AN APPROVED LANDFILL FACILITY.
4. EXISTING ON-SITE MATERIALS SHALL BE CAREFULLY REMOVED AND STORED, OR DISPOSED OF. COMPLETELY REMOVE STUMPS, ROOTS, WILLOWS, SHRUBS, WEEDS, AND OTHER DEBRIS PROTRUDING FROM THE GROUND WHERE DIRECTED BY COR. WOODY DEBRIS AND PLANT MATERIAL SHALL BE SALVAGED FOR REUSE AS DIRECTED.
5. TREES TO BE CLEARED WILL BE FLAGGED BY THE CONTRACTOR. TREES DESIGNATED FOR CLEARING SHALL BE REUSED IN STREAM CHANNEL AS SHOWN AND AS APPROVED BY COR. TREES AND LAND AREAS OUTSIDE CONSTRUCTION AND PLANTING LIMITS SHALL BE MARKED FOR PROTECTION IN THE FIELD. EXERCISE CARE IN AREAS NOT SO MARKED TO AVOID UNNECESSARY DAMAGE TO NATURAL VEGETATION.
6. IF WET WEATHER IS FORECAST OR CONSTRUCTION ACTIVITIES ARE NOT ANTICIPATED FOR A 72-HOUR PERIOD, CONTRACTOR SHALL MULCH ALL EXPOSED GROUND, WITH EXCEPTIONS INCLUDING BOTTOMS OF CHANNELS, AND AREAS OF HIGH CONSTRUCTION TRAFFIC. CONTRACTOR SHALL HAVE STRAW BALES ON SITE AT ALL TIMES FOR MULCHING. MULCH SHALL BE FREE FROM WEEDS, MOLD, AND OTHER DELETERIOUS MATERIALS. STRAW OR WOOD CELLULOSE FIBER IS SUITABLE FOR MULCH. STRAW SHALL BE STALKS FROM OATS, WHEAT, RYE, BARLEY, OR RICE.
7. ALL AREAS DISTURBED BY CONSTRUCTION OPERATIONS, INCLUDING STAGING AREA, SHALL BE SEEDED UPON COMPLETION OF THE PROJECT. SEEDING SHOULD ONLY BE PERFORMED AT OPPORTUNE TIMES. SEEDING SHOULD NOT OCCUR DURING EXCESSIVE PRECIPITATION EVENTS OR IN LOCATIONS WHERE RIVER FLOWS WILL ERODE SEED PLACEMENT. SEED MIXTURE SHALL BE IN ACCORDANCE WITH PLANTING PLAN (BY OTHERS). SEEDING WILL INCLUDE MULCH. MULCH SHALL BE STABILIZED THROUGH THE USE OF TACKIFIERS.

DEWATERING AND EROSION CONTROL

1. THE CONTRACTOR SHALL SUBMIT A WATER DIVERSION PLAN TO THE COR. DIVERSION PLAN IS SUBJECT TO APPROVAL BY COR. NOTICE SHALL BE GIVEN TO THE COR A MINIMUM OF THREE DAYS PRIOR TO DIVERSION. CARE SHALL BE TAKEN WHEN INSTALLING SILT CURTAINS TO EXCLUDE FISH FROM CURTAINED AREA.
2. SEDIMENT FENCES SHALL BE INSTALLED WITH FIELD-DIRECTION BY THE COR. SEDIMENT FENCING MATERIALS SHALL BE PROVIDED BY THE CONTRACTOR.
3. STRAW BALES SHALL BE PLACED DOWNSTREAM OF THE WATER RETURN TO TRAP SILT. BALES SHALL BE SECURED WITH WOOD OR METAL STAKES DRIVEN 2 FEET INTO GROUND. 3" MINUS GRAVEL SHALL BE PLACED AT A DEPTH OF 4" ON THE UP-GRADIENT TOE OF THE BALES.

SITE EARTHWORK AND GRADING

1. THE CONTRACTOR IS RESPONSIBLE FOR ALL SITE EARTHWORK AND GRADING ACTIVITIES. MODIFICATIONS MAY BE REQUIRED TO SUIT JOB SITE CONDITIONS PER DIRECTION OF THE COR. SIGNIFICANT DEVIATIONS FROM THESE PLANS SHALL BE COORDINATED WITH THE ENGINEER OF RECORD AND SHALL BE DOCUMENTED FOR INCLUSION IN AS-BUILT DRAWINGS TO BE PREPARED AT COMPLETION OF PROJECT.
2. ALL FILL MATERIAL, WHETHER IMPORTED FILL OR BORROW MATERIAL FROM ON-SITE SHALL BE SUBJECT TO VISUAL INSPECTION BY THE COR AND SHALL BE FREE FROM ORGANIC MATTER, SILTS, CLAYBALLS AND OTHER DELETERIOUS MATERIALS AND SHALL NOT CONTAIN STONES LARGER THAN 3 INCHES IN DIAMETER.
3. EXCAVATED NATIVE SPOILS SHALL BE DISPOSED OF AT THE ONSITE DISPOSAL AREA.

TEMPORARY CONSTRUCTION FACILITIES

1. ALL TEMPORARY UTILITIES AND FACILITIES WILL BE THE RESPONSIBILITY OF THE CONTRACTOR. A CONSTRUCTION TRAILER IS NOT REQUIRED. ANY USE OF POTABLE WATER OR ELECTRICITY FROM EXISTING CONNECTIONS ON SITE MUST BE COORDINATED WITH LANDOWNER THROUGH WRITTEN AGREEMENT PRIOR TO USE. A CHEMICAL TOILET OF SUITABLE TYPE SHALL BE PROVIDED AND MAINTAINED BY THE CONTRACTOR AT ALL TIMES.

US Army Corps of Engineers
Portland District

DESCRIPTION	DATE	APPR.
DESCRIPTION	DATE	APPR.

DATE: MARCH 2014
SOLICITATION NO.: W911KB-09-D-0009
CONTRACT NO.: W912EF-10-D-0008
FILE NUMBER:

DESIGNED BY: JK
DWN BY: TS-KK-MR
CKD BY: WF-MM
SUBMITTED BY: (SEE STAMP)
PLOT SCALE: AS STATED
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SIZE: ANSI D
FILE NAME: (SEE STAMP)

U.S. ARMY CORPS OF ENGINEERS
PORTLAND DISTRICT
PORTLAND, OREGON

Tetra Tech, Inc
1020 SW Taylor Street
Suite 530
Portland, OR 97205

LOWER WILLAMETTE RIVER
ECOSYSTEM RESTORATION PROJECT

ABBREVIATIONS, NOTES, AND LEGEND

Multnomah County, Oregon

SHEET IDENTIFICATION
02
SHEET 02 OF 19

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NORTH MAINSTEM WILLAMETTE

SCALE: 1 IN = 2200 FT

1

US Army Corps of Engineers
Portland District

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U.S. ARMY CORPS OF ENGINEERS
PORTLAND DISTRICT
PORTLAND, OREGON

Tetra Tech, Inc
1020 SW Taylor Street
Suite 530
Portland, OR 97205

DESIGNED BY: JK		DATE: JUNE 2011	
DWN BY: TS,KK,MR	CKD BY: WP,MM	SOLICITATION NO.: W911KB-04-D-0009	
SUBMITTED BY:		CONTRACT NO.: W911KB-04-D-0009	
PLOT SCALE: AS STATED	PLOT DATE: (SEE STAMP)	FILE NUMBER:	
SIZE: ANSI D	FILE NAME: (SEE STAMP)		

LOWER WILLAMETTE RIVER
ECOSYSTEM RESTORATION PROJECT

NORTH MAINSTEM
LOCATION MAP
Multnomah County, Oregon

SHEET IDENTIFICATION
03
SHEET 03 OF 19

S:\Projects\SWW-726638 Lower Willamette Feasibility\DGN\003-G07-LOCATION MAPS.dwg



COLUMBIA SLOUGH

SCALE: 1 IN = 800 FT

1

US Army Corps of Engineers
Portland District

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U.S. ARMY CORPS OF ENGINEERS
PORTLAND DISTRICT
PORTLAND, OREGON

Tetra Tech, Inc
1020 SW Taylor Street
Suite 530
Portland, OR 97205

DESIGNED BY: JK
DWN BY: TS KAJMR
CKD BY: WF AM
SUBMITTED BY:
PLOT SCALE: AS STATED
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SIZE: ANSI D
FILE NAME: (SEE STAMP)

DATE: JUNE 2011
SOLICITATION NO.: W911KB-04-D-0009
CONTRACT NO.: W911KB-04-D-0009
FILE NUMBER:

LOWER WILLAMETTE RIVER
ECOSYSTEM RESTORATION PROJECT

COLUMBIA SLOUGH
LOCATION MAP

Multnomah County, Oregon

SHEET IDENTIFICATION
04
SHEET 04 OF 19

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SOUTH MAINSTEM WILLAMETTE

SCALE: 1 IN = 700 FT

1

US Army Corps of Engineers
Portland District

MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

DATE: JUNE 2011
SOLICITATION NO.: W911KB-09-D-0009
CONTRACT NO.: W911KB-09-D-0009
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DESIGNED BY: JK
DWN BY: TS KA MR
CKD BY: WF AM
SUBMITTED BY:
PLOT SCALE: AS STATED
PLOT DATE: (SEE STAMP)
SIZE: ANSI D
FILE NAME: (SEE STAMP)

U.S. ARMY CORPS OF ENGINEERS
PORTLAND DISTRICT
PORTLAND, OREGON

Tetra Tech, Inc
1020 SW Taylor Street
Suite 530
Portland, OR 97205

LOWER WILLAMETTE RIVER
ECOSYSTEM RESTORATION PROJECT

SOUTH MAINSTEM
LOCATION MAP

Multnomah County, Oregon

SHEET IDENTIFICATION
05
SHEET 05 OF 19

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N

800 0 800 1600
SCALE IN FEET

TRYON CREEK/HWY 43
SCALE: 1 IN = 800 FT

1

US Army Corps of Engineers
Portland District

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DATE: JUNE 2011
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U.S. ARMY CORPS OF ENGINEERS
PORTLAND DISTRICT
PORTLAND, OREGON

Tetra Tech, Inc
1020 SW Taylor Street
Suite 530
Portland, OR 97205

DESIGNED BY: JK	DWN BY: TS/KK/AR	SUBMITTED BY:	PLOT SCALE: AS STATED	PLOT DATE: (SEE STAMP)
	CKD BY: WP-MM		SIZE: ANSI D	FILE NAME: (SEE STAMP)

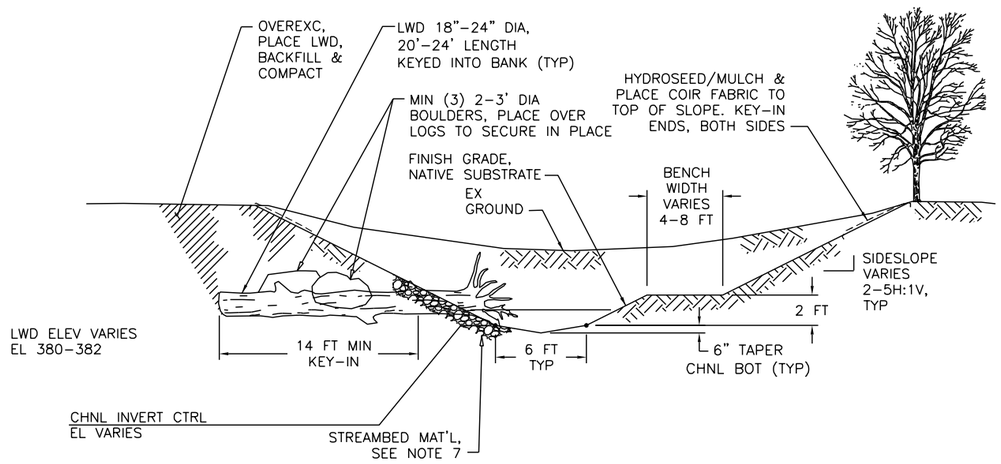
LOWER WILLAMETTE RIVER
ECOSYSTEM RESTORATION PROJECT

TRYON CREEK LOCATION MAP

Multnomah County, Oregon

SHEET IDENTIFICATION
06
SHEET 06 OF 19

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TYPICAL SECTION
W/ NATIVE SUBSTRATE
HORZ. 1 IN = 5 FT/ VERT 1 IN = 5 FT

NOTES

1. STREAMBED MATERIAL SHALL INCLUDE 15% BY WEIGHT SANDY, ORGANIC MIX, AND 85% BY WEIGHT STREAMBED ROCK AS SPECIFIED. PLACEMENT OF STREAMBED MATERIAL SHALL BE AS SPECIFIED.

STREAMBED ROCK GRADATION	
ROCK DIAMETER / SIZE (IN)	PERCENT SMALLER (%)
20	100
16	75–85
12	40–60
4	20–30
1	7–15
1/2	0–10

2. LWD SHALL BE SELECTED FROM LOGS SALVAGED DURING CLEARING, OR IMPORTED PER SPECIFICATIONS.
3. AFTER CONTRACTOR STAKES TOP OF BANK WITH 2.5:1 OR STEEPER SLOPES, NOTIFY COR. COR APPROVAL REQUIRED BEFORE GRADING.
4. VARY CHANNEL SLOPES TO CREATE A NATURAL LOOKING CHANNEL. MAX SLOPE 2:1, MIN SLOPE 5:1.
5. CONSTRUCT 4 FT STREAMBED MATL POCKETS (OR TOEDOWNS) SIMILAR TO DETAIL 1 AT U/S AND D/S ENDS OF BRIDGE PROTECTION.
6. HYDROSEED, PLACE MULCH AND COIR FABRIC ALONG UPPER SLOPE OF ENTIRE CHANNEL.
7. BACKFILL WITH STREAMBED MAT'L AT FINISH GRADE SURFACE ADJACENT TO ALL LWD. SEE DETAILS ON SHT 08.

US Army Corps of Engineers
Portland District

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MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY: JK
DWN BY: TS,KK,MR
CHD BY: WF,MM
SUBMITTED BY: DM
DATE: JUNE 2011
SOLICITATION NO.: W911KB-09-3-0009
CONTRACT NO.: W911KB-09-3-0009
PLOT SCALE: AS STATED
PLOT DATE: (SEE STAMP)
FILE NUMBER:
SIZE: ANSI D
FILE NAME: (SEE STAMP)

U.S. ARMY CORPS OF ENGINEERS
PORTLAND DISTRICT
PORTLAND, OREGON

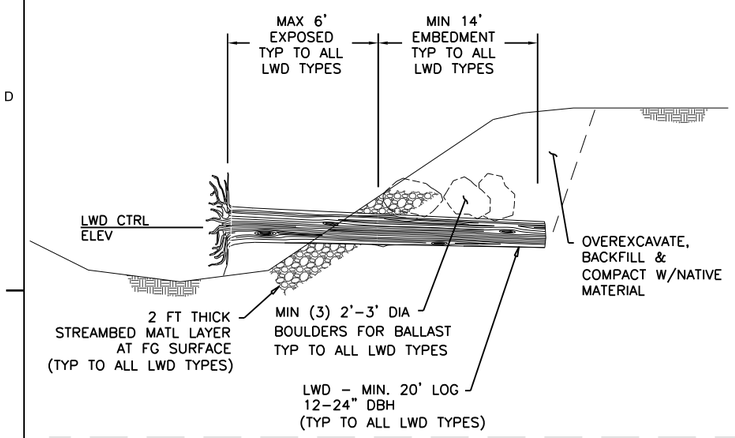
Tetra Tech, Inc
1020 SW Taylor Street
Suite 530
Portland, OR 97205

LOWER WILLAMETTE RIVER
ECOSYSTEM RESTORATION PROJECT

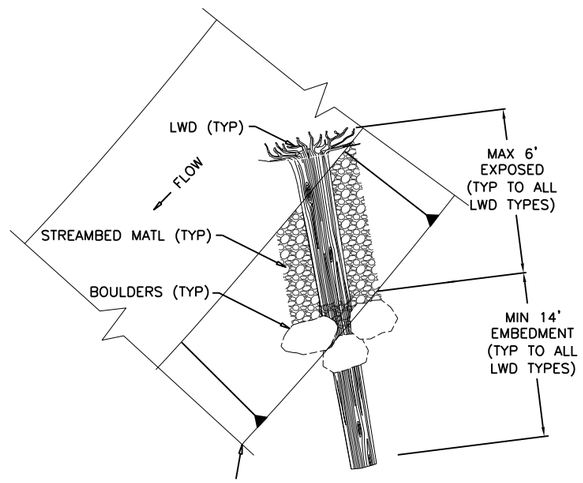
CHANNEL TYPICAL
CROSS SECTION
Multnomah County, Oregon

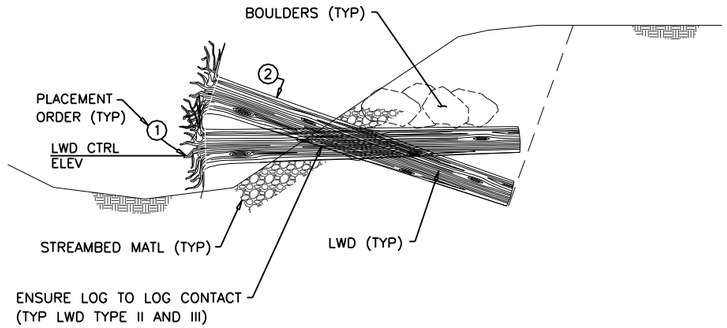
SHEET IDENTIFICATION
07
SHEET 07 OF 19

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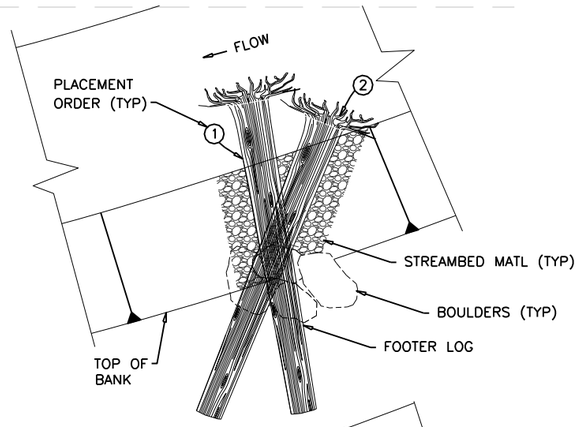


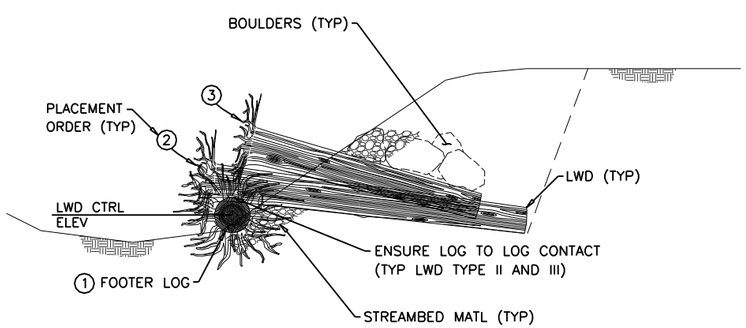
LWD TYPE I



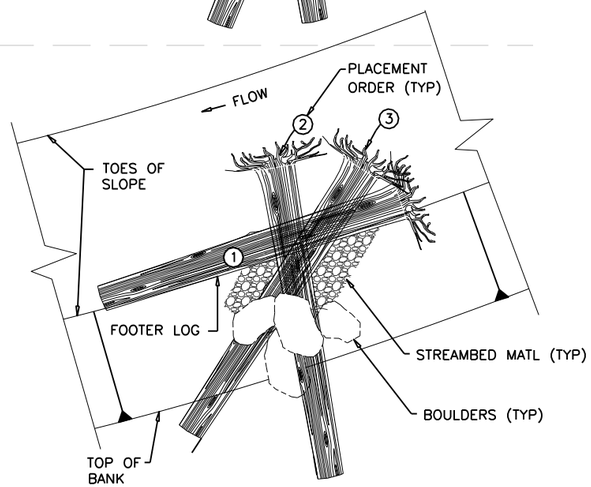


LWD TYPE II





LWD TYPE III



TYPICAL LWD SECTIONS

NTS

A

TYPICAL LWD PLANS

NTS

B

NOTES:

1. LWD SELECTED FROM LOGS SALVAGED DURING CLEARING ACTIVITIES SHALL HAVE ROOTWADS INTACT. ACCEPTANCE OF LOGS SHALL BE PER ENGINEER.
2. CONTRACTOR TO VARY PLAN VIEW ORIENTATION OF LOGS WITHIN LIMITS SHOWN AND PER SPECS AND FIELD DIRECTION FROM COR AND/OR ENGINEER. GENERALLY ORIENT LWD WITH ROOTWAD FACING U/S.
3. BOULDERS SALVAGED DURING CHANNEL EXCAVATION AND DEMO ACTIVITIES MAY BE USED FOR LWD BALLAST IF THEY MEET SIZE REQUIREMENTS SHOWN.
4. COBBLE AND BOULDERS (>6 IN DIA) FROM CHANNEL EXCAVATION MAY BE SUBSTITUTED FOR STREAMBED MATERIAL PLACED AT LWD. MATERIAL TO BE VISUALLY INSPECTED BY COR BEFORE CONSTRUCTION OF LWD.

US Army Corps of Engineers Portland District

MARK	DESCRIPTION	DATE	APPR.

MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY: K. AHLSTROM
DRN. BY: TS,KK,MR
CKD BY: WF,MM
SUBMITTED BY: DM
DATE: JUNE 2011
SOLICITATION NO.: W911KB-09-D-0009
CONTRACT NO.: W911KB-09-D-0009
PLOT SCALE: AS STATED
PLOT DATE: (SEE STAMP)
SIZE: ANSI J
FILE NAME: (SEE STAMP)
FILE NUMBER:

U.S. ARMY CORPS OF ENGINEERS
PORTLAND DISTRICT
PORTLAND, OREGON

Tetra Tech, Inc
1020 SW Taylor Street
Suite 530
Portland, OR 97205

5/17/2010 4:52 PM

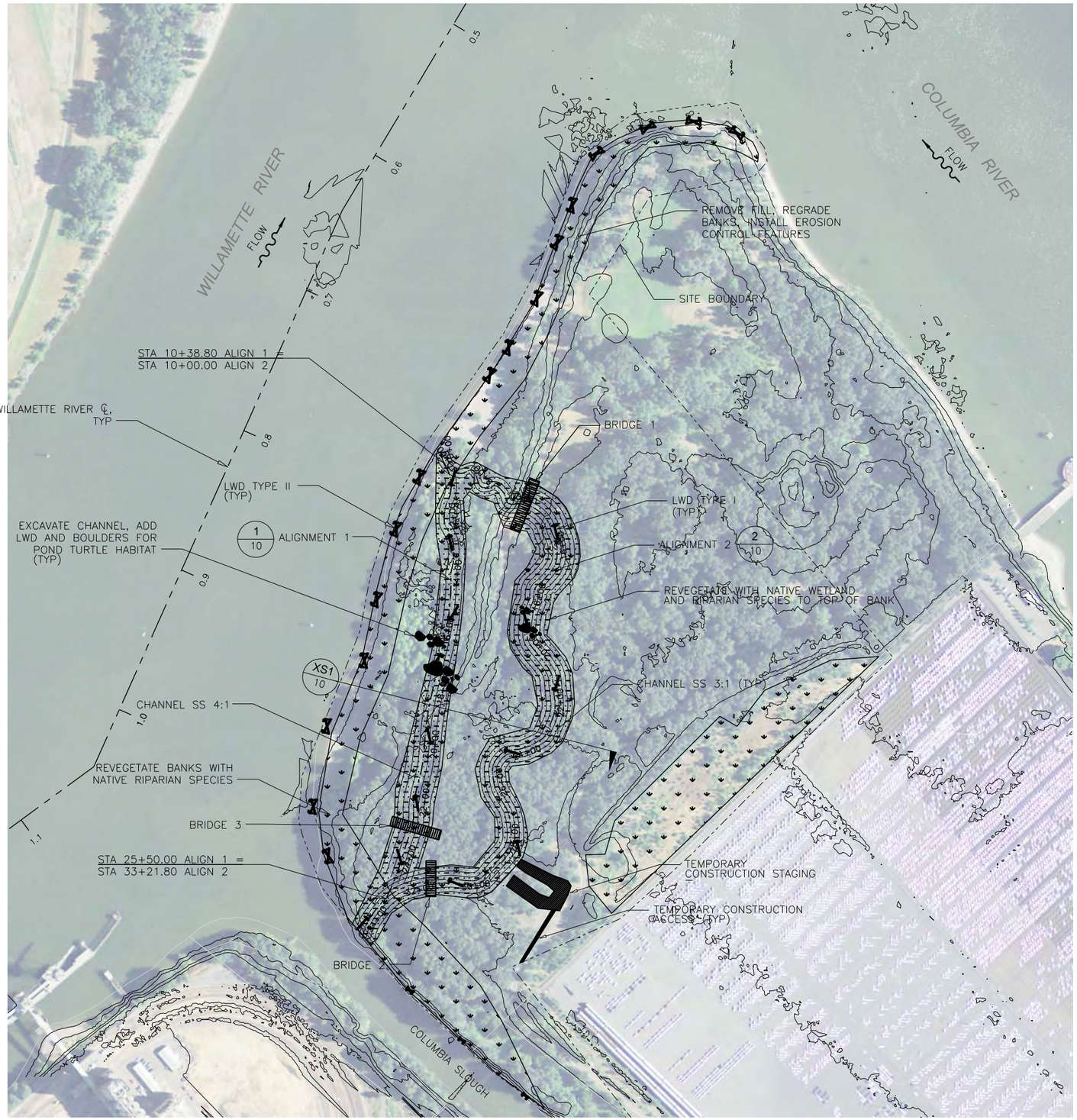
LOWER WILLAMETTE RIVER
ECOSYSTEM RESTORATION PROJECT

LWD DETAILS

Multnomah County, Oregon

SHEET IDENTIFICATION
08
SHEET 08 OF 19

S:\Projects\SNW-726638 Lower Willamette Feasibility\DGN\G09-LWD DETAILS.dwg



SITE PLAN - KELLEY POINT PARK

SCALE: 1 IN = 200 FT

1/11

N

200 0 200 400

SCALE IN FEET

PEDESTRIAN BRIDGES				
BRIDGE	ALIGN	STATION	LENGTH (FT)	WIDTH (FT)
1	2	14+00	190	10
2	2	31+50	120	10
3	1	23+00	180	10

NOTES:

1. LWD ARE DOUBLED IN SIZE FOR CLARITY.
2. ONLY 5' PROPOSED CONTOURS ARE SHOWN
3. ALL PEDESTRIAN BRIDGES ARE PREFABRICATED

US Army Corps of Engineers
Portland District

MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY: JK
DRAWN BY: TS,KK,MR
CKD.BY: WF,MM
SUBMITTED BY: DM
PLOT SCALE: AS STATED
PLOT DATE: (SEE STAMP)
DATE: MARCH 2014
SOLICITATION NO.: W91YKB-09-D-0009
CONTRACT NO.: W91YKB-09-D-0009
FILE NUMBER:
SCALE: AS STATED
DATUM: NAD 83
ELEVATIONS: (SEE STAMP)

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Suite 530
Portland, OR 97205

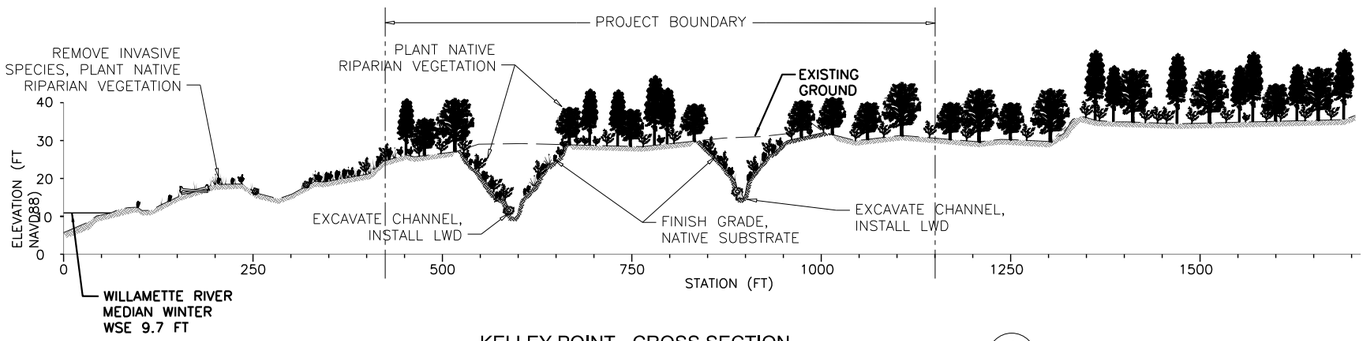
LOWER WILLAMETTE RIVER
ECOSYSTEM RESTORATION PROJECT

KELLEY POINT PARK - SITE PLAN

Multnomah County, Oregon

SHEET IDENTIFICATION
09
SHEET 09 OF 19

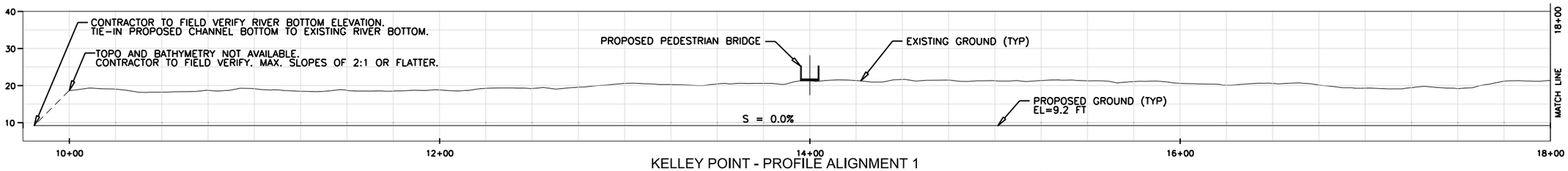
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KELLEY POINT - CROSS SECTION

SCALE: HOR. 1 IN = 20 FT
VER. 1 IN = 20 FT

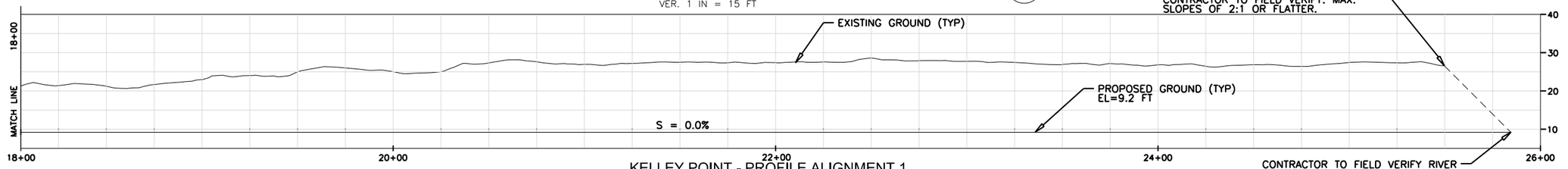
XS 1 / 09



KELLEY POINT - PROFILE ALIGNMENT 1 STA 10+00 - 18+00

SCALE: HOR. 1 IN = 30 FT
VER. 1 IN = 15 FT

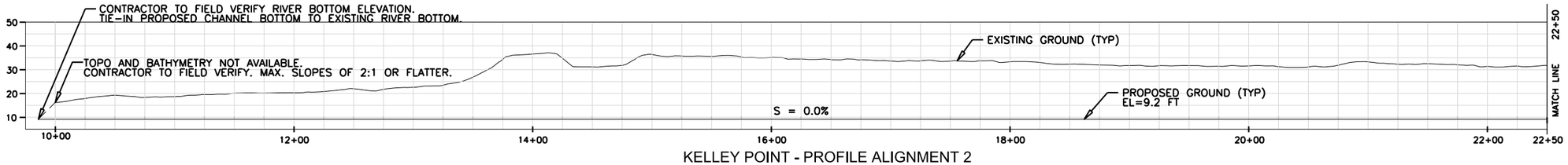
1 / 09



KELLEY POINT - PROFILE ALIGNMENT 1 STA 18+00 - 25+55

SCALE: HOR. 1 IN = 30 FT
VER. 1 IN = 15 FT

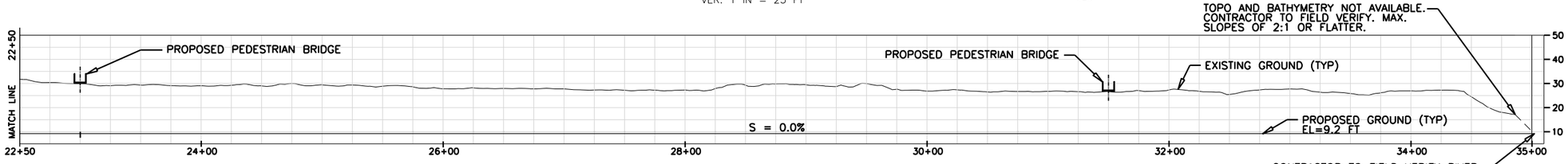
2 / 09



KELLEY POINT - PROFILE ALIGNMENT 2 STA 10+00 - 22+50

SCALE: HOR. 1 IN = 50 FT
VER. 1 IN = 25 FT

3 / 09



KELLEY POINT - PROFILE ALIGNMENT 2 STA 22+50 - 34+86

SCALE: HOR. 1 IN = 50 FT
VER. 1 IN = 25 FT

4 / 09

US Army Corps of Engineers
Portland District

MARK	DESCRIPTION	DATE	APPR.
MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY: JK
DWN BY: TS-KK-MR
CKD BY: WF-MM
SUBMITTED BY:
PLOT SCALE: AS STATED
PLOT DATE: (SEE STAMP)
SIZE: ANSI D
FILE NAME: (SEE STAMP)
DATE: MARCH 2014
SOLICITATION NO.: W911KB-09-D-0009
CONTRACT NO.: W9127N-12-D-0009
FILE NUMBER:

U.S. ARMY CORPS OF ENGINEERS
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12/15/2010 11:37 AM

LOWER WILLAMETTE RIVER
ECOSYSTEM RESTORATION PROJECT

KELLEY POINT PARK - CROSS SECTION & PROFILE

Multnomah County, Oregon

SHEET IDENTIFICATION
10
SHEET 10 OF 19

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SITE BOUNDARY (TYP)

EXCAVATE AND REGRADE AT 3:1 TO CREATE HIGH WATER REFUGE HABITAT

LWD TYPE II (TYP)

PROPERTY LINE (TYP)

N PORTLAND RD

RAILROAD

COLUMBIA SLOUGH

FLOW

EXCAVATE LOW FLOW CHANNEL ENHANCE POND TURTLE HABITAT WITH BOULDERS AND LOGS (TYP)

4:1

4:1

LWD TYPE II (TYP)

3:1

PORTLAND WASTE WATER TREATMENT PLANT

REGRADE BANKS 4:1 SS

TEMP CONSTRUCTION STAGING SEE NOTES

CHANNEL SS VARIES 2:1, 1:1, & 4:1

REVEGETATE WITH NATIVE RIPARIAN SPECIES

REMOVE CULVERT ALLOW FREE FLOW CHANNEL

ALTERNATE TEMP CONSTRUCTION STAGING SEE NOTES

TEMP CONSTRUCTION ACCESS

N

150 0 150

SCALE IN FEET

NOTES:
1. ONLY 5' CONTOURS SHOWN.
2. LWD IS DOUBLED IN SIZE FOR CLARITY.
3. CONTRACTOR TO ENSURE EXISTING SANITARY SEWER AND ALL UTILITIES BELOW STAGING AREA ARE NOT DAMAGED OR IMPACTED BY STAGING ACTIVITIES. CONTRACTOR TO REPAIR/REPLACE ALL DAMAGED UTILITIES.

SITE PLAN - BES TREATMENT PLANT

SCALE: 1 IN = 150 FT

1

US Army Corps of Engineers Portland District

MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY: JK
DWN BY: TS-KA,MR
SUBMITTED BY:
PLOT SCALE: AS STATED
SIZE: ANSI D
CKD BY: WF,MM
PLOT DATE: (SEE STAMP)
FILE NAME: (SEE STAMP)
DATE: MARCH 2014
SOLICITATION NO.: W911KB-09-D-0009
CONTRACT NO.: W911KB-14-F-0009
FILE NUMBER:

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Tetra Tech, Inc
1020 SW Taylor Street
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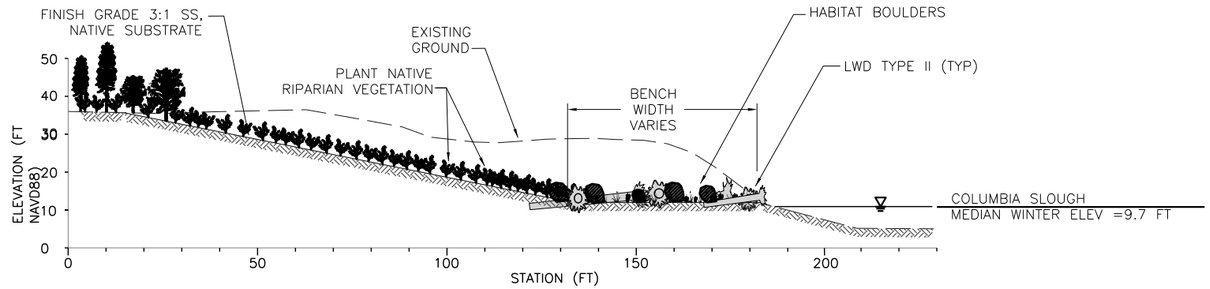
LOWER WILLAMETTE RIVER ECOSYSTEM RESTORATION PROJECT

BES TREATMENT PLANT - SITE PLAN

Multnomah County, Oregon

SHEET IDENTIFICATION
11
SHEET 11 OF 19

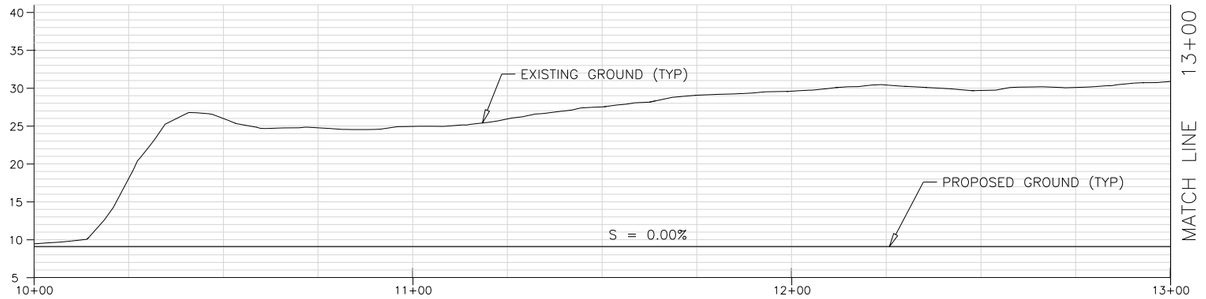
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BES TREATMENT PLANT BANKS - CROSS SECTION

XS 1
11

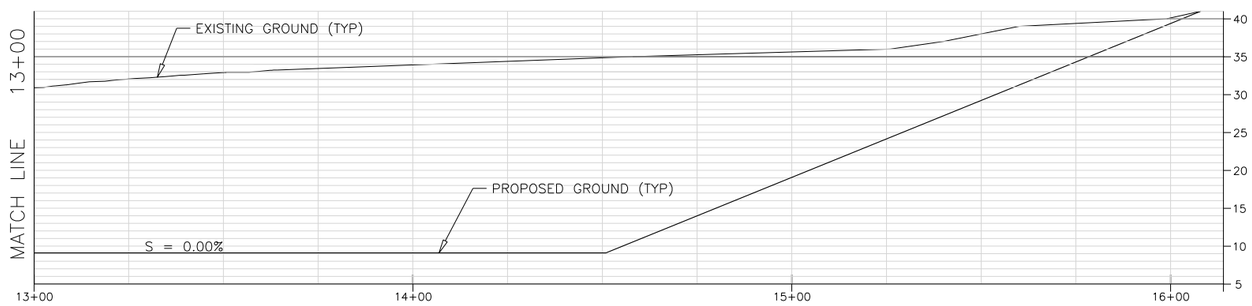
SCALE: HOR. 1 IN = 40 FT
VER. 1 IN = 40 FT



BES TREATMENT PLANT
LOW FLOW CHANNEL - PROFILE STA 10+00 - 13+00

1
11

SCALE: HOR. 1 IN = 20 FT
VER. 1 IN = 10 FT



BES TREATMENT PLANT
LOW FLOW CHANNEL - PROFILE STA 13+00 - 16+00

1
11

SCALE: HOR. 1 IN = 20 FT
VER. 1 IN = 10 FT

US Army Corps of Engineers
Portland District

MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY: JK
DRN BY: TS-KK-MR
CKD BY: VF-MM
SUBMITTED BY:
PLOT SCALE: AS STATED
PLOT DATE: (SEE STAMP)
SIZE: ANSI D
FILE NAME: (SEE STAMP)
DATE: MARCH 2014
SOLICITATION NO.: W911KB-09-D-0009
CONTRACT NO.: W912EF-10-D-0009
FILE NUMBER:

U.S. ARMY CORPS OF ENGINEERS
PORTLAND DISTRICT
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LOWER WILLAMETTE RIVER
ECOSYSTEM RESTORATION PROJECT

BES TREATMENT PLANT BANKS - CROSS SECTION AND PROFILE

Multnomah County, Oregon

SHEET IDENTIFICATION
12
SHEET 12 OF 19

P:\Projects\26638 Lower Willamette Feasibility\726638 CAD Lower Willamette\DGN\COLUMBIA P&P.dwg

TEMPORARY CONSTRUCTION STAGING

TEMPORARY CONSTRUCTION ACCESS

SITE BOUNDARY

REMOVE INVASIVE SPECIES AND REVEGETATE WITH NATIVE RIPARIAN SPECIES

COLUMBIA SLOUGH TRAIL

YSI 14

N. DENVER AVENUE

PROPERTY LINE (TYP)

LWD TYPE II (TYP)

N. SCHMEER RD

FLOW

COLUMBIA SLOUGH

SITE PLAN - KENTON COVE

SCALE: 1 IN = 50 FT

1

N

50 0 50

SCALE IN FEET

US Army Corps of Engineers
Portland District

MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
PORTLAND DISTRICT
PORTLAND, OREGON

Tetra Tech, Inc
1020 SW Taylor Street
Suite 530
Portland, OR 97205

DESIGNED BY: JK
DWN BY: TS AK JAR
CKD BY: WF AM
SUBMITTED BY:
PLOT SCALE: AS STATED
PLOT DATE: (SEE STAMP)
SIZE: ANSI D
FILE NAME: (SEE STAMP)
DATE: JUNE 2011
SOLICITATION NO.: W911KB-04-2-0009
CONTRACT NO.: W912EP-10-D-0009
FILE NUMBER:

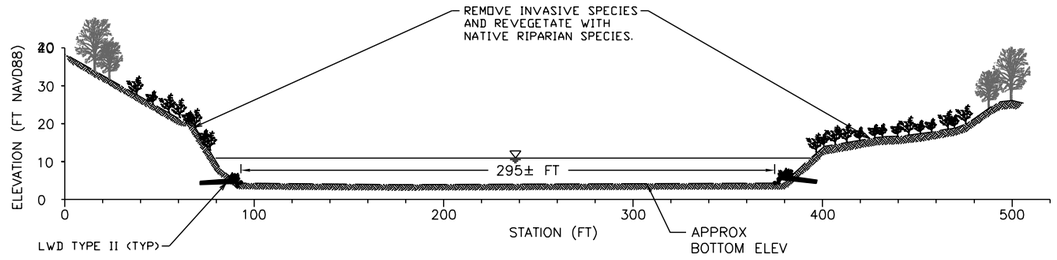
LOWER WILLAMETTE RIVER
ECOSYSTEM RESTORATION PROJECT

KENTON COVE - SITE PLAN

Multnomah County, Oregon

SHEET IDENTIFICATION
13
SHEET 13 OF 19

P:\Projects\726538 Lower Willamette Feasibility\726538 CAD Lower Willamette\DGN\COLUMBIA P&P.dwg



KENTON COVE - CROSS SECTION

XS 1
13

SCALE: HOR. 1 IN = 80 FT
VER. 1 IN = 20 FT

US Army Corps of Engineers
Portland District

MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
PORTLAND DISTRICT
PORTLAND, OREGON

Tetra Tech, Inc.
1020 SW Taylor Street
Suite 530
Portland, OR 97205

DESIGNED BY: AM,JC	DATE: AUG 2011
DWN BY: TS,NK,MR	CKD BY: WF,MM
SUBMITTED BY: DM	SOLICITATION NO.: W911KB-09-D-0009
PLOT SCALE: AS STATED	CONTRACT NO.: W911KB-09-D-0009
SIZE: ANSI D	PLOT DATE: (SEE STAMP)
	FILE NUMBER:
	FILE NAME: (SEE STAMP)

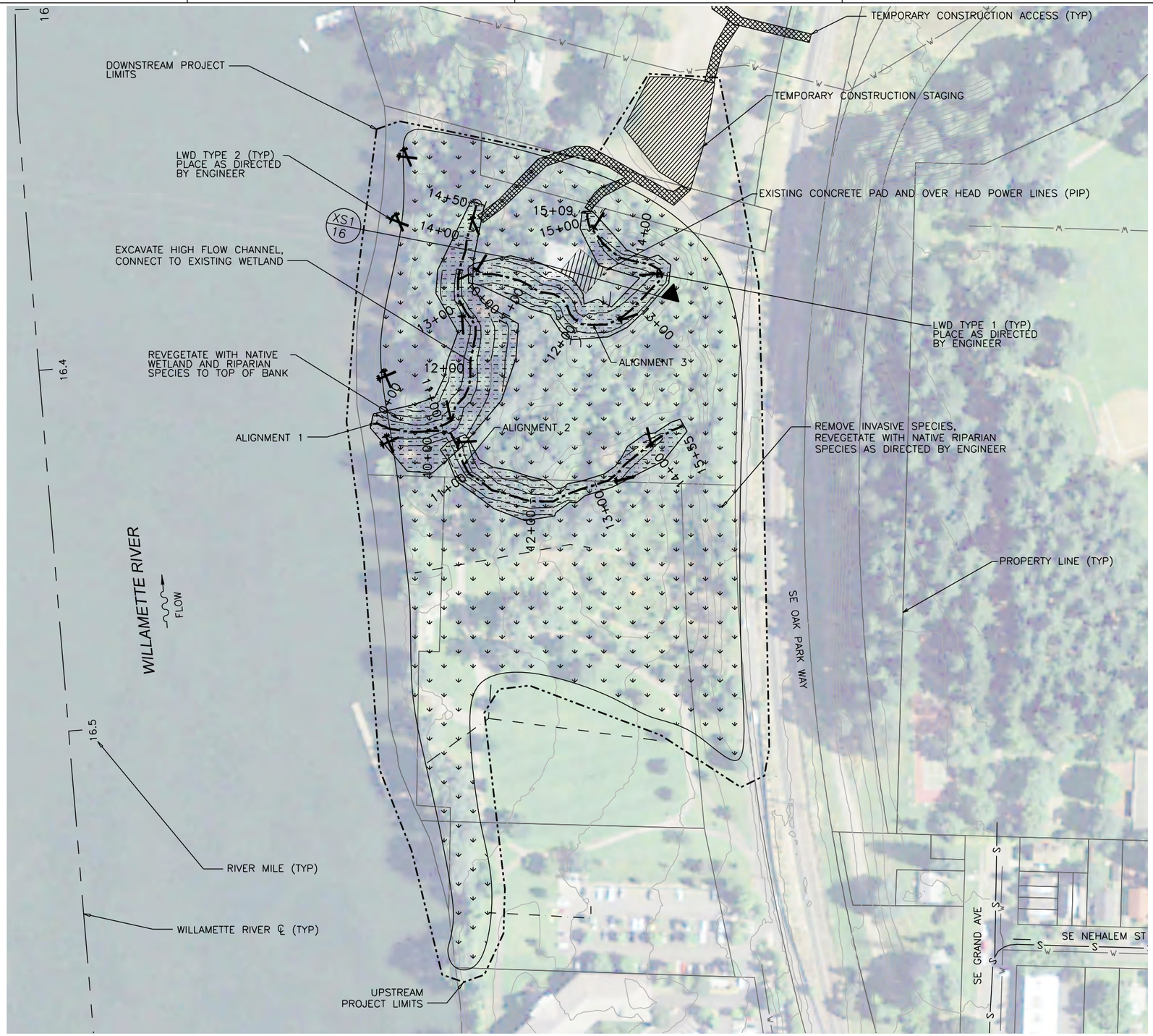
LOWER WILLAMETTE RIVER
ECOSYSTEM RESTORATION PROJECT

KENTON COVE - CROSS SECTION

Multnomah County, Oregon

SHEET IDENTIFICATION
14
SHEET 14 OF 19

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SITE PLAN - OAKS CROSSING 1

N

160 0 160
SCALE IN FEET

US Army Corps of Engineers
Portland District

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PORTLAND DISTRICT
PORTLAND, OREGON

Tetra Tech, Inc
1020 SW Taylor Street
Suite 530
Portland, OR 97205

DESIGNED BY: JK	CKD BY: WF,AM	DATE: JUNE 2011	
DWN BY: TS-KA,MR		SOLICITATION NO.: W911KB-09-D-0009	
SUBMITTED BY:		CONTRACT NO.: W911KB-10-D-0009	
PLOT SCALE: AS STATED	PLOT DATE: (SEE STAMP)	FILE NUMBER:	
SIZE: ANSI D	FILE NAME: (SEE STAMP)		

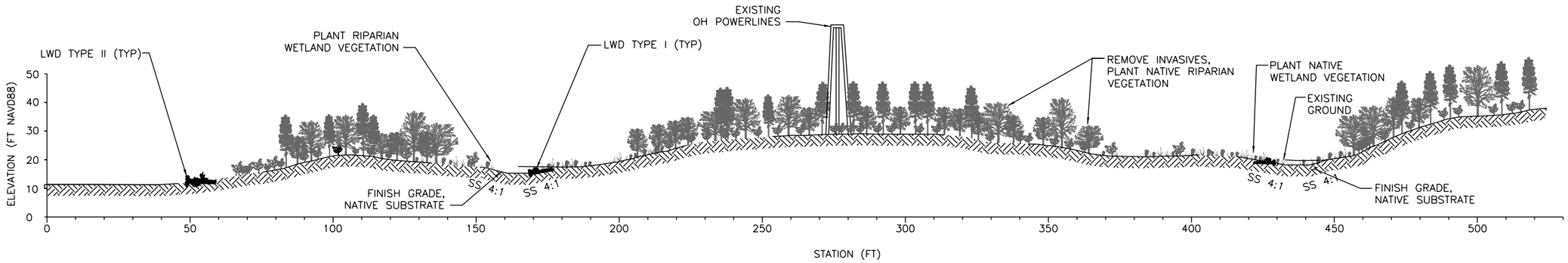
LOWER WILLAMETTE RIVER
ECOSYSTEM RESTORATION PROJECT

OAKS CROSSING - SITE PLAN

Multnomah County, Oregon

SHEET IDENTIFICATION
15
SHEET 15 OF 19

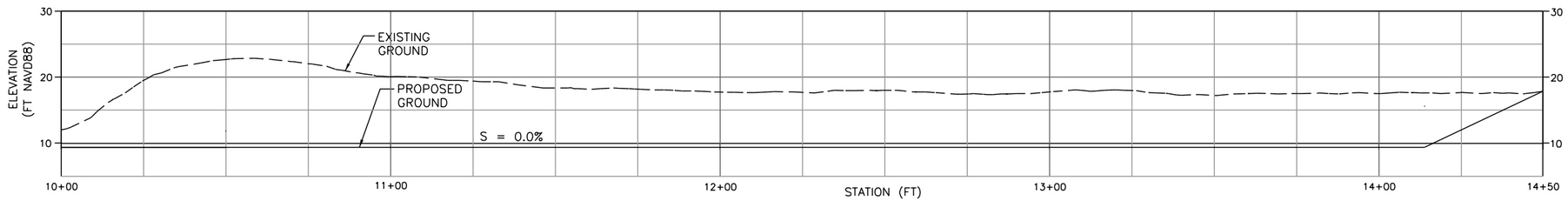
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OAKS CROSSING - CROSS SECTION

XS 1 / 15

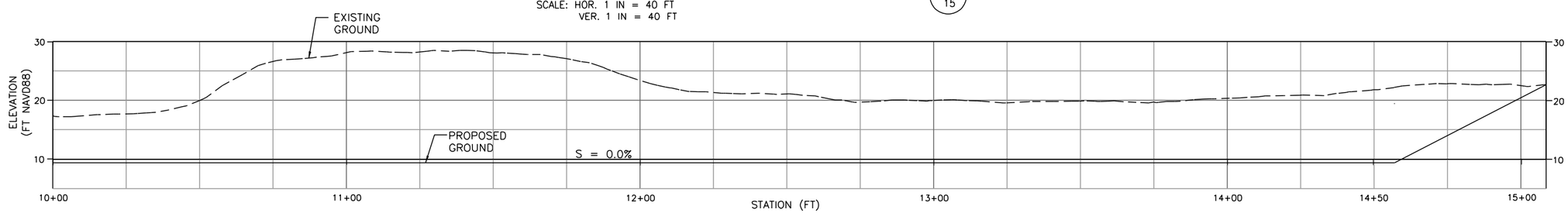
SCALE: HOR. 1 IN = 40 FT
VER. 1 IN = 40 FT



OAKS CROSSING - PROFILE, ALIGNMENT 1

1 / 15

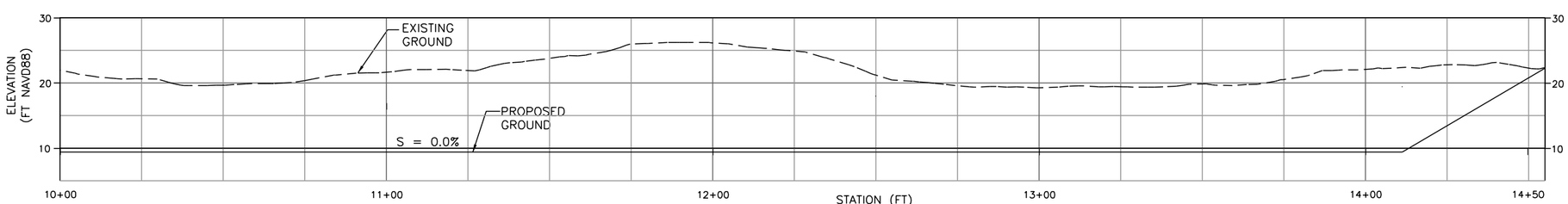
SCALE: HOR. 1 IN = 40 FT
VER. 1 IN = 40 FT



OAKS CROSSING - PROFILE ALIGNMENT, 2

2 / 15

SCALE: HOR. 1 IN = 40 FT
VER. 1 IN = 40 FT



OAKS CROSSING - PROFILE, ALIGNMENT 3

3 / 15

SCALE: HOR. 1 IN = 40 FT
VER. 1 IN = 40 FT

US Army Corps of Engineers
Portland District

MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY: JK
DWN BY: TS-KJ/R
SUBMITTED BY: DEA
CKD BY: WF/AM
PLOT SCALE: AS STATED
PLOT DATE: (SEE STAMP)
SIZE: ANSI D
FILE NAME: (SEE STAMP)
DATE: JUNE 2011
SOLICITATION NO.: W911KB-09-D-0009
CONTRACT NO.: W912EP-10-D-0008
FILE NUMBER:

U.S. ARMY CORPS OF ENGINEERS
PORTLAND DISTRICT
PORTLAND, OREGON

Tetra Tech, Inc
1020 SW Taylor Street
Suite 530
Portland, OR 97205

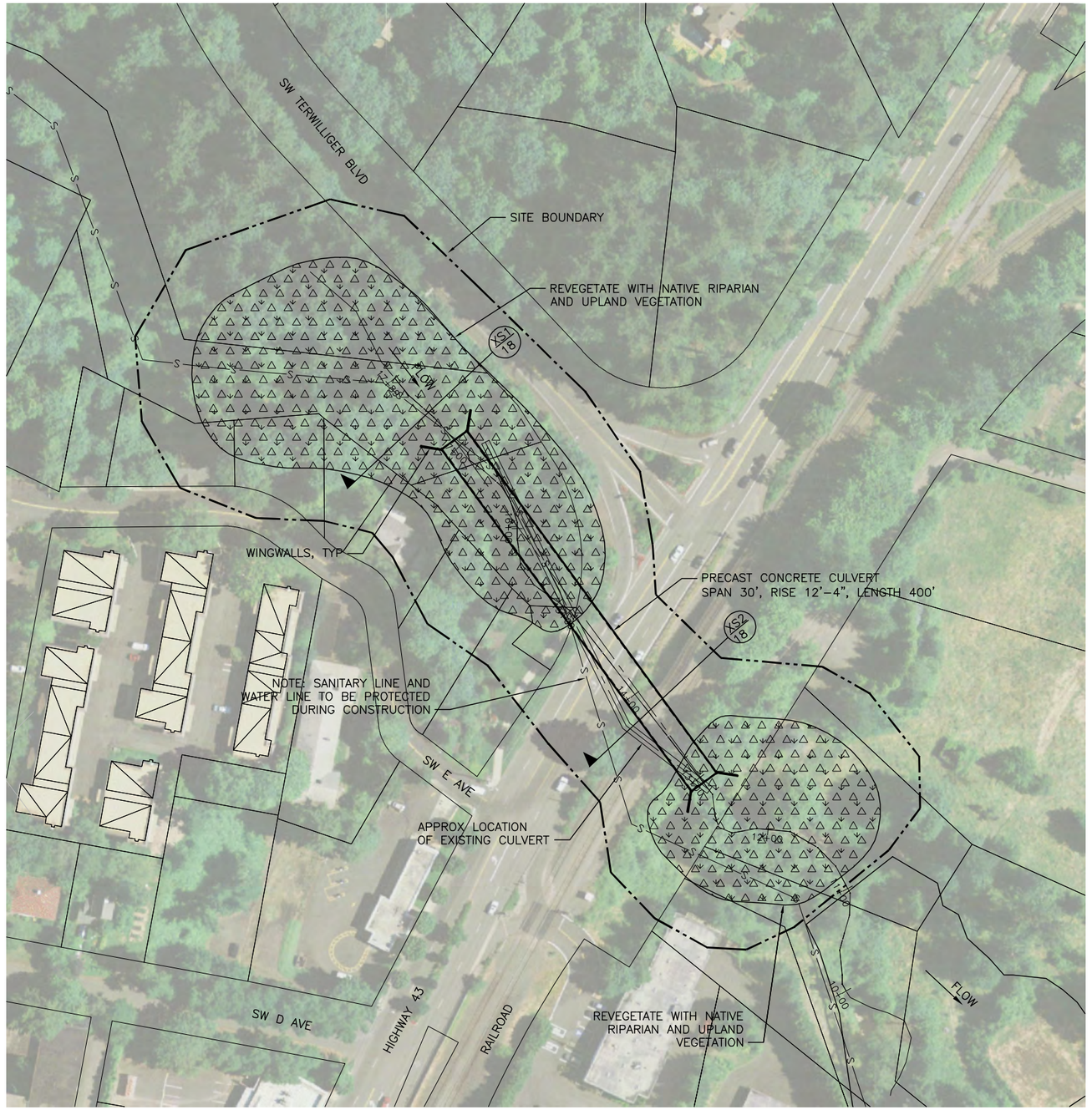
LOWER WILLAMETTE RIVER
ECOSYSTEM RESTORATION PROJECT

OAKS CROSSING - PROFILE & CROSS SECTIONS

Multnomah County, Oregon

SHEET IDENTIFICATION
16
SHEET 16 OF 19

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SITE PLAN - TRYON CREEK HIGHWAY 43 CULVERT

SCALE: 1 IN = 60 FT

1

N

60 0 60 120

SCALE IN FEET

NOTE:

LOCATIONS OF CONSTRUCTION STAGING WILL BE DETERMINED AT A LATER DATE UPON COORDINATION WITH CITY OF PORTLAND, CITY OF LAKE OSWEGO, OREGON DEPARTMENT OF TRANSPORTATION, AND UNION PACIFIC RAILROAD.

US Army Corps of Engineers
Portland District

MARK	DESCRIPTION	DATE	APPR.

MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY: JK
DRN BY: TS,KK,MR
CKD BY: WF,MM
SUBMITTED BY: JM
DATE: JUNE 2011
SOLICITATION NO.: W911KB-09-D-0009
CONTRACT NO.: W911KB-09-D-0009
PLOT SCALE: AS STATED
PLOT DATE: (SEE STAMP)
FILE NUMBER:
SIZE: ANSI D
FILE NAME: (SEE STAMP)

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PORTLAND, OREGON

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Portland, OR 97205

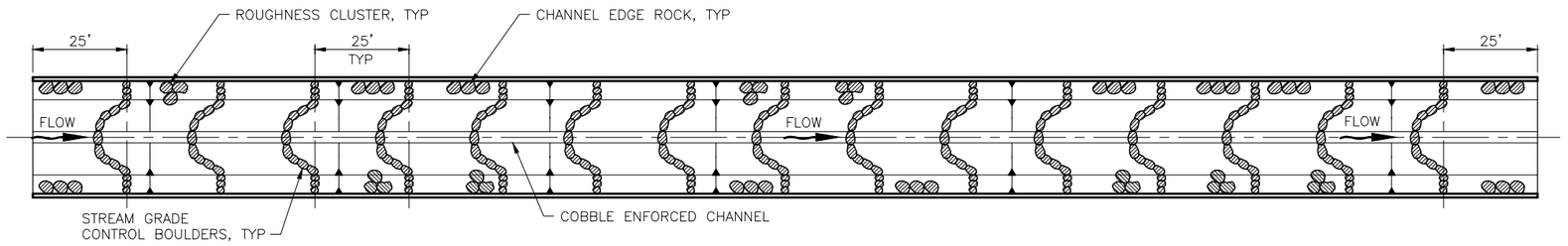
LOWER WILLAMETTE RIVER
ECOSYSTEM RESTORATION PROJECT

TRYON CREEK HIGHWAY 43
CULVERT - SITE PLAN

Multnomah County, Oregon

SHEET IDENTIFICATION
17
SHEET 17 OF 19

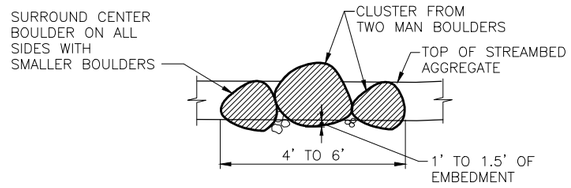
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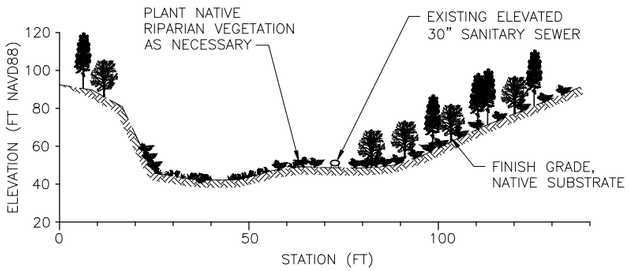
CHANNEL IN CULVERT PLAN (1/–)
SCALE: 1"=20'

ROUGHNESS CLUSTERS SHALL BE FORMED BY PLACING STREAMBED BOULDERS ADJACENT TO EACH OTHER IN A TRIANGULAR SHAPE. CHANNEL EDGE ROCK SHALL BE FORMED BY PLACING THE STREAMBED BOULDERS ADJACENT TO EACH OTHER IN A LINEAR PATTERN.

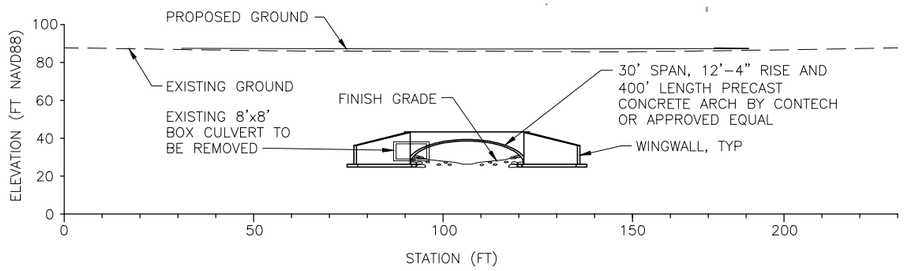
NOTE: IN-PLACE MATRIX SHALL BE LARGE ROCK TO ROCK CONTACT OF MATERIAL MEETING THE SPECIFICATION. VOIDS SHALL BE FILLED IN WHEN SURROUNDING STREAMBED AGGREGATE IS PLACED AND WASHED INTO VOIDS.



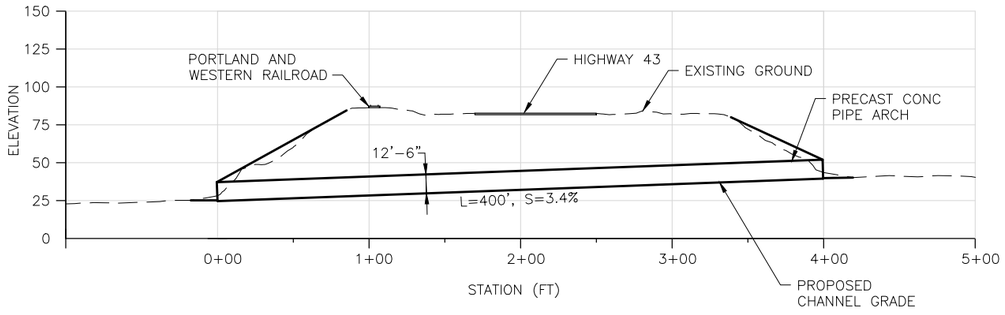
ROUGHNESS CLUSTER AND CHANNEL EDGE ROCK TYPICAL SECTION (4/–)
NO SCALE



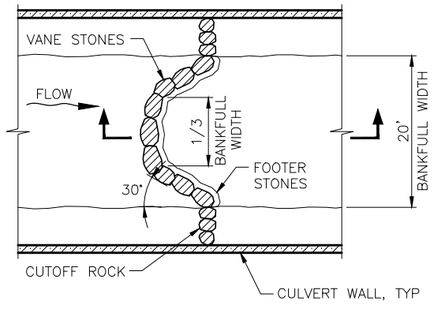
CROSS SECTION (1/17)
SCALE: 1"=20' HORIZ, 1"=40' VERT



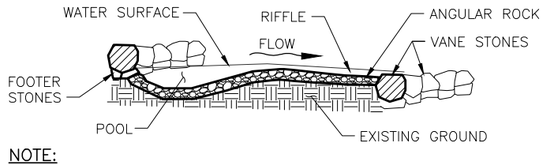
CULVERT CROSS SECTION (2/17)
SCALE: 1"=20' HORIZ, 1"=40' VERT



CULVERT PROFILE (5/–)
SCALE: 1"=50'



PLAN



NOTE:
VANESTONES TO BE 36" BOULDERS, TWO THIRDS OF BOULDERS TO BE BURIED.

SECTION

STREAM GRADE CONTROL (6/–)
NO SCALE

US Army Corps of Engineers
Portland District

MARK	DESCRIPTION	DATE	APPR
MARK	DESCRIPTION	DATE	APPR

DESIGNED BY: JK
DRAWN BY: TSXKMR
SUBMITTED BY: DM
PLOT SCALE: AS STATED
SIZE: ANSI D
DATE: MARCH 2014
CKD BY: WF,MM
PLOT DATE: (SEE STAMP)
FILE NAME: (SEE STAMP)
SOLICITATION NO.: W911KB-09-D-0009
CONTRACT NO.: W911KB-09-D-0009
FILE NUMBER:

U.S. ARMY CORPS OF ENGINEERS
PORTLAND DISTRICT
PORTLAND, OREGON

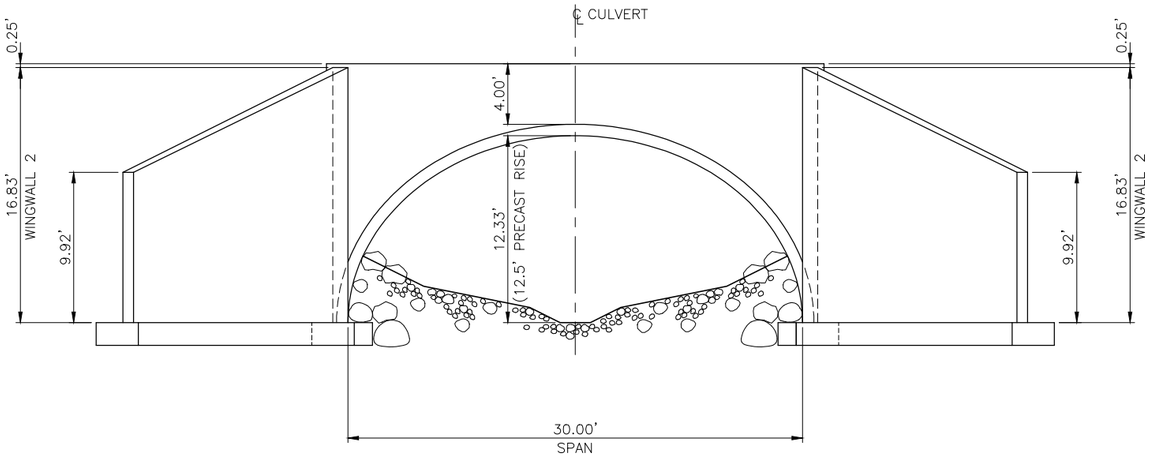
Tetra Tech, Inc.
1020 SW Taylor Street
Suite 530
Portland, OR 97205

LOWER WILLAMETTE RIVER
ECOSYSTEM RESTORATION PROJECT

TRYON CREEK HIGHWAY 43
CULVERT - PROFILE

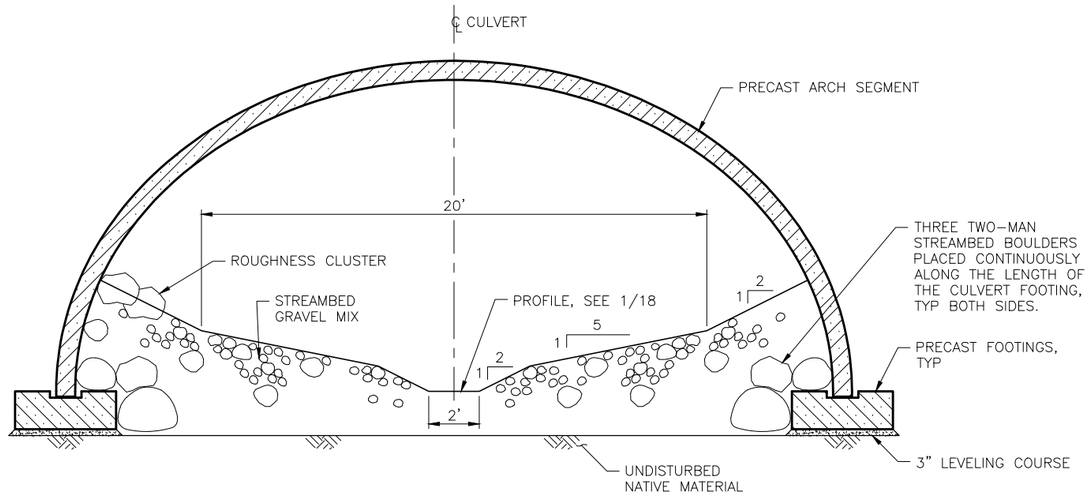
Multnomah County, Oregon

SHEET IDENTIFICATION
18
SHEET 18 OF 19



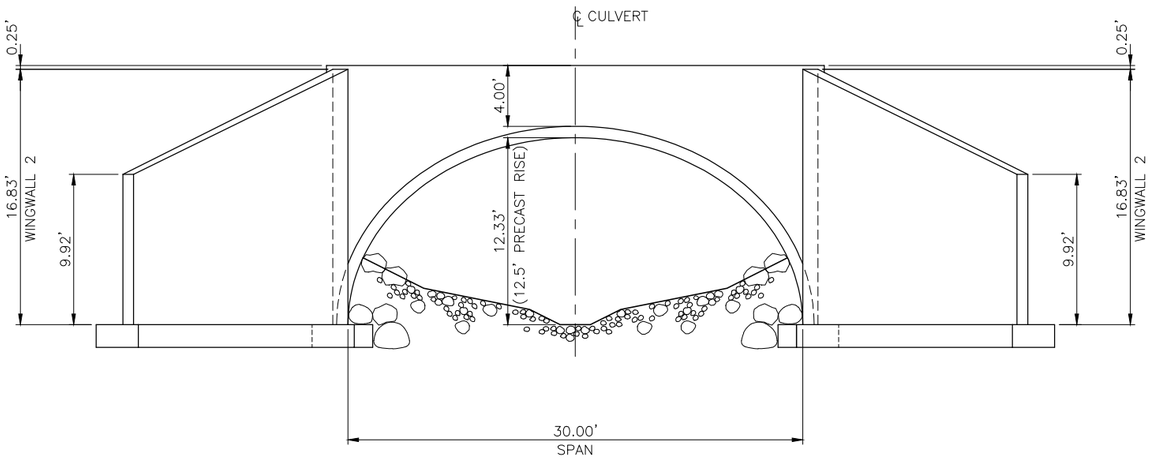
DOWNSTREAM
END ELEVATION 1

SCALE: 1"=5'



CHANNEL
SECTION IN CULVERT 3

SCALE: 1"=3'



UPSTREAM
END ELEVATION 2

SCALE: 1"=5'

US Army Corps
of Engineers
Portland District

MARK	DESCRIPTION	DATE	APPR

U.S. ARMY CORPS OF ENGINEERS PORTLAND DISTRICT PORTLAND, OREGON	DESIGNED BY: JK	DATE: MARCH 2014	
	DWN BY: TS,KK,MR	CKD BY: WF,MM	SOLICITATION NO.: W911KB-09-D-0009
	SUBMITTED BY: DM		CONTRACT NO.: W911KB-09-D-0009
	PLOT SCALE: AS STATED	PLOT DATE: (SEE STAMP)	FILE NUMBER:
	SIZE: ANSI D	FILE NAME: (SEE STAMP)	
Tetra Tech, Inc. 1020 SW Taylor Street Suite 530 Portland, OR 97205			

LOWER WILLAMETTE RIVER
ECOSYSTEM RESTORATION PROJECT

TRYON CREEK HIGHWAY 43
CULVERT - DETAILS

Multnomah County, Oregon

SHEET
IDENTIFICATION
19
SHEET 19 OF 19

APPENDIX B

DRAFT PLANTING LIST

Lower Willamette Planting Tables

Emergent Wetland Seed Mix		
Native Grasses	**Common Name**	**Lbs/Acre**
Alopecuris geniculatus	Water Foxtail	3
Agrostis exarata	Spike Bent Grass	3
Beckmania syzigachne	American Slough Grass	2
Deschampsia elongata	Slender hair Grass	3
Hordeum brachyantherum	Meadow Barley	5
Carex obnupta	Slough Sedge	2
	Total Lbs/Acre	18

Riparian Herbaceous Seed Mix

Agrostis exarata	Spike Bent Grass	3
Deschampsia elongata	Slender hair Grass	4
Elymus glaucus	Blue wildrye	5
Hordeum brachyantherum	Meadow Barley	5
	Total Lbs/Acre	17

Pacific Willow Temporarily Flooded Woodland Plant list

Species	Common Name	Plant Density	Propagule
Salix lucida var. lasiandra	Pacific Willow	4000/acre	Tublings/cuttings
Salix fluviatilis	Columbia River Willow		Tublings/cuttings
Salix sitchensis	Sitka Willow		Tublings/cuttings
Salix hookeriana	Piper's Willow		Tublings/cuttings
Spirea douglasii	Spirea		Tublings/cuttings
Lonicera involucrata	Twin Berry		Tublings/cuttings
Cornus sericea	Red Osier Dogwood		Tublings/cuttings

Riparian Forested Plant List

Species	Common Name	Plant Density	Propagule
Fraxinus latifolia	Oregon Ash	100/ac	1 gal
Thuja plicata	Western red cedar	50/ac	1 gal/bareroot
Salix lucida var. lasiandra	Pacific Willow	200/ac	Tublings/cuttings
Salix sitchensis	Sitka Willow	100/ac	Tublings/cuttings
Populus balsamifera	Black cottonwood	100/ac	Poles
Lonicera involucrata	Twin Berry	200/ac	Tublings/cuttings
Cornus sericea	Red Osier Dogwood	200/ac	Tublings/cuttings

Upland Plant List

Species	Common Name	Plant Density	Propagule
Acer macrophyllum	Big leaf maple	100/ac	1 gal
Pseudotsuga menziesii	Douglas fir	100/ac	5 gal
Sambucus caerula	Blue elderberry	50/ac	1 gal
Ribes sanguineum	Red-flowering currant	200/ac	1 gal
Mahonia aquifolium	Tall Oregon grape	200/ac	1 gal
Holodiscus discolor	Oceanspray	200/ac	1 gal

APPENDIX C

PRELIMINARY COST ESTIMATE

Lower Willamette ERGI Phase II
Unit Costs and Standard Markups for Restoration Projects

Cat.	Line Item	Unit	Source	Notes
Site Preparation Markups	Mob/Demob	Site prep markups are shown as percentage of construction subtotal, NOT INCLUDING THESE SITE PREP MARKUPS	PDOT Bid Tab #1 (8% mobilization)	Includes mob/demob of construction equipment and preparation of site access and staging areas.
	Permitting		Engineer's estimate - average for restoration sites	Includes contractor's construction permits only. NEPA and other pre-construction permit documents included in design phase costs.
	Dewatering/Diversion		Engineer's estimate - average for restoration sites	Includes dewatering, water control, and stream diversion as necessary.
	Erosion/Control and BMP's		PDOT Bid Tab #22,30 (1.5% Erosion+1% Pollution)	Includes silt fences, straw bales, inlet protection, biofilter bags, and other BMP's.
	Traffic Control		PDOT Bid Tab #2 (4% temp prot/div of traffic)	Site access/routing constr. vehicle traffic, not incl. long-term detours, rerouting traffic, or improvements to detour routes (sep. line items).
	Utilities		Engineer's estimate - average for restoration sites	Utility coord/notif, accomodations for minor utility impacts only, not incl. major service interruptions/relocations (covered in sep. line items).
	Demolition		PDOT Bid Tab #31 (3% rem of struc. & obstr.)	Demo and disposal of debris/obstructions, not including demolition of major infrastructure. Major work included in separate line items.
	Sum of Site Preparation Markups		Subtotal	Site prep markups are to construction subtotal, non-inclusive of markups.
Construction Line Items	Structural Concrete	per cubic yard	Engineer's estimate	Average cost for precast (delivered) or cast-in-place (incl. forms) structural concrete, including reinforcing steel
	Demo/Dispose Rock/Concrete	per ton	Engineer's estimate	Demo of grouted rock or unreinforced concrete
	Concrete Box Culvert	per lineal foot	PDOT Bid Tab #128 ($1220/ft concrete arch culvert)	8'-12' span culvert, incl. fabrication, delivery, installation/forming, footings, wingwalls, headwalls, streambed (double PDOT est for extras)
	Concrete Arch Culvert	per lineal foot	Engineer's estimatem (compare Boones Ferry)	~30'-40'-span culvert, incl. fabrication, delivery, installation/forming, footings, wingwalls, headwalls, streambed (double cost of shorter span)
	Pipe Culvert	per lineal foot	Engineer's estimate	Assume HDPE or PVC pipe, ~18" dia
	Pipe Culvert	per lineal foot	Engineer's estimate	Assume concrete pipe or aluminum arch, ~60"-72" dia
	Pipe Culvert with Slide Gate	per lineal foot	Engineer's estimate	Culvert fabrication, delivery, installation, based on 12" dia CMP with hand-operated slide gate
	Concrete Bridge	per square foot	Average from 2006 ODOT bridge cost data	Price based on deck area, including abutments and superstructure
	Railroad Bridge	per square foot	Engineer's estimate	Price based on deck area, including abutments and superstructure
	Footbridge	per square foot	Continental Bridge	Price based on deck area, including abutments and superstructure
	Metal Grating	per square foot	Engineer's estimate	Install metal grating for drainage, accommodate HS-20 load
	Barge Excavation	per cubic yard	Engineer's estimate	Excavate and haul offsite based on barge-mounted dredge with access from Willamette River
	Excavate and Haul Offsite	per cubic yard	PDOT Bid Tab #46	Standard excavation, assume 10-mile round-trip haul with no soil treatment
	Excavate and Regrade Onsite	per cubic yard	Engineer's estimate	Excavation and regrading within 50 feet with no net haul
	Import, Place, and Compact Fill	per cubic yard	PDOT Bid Tab #114 ($38.30 per SY)	Average cost for imported topsoil, structural backfill (PDOT Bid Tab #224), including delivery, rough grading, compaction, and smoothing
	Erosion Control Fabric	per square yard	PDOT Bid Tab #55 ($1 per SY)	Place on steep slopes or areas exposed to flow
	Plant Wetland Vegetation	per acre	Beaver Lake Nursery, Valley Growers, Scholl's	Remove invasives @$3,000 per acre, plant emergent wetland planting plugs at 2' O.C. $0.50 each material, $1.25 each installed
	Plant Shrub/Riparian Vegetation	per acre	Beaver Lake Nursery, Valley Growers, Scholl's	Remove invasives @$3,000 per acre, plant riparian species @$3 ea gal mat'l, $6 ea installed at 8' O.C.+ seeding @$2,500/acre + willow cuttings/alder stakes
	Plant Upland Vegetation	per acre	Beaver Lake Nursery, Valley Growers, Scholl's	Remove invasives @$3,000 per acre, plant riparian species @$3 ea gal mat'l, $6 ea installed at 8' O.C.+seeding @$2,500/acre
	Place Large Woody Debris	each	Engineer's estimate - average for restoration sites	Place buried, non-anchored logs with attached rootballs
	Place Anchored Large Woody Debris	each	Engineer's estimate - average for restoration sites	Place buried logs with attached rootballs, anchored with ecology blocks
	Remove Boulders	per ton	Engineer's estimate	Assume salvage value for rip rap
	Place Boulders	per ton	PDOT Bid Tab #61 ($80/CY)	Place boulders as habitat features among large woody debris clusters or grade control, including geotextile as necessary
General Markups	Contingency	General markups are shown as % of construction subtotal, including site prep markups, but NOT INCLUDING EACH PRECEDING INDIVIDUAL GENERAL MARKUP	Previous Corps 206 projects	Relatively high contingency to account for unknown topography, subsurface conditions, and site conditions
	Design Phase		Previous Corps 206 projects (PDOT Standard 25%)	Includes geotech, permitting, precon survey, staking, and as-builts
	Real Estate		Engineer's estimate (PDOT ROW Contingency 20%)	Investigations, notification & coordination with site landowners and adjacent landowners. No acquisition costs included at this level.
	Construction Management		Engineer's estimate (PDOT Standard 15%)	Includes construction oversight, inspections, administration, and engineering during construction
	Present Value of O&M Costs		Engineer's estimate	Present value for 50 years of inspections, maintenance, revegetation, replacement, operation, etc.
	Monitoring		Engineer's estimate	Includes development of site specific monitoring plans, annual monitoring and reporting.
	Sum of General Markups		Subtotal	Markup to construction subtotal, including site preparation markups, but not including individual general markups

Additional Assumptions:

1. Unit costs include equipment, labor, materials, contractor overhead and profit.
2. Real estate costs were developed on a preliminary basis based on assessors parcel values multiplied by the percent of the parcel(s) need for any given proejct.
3. Mitigation costs are not included as projects are generally assumed to be self-mitigating. Some additional costs may need to be added to individual projects.
4. Where applicable, unit prices are based on prior USACE or BES projects and City of Portland Transportation Engineering and Development bid tabs.
5. Costs do not account for phased construction (multiple mobilizations).
6. Markups in PDOT bid tabs are based on percentage of contract, inclusive of markups (see conversion tab).
7. Costs are in 2008 dollars. Escalation costs for anticipated period of construction are not included and would need to be added dependent on the time of construction.
8. Revegetation costs include topsoil as needed.
9. All haul-away costs for barge-based disposal assume open-water disposal without the need for additional handling by land-based equipment.
10. Earthwork costs assume no contaminated material. If contaminated materials are encountered, additional costs would be incurred for treatment.
11. Operation and maintenance costs assume a 50-year project life, with annual costs shown as an equivalent present value.

BES Treatment Plant Cost Estimate			
Line Item	Units	Cost	Notes/Assumptions
Site Preparation	LS	$ 68,741	Standard markups (see cost appendix)
Barge Excavation	CY	$ 129,222	Lay back existing 2:1 riverbank to 5:1
Excavate and Haul	CY	$ 62,785	Excavate and haul for high-water refugia and low-flow channel
Plant Riparian Vegetation	AC	$ 8,010	Remove invasives and plant native species, including soil treatment
Place Large Woody Debris	EA	$ 28,000	Place buried, non-anchored logs with attached rootballs
Place Boulders	TN	$ 1,120	Place boulders as habitat features among large woody debris clusters
General Markups	LS	$ 217,451	Standard markups (see cost appendix)
Real Estate	LS	$ 66,770	Assessor's value for parcels multiplied by percent of parcels needed for project
Total Cost		$ 582,099	Total cost of design, construction and maintenance

Kelley Point Park Cost Estimate			
Line Item	Units	Cost	Notes/Assumptions
Site Preparation	LS	$ 1,048,957	Standard markups (see cost appendix)
Construct Footbridge	SF	$ 160,000	Fabricate, deliver, and install 2 footbridges, 100' length, 8' width, including abutments and superstructure
Barge Excavation	CY	$ 2,108,800	Lay back existing 2:1 riverbank to 5:1
Excavate and Haul	CY	$ 531,109	Create channels
Erosion control fabric	SF	$ 474,480	Place erosion control fabric on exposed bank
Plant Riparian Vegetation	AC	$ 130,711	Remove invasives and plant native species, including soil treatment
Plant Upland Vegetation	AC	$ 50,302	Remove invasives and plant native species, including soil treatment
Place Boulders	TN	$ 1,120	Place boulders as habitat features among large woody debris clusters
Place Large Woody Debris	EA	$ 40,000	Place buried, non-anchored logs with attached rootballs
General Markups	LS	$ 3,318,200	Standard markups (see cost appendix)
Real Estate	LS	$ 100,000	Estimated cost for construction easement.
Total Cost		$ 7,963,679	Total cost of design, construction and maintenance

Kenton Cove Cost Estimate			
Line Item	Units	Cost	Notes/Assumptions
Site Preparation	LS	$ 3,840	Standard markups (see cost appendix)
Import Soil for Fill	CY	$ 51,105	Import and place clean sand fill for shallow water habitat
Plant Riparian Vegetation	AC	$ 38,655	Remove invasives and plant native species, including soil treatment
Place Large Woody Debris	EA	$ 12,800	Place buried, non-anchored logs with attached rootballs
General Markups	LS	$ 77,672	Standard markups (see cost appendix)
Estimated Real Estate Cost	LS	$ 47,250	Assessor's value for parcels multiplied by percent of parcels needed for project
Total Cost		$ 231,322	Total cost of design, construction and maintenance

Oaks Crossing/Sellwood Riverfront Park				
Line Item	Units	Cost		Notes/Assumptions
Site Preparation	LS	$	30,398	Standard markups (see cost appendix)
Excavate and Haul	CY	$	219,213	Create off-channel habitat area
Plant Wetland Vegetation	AC	$	40,763	Remove invasives and plant native species, including soil treatment
Plant Riparian Vegetation	AC	$	54,165	Remove invasives and plant native species, including soil treatment
Place Large Woody Debris	EA	$	6,400	Place buried, non-anchored logs with attached rootballs
General Markups	LS	$	256,186	Standard markups (see cost appendix)
Estimated Real Estate Costs	LS	$	44,090	Assessor's value for parcels multiplied by percent of parcels needed for project
Total Cost		$	651,215	Total cost of design, construction and maintenance

Tryon Highway 43 Cost Estimate			
Line Item	Units	Cost	Notes/Assumptions
Site Preparation	LS	$ 1,526,311	Standard markups (see cost appendix)
Traffic Control	LS	$ 500,000	Supplemental traffic control (beyond accomodations for construction vehicles) - full closure and detour, 90 days
Temporary Shoo-Fly	LS	$ 1,000,000	Temporary railroad bridge during construction (or phased construction)
Utilities	LS	$ 180,000	Supplemental utility work beyond standard markups, assume OH electric, gas, water, sewer, telecom
Demolition	LS	$ 40,000	Demo and haul existing culvert
Shoring	SF	$ 1,650,000	Soldier pile full length and depth for culvert
Excavation for culvert	CY	$ 273,000	38' excavation width used
Bedrock removal	CY	$ 297,600	Lower portion expected to encounter bedrock, especially under the railroad
Obstruction removal	LS	$ 100,000	Buried trestle piles and other remnants from 1929 construction
Culvert backfill	CY	$ 320,400	
Sewer trunk relocation	LS	$ 720,000	Both open cut along SW E Ave and bore/jack under HWY 43/RR for 30" trunk sewer feeding nearby treatment plant
Culvert material and installation	LS	$ 1,400,000	30' span BEBO arch system, CIP footings
Headwalls, wingwalls	LS	$ 100,000	
Road surface restoration	LS	$ 200,000	HMA over CSBC
Plant Riparian Vegetation	AC	$ 14,904	Remove invasives and plant native species, including soil treatment
Plant Upland Vegetation	AC	$ 11,799	Remove invasives and plant native species, including soil treatment
General Markups	LS	$ 6,083,829	Standard markups (see cost appendix)
Estimated Real Estate Costs	LS	$ 63,455	Assessor's value for parcels multiplied by percent of parcels needed for project
Total Cost		$ 14,481,297	Total cost of design, construction and maintenance

APPENDIX D

MCACES Cost Estimate

****** TOTAL PROJECT COST SUMMARY ******

PROJECT: **Lower Willamette Ecosystem Restoration Project** **PREPARED:** **3/9/2015-Updated w/Real Estate cost-4/17/2015**
PROJECT NO: T26638 **DISTRICT: Portland District** **POC: CHIEF, COST ENGINEERING, Eileen Horiuchi**
LOCATION: Willamette River, OR

This Estimate reflects the scope and schedule in report; Lower Willamette Ecosys. Rest. Proj. Draft Tech. Memo.

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2016									
						Effective Price Level Date: 1 OCT 15									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: **10/1/2014** ($K)	**TOTAL FIRST COST** ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*		*K*	*L*	*M*	*N*	*O*
02	RELOCATIONS	$337	$152	45.02%	$489	1.9%	$343	$155	$498	$0	$498	3.5%	$355	$160	$515
06	FISH & WILDLIFE FACILITIES	$11,066	$3,857	34.85%	$14,923	1.9%	$11,273	$3,929	$15,202	$0	$15,202	2.2%	$11,519	$4,023	$15,542
08	ROADS, RAILROADS & BRIDGES	$1,400	$715	51.05%	$2,115	1.9%	$1,426	$728	$2,154	$0	$2,154	3.5%	$1,476	$754	$2,230
14	RECREATION FACILITIES	$1,103	$271	24.53%	$1,373	1.9%	$1,123	$276	$1,399	$0	$1,399	1.4%	$1,140	$280	$1,419
	CONSTRUCTION ESTIMATE TOTALS:	$13,906	$4,994	35.91%	$18,900	1.9%	$14,166	$5,087	$19,253	$0	$19,253	2.4%	$14,490	$5,216	$19,706
01	LANDS AND DAMAGES	$5,383	$1,077	20.00%	$6,460	1.9%	$5,484	$1,097	$6,580	$0	$6,580	0.2%	$5,493	$1,099	$6,592
30	PLANNING, ENGINEERING & DESIGN	$1,743	$316	18.15%	$2,059	3.4%	$1,803	$327	$2,130	$0	$2,130	2.6%	$1,849	$336	$2,185
31	CONSTRUCTION MANAGEMENT	$1,390	$361	25.96%	$1,751	3.4%	$1,438	$373	$1,811	$0	$1,811	4.6%	$1,503	$390	$1,893
	PROJECT COST TOTALS:	$22,422	$6,747	30.09%	$29,169		$22,890	$6,884	**$29,774**	$0	**$29,774**	2.0%	$23,336	$7,040	$30,376

_____ **CHIEF, COST ENGINEERING, Eileen Horiuchi**

_____ **PROJECT MANAGER, Gail Saldana**

_____ **CHIEF, REAL ESTATE, Amanda Dethman**

_____ **CHIEF, PLANNING, Laura Hicks**

_____ **CHIEF, ENGINEERING, Lance Helwig**

_____ **CHIEF, OPERATIONS, Dwane Watsek**

_____ **CHIEF, CONSTRUCTION, Karen Garmire**

_____ **CHIEF, CONTRACTING, Ralph Banse-Fay**

_____ **CHIEF, PM-PB, Don Erickson**

_____ **CHIEF, DPM, Kevin Brice**

ESTIMATED FEDERAL COST:	**65%**	**$18,822**
ESTIMATED NON-FEDERAL COST:	**35%**	**$10,135**
ESTIMATED TOTAL PROJECT COST:		**$28,957**

RECREATIONAL FACILITIES		
ESTIMATED FEDERAL COST:	**50%**	**$710**
ESTIMATED NON-FEDERAL COST:	**50%**	**$710**
ESTIMATED TOTAL PROJECT COST:		**$1,419**

TOTAL PROJECT COST WITH RECREATIONAL FACILITIES	**$30,376**

Filename: MCASES TCPS 28_Apr_2015_approved by MCX.xlsx
TPCS

BES TREATMENT PLANT

**** CONTRACT COST SUMMARY ****

PROJECT: Lower Willamette Ecosystem Restoration Project
LOCATION: Willamette River, OR
This Estimate reflects the scope and schedule in report; Lower Willamette Ecosys. Rest. Proj. Draft Tech. Memo.

DISTRICT: Portland District
POC: CHIEF, COST ENGINEERING, Eileen Horiuchi

PREPARED: lated w/Real Estate cc

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 2/5/2015 Effective Price Level: 1-Oct-14				Program Year (Budget EC): 2016 Effective Price Level Date: 1 OCT 15								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	RISK BASED CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	BES TREATMENT PLANT													
02	RELOCATIONS	$0	$0	10.00%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$581	$183	31.48%	$763	1.9%	$591	$186	$778	2016Q3	1.0%	$597	$188	$785
08	ROADS, RAILROADS & BRIDGES		$0	0.00%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
14	RECREATION FACILITIES		$0	0.00%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$581	$183	31.48%	**$763**		$591	$186	$778			$597	$188	$785
01	LANDS AND DAMAGES	$2,300	$460	20.00%	$2,760	1.9%	$2,343	$469	$2,812	2016Q1	0.0%	$2,343	$469	$2,812
30	PLANNING, ENGINEERING & DESIGN													
1.5%	Project Management	$9	$2	18.15%	$11	3.4%	$9	$2	$11	2016Q1	0.0%	$9	$2	$11
1.5%	Planning & Environmental Compliance	$9	$2	18.15%	$11	3.4%	$9	$2	$11	2016Q1	0.0%	$9	$2	$11
4.0%	Engineering & Design	$23	$4	18.15%	$27	3.4%	$24	$4	$28	2016Q1	0.0%	$24	$4	$28
0.5%	Reviews, ATRs, IEPRs, VE	$3	$1	18.15%	$4	3.4%	$3	$1	$4	2016Q1	0.0%	$3	$1	$4
0.5%	Life Cycle Updates (cost, schedule, risks)	$3	$1	18.15%	$4	3.4%	$3	$1	$4	2016Q1	0.0%	$3	$1	$4
1.0%	Contracting & Reprographics	$6	$1	18.15%	$7	3.4%	$6	$1	$7	2016Q1	0.0%	$6	$1	$7
1.5%	Engineering During Construction	$9	$2	18.15%	$11	3.4%	$9	$2	$11	2016Q3	1.9%	$9	$2	$11
1.0%	Planning During Construction	$6	$1	18.15%	$7	3.4%	$6	$1	$7	2016Q3	1.9%	$6	$1	$7
1.0%	Project Operations	$6	$1	18.15%	$7	3.4%	$6	$1	$7	2016Q1	0.0%	$6	$1	$7
31	CONSTRUCTION MANAGEMENT													
6.0%	Construction Management	$35	$9	25.96%	$44	3.4%	$36	$9	$46	2016Q3	1.9%	$37	$10	$46
2.0%	Project Operation:	$12	$3	25.96%	$15	3.4%	$12	$3	$16	2016Q3	1.9%	$13	$3	$16
2.0%	Project Management	$12	$3	25.96%	$15	3.4%	$12	$3	$16	2016Q3	1.9%	$13	$3	$16
	CONTRACT COST TOTALS:	$3,014	$671		$3,685		$3,072	$684	$3,756			$3,079	$687	$3,766

****** TOTAL PROJECT COST SUMMARY ******

KENTON COVE

****** CONTRACT COST SUMMARY ******

PROJECT: Lower Willamette Ecosystem Restoration Project
LOCATION: Willamette River, OR
This Estimate reflects the scope and schedule in report; Lower Willamette Ecosys. Rest. Proj. Draft Tech. Memo.

DISTRICT: Portland District
POC: CHIEF, COST ENGINEERING, Eileen Horiuchi

PREPARED: lated w/Real Estate cc

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: / Effective Price Level:			3/15/2014 / 1-Oct-14	Program Year (Budget EC): / Effective Price Level Date:			2016 / 1 OCT 15					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	KENTON COVE													
02	RELOCATIONS		$0	0.00%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$366	$87	23.65%	$453	1.9%	$373	$88	$461	2016Q3	1.0%	$377	$89	$466
08	ROADS, RAILROADS & BRIDGES		$0	0.00%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
14	RECREATION FACILITIES		$0	0.00%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
							$0							
	CONSTRUCTION ESTIMATE TOTALS:	$366	$87	23.65%	**$453**		$373	$88	$461			$377	$89	$466
01	LANDS AND DAMAGES	$131	$26	20.00%	$157	1.9%	$133	$27	$160	2016Q1	0.0%	$133	$27	$160
30	PLANNING, ENGINEERING & DESIGN													
1.5%	Project Management	$5	$1	18.15%	$6	3.4%	$5	$1	$6	2016Q1	0.0%	$5	$1	$6
1.5%	Planning & Environmental Compliance	$5	$1	18.15%	$6	3.4%	$5	$1	$6	2016Q1	0.0%	$5	$1	$6
4.0%	Engineering & Design	$15	$3	18.15%	$18	3.4%	$16	$3	$18	2016Q1	0.0%	$16	$3	$18
0.5%	Reviews, ATRs, IEPRs, VE	$2	$0	18.15%	$2	3.4%	$2	$0	$2	2016Q1	0.0%	$2	$0	$2
0.5%	Life Cycle Updates (cost, schedule, risks)	$2	$0	18.15%	$2	3.4%	$2	$0	$2	2016Q1	0.0%	$2	$0	$2
1.0%	Contracting & Reprographics	$4	$1	18.15%	$5	3.4%	$4	$1	$5	2016Q1	0.0%	$4	$1	$5
1.5%	Engineering During Construction	$5	$1	18.15%	$6	3.4%	$5	$1	$6	2016Q3	1.9%	$5	$1	$6
1.0%	Planning During Construction	$4	$1	18.15%	$5	3.4%	$4	$1	$5	2016Q3	1.9%	$4	$1	$5
1.0%	Project Operations	$4	$1	18.15%	$5	3.4%	$4	$1	$5	2016Q1	0.0%	$4	$1	$5
31	CONSTRUCTION MANAGEMENT													
6.0%	Construction Management	$22	$6	25.96%	$28	3.4%	$23	$6	$29	2016Q3	1.9%	$23	$6	$29
2.0%	Project Operation:	$7	$2	25.96%	$9	3.4%	$7	$2	$9	2016Q3	1.9%	$7	$2	$9
2.0%	Project Management	$7	$2	25.96%	$9	3.4%	$7	$2	$9	2016Q3	1.9%	$7	$2	$9
	CONTRACT COST TOTALS:	$579	$131		$710		$591	$133	$725			$596	$134	$730

KELLEY POINT PARK

**** CONTRACT COST SUMMARY ****

PROJECT: Lower Willamette Ecosystem Restoration Project
LOCATION: Willamette River, OR
This Estimate reflects the scope and schedule in report; Lower Willamette Ecosys. Rest. Proj. Draft Tech. Memo.

DISTRICT: Portland District
POC: CHIEF, COST ENGINEERING, Eileen Horiuchi

PREPARED: lated w/Real Estate cc

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: / Effective Price Level:			3/15/2014 1-Oct-14	Program Year (Budget EC): / Effective Price Level Date:			2016 1 OCT 15					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	KELLEY POINT PARK													
02	RELOCATIONS		$0	0.00%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$5,428	$1,632	30.06%	$7,060	1.9%	$5,530	$1,662	$7,192	2016Q4	1.4%	$5,609	$1,686	$7,295
08	ROADS, RAILROADS & BRIDGES		$0	0.00%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
14	RECREATION FACILITIES	$1,103	$271	24.53%	$1,373	1.9%	$1,123	$276	$1,399	2016Q4	1.4%	$1,140	$280	$1,419
							$0							
	CONSTRUCTION ESTIMATE TOTALS:	$6,531	$1,902	29.13%	**$8,434**		$6,653	$1,938	$8,591			$6,749	$1,966	$8,714
01	LANDS AND DAMAGES	$2,118	$424	20.00%	$2,542	1.9%	$2,158	$432	$2,589	2016Q1	0.0%	$2,158	$432	$2,589
30	PLANNING, ENGINEERING & DESIGN													
1.5%	Project Management	$98	$18	18.15%	$116	3.4%	$101	$18	$120	2016Q1	0.0%	$101	$18	$120
1.5%	Planning & Environmental Compliance	$98	$18	18.15%	$116	3.4%	$101	$18	$120	2016Q1	0.0%	$101	$18	$120
4.0%	Engineering & Design	$261	$47	18.15%	$308	3.4%	$270	$49	$319	2016Q1	0.0%	$270	$49	$319
0.5%	Reviews, ATRs, IEPRs, VE	$33	$6	18.15%	$39	3.4%	$34	$6	$40	2016Q1	0.0%	$34	$6	$40
0.5%	Life Cycle Updates (cost, schedule, risks)	$33	$6	18.15%	$39	3.4%	$34	$6	$40	2016Q1	0.0%	$34	$6	$40
1.0%	Contracting & Reprographics	$65	$12	18.15%	$77	3.4%	$67	$12	$79	2016Q1	0.0%	$67	$12	$79
1.5%	Engineering During Construction	$98	$18	18.15%	$116	3.4%	$101	$18	$120	2016Q4	2.9%	$104	$19	$123
1.0%	Planning During Construction	$65	$12	18.15%	$77	3.4%	$67	$12	$79	2016Q4	2.9%	$69	$13	$82
1.0%	Project Operations	$65	$12	18.15%	$77	3.4%	$67	$12	$79	2016Q1	0.0%	$67	$12	$79
31	CONSTRUCTION MANAGEMENT													
6.0%	Construction Management	$392	$102	25.96%	$494	3.4%	$405	$105	$511	2016Q4	2.9%	$417	$108	$526
2.0%	Project Operation:	$131	$34	25.96%	$165	3.4%	$135	$35	$171	2016Q4	2.9%	$139	$36	$176
2.0%	Project Management	$131	$34	25.96%	$165	3.4%	$135	$35	$171	2016Q4	2.9%	$139	$36	$176
	CONTRACT COST TOTALS:	$10,119	$2,644		**$12,763**		$10,331	$2,698	$13,030			$10,451	$2,732	**$13,183**

****** TOTAL PROJECT COST SUMMARY ******

OAKS CROSSING/SELLWOOD RIVERFRONT PARK

****** CONTRACT COST SUMMARY ******

PROJECT: Lower Willamette Ecosystem Restoration Project
LOCATION: Willamette River, OR
This Estimate reflects the scope and schedule in report; Lower Willamette Ecosys. Rest. Proj. Draft Tech. Memo.

DISTRICT: Portland District
POC: CHIEF, COST ENGINEERING, Eileen Horiuchi

PREPARED: lated w/Real Estate cc

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			3/15/2014	Program Year (Budget EC):			2016					
		Effective Price Level:			1-Oct-14	Effective Price Level Date:			1 OCT 15	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	OAKS CROSSING/SELLWOOD RIVERFRONT PARK													
02	RELOCATIONS		$0	0.00%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$455	$108	23.65%	$563	1.9%	$464	$110	$574	2016Q4	1.4%	$471	$111	$582
08	ROADS, RAILROADS & BRIDGES		$0	0.00%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
14	RECREATION FACILITIES		$0	0.00%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
							$0							
	CONSTRUCTION ESTIMATE TOTALS:	$455	$108	23.65%	**$563**		$464	$110	$574			$471	$111	$582
01	LANDS AND DAMAGES	$458	$92	20.00%	$550	1.9%	$467	$93	$560	2016Q1	0.0%	$467	$93	$560
30	PLANNING, ENGINEERING & DESIGN													
1.5%	Project Management	$7	$1	18.15%	$8	3.4%	$7	$1	$9	2016Q1	0.0%	$7	$1	$9
1.5%	Planning & Environmental Compliance	$7	$1	18.15%	$8	3.4%	$7	$1	$9	2016Q1	0.0%	$7	$1	$9
4.0%	Engineering & Design	$18	$3	18.15%	$21	3.4%	$19	$3	$22	2016Q1	0.0%	$19	$3	$22
0.5%	Reviews, ATRs, IEPRs, VE	$2	$0	18.15%	$2	3.4%	$2	$0	$2	2016Q1	0.0%	$2	$0	$2
0.5%	Life Cycle Updates (cost, schedule, risks)	$2	$0	18.15%	$2	3.4%	$2	$0	$2	2016Q1	0.0%	$2	$0	$2
1.0%	Contracting & Reprographics	$5	$1	18.15%	$6	3.4%	$5	$1	$6	2016Q1	0.0%	$5	$1	$6
1.5%	Engineering During Construction	$7	$1	18.15%	$8	3.4%	$7	$1	$9	2016Q4	2.9%	$7	$1	$9
1.0%	Planning During Construction	$5	$1	18.15%	$6	3.4%	$5	$1	$6	2016Q4	2.9%	$5	$1	$6
1.0%	Project Operations	$5	$1	18.15%	$6	3.4%	$5	$1	$6	2016Q1	0.0%	$5	$1	$6
31	CONSTRUCTION MANAGEMENT													
6.0%	Construction Management	$27	$7	25.96%	$34	3.4%	$28	$7	$35	2016Q4	2.9%	$29	$7	$36
2.0%	Project Operation:	$9	$2	25.96%	$11	3.4%	$9	$2	$12	2016Q4	2.9%	$10	$2	$12
2.0%	Project Management	$9	$2	25.96%	$11	3.4%	$9	$2	$12	2016Q4	2.9%	$10	$2	$12
	CONTRACT COST TOTALS:	$1,016	$222		**$1,238**		$1,037	$226	$1,263			$1,045	$228	**$1,273**

****** TOTAL PROJECT COST SUMMARY ******

TRYON HIGHWAY 43 CULVERT

****** CONTRACT COST SUMMARY ******

PROJECT: Lower Willamette Ecosystem Restoration Project
LOCATION: Willamette River, OR
This Estimate reflects the scope and schedule in report; Lower Willamette Ecosys. Rest. Proj. Draft Tech. Memo.

DISTRICT: Portland District
POC: CHIEF, COST ENGINEERING, Eileen Horiuchi
PREPARED: lated w/Real Estate cc

Civil Works Work Breakdown Structure			ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
			Estimate Prepared:			3/15/2014	Program Year (Budget EC):			2016					
			Effective Price Level:			1-Oct-14	Effective Price Level Date:			1 OCT 15	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER		Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A		*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
		TRYON HIGHWAY 43 CULVERT													
02		RELOCATIONS	$337	$152	45.02%	$489	1.9%	$343	$155	$498	2017Q4	3.5%	$355	$160	$515
06		FISH & WILDLIFE FACILITIES	$4,235	$1,848	43.63%	$6,083	1.9%	$4,315	$1,882	$6,197	2017Q4	3.5%	$4,466	$1,948	$6,414
08		ROADS, RAILROADS & BRIDGES	$1,400	$715	51.05%	$2,115	1.9%	$1,426	$728	$2,154	2017Q4	3.5%	$1,476	$754	$2,230
14		RECREATION FACILITIES		$0	0.00%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
								$0							
		CONSTRUCTION ESTIMATE TOTALS:	$5,972	$2,714	45.45%	**$8,687**		$6,084	$2,765	$8,849			$6,297	$2,862	$9,159
01		LANDS AND DAMAGES	$376	$75	20.00%	$451	1.9%	$383	$77	$460	2017Q2	2.5%	$393	$79	$471
30		PLANNING, ENGINEERING & DESIGN													
	1.5%	Project Management	$90	$16	18.15%	$106	3.4%	$93	$17	$110	2017Q2	4.9%	$98	$18	$115
	1.5%	Planning & Environmental Compliance	$90	$16	18.15%	$106	3.4%	$93	$17	$110	2017Q2	4.9%	$98	$18	$115
	4.0%	Engineering & Design	$239	$43	18.15%	$282	3.4%	$247	$45	$292	2017Q2	4.9%	$259	$47	$306
	0.5%	Reviews, ATRs, IEPRs, VE	$30	$5	18.15%	$35	3.4%	$31	$6	$37	2017Q2	4.9%	$33	$6	$38
	0.5%	Life Cycle Updates (cost, schedule, risks)	$30	$5	18.15%	$35	3.4%	$31	$6	$37	2017Q2	4.9%	$33	$6	$38
	1.0%	Contracting & Reprographics	$60	$11	18.15%	$71	3.4%	$62	$11	$73	2017Q2	4.9%	$65	$12	$77
	1.5%	Engineering During Construction	$90	$16	18.15%	$106	3.4%	$93	$17	$110	2017Q4	6.9%	$100	$18	$118
	1.0%	Planning During Construction	$60	$11	18.15%	$71	3.4%	$62	$11	$73	2017Q4	6.9%	$66	$12	$78
	1.0%	Project Operations	$60	$11	18.15%	$71	3.4%	$62	$11	$73	2017Q2	4.9%	$65	$12	$77
31		CONSTRUCTION MANAGEMENT													
	6.0%	Construction Management	$358	$93	25.96%	$451	3.4%	$370	$96	$466	2017Q4	6.9%	$396	$103	$499
	2.0%	Project Operation:	$119	$31	25.96%	$150	3.4%	$123	$32	$155	2017Q4	6.9%	$132	$34	$166
	2.0%	Project Management	$119	$31	25.96%	$150	3.4%	$123	$32	$155	2017Q4	6.9%	$132	$34	$166
		CONTRACT COST TOTALS:	$7,693	$3,080		**$10,774**		$7,858	$3,142	$11,000			$8,164	$3,259	**$11,424**

TABLE OF CONTENTS

MCACES Project Cost Summary ……...…….....…….…..…….……ii

Cost Estimate Narrative…….1

APPENDICES

A Site Plan
B Project Quantity Take-Offs
C Construction Schedule
D Local Market Labor Rates
E Productivity Index and Notes and Estimated Production Rates
F Phone Logs and Emails
G Abbreviated Risk Analysis
H MCACES Construction Cost Estimate Summary Report

****** TOTAL PROJECT COST SUMMARY ******

PROJECT: **Lower Willamette Ecosystem Restoration Project** **PREPARED:** **3/9/2015-Updated w/Real Estate cost-4/17/2015**
PROJECT NO: T26638 **DISTRICT: Portland District** **POC: CHIEF, COST ENGINEERING, Eileen Horiuchi**
LOCATION: Willamette River, OR

This Estimate reflects the scope and schedule in report; Lower Willamette Ecosys. Rest. Proj. Draft Tech. Memo.

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2016									
						Effective Price Level Date: 1 OCT 15									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: **10/1/2014** ($K)	**TOTAL FIRST COST** ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*		*K*	*L*	*M*	*N*	*O*
02	RELOCATIONS	$337	$152	45.02%	$489	1.9%	$343	$155	$498	$0	$498	3.5%	$355	$160	$515
06	FISH & WILDLIFE FACILITIES	$11,066	$3,857	34.85%	$14,923	1.9%	$11,273	$3,929	$15,202	$0	$15,202	2.2%	$11,519	$4,023	$15,542
08	ROADS, RAILROADS & BRIDGES	$1,400	$715	51.05%	$2,115	1.9%	$1,426	$728	$2,154	$0	$2,154	3.5%	$1,476	$754	$2,230
14	RECREATION FACILITIES	$1,103	$271	24.53%	$1,373	1.9%	$1,123	$276	$1,399	$0	$1,399	1.4%	$1,140	$280	$1,419
	CONSTRUCTION ESTIMATE TOTALS:	$13,906	$4,994	35.91%	$18,900	1.9%	$14,166	$5,087	$19,253	$0	$19,253	2.4%	$14,490	$5,216	$19,706
01	LANDS AND DAMAGES	$5,383	$1,077	20.00%	$6,460	1.9%	$5,484	$1,097	$6,580	$0	$6,580	0.2%	$5,493	$1,099	$6,592
30	PLANNING, ENGINEERING & DESIGN	$1,743	$316	18.15%	$2,059	3.4%	$1,803	$327	$2,130	$0	$2,130	2.6%	$1,849	$336	$2,185
31	CONSTRUCTION MANAGEMENT	$1,390	$361	25.96%	$1,751	3.4%	$1,438	$373	$1,811	$0	$1,811	4.6%	$1,503	$390	$1,893
	PROJECT COST TOTALS:	$22,422	$6,747	30.09%	$29,169		$22,890	$6,884	**$29,774**	$0	**$29,774**	2.0%	$23,336	$7,040	$30,376

_____ **CHIEF, COST ENGINEERING, Eileen Horiuchi**

_____ **PROJECT MANAGER, Gail Saldana**

_____ **CHIEF, REAL ESTATE, Amanda Dethl**

_____ **CHIEF, PLANNING, Laura Hicks**

_____ **CHIEF, ENGINEERING, Lance Helwig**

_____ **CHIEF, OPERATIONS, Dwane Watsek**

_____ **CHIEF, CONSTRUCTION, Karen Garmire**

_____ **CHIEF, CONTRACTING, Ralph Banse-Fay**

_____ **CHIEF, PM-PB, Don Erickson**

_____ **CHIEF, DPM, Kevin Brice**

ESTIMATED FEDERAL COST:	**65%**	**$18,822**
ESTIMATED NON-FEDERAL COST:	**35%**	**$10,135**
ESTIMATED TOTAL PROJECT COST:		**$28,957**

RECREATIONAL FACILITIES		
ESTIMATED FEDERAL COST:	**50%**	**$710**
ESTIMATED NON-FEDERAL COST:	**50%**	**$710**
ESTIMATED TOTAL PROJECT COST:		**$1,419**

TOTAL PROJECT COST WITH RECREATIONAL FACILITIES	**$30,376**

Filename: MCASES TCPS 28_Apr_2015_approved by MCX.xlsx
TPCS

LOWER WILLAMETTE RIVER
ECOSYSTEM RESTORATION PROJECT

COST ESTIMATE NARRATIVE

1. Project Description

A. General: This work is in support of the design of the five ecosystem restoration sites located along the Lower Willamette River, Columbia Slough, and Tryon Creek in Multnomah County, Oregon. The design of the five ecosystem restoration sites has been developed to a 35% design level.

B. Purpose: The purpose of this work is to develop a detailed cost estimate – consistent to the level of design – for the cost and quantities of the structural features using Micro-Computer Aided Cost Estimating System (MCACES).

C. Design Features: Features for each of the projects includes:

- Kelley Point Park
  - Restoration measures at these sites include developing side channels or backwater areas, reducing bank steepness, and revegetating with native species and three pedestrian bridges.
- City of Portland Bureau of Environmental Services (BES) Treatment Plant
  - Restoration measures at these sites involve reshaping and restoring banks and/or side slough areas, adding large woody debris (LWD), and revegetating with native species
- Kenton Cove
  - Restoration measures at these sites involve reshaping and restoring banks and/or side slough areas, adding LWD, and revegetating with native species
- Oaks Crossing/Sellwood Riverfront Park
  - Restoration measures at these sites include developing side channels or backwater areas, reducing bank steepness, and revegetating with native species
- Tryon Creek Highway 43 Culvert Replacement
  - Removal of the existing 8 foot by 8 foot box culvert and replacement with an open bottom arch culvert with a span of 30 feet, and creation of a natural stream channel that provides fish passage

2. Basis of Estimate

A. Basis of Design: The project's design documents are listed below. The project site plan is presented in Appendix A. Quantities were developed based off schematics of the proposed construction components.

- Lower Willamette River Ecosystem Restoration Project, Appendix I – Draft 35% Design Report, March 2015

- Lower Willamette River Ecosystem Restoration Project, 35% Design Drawings, June 2011

B. Basis of Quantities: The cost estimate is based on project quantity take-offs that have been calculated from the documents listed above. A quantity summary along with detailed quantity take-offs are presented in Appendix B. The quantities include waste/loss factors for the project materials as listed below:

Geotextile Waste	5%
Stone Waste	15%.
Concrete Waste	10%
Spoils Swell	15%

3. Project Schedule

The project schedule provides the estimated construction durations for each project site. The schedule can be found in Appendix C. The estimated durations have been used in the estimate to determine costs for the contractors to maintain field facilities and construction supervision. The overall schedule is based on the following reasoning and assumptions:

- Typical construction, crew (1 shift) working 8-hr/day and 5-days per week.
- Schedule is based on the assumption that all necessary materials have been ordered and are delivered to the project site as required to be placed during timeframes shown.

4. Acquisition Plan

The cost estimate is based on individual contracts being awarded to a prime contractor for each site. Each prime contractor is assumed to work with subcontractors for pile driving, concrete items, landscaping, railroad, pre-casting, and asphalt work. The prime contractor would be responsible for the preparatory work, and placing all associated site work as well as overseeing the subcontractors' work on all necessary construction activities. The bidding market is expected to be competitive, and is assumed to be awarded by Lowest Price Technically Acceptable Best Value process.

5. Project Construction

A. Mobilization/Demobilization: Mobilization costs are based on transporting the land-based equipment and personnel to the project site, as well as preparing site as necessary for construction. All labor and equipment is assumed to be available in the greater Portland area.

B. Staging and Site Access: The staging and access areas for each site are designated in the design plans. The cost estimate includes quantities and costs for developing these areas. The estimate assumes that both the staging area and the access areas would be graded and would have gravel material placed over the entire area. This layer would also require removal at completion of construction.

C. Borrow/Disposal Areas and Materials: Material sources for rock, gravel, wood, and fill material are assumed to originate within a 10-mile radius of the project sites. Disposal sites for clean soils and demolished concrete, asphalt, and other structural materials are also assumed to be within a 10-mile radius of the project site.

- Remove Staging Area and Access Routes as Appropriate
- Install Plants

2) Culvert replacement at Highway 43 on Tryon Creek

The following *additional* construction methodology details the steps for construction completion at Highway 43 on Tryon Creek site:

- Temporary highway and railroad traffic control and re-route as needed for the duration of project,
- Temporary water management for bypass of flow around work area,
- Placement arch span culvert, streambed material, and streambed grade control features,
- Abandon existing 8 foot by 8 foot box culvert in place or dispose offsite,
- Potential relocation of sewer trunk line and other utilities,
- Placement of fill, and
- Resurfacing of highway and reconstruction of railroad.

E. Unusual Conditions: (Soil, Water, Weather, Traffic). Possible high water levels, flooding, strong currents, barge mounted equipment use, constricted work areas due to existing roadways/railroads.

F. Unique Construction Techniques: In-river work with specialty equipment to for excavating banks.

G. Equipment/Labor Availability and Distance Traveled: All equipment and labor is assumed to be available in the Portland area.

6. Effective Dates for Labor, Equipment and Material Pricing

The labor, equipment, and material pricing were developed using the MCACES 2012 English Unit Cost Library, 2015 Multnomah County Labor Library, and the 2011 Equipment Library (Region VIII) for the base cost estimates. The index pricing data has been prepared in February 2015 dollars.

The cost estimate has been updated with current quoted fuel prices of $2.54/gal for off-road diesel, $3.09/gal for on-road diesel and $2.49/gal for gasoline in the Portland area.

7. Estimated Production Rates

The construction of this project would require many types of specialty crews and equipment due to the unique construction techniques required for in-river work. See Appendix E for the Estimated Production Rates for these specialty crews.

The disposal site for contaminated soils is assumed to be the Waste Management Hillsboro Landfill in Hillsboro, Oregon. The procedure for culvert construction assumes culvert fabrication and delivery; installation; construction of footings, headwalls and wingwalls; placement of bed materials; and restoration of the adjacent streambed and banks. Vegetative restoration assumes invasive plant removal by spraying and mowing, and planting materials from locally sourced nurseries.

D. Construction Methodology:

The construction items for this project would be accomplished with land and barge based equipment. There are two separate sequences considered in this section, the fish passage and an additional sequence for the culvert replacement at Highway 43 on Tryon Creek.

1) All Project Sites

The following construction methodology details the steps for construction completion at each of the sites:

- Contractor Mobilize to Site
- Contractor Install Erosion Control Best Management Practices (BMPs) and Create Staging Work Area
- Improve Access, Only as Necessary
- Begin Clearing and Grubbing
- Remove Invasive Species (can go on while other actions are occurring)
- Isolate In-Water Work Areas and Remove Fish
- Conduct Onsite Grading
- Remove Debris/Concrete/Riprap
- Excavate Connector Channels Outside of In-Water Work Areas, including Side Channel and Backwater Areas
- Isolate In-Water Wood and Boulder Work Areas and Remove Fish
- Construct Wood and Boulder Structures
- Remove In-Water Isolation Measures When Work is Complete (Grading or Wood/Boulders)
- Isolate In-Water Work Area for River Channel Connections and Remove Fish
- Excavate Final In-Water Channel Connections, including Side Channel, Backwater Areas, and Confluence/Mouth Areas
- Remove Final Water Isolation Measures
- Grade Site for Plantings

8. Direct and Contractor Markups

A. Direct Markups: The cost estimate does not contain any direct mark-ups as there is no sales tax in the state of Oregon, and no overtime is currently assumed to be required for construction.

B. Contractor Markups: The prime contractor Job Office Overhead (JOOH) markup is calculated within MCACES which accounts for project supervision; The estimated prime contractor Home Office Overhead (HOOH) markup of 8% is a running percentage for all prime contractors; The calculated prime contractor profit has been completed for each prime contractor, and is based on ER 1110-2-1302 Profit Weighted Guideline; The estimated prime contractor insurance markup of 2% is a direct percent to account for overwater work and associated higher equipment insurance premiums.

9. Project Markups

A. Escalation: Price levels have been escalated from effective price levels of the construction cost estimate for February (2015Q2) to the mid-point of construction for each project site. The total construction mid-point is estimated to be 2017Q3. The cost factors for each feature account have been calculated within the Total Project Cost Summary.

B. Contingency: Contingencies represent allowances to cover unknowns, uncertainties and/or unanticipated conditions that are not possible to adequately evaluate from the data on hand at the time the cost estimate is prepared but must be represented by a sufficient cost to cover the identified risks. Contingencies have been calculated for each project site, by utilizing the Abbreviated Risk Analysis spreadsheet which can be found in Appendix G.

10. Functional Costs

A. 01 Account – Lands and Damages: The costs and contingencies for this account have been taken from the Lower Willamette River Ecosystem Restoration Feasibility Study Real Estate Plan, dated January 2015.

B. 02 Account – Relocations: The Relocations costs shown in the TPCS account for the costs to relocate an existing sewer line at the Tryon Highway 43 Culvert project site.

C. 06 Account – Fish and Wildlife Facilities: The majority of the construction, other than the items in the 02 and 08 Accounts, is included under this feature account.

D. 08 Account – Roads, Railroads, and Bridges - Relocations: The construction activities for this account are the railroad temporary shoo-fly, and reconstruction required at the Tryon Highway 43 Culvert project site.

E. 14 Account – Recreation: The construction activities for this account are the construction of three pedestrian foot bridges located at Kelley Point Park.

F. 30 Account – Planning, Engineering, and Design: Costs for this account were estimated at 12.5% of the construction costs. This account covers the preparation of plans and specifications that have already been advanced beyond the feasibility level by the City.

G. 31 Account – Construction Management: Costs for this account were estimated to be 10.0% of the construction costs. This account covers construction management during construction.

11. Total Project Cost Summary (TPCS)

The TPCS was prepared using the latest TPCS excel spreadsheet provided by the USACE, Walla Walla District. The TPCS incorporates the construction costs developed in the MII, the project markups, and the functional costs. The cost sharing shown on this spreadsheet is based on the typical cost sharing percentages which are as follows:

- [01] Lands and Damages: 100% Non-Federal** (LERRD)
- [02] Relocations: 100% Non-Federal** (LERRD)
- [06] Fish and Wildlife Facilities: 65% Federal / 35% Non-Federal
- [08] Roads, Railroads & Bridges: 100% Non-Federal** (LERRD)
- [14] Recreation: 50% Federal / 50% Non-Federal
- [30] PED and [31] CM: 65% Federal / 35% Non-Federal

**Counts toward 35% of Non-Federal Costs

12. MCACES Construction Cost Estimate

The construction cost estimate was developed using MCACES 2nd Generation (MII) cost estimating software in accordance with guidance contained in ER 1110-2-1302, Civil Works Cost Engineering. While the MCACES construction cost estimate includes Contingencies as mentioned above, it is not a Total Project Cost estimate as it does not include any Escalation or Functional Costs such as Lands and Damage, Feasibility Studies, Planning Engineering and Design or Construction Management. See Appendix H for the MCACES construction cost estimate output report.

G. 31 Account – Construction Management: Costs for this account were estimated to be 10.0% of the construction costs. This account covers construction management during construction.

11. Total Project Cost Summary (TPCS)

The TPCS was prepared using the latest TPCS excel spreadsheet provided by the USACE, Walla Walla District. The TPCS incorporates the construction costs developed in the MII, the project markups, and the functional costs. The cost sharing shown on this spreadsheet is based on the typical cost sharing percentages which are as follows:

- [01] Lands and Damages: 100% Non-Federal**
- [02] Relocations: 100% Non-Federal**
- [06] Fish and Wildlife Facilities: 65% Federal / 35% Non-Federal
- [08] Roads, Railroads & Bridges: 100% Non-Federal**
- [14] Recreation: 50% Federal / 50% Non-Federal
- [30] PED and [31] CM: 65% Federal / 35% Non-Federal

**Counts toward 35% of Non-Federal Costs

12. MCACES Construction Cost Estimate

The construction cost estimate was developed using MCACES 2nd Generation (MII) cost estimating software in accordance with guidance contained in ER 1110-2-1302, Civil Works Cost Engineering. While the MCACES construction cost estimate includes Contingencies as mentioned above, it is not a Total Project Cost estimate as it does not include any Escalation or Functional Costs such as Lands and Damage, Feasibility Studies, Planning Engineering and Design or Construction Management. See Appendix H for the MCACES construction cost estimate output report.

11. References

U.S. Army Corps of Engineers, 1993, *Engineering and Design Cost Engineering Policy and General Requirements, Engineering Regulation 1110-1-1300,* Department of the Army, Washington D.C., 26 March 1993.

U.S. Army Corps of Engineers, 1999, *Engineering and Design For Civil Works Projects, Engineering Regulation 1110-2-1150,* Department of the Army, Washington D.C., 31 August 1999.

U.S. Army Corps of Engineers, 2008a, *Civil Works Cost Engineering, Engineering Regulation 1110-2-1302,* Department of the Army, Washington D.C., 15 September 2008.

U.S. Army Corps of Engineers, 2008b, *Construction Cost Estimating Guide For Civil Works, Engineering Technical Letter 1110-2-573,* Department of the Army, Washington D.C., 30 September 2008.

U.S. Army Corps of Engineers, 2009, *Civil Works Construction Cost Index System, Engineering Manual 1110-2-1304,* Department of the Army, Washington D.C., 31 March 2009.

APPENDIX A

Site Plan


KELLEY PT PARK
BES TREATMENT PLANT BANKS
COLUMBIA RIVER
KENTON COVE
COLUMBIA SLOUGH
WILLAMETTE RIVER
OAKS CROSSING/SELLWOOD
HWY 43 CULVERT REPLACEMENT

APPENDIX B

Project Quantity Take-Offs

Quantities taken out of this report during reviews - Available upon request

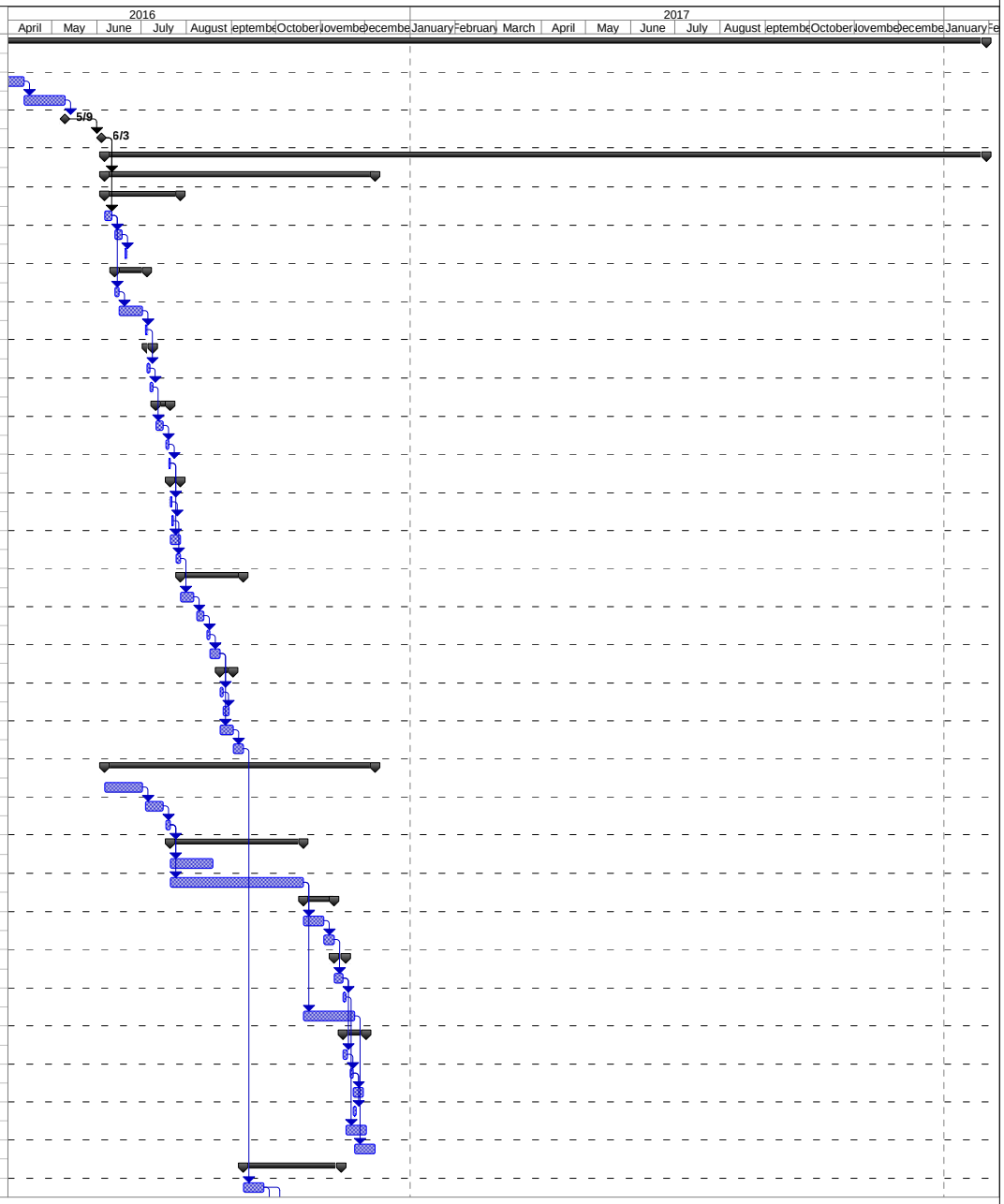
APPENDIX C

Construction Schedule

Lower Willamette River Ecosystem Restoration
Tentative Project Schedule

Fri 2/20/15

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Lower Willamette Ecosystem Restoration Project**	**768 days**	**Thu 2/19/15**	**Mon 1/29/18**	
2	Feasibility Phase	145 days	Thu 2/19/15	Wed 9/9/15	
3	Final Design	153 days	Thu 9/10/15	Mon 4/11/16	2
4	Bidding Phase	20 days	Tue 4/12/16	Mon 5/9/16	3
5	Award	0 days	Mon 5/9/16	Mon 5/9/16	4
6	Notice to Proceed	0 days	Fri 6/3/16	Fri 6/3/16	5FS+19 days
7	**Construction**	**431 days**	**Mon 6/6/16**	**Mon 1/29/18**	
8	**Phase 1**	**133 days**	**Mon 6/6/16**	**Wed 12/7/16**	6
9	**BES TREATMENT PLANT**	**38 days**	**Mon 6/6/16**	**Wed 7/27/16**	
10	Mobilization	5 days	Mon 6/6/16	Fri 6/10/16	6
11	Site Preparation	5 days	Mon 6/13/16	Fri 6/17/16	10
12	Invasive Species Removal	1 day	Mon 6/20/16	Mon 6/20/16	11
13	**Regrade Banks**	**16 days**	**Mon 6/13/16**	**Mon 7/4/16**	
14	Barge Excavation	3 days	Mon 6/13/16	Wed 6/15/16	10
15	Channel Bank Excavation	12 days	Thu 6/16/16	Fri 7/1/16	14
16	Grading	1 day	Mon 7/4/16	Mon 7/4/16	15
17	**High Water Refugia**	**4 days**	**Tue 7/5/16**	**Fri 7/8/16**	
18	Channel Bank Excavation	2 days	Tue 7/5/16	Wed 7/6/16	16
19	Filling and Grading	2 days	Thu 7/7/16	Fri 7/8/16	18
20	**Low Flow Channel Excavation**	**8 days**	**Mon 7/11/16**	**Wed 7/20/16**	
21	Low Flow Excavation	5 days	Mon 7/11/16	Fri 7/15/16	19
22	Demo Existing Culvert	2 days	Mon 7/18/16	Tue 7/19/16	21
23	Filling and Grading	1 day	Wed 7/20/16	Wed 7/20/16	22
24	**Landscape**	**5 days**	**Thu 7/21/16**	**Wed 7/27/16**	
25	Riparian Shrubs	1 day	Thu 7/21/16	Thu 7/21/16	23
26	Cuttings	1 day	Fri 7/22/16	Fri 7/22/16	25
27	Large Woody Debris	5 days	Thu 7/21/16	Wed 7/27/16	23
28	Demobilization	3 days	Mon 7/25/16	Wed 7/27/16	26
29	**KENTON COVE**	**31 days**	**Thu 7/28/16**	**Thu 9/8/16**	
30	Mobilization	7 days	Thu 7/28/16	Fri 8/5/16	28
31	Site Preparation	5 days	Mon 8/8/16	Fri 8/12/16	30
32	Invasive Species Removal	2 days	Mon 8/15/16	Tue 8/16/16	31
33	Sand Placement	5 days	Wed 8/17/16	Tue 8/23/16	32
34	**Landscape**	**7 days**	**Wed 8/24/16**	**Thu 9/1/16**	
35	Riparian Shrubs	2 days	Wed 8/24/16	Thu 8/25/16	33
36	Cuttings	2 days	Fri 8/26/16	Mon 8/29/16	35
37	Large Woody Debris	7 days	Wed 8/24/16	Thu 9/1/16	33
38	Demobilization	5 days	Fri 9/2/16	Thu 9/8/16	37
39	**KELLEY POINT PARK**	**133 days**	**Mon 6/6/16**	**Wed 12/7/16**	
40	Mobilization	20 days	Mon 6/6/16	Fri 7/1/16	
41	Site Preparation	10 days	Mon 7/4/16	Fri 7/15/16	40
42	Invasive Species Removal	3 days	Mon 7/18/16	Wed 7/20/16	41
43	**Regrade Banks**	**65 days**	**Thu 7/21/16**	**Wed 10/19/16**	**42**
44	Barge Excavation	21 days	Thu 7/21/16	Thu 8/18/16	42
45	Channel Bank Excavation	65 days	Thu 7/21/16	Wed 10/19/16	42
46	**Main Channel**	**15 days**	**Thu 10/20/16**	**Wed 11/9/16**	
47	Low Flow Channel Excavation	10 days	Thu 10/20/16	Wed 11/2/16	45
48	Filling and Grading	5 days	Thu 11/3/16	Wed 11/9/16	47
49	**Low Flow Channel Excavation**	**6 days**	**Thu 11/10/16**	**Thu 11/17/16**	
50	Low Flow Excavation	4 days	Thu 11/10/16	Tue 11/15/16	48
51	Filling and Grading	2 days	Wed 11/16/16	Thu 11/17/16	50
52	Footbridges	25 days	Thu 10/20/16	Wed 11/23/16	45
53	**Landscape**	**12 days**	**Wed 11/16/16**	**Thu 12/1/16**	
54	Riparian Shrubs	3 days	Wed 11/16/16	Fri 11/18/16	50
55	Cuttings	2 days	Mon 11/21/16	Tue 11/22/16	54
56	Upland Shrubs	5 days	Wed 11/23/16	Tue 11/29/16	55
57	Upland Trees	2 days	Wed 11/23/16	Thu 11/24/16	55
58	Large Woody Debris	10 days	Fri 11/18/16	Thu 12/1/16	51
59	Demobilization	10 days	Thu 11/24/16	Wed 12/7/16	52
60	**OAKS CROSSING/SELLWOOD RIVERFRONT PARK**	**47 days**	**Fri 9/9/16**	**Mon 11/14/16**	
61	Mobilization	10 days	Fri 9/9/16	Thu 9/22/16	38

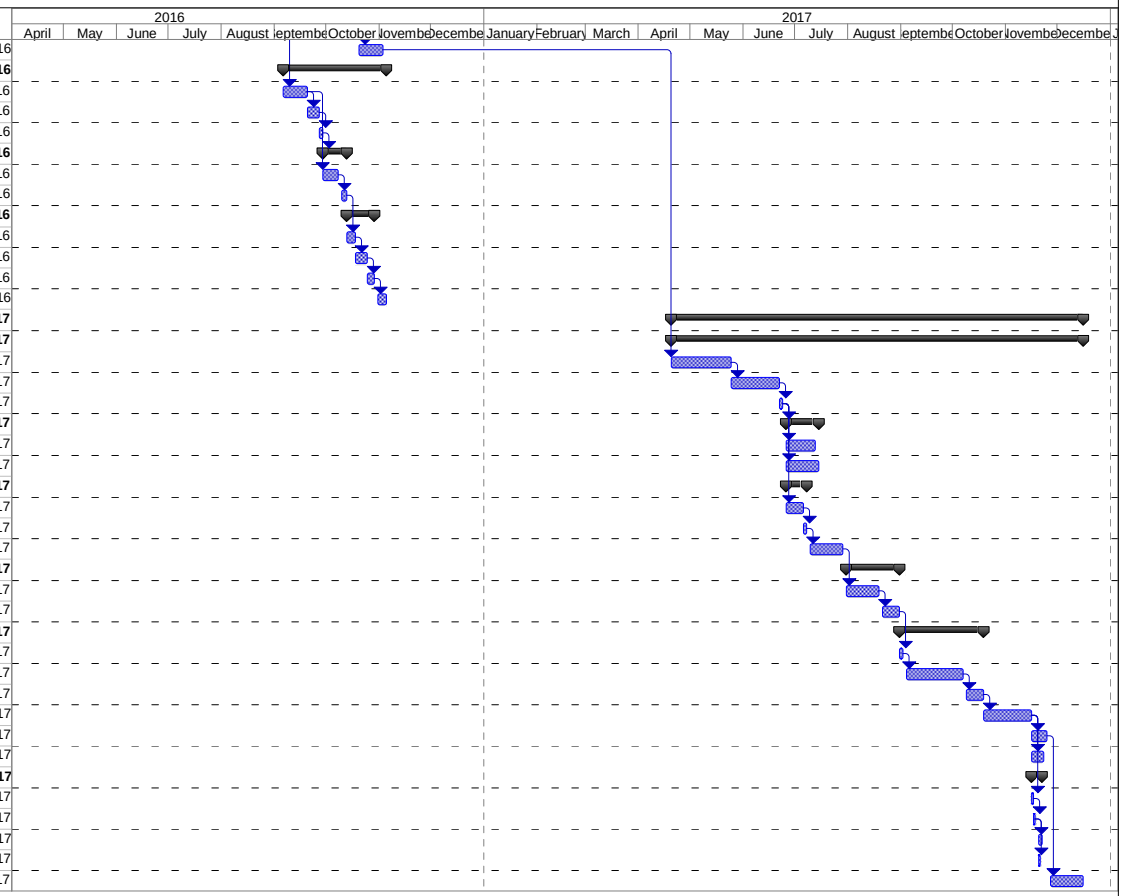


Task
Split
Milestone
Summary
Project Summary
External Tasks
External MileTask
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
Progress
Split

Lower Willamette River Ecosystem Restoration
Tentative Project Schedule

Mon 2/24/14

ID	Task Name	Duration	Start	Finish
59	Demobilization	10 days	Thu 10/20/16	Wed 11/2/16
60	**OAKS CROSSING/SELLWOOD RIVERFRONT PARK**	**44 days**	**Tue 9/6/16**	**Fri 11/4/16**
61	Mobilization	10 days	Tue 9/6/16	Mon 9/19/16
62	Site Preparation	5 days	Tue 9/20/16	Mon 9/26/16
63	Invasive Species Removal	2 days	Tue 9/27/16	Wed 9/28/16
64	**Backwatered Wetland**	**10 days**	**Thu 9/29/16**	**Wed 10/12/16**
65	Channel Bank Excavation	7 days	Thu 9/29/16	Fri 10/7/16
66	Fine Grading	3 days	Mon 10/10/16	Wed 10/12/16
67	**Landscape**	**12 days**	**Thu 10/13/16**	**Fri 10/28/16**
68	Riparian Shrubs	3 days	Thu 10/13/16	Mon 10/17/16
69	Cuttings	5 days	Tue 10/18/16	Mon 10/24/16
70	Large Woody Debris	4 days	Tue 10/25/16	Fri 10/28/16
71	Demobilization	5 days	Mon 10/31/16	Fri 11/4/16
72	**Phase 2**	**172 days**	**Thu 4/20/17**	**Fri 12/15/17**
73	**TRYON HIGHWAY 43 CULVERT**	**172 days**	**Thu 4/20/17**	**Fri 12/15/17**
74	Mobilization	25 days	Thu 4/20/17	Wed 5/24/17
75	Site Preparation	20 days	Thu 5/25/17	Wed 6/21/17
76	Invasive Species Removal	2 days	Thu 6/22/17	Fri 6/23/17
77	**Shoring (Culvert)**	**15 days**	**Mon 6/26/17**	**Fri 7/14/17**
78	H Pile Placement	13 days	Mon 6/26/17	Wed 7/12/17
79	Timber Lagging	15 days	Mon 6/26/17	Fri 7/14/17
80	**Roadway Demolition**	**10 days**	**Mon 6/26/17**	**Fri 7/7/17**
81	Asphalt Demolition	8 days	Mon 6/26/17	Wed 7/5/17
82	Base Course Excavation	2 days	Thu 7/6/17	Fri 7/7/17
83	Railroad Demolition	15 days	Mon 7/10/17	Fri 7/28/17
84	**Earthwork**	**23 days**	**Mon 7/31/17**	**Wed 8/30/17**
85	Excavation	15 days	Mon 7/31/17	Fri 8/18/17
86	Bedrock Removal	8 days	Mon 8/21/17	Wed 8/30/17
87	**Culvert**	**35 days**	**Thu 8/31/17**	**Wed 10/18/17**
88	Culvert Demolition	2 days	Thu 8/31/17	Fri 9/1/17
89	Install Culvert and Footings	25 days	Mon 9/4/17	Fri 10/6/17
90	Install Wingwalls	8 days	Mon 10/9/17	Wed 10/18/17
91	Backfill	20 days	Thu 10/19/17	Wed 11/15/17
92	Install New Railroad	7 days	Thu 11/16/17	Fri 11/24/17
93	Repave Roadway	5 days	Thu 11/16/17	Wed 11/22/17
94	**Landscape**	**4 days**	**Thu 11/16/17**	**Tue 11/21/17**
95	Riparian Shrubs	1 day	Thu 11/16/17	Thu 11/16/17
96	Cuttings	1 day	Fri 11/17/17	Fri 11/17/17
97	Upland Shrubs	2 days	Mon 11/20/17	Tue 11/21/17
98	Upland Trees	1 day	Mon 11/20/17	Mon 11/20/17
99	Demobilization	15 days	Mon 11/27/17	Fri 12/15/17



Task
Split
Milestone
Summary
Project Summary
External Tasks
External MileTask
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
Progress
Split

APPENDIX D

Local Market Labor Rates

>

General Decision Number: OR150059 01/23/2015 OR59

Superseded General Decision Number: OR20140059

State: Oregon

Construction Type: Heavy

County: Multnomah County in Oregon.

HEAVY CONSTRUCTION PROJECTS

Note: Executive Order (EO) 13658 establishes an hourly minimum wage of $10.10 for 2015 that applies to all contracts subject to the Davis-Bacon Act for which the solicitation is issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.10 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/02/2015
1	01/16/2015
2	01/23/2015

BROR0001-013 06/01/2014

	Rates	Fringes
BRICKLAYER	$ 25.31	8.77

CARP0001-035 06/01/2012

	Rates	Fringes
CARPENTER (Including Form Work)	$ 32.61	14.44
MILLWRIGHT	$ 33.11	14.44
PILEDRIVERMAN	$ 33.61	14.44

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* ELEC0048-018 01/01/2015

	Rates	Fringes
ELECTRICIAN	$ 40.20	21.50

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* ELEC0048-026 01/01/2015

	Rates	Fringes
ELECTRICIAN Low voltage wiring		

installer for all other work.....$ 24.50 15.93
Low voltage wiring installer for fire alarm, nurse call, burglar alarm, security and voice evacuation systems and other systems that are part of a fire or life safety system.....$ 30.75 17.07

ENGI0701-034 01/01/2015

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
GROUP 1	$ 39.47	14.10
GROUP 1A	$ 41.44	14.10
GROUP 1B	$ 43.42	14.10
GROUP 2	$ 37.58	14.10
GROUP 3	$ 36.44	14.10
GROUP 4	$ 35.36	14.10
GROUP 5	$ 34.13	14.10
GROUP 6	$ 30.94	14.10

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: CRANE: Helicopter Operator, when used in erecting work; Whirley Operator, 90 ton and over; LATTICE BOOM CRANE: Operator 200 tons through 299 tons, and/or over 200 feet boom; HYDRAULIC CRANE: Hydraulic Crane Operator 90 tons through 199 tons with luffing or tower attachments;

GROUP 1A: HYDRAULIC CRANE: Hydraulic Operator, 200 tons and over (with luffing or tower attachment); LATTICE BOOM CRANE: Operator, 200 tons through 299 tons, with over 200 feet boom;

GROUP 1B: LATTICE BOOM CRANE: Operator, 300 tons through 399 tons with over 200 feet boom; Operator 400 tons and over

GROUP 2: CRANE: Cableway Operator, 25 tons and over; HYDRAULIC CRANE: Hydraulic crane operator 90 tons through 199 tons (without luffing or tower attachment); TOWER/WHIRLEY OPERATOR: Tower Crane Operator; Whirley Operator, under 90 tons; LATTICE BOOM CRANE: 90 through 199 tons and/or 150 to 200 feet boom; HYDRAULIC CRANE: Hydraulic crane operator, 50 tons through 89 tons (with luffing or tower attachment); Rubber tired scraper with tandom scrapers, multi-engineTrenching Machine-Wheel Operator; Loader 120,000 lbs and above; BLADE: Auto Grader; Blade Operator-Robotic; Bulldozer over 120,000 lbs and above; CRANE: Derrick Barge Operator 30 ton but less than 150 ton; Excavator over 130,000 lbs and above

GROUP 3: HYDRAULIC CRANE: Hydraulic crane operator, 50 tons through 89 tons (without luffing or tower attachment); LATTICE BOOM CRANES: Lattice Boom Crane-50 through 89 tons (and less than 150 feet boom); Rubber Tired Scraper: with tandom scrapers; self loading, paddle wheel, auger type,

finish and/or 2 or more units; Loader 60,000 lbs and less than 120,000 lbs; Bulldozer over 70,000 lbs up to and including 120,000 lbs; Excavator over 80,000 lbs through 130,000 lbs

GROUP 4: CRANE: Hydraulic Crane Operator, under 50 tons; LATTICE BOOM CRANE OPERATOR: Lattice Boom Crane Operator, under 50 tons; TRACKHOE/BACKHOE-ROBOTIC: track and wheel type, up to and including 20,0000 lbs. with any or all attachments; BLADE: Blade Operator; Tractor operator with boom attachment; DRILLING: Churm Drill and Earth Boring Machine Operator; Directional Drill Operator over 20,000 lbs pullback; CRANE: Chicago boom and similar types; Boom type lifting device, 5 ton capacity or less; Asphalt Paver; Rubber-Tired Scraper, single engine, single scraper; Compactor-Self Propelled; Loaders 25,000 lbs and less than 60,000 lbs; Bulldozer over 20,000 lbs and more than 100 horse up to 70,000 lbs; Mechanic;CRANE: Derrick Barge Operator less than 30 ton; Piledriver; Excavator over 20,000 lbs through 80,000 lbs; Screed; compactor with blade

GROUP 5: TRACKHOE/BACKHOE HYDRAULIC: Track type up to and including 20,000 lbs, Wheel type (Ford, John Deer, Case Type); Boom truck operator; DRILLING: Churm Drill and Earth Boring Machine Operator; Directional Drill Operator less than 20,000 lbs pullback; Concrete Pumper; Concrete Paver: Compactor; Loaders, rubber tired type , less than 25,00 lbs; Forklift over 5 ton, Bulldozer 20,000 lbs or 100 horses or less; Mixer operator; Roller; Compactor without blade

GROUP 6: LOADERS: (less than 1 cu yd.); Oiler; Bobcat/Skid Loader; Grade Checker; Crane oiler; Asphalt Spreader; Broom Operator; Forklift; Roller (non-asphalt)

Zone Differential (add to Zone 1 rates):
Zone 2 - $3.00
Zone 3 - $6.00

For the following metropolitan counties: MULTNOMAH; CLACKAMAS; MARION; WASHINGTON; YAMHILL; AND COLUMBIA; CLARK; AND COWLITZ COUNTY, WASHINGTON WITH MODIFICATIONS AS INDICATED:

All jobs or projects located in Multnomah, Clackamas and Marion Counties, West of the western boundary of Mt. Hood National Forest and West of Mile Post 30 on Interstate 84 and West of Mile Post 30 on State Highway 26 and West of Mile Post 30 on Highway 22 and all jobs or projects located in Yamhill County, Washington County and Columbia County and all jobs or porjects located in Clark & Cowlitz County, Washington except that portion of Cowlitz County in the Mt. St. Helens "Blast Zone" shall receive Zone I pay for all classifications.

All jobs or projects located in the area outside the identified boundary above, but less than 50 miles from the Portland City Hall shall receive Zone II pay for all classifications.

All jobs or projects located more than 50 miles from the Portland City Hall, but outside the identified border above, shall receive Zone III pay for all classifications.

For the following cities: ALBANY; BEND; COOS BAY; EUGENE; GRANTS PASS; KLAMATH FALLS; MEDFORD; ROSEBURG

All jobs or projects located within 30 miles of the respective city hall of the above mentioned cities shall receive Zone I pay for all classifications.

All jobs or projects located more than 30 miles and less than 50 miles from the respective city hall of the above mentioned cities shall receive Zone II pay for all classifications.

All jobs or projects located more than 50 miles from the respective city hall of the above mentioned cities shall receive Zone III pay for all classifications.

IRON0029-011 07/01/2013

	Rates	Fringes
IRONWORKER (Ornamental, Reinforcing, and Structural)	$ 34.12	21.35

LABO0001-030 09/01/2014

	Rates	Fringes
Laborers: (Mason Tender-Cement/Concrete)	$ 27.44	13.10

LABO0001-031 06/01/2014

	Rates	Fringes
Laborers: (Mason Tender-Brick)	$ 27.44	13.10

LABO0003-023 06/01/2014

	Rates	Fringes
Laborers:		
GROUP 1	$ 26.43	13.10
GROUP 2	$ 27.44	13.10
GROUP 3	$ 22.86	13.10

LABORER CLASSIFICATIONS:

GROUP 1: Blaster, Demolition; General Laborer; Chain Saw

GROUP 2: Vibrating Plate; Pipelayer; Grade Checker

GROUP 3: Traffic Control-Cone Setter

PAIN0055-002 11/01/2014

	Rates	Fringes
PAINTER		
HIGHWAY & PARKING LOT		
STRIPER	$ 33.43	11.08

PAIN0055-022 07/01/2013

	Rates	Fringes
PAINTER		
BRUSH, ROLLER AND SPRAY	$ 21.01	8.83

PLAS0555-006 06/01/2014

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 29.98	17.76

PLUM0290-012 04/01/2012

	Rates	Fringes
PIPEFITTER	$ 38.20	21.36

TEAM0037-010 06/01/2014

	Rates	Fringes
TRUCK DRIVER		
GROUP 1	$ 26.90	14.37
GROUP 2	$ 27.02	14.37
GROUP 3	$ 27.15	14.37
GROUP 4	$ 27.41	14.37

TRUCK DRIVERS CLASSIFICATIONS

GROUP 1: Flatbed Truck; Off the Road Truck; Water Truck up to 3,000 gallons

GROUP 2: Vactor Truck; Water Truck over 3,000 to 5,000 gallons

GROUP 3: Water Truck over 5,000 to 10,000 gallons

GROUP 4: Water Truck over 10,000 to 15,000 gallons

SUOR2009-057 11/23/2009

	Rates	Fringes
LABORER: Asphalt Spreader	$ 22.18	9.39
LABORER: Flagger	$ 20.85	7.40
LABORER: Form-Stripping	$ 19.27	6.32
LABORER: Landscape	$ 22.18	7.45

LABORER: Water, Sewer,
Underground.....$ 17.00 1.75

OPERATOR: Rotomill.....$ 28.25 9.70

OPERATOR: Tractor.....$ 20.00 0.73

TRUCK DRIVER: Dump Truck.....$ 18.11 5.50

TRUCK DRIVER: Lowboy Truck.....$ 17.07 5.50

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and

the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

APPENDIX E

Estimated Production Rates

TITLE:	Lower Willamette Ecosystem Restoration	
SUBJECT:	Output Rates for Loading and Hauling of Excavated Materials	
MADE BY:	SKV	JOB NO.:
CHECKED BY:		DATE: 10/15/2013

CSI TASK:

LOAD AND HAUL EXCAVTED MATERIAL
3-cy Loader, 12-cy Dump Truck, 20-mile Haul, 30-mph Avg.

CREW:	*Load and Haul Concrete Crew*		20 crew members
	1	Equip. Oper. Heavy	
	1	Oiler	
	18	Truck Driver, Heavy	
	1	Front End Loader, 6-cy Bucket	
	17.42	16-cy Dump Truck	
	0.58	Dump Truck on Stand-By	

OVERALL PRODUCTION RATE → **128 cy/crew hr**

LOADING

CREW:	Loading Crew		2 crew members
	1	Equip. Oper. Heavy	
	1	Oiler	
	1	Front End Loader, 6-cy Bucket	

PRODUCTION

3	cy bucket
0.85	% fill
50	min/hr
1.00	cycle/min

128 cy/crew hr → 128 cy/crew hr

TITLE: Lower Willamette Ecosystem Restoration
SUBJECT: Output Rates for Loading and Hauling of Excavated Materials
MADE BY: SKV JOB NO.:
CHECKED BY: DATE: 10/15/2013

HAUL TO DISPOSAL SITE

CREW: Truck Haul Crew — 1 crew members

1 Truck Driver, Heavy
1 16-cy Dump Truck

PRODUCTION

12	cy truck
0.85	% fill
2.1	min. for loading
20	mi. to disposal location
30	mph haul speed
1.5	min. dump time

Quantity per Truck 10.2 cy/truck

Duration of Hauling 1.39 hr

7.3 cy/hr →

17.42 crews/equipment members to match overall production rate

18.00 total number of crews needed

0.58 equipment standby time

TITLE:	Lower Willamette Ecosystem Restoration		
SUBJECT:	Output Rates for Earthwork		
MADE BY:	SKV	JOB NO.:	
CHECKED BY:		DATE:	10/15/2013

EXCAVATION
1.5-cy Hydr. Excavat., Dry Conditions

CREW:

	1.5-cy Hydraul. Excavt. Crew	3 crew members
1	Equip. Oper. Medium	
1	Oiler	
1	Equip. Oper. Heavy	
1	Front End Loader	
1	Excavator, 1.5-cy	

PRODUCTION

1.5	cy bucket
0.85	% fill
50	min/hr
0.50	cycle/min
32	cy/crew hr

OVERALL PRODUCTION RATE → **32 cy/crew hr**

EXCAVATION
2.5-cy Hydr. Excavat., Open Site

CREW:

	2.5-cy Hydraul. Excavt. Crew	3 crew members
1	Equip. Oper. Medium	
1	Oiler	
1	Equip. Oper. Heavy	
1	Front End Loader	
1	Excavator, 1.5-cy	

PRODUCTION

2.5	cy bucket
0.85	% fill
50	min/hr
0.50	cycle/min
53	cy/crew hr

OVERALL PRODUCTION RATE → **53 cy/crew hr**

CHANNEL BANK EXCAVATION
3-cy Hydraul. Excavator

CREW:

	Bank Excavation Crew	3 crew members
1	Equip. Oper. Medium	
1	Oiler	
1	Equip. Oper. Heavy	
1	Front End Loader	
1	Excavator, 1.5-cy	

PRODUCTION

2	cy bucket
0.85	% fill
50	min/hr
1.00	cycle/min
85	cy/crew hr

OVERALL PRODUCTION RATE → **85 cy/crew hr**

PIPE TRENCHING
1.5-cy Hydr. Excavat., Dry Conditions

CREW:

	1.5-cy Hydraul. Excavt. Crew	3 crew members
1	Equip. Oper. Medium	
1	Oiler	
1	Equip. Oper. Heavy	
1	Front End Loader	
1	Excavator, 1.5-cy	

PRODUCTION

1.5	cy bucket
0.85	% fill
50	min/hr
1.00	cycle/min
64	cy/crew hr

OVERALL PRODUCTION RATE → **64 cy/crew hr**

TRENCH BACKFILL
300-ft Haul, 3-cy Bucket, Vibro-Compacted

CREW:

Fill and Compact From Stockpile Crew		5 crew members
3	Equip. Oper. Medium	
1	Truck Driver	
1	Laborer	
1	Vibratory Roller	
1	Water Truck	
1	Front End Loader	
1	Dozer	

PRODUCTION

3	cy bucket
0.85	% fill
50	min/hr
0.60	cycle/min
77	cy/crew hr

OVERALL PRODUCTION RATE → **77 cy/crew hr**

FILL AND COMPACT FROM STOCKPILE
300-ft Haul, 3-cy Bucket, Vibro-Compacted

CREW:

Fill and Compact From Stockpile Crew		5 crew members
3	Equip. Oper. Medium	
1	Truck Driver	
1	Laborer	
1	Vibratory Roller	
1	Water Truck	
1	Front End Loader	
1	Dozer	

PRODUCTION

3	cy bucket
0.85	% fill
50	min/hr
0.75	cycle/min
96	cy/crew hr

OVERALL PRODUCTION RATE → **96 cy/crew hr**

TITLE:	Lower Willamette Ecosystem Restoration	
SUBJECT:	Output Rates for Earthwork	
MADE BY:	SKV	JOB NO.:
CHECKED BY:		DATE: 10/15/2013

LOW FLOW CHANNEL EXCAVATION
1.5-cy Hydr. Excavat

CREW:

1.5-cy Hydraul. Excavt. Crew — 3 crew members

1	Equip. Oper. Medium
1	Oiler
1	Equip. Oper. Heavy
1	Front End Loader
1	Excavator, 1.5-cy

PRODUCTION

1.5	cy bucket
0.85	% fill
50	min/hr
0.95	cycle/min
61	cy/crew hr

OVERALL PRODUCTION RATE → **61 cy/crew hr**

TITLE:	Lower Willamette Ecosystem Restoration	
SUBJECT:	Output Rates for Loading, Hauling and Disposal of Concrete	
MADE BY:	SKV	JOB NO.:
CHECKED BY:		DATE: 10/15/2013

CSI TASK:

CONCRETE LOAD AND HAUL
12-cy Dump Truck, 20-mile Haul, 40-mph Avg.

CREW:

	Load and Haul Concrete Crew	16 crew members
1	Equip. Oper. Heavy	
1	Oiler	
14	Truck Driver, Heavy	
1	Front End Loader, 6-cy Bucket	
13.07	16-cy Dump Truck	
0.93	Dump Truck on Stand-By	

OVERALL PRODUCTION RATE → **75 cy/crew hr**

LOADING

CREW:

	Loading Crew	2 crew members
1	Equip. Oper. Heavy	
1	Oiler	
1	Front End Loader, 6-cy Bucket	

PRODUCTION

3	cy bucket
0.50	% fill
50	min/hr
1.00	cycle/min
75	cy/crew hr

→ 75 cy/crew hr

TITLE:	Lower Willamette Ecosystem Restoration		
SUBJECT:	Output Rates for Loading, Hauling and Disposal of Concrete		
MADE BY:	SKV	JOB NO.:	
CHECKED BY:		DATE:	10/15/2013

HAUL TO DISPOSAL SITE

CREW:

Truck Haul Crew — 1 crew members

1 Truck Driver, Heavy

1 16-cy Dump Truck

PRODUCTION

12	cy truck
0.50	% fill
1.3	min. for loading
20	mi. to disposal location
40	mph haul speed
1.5	min. dump time

Quantity per Truck 6.0 cy/truck

Duration of Hauling 1.05 hr

5.7 cy/hr →

13.07 crews/equipment members to match overall production rate

14.00 total number of crews needed

0.93 equipment standby time

TITLE: Lower Willamette Ecosystem Restoration
SUBJECT: Output Rates for Stone Placement
MADE BY: SKV
CHECKED BY:
JOB NO.:
DATE: 10/15/2013

BOULDERS, PLACEMENT

CREW:

Riprap Crew — 4 crew members
2 Laborers
1 Labor Foreman
1 Equip. Oper. Medium
1 Loader, 1.5-cy Bucket

5.00	min/boulder
1.00	tons/boulder

OVERALL PRODUCTION RATE → **12 cy/hr**

FOOTER STONES, PLACEMENT

CREW:

Riprap Crew — 4 crew members
2 Laborers
1 Labor Foreman
1 Equip. Oper. Medium
1 Loader, 1.5-cy Bucket

PRODUCTION

1.5	cy bucket
0.50	% fill
45	min/hr
0.60	cycle/min
1.50	tons/cy

→ **30 ton/hr**

SPAWNING GRAVELS

CREW:

Rock Placement Crew — 4 crew members
2 Laborers
1 Oiler
1 Equip. Oper. Medium
1 Loader, 3-cy Bucket

PRODUCTION

3	cy bucket
0.85	% fill
45	min/hr
0.75	cycle/min

→ **86 cy/crew hr**

TITLE:	Lower Willamette Ecosystem Restoration		
SUBJECT:	Output Rates for Stone Placement		
MADE BY:	SKV	JOB NO.:	
CHECKED BY:		DATE:	10/15/2013

STREAMBED STONE

CREW:

Rock Placement Crew — 4 crew members

- 2 Laborers
- 1 Oiler
- 1 Equip. Oper. Medium
- 1 Loader, 3-cy Bucket

PRODUCTION

3	cy bucket
0.85	% fill
45	min/hr
0.90	cycle/min

103 cy/crew hr →

TITLE:	Lower Willamette Ecosystem Restoration		
SUBJECT:	Output Rate for Clearing and Grubbing		
MADE BY:	SKV	JOB NO.:	
CHECKED BY:		DATE:	10/15/2013

CLEARING AND GRUBBING

SUB-CREW: Clear and Grub Crew — 3 crew members

- 1 Equip. Oper. Medium
- 2 Laborers
- 1 Dozer

PRODUCTION 480.00 min/acre

OVERALL PRODUCTION RATE **0.125 ea/hr**

APPENDIX F

Phone Logs and Emails

(For Official Use Only)

APPENDIX G

Abbreviated Risk Analysis

Abbreviated Risk Analysis

Lower Willamette Ecosystem Restoration
Feasibility (Alternatives)

Meeting Date: 1-Oct-13

PDT Members

Note: PDT involvement is commensurate with project size and involvement.

OWPR Formulator	Lee Ware, HQ
Planning Facilitator	Maria Placht
Sr. Envir. Planning Spec.	Valerie Ringold, NWD
Biologist	Elliott Stefanik, MVP
Sr. Planning Specialist	Jim Fredericks, NWD
Deputy Chief of Engineering	Doug Putman, NWD
Environmental Engineer	Alison Burcham, Portland District
Real Estate Specialist	Doris Cope, Seattle District
Biologist	Kris Lightner, Portland District
Economist	Chris McCann
Project Manager:	Dave Munro, Tetra Tech
Project Engineer:	Ike Pace, Tetra Tech
Cost Estimator:	Scott Vose, Tetra Tech

Abbreviated Risk Analysis

Project Name & Location: **Lower Willamette Ecosystem Restoration** — **District:** **NWP**
Project Development Stage/Alternative: **Feasibility (Alternatives)** — **Alternative:**
Risk Category: **Moderate Risk: Typical Project Construction Type** — **Meeting Date:** **10/1/2013**

Total Estimated Construction Contract Cost = **$ 13,905,858**

	CWWBS	Feature of Work	Contract Cost		% Contingency	$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	**$ 5,187,000**		**20.00%**	$ 1,037,400	$ 6,224,400
1	**06 FISH AND WILDLIFE FACILITIES**	**BES Treatment Plant**	**$ 580,501**		31.48%	$ 182,757	$ 763,258
2	**06 FISH AND WILDLIFE FACILITIES**	**Kelley Point Park (Fish & Wildlife)**	**$ 5,428,443**		30.06%	$ 1,631,616	$ 7,060,059
3	**06 FISH AND WILDLIFE FACILITIES**	**Kenton Cove**	**$ 366,320**		23.65%	$ 86,639	$ 452,959
4	**06 FISH AND WILDLIFE FACILITIES**	**Oaks Crossing/Sellwood Riverfront Park**	**$ 455,424**		23.65%	$ 107,713	$ 563,136
5	**02 RELOCATIONS**	**Tryon Highway 43 Culvert (Relocations)**	**$ 336,595**		45.02%	$ 151,535	$ 488,130
6	**06 FISH AND WILDLIFE FACILITIES**	**Tryon Highway 43 Culvert (Fish & Wildlife)**	**$ 4,235,369**		43.63%	$ 1,847,808	$ 6,083,176
7	**08 ROADS, RAILROADS, AND BRIDGES**	**Tryon Highway 43 Culvert (Roads/Railroads)**	**$ 1,400,429**		51.05%	$ 714,883	$ 2,115,312.56
8	**14 RECREATION FACILITIES**	**Kelley Point Park (Recreation)**	**$ 1,102,777**		24.53%	$ 270,496	$ 1,373,272.42
9			**$ -**		0.00%	$ -	$ -
10			**$ -**		0.00%	$ -	$ -
11			**$ -**		0.00%	$ -	$ -
12	All Other (less than 10% of construction costs)	**Remaining Construction Items**	**$ 0**	*0.0%*	0.00%	$ -	$ 0
13	30 PLANNING, ENGINEERING, AND DESIGN	**Planning, Engineering, & Design**	**$ 1,743,000**		18.15%	$ 316,296	$ 2,059,296
14	31 CONSTRUCTION MANAGEMENT	**Construction Management**	**$ 1,390,000**		25.96%	$ 360,849	$ 1,750,849
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUST INCLUDE JUSTIFICATION SEE BELOW)					**$ -**	

Totals					
Real Estate	$ 5,187,000	20.00%	$ 1,037,400	$	6,224,400.00
Total Construction Estimate	$ 13,905,858	35.91%	$ 4,993,446	$	18,899,304
Total Planning, Engineering & Design	$ 1,743,000	18.15%	$ 316,296	$	2,059,296
Total Construction Management	$ 1,390,000	25.96%	$ 360,849	$	1,750,849
Total	**$ 22,225,858**	**30.18%**	**$ 6,707,991**	**$**	**28,933,849**

	Base	**50%**	**80%**
Range Estimate ($000's)	$22,226k	$26,251k	$28,934k

* 50% based on base is at 50% CL.

Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.	

Lower Willamette Ecosystem Restoration

Feasibility (Alternatives)
Abbreviated Risk Analysis
Meeting Date: 1-Oct-13



Risk Register

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
Project Scope Growth				**Maximum Project Growth**		**60%**
PS-1	BES Treatment Plant	• Potential for scope growth, added features and quantities? • Investigations sufficient to support design assumptions? • Design confidence? • Water care and diversion fully understood, planned?	Project is at early design stage. Construction activities and quantities are subject to change as project progresses. Changes to design/quantities are likely to occur but are not likely to increase greatly.	Marginal	Likely	2
PS-2	Kelley Point Park (Fish & Wildlife)	• Potential for scope growth, added features and quantities? • Investigations sufficient to support design assumptions? • Design confidence? • Water care and diversion fully understood, planned?	Project is at early design stage. Construction activities and quantities are subject to change as project progresses. Changes to design/quantities are likely to occur but are not likely to increase greatly.	Marginal	Likely	2
PS-3	Kenton Cove	• Potential for scope growth, added features and quantities? • Investigations sufficient to support design assumptions? • Design confidence? • Water care and diversion fully understood, planned?	Project is at early design stage. Construction activities and quantities are subject to change as project progresses. Changes to design/quantities are likely to occur but are not likely to increase greatly.	Marginal	Likely	2
PS-4	Oaks Crossing/Sellwood Riverfront Park	• Potential for scope growth, added features and quantities? • Investigations sufficient to support design assumptions? • Design confidence? • Water care and diversion fully understood, planned?	Project is at early design stage. Construction activities and quantities are subject to change as project progresses. Changes to design/quantities are likely to occur but are not likely to increase greatly.	Marginal	Likely	2
PS-5	Tryon Highway 43 Culvert (Relocations)	• Investigations sufficient to support design assumptions? • Design confidence? • Water care and diversion fully understood, planned?	Further investigations remain to determine construction types required to relocation existing utilities. Until then, significant risks remain if alignment/placement method/quantity/number of utilities changes.	Moderate	Likely	3
PS-6	Tryon Highway 43 Culvert (Fish & Wildlife)	• Potential for scope growth, added features and quantities? • Investigations sufficient to support design assumptions? • Design confidence? • Water care and diversion fully understood, planned?	Further analysis remains to be completed into construction sequencing for this site. Also, large shoring walls are assumed to be placed and these need further investigation as well. Scope of site could change based on future findings.	Moderate	Likely	3
PS-7	Tryon Highway 43 Culvert (Roads/Railroads)	• Potential for scope growth, added features and quantities? • Investigations sufficient to support design assumptions? • Design confidence? • Water care and diversion fully understood, planned?	Further analysis remains to be completed into construction sequencing for this site. Also, large shoring walls are assumed to be placed and these need further investigation as well. Scope of site could change based on future findings.	Moderate	Likely	3
PS-8	Kelley Point Park (Recreation)	• Potential for scope growth, added features and quantities? • Investigations sufficient to support design assumptions? • Design confidence? • Water care and diversion fully understood, planned?	Project is at early design stage. Construction activities and quantities are subject to change as project progresses. Changes to design/quantities are likely to occur but are not likely to increase greatly.	Marginal	Likely	2
PS-9	0					N/A
PS-10	0					N/A
PS-11	0					N/A
PS-12	Remaining Construction Items					N/A
PS-13	Planning, Engineering, & Design	• Potential for scope growth, added features and quantities? • Project accomplish intent? • Investigations sufficient to support design assumptions? • Design confidence? • Water care and diversion fully understood, planned?	Many investigations remain to be completed in order to finalize the design. If the scope grows in extent then the cost to complete the PED phase would grow as well.	Marginal	Likely	2
PS-14	Construction Management	• Potential for scope growth, added features and quantities? • Project accomplish intent? • Investigations sufficient to support design assumptions? • Design confidence? • Water care and diversion fully understood, planned?	The primary concern for construction management, is the possible encountering of a large area of HTRW. This would create a significant impact on the management costs.	Marginal	Likely	2

Acquisition Strategy				Maximum Project Growth		40%
AS-1	BES Treatment Plant	• Contracting plan firmly established? • 8a or small business likely? • Accelerated schedule or harsh weather schedule? • Bid schedule developed to reduce quantity risks?	Contracting plan has not been firmly established. Estimate assumes each site would have it's own prime contractor with sub-contractors for various specialty items. 8a business may occur, which is not assumed currently in the MII. Some scheduling issues may arise to due to traffic, weather and environmental concerns.	Marginal	Possible	1
AS-2	Kelley Point Park (Fish & Wildlife)	• Contracting plan firmly established? • 8a or small business likely? • Accelerated schedule or harsh weather schedule? • Bid schedule developed to reduce quantity risks?	See discussion in first box above.	Marginal	Possible	1
AS-3	Kenton Cove	• Contracting plan firmly established? • 8a or small business likely? • Accelerated schedule or harsh weather schedule? • Bid schedule developed to reduce quantity risks?	See discussion in first box above.	Marginal	Possible	1
AS-4	Oaks Crossing/Sellwood Riverfront Park	• Contracting plan firmly established? • 8a or small business likely? • Accelerated schedule or harsh weather schedule? • Bid schedule developed to reduce quantity risks?	See discussion in first box above.	Marginal	Possible	1
AS-5	Tryon Highway 43 Culvert (Relocations)	• Contracting plan firmly established? • 8a or small business likely? • Accelerated schedule or harsh weather schedule? • Bid schedule developed to reduce quantity risks?	See discussion in first box above.	Marginal	Possible	1
AS-6	Tryon Highway 43 Culvert (Fish & Wildlife)	• Contracting plan firmly established? • 8a or small business likely? • Accelerated schedule or harsh weather schedule? • Bid schedule developed to reduce quantity risks?	See discussion in first box above.	Marginal	Possible	1
AS-7	Tryon Highway 43 Culvert (Roads/Railroads)	• Contracting plan firmly established? • 8a or small business likely? • Accelerated schedule or harsh weather schedule? • Bid schedule developed to reduce quantity risks?	See discussion in first box above.	Marginal	Possible	1
AS-8	Kelley Point Park (Recreation)	• Contracting plan firmly established? • 8a or small business likely? • Accelerated schedule or harsh weather schedule? • Bid schedule developed to reduce quantity risks?	See discussion in first box above.	Marginal	Possible	1
AS-9	0					N/A
AS-10	0					N/A
AS-11	0					N/A
AS-12	Remaining Construction Items					N/A
AS-13	Planning, Engineering, & Design	• Contracting plan firmly established? • 8a or small business likely? • Accelerated schedule or harsh weather schedule? • Bid schedule developed to reduce quantity risks?	See discussion in first box above.	Marginal	Possible	1
AS-14	Construction Management	• Contracting plan firmly established? • 8a or small business likely? • Accelerated schedule or harsh weather schedule? • Bid schedule developed to reduce quantity risks?	See discussion in first box above.	Marginal	Possible	1

Construction Elements				Maximum Project Growth		30%
CON-1	BES Treatment Plant	• High risk or complex construction elements, site access, in-water? • Water care and diversion plan? • Special mobilization? • Special equipment or subcontractors needed?	This site requires barge mounted equipment for excavation. This work is common in the area but has inherent risks in terms of productivity and constructibility. Diversion and control of water has not been designed, and could be subject to change from what is in MII. These risks are possible to occur, and could impose significant changes to cost.	Significant	Possible	3
CON-2	Kelley Point Park (Fish & Wildlife)	• Water care and diversion plan? • Potential for construction modification and claims?	Water care and diversion plan has not been fully developed. General assumptions have been used for the MII. The work at this site is pretty typical and therefore no significant risks are anticipated.	Marginal	Possible	1
CON-3	Kenton Cove	• Water care and diversion plan? • Potential for construction modification and claims?	Water care and diversion plan has not been fully developed. General assumptions have been used for the MII. The work at this site is pretty typical and therefore no significant risks are anticipated.	Marginal	Possible	1
CON-4	Oaks Crossing/Sellwood Riverfront Park	• Water care and diversion plan? • Potential for construction modification and claims?	Water care and diversion plan has not been fully developed. General assumptions have been used for the MII. The work at this site is pretty typical and therefore no significant risks are anticipated.	Marginal	Possible	1
CON-5	Tryon Highway 43 Culvert (Relocations)	• High risk or complex construction elements, site access, in-water? • Water care and diversion plan? • Unique construction methods?	The relocation as currently estimated, assumes some of the utility line would be placed with use of horizontal drills. There is no set diversion and control of water plan either. Thus the placement of the utility line could be more difficult than assumed.	Significant	Possible	3
CON-6	Tryon Highway 43 Culvert (Fish & Wildlife)	• Accelerated schedule or harsh weather schedule? • High risk or complex construction elements, site access, in-water? • Water care and diversion plan? • Unique construction methods? • Special equipment or subcontractors needed? • Potential for construction modification and claims?	The placement of the culvert is going to be difficult due to the depth and the fact that the roadway and railroad lines run through the footprint. Sequencing the construction could change drastically as the project progresses. Also, the need for different structures may be required to keep railroad open. Demo and removal of existing railroad bridge could be more difficult since it is not known what exactly may be underground there.	Moderate	Likely	3
CON-7	Tryon Highway 43 Culvert (Roads/Railroads)	• Accelerated schedule or harsh weather schedule? • High risk or complex construction elements, site access, in-water? • Water care and diversion plan? • Unique construction methods? • Special equipment or subcontractors needed? • Potential for construction modification and claims?	The placement of the culvert is going to be difficult due to the depth and the fact that the roadway and railroad lines run through the footprint. Sequencing the construction could change drastically as the project progresses. Also, the need for different structures may be required to keep railroad open. Demo and removal of existing railroad bridge could be more difficult since it is not known what exactly may be underground there.	Moderate	Likely	3
CON-8	Kelley Point Park (Recreation)	• Water care and diversion plan? • Potential for construction modification and claims?	Water care and diversion plan has not been fully developed. General assumptions have been used for the MII. The work at this site is pretty typical and therefore no significant risks are anticipated.	Marginal	Possible	1
CON-9	0					N/A
CON-10	0					N/A
CON-11	0					N/A
CON-12	Remaining Construction Items					N/A
CON-13	Planning, Engineering, & Design	• High risk or complex construction elements, site access, in-water? • Water care and diversion plan? • Potential for construction modification and claims?	Designs will need to be very detailed in order for the large scale structures to be constructed properly. Extra time and oversight may be required, but current PED cost should be more than adequate to complete the design work. Thus no impacts to costs are assumed.	Negligible	Unlikely	0
CON-14	Construction Management	• High risk or complex construction elements, site access, in-water? • Water care and diversion plan? • Potential for construction modification and claims?	Assumed CM costs could differ from actual if some of the risks noted above occur. Primarily if there are mods to the contract, there could be need for more management costs.	Marginal	Possible	1

Quantities for Current Scope				Maximum Project Growth		20%
Q-1	BES Treatment Plant	• Level of confidence based on design and assumptions? • Sufficient investigations to develop quantities?	Level of detail in design is still low, and thus quantities are at risk of increasing as further drawings are created. Conservative assumptions were used, so the likelihood should not be great, but the impacts could be significant.	Moderate	Possible	2
Q-2	Kelley Point Park (Fish & Wildlife)	• Level of confidence based on design and assumptions? • Sufficient investigations to develop quantities?	Level of detail in design is still low, and thus quantities are at risk of increasing as further drawings are created. Conservative assumptions were used, so the likelihood should not be great, but the impacts could be significant.	Moderate	Possible	2
Q-3	Kenton Cove	• Level of confidence based on design and assumptions? • Sufficient investigations to develop quantities?	Level of detail in design is still low, and thus quantities are at risk of increasing as further drawings are created. Conservative assumptions were used, so the likelihood should not be great, but the impacts could be significant.	Moderate	Possible	2
Q-4	Oaks Crossing/Sellwood Riverfront Park	• Level of confidence based on design and assumptions? • Sufficient investigations to develop quantities?	Level of detail in design is still low, and thus quantities are at risk of increasing as further drawings are created. Conservative assumptions were used, so the likelihood should not be great, but the impacts could be significant.	Moderate	Possible	2
Q-5	Tryon Highway 43 Culvert (Relocations)	• Level of confidence based on design and assumptions? • Sufficient investigations to develop quantities? • Appropriate methods applied to calculate quantities?	The length and number of pipelines that need to be relocated are not based on complete utility knowledge. Further designs remain, and more relocations may be required than are included in the estimate. At this time, no other utilities are known, other than the one estimated.	Significant	Possible	3
Q-6	Tryon Highway 43 Culvert (Fish & Wildlife)	• Level of confidence based on design and assumptions? • Appropriate methods applied to calculate quantities? • Sufficient investigations to develop quantities?	Quantities for this site are based on conservative assumptions. There is still a chance that furthur design could change these. The design level is still low and thus there is a likelihood for change.	Moderate	Possible	2
Q-7	Tryon Highway 43 Culvert (Roads/Railroads)	• Level of confidence based on design and assumptions? • Appropriate methods applied to calculate quantities? • Sufficient investigations to develop quantities?	Quantities for this site are based on conservative assumptions. There is still a chance that furthur design could change these. The design level is still low and thus there is a likelihood for change.	Moderate	Possible	2
Q-8	Kelley Point Park (Recreation)	• Level of confidence based on design and assumptions? • Sufficient investigations to develop quantities?	Level of detail in design is still low, and thus quantities are at risk of increasing as further drawings are created. However, bridge quantities are not likely to change.	Moderate	Unlikely	1
Q-9	0					N/A
Q-10	0					N/A
Q-11	0					N/A
Q-12	Remaining Construction Items					N/A
Q-13	Planning, Engineering, & Design	• Appropriate methods applied to calculate quantities? • Level of confidence based on design and assumptions? • Sufficient investigations to develop quantities?	Design level is very low at this time. Many investigations still remain to be order to accurately calculate quantities. Current PED percentage should be adequate, but there is some small chance it might not be.	Marginal	Possible	1
Q-14	Construction Management	No significant risks anticipated.	CM is not anticipated to affected by risks to the quantities of the project.	Negligible	Unlikely	0

Specialty Fabrication or Equipment				Maximum Project Growth		75%
FE-1	BES Treatment Plant	No significant risks anticipated.	This construction feature does no require specialty fabrication or equipment and thus no risks are anticipated.	Negligible	Unlikely	0
FE-2	Kelley Point Park (Fish & Wildlife)	No significant risks anticipated.	This construction feature does no require specialty fabrication or equipment and thus no risks are anticipated.	Negligible	Unlikely	0
FE-3	Kenton Cove	No significant risks anticipated.	This construction feature does no require specialty fabrication or equipment and thus no risks are anticipated.	Negligible	Unlikely	0
FE-4	Oaks Crossing/Sellwood Riverfront Park	No significant risks anticipated.	This construction feature does no require specialty fabrication or equipment and thus no risks are anticipated.	Negligible	Unlikely	0
FE-5	Tryon Highway 43 Culvert (Relocations)	No significant risks anticipated.	This construction feature does no require specialty fabrication or equipment and thus no risks are anticipated.	Negligible	Unlikely	0
FE-6	Tryon Highway 43 Culvert (Fish & Wildlife)	• Ability to reasonably transport? • Risk of specialty equipment functioning first time? Test?	This site requires a large culvert to be precast and delivered to the product site. Issues could arise from site accessibility to traffic control. Contractor should be able to transport as necessary but costs could increase significantly if there are issues.	Moderate	Possible	2
FE-7	Tryon Highway 43 Culvert (Roads/Railroads)	No significant risks anticipated.	This construction feature does no require specialty fabrication or equipment and thus no risks are anticipated.	Negligible	Unlikely	0
FE-8	Kelley Point Park (Recreation)	• Ability to reasonably transport? • Risk of specialty equipment functioning first time? Test?	The recreation account at this site features several pedestrian bridges. There could be increased costs or delays due to the delivery of the bridges. The bridges are expected to be typical pedestrian bridges though, and therefore not likely to cause major impacts.	Moderate	Unlikely	1
FE-9	0					N/A
FE-10	0					N/A
FE-11	0					N/A
FE-12	Remaining Construction Items					N/A
FE-13	Planning, Engineering, & Design	No significant risks anticipated.	This construction feature does no require specialty fabrication or equipment and thus no risks are anticipated.	Negligible	Unlikely	0
FE-14	Construction Management	• Unusual parts, material or equipment manufactured or installed? • Ability to reasonably transport?	Primary risk is the capability of the contractors to keep the transporation of the materials to the site on schedule (especially the planters). If materials are not provided on schedule significant impact to costs may be accrued.	Moderate	Possible	2

Cost Estimate Assumptions				Maximum Project Growth		35%
EST-1	BES Treatment Plant	• Reliability and number of key quotes? • Assumptions regarding crew, productivity, overtime? • Site accessibility, transport delays, congestion?	Assumptions regarding crew productivity are at risk of being different at time of construction. No overtime is currently assumed, which could be needed. Site accessibility may be more difficult than assumed as well. These are not likely to occur but could cause significant impacts to costs and schedule.	Moderate	Possible	2
EST-2	Kelley Point Park (Fish & Wildlife)	• Reliability and number of key quotes? • Assumptions regarding crew, productivity, overtime? • Site accessibility, transport delays, congestion?	Assumptions regarding crew productivity are at risk of being different at time of construction. No overtime is currently assumed, which could be needed. Site accessibility may be more difficult than assumed as well. These are not likely to occur but could cause significant impacts to costs and schedule. Also, bridges are not designed, and thus a MII cost item was used to estimate, which could vary from what is to be required.	Moderate	Likely	3
EST-3	Kenton Cove	• Reliability and number of key quotes? • Assumptions regarding crew, productivity, overtime? • Site accessibility, transport delays, congestion?	Assumptions regarding crew productivity are at risk of being different at time of construction. No overtime is currently assumed, which could be needed. Site accessibility may be more difficult than assumed as well. These are not likely and should only have a marginal impact to overall costs at this site.	Marginal	Possible	1
EST-4	Oaks Crossing/Sellwood Riverfront Park	• Reliability and number of key quotes? • Assumptions regarding crew, productivity, overtime? • Site accessibility, transport delays, congestion?	Assumptions regarding crew productivity are at risk of being different at time of construction. No overtime is currently assumed, which could be needed. Site accessibility may be more difficult than assumed as well. These are not likely and should only have a marginal impact to overall costs at this site.	Marginal	Possible	1
EST-5	Tryon Highway 43 Culvert (Relocations)	• Reliability and number of key quotes? • Assumptions regarding crew, productivity, overtime? • Site accessibility, transport delays, congestion?	Large volumes of stone would be required, and thus would heavily depend on the material and trucking costs. If these costs are different at time of construction, which is likely, then there would be significant impacts to costs.	Moderate	Likely	3
EST-6	Tryon Highway 43 Culvert (Fish & Wildlife)	• Reliability and number of key quotes? • Assumptions regarding crew, productivity, overtime? • Site accessibility, transport delays, congestion?	Culvert material cost have been obtained from contractor referenced in design, and are not likely to be significantly off. Productivity for placing the culverts and the shoring could be more difficult due to the scale of the open cut excavation. Significant cost increases could occur if shoring is not adequate.	Moderate	Possible	2
EST-7	Tryon Highway 43 Culvert (Roads/Railroads)	• Site accessibility, transport delays, congestion? • Reliability and number of key quotes? • Assumptions regarding crew, productivity, overtime? • Lack confidence on critical cost items?	The removal, shoo-fly, and reinstallation of the railroad has not been fully developed. Key assumptions regarding how this is all to be completed could change drastically. The cost impacts to this could shift greatly depending on finalized plan.	Significant	Likely	4
EST-8	Kelley Point Park (Recreation)	• Reliability and number of key quotes? • Assumptions regarding crew, productivity, overtime? • Site accessibility, transport delays, congestion?	Pedestrian bridge quotes could be different as project progresses, as there are no details for the current bridges. These bridges are assumed to be standard with no significant modifications required. Therefore it is not likely to change.	Moderate	Unlikely	1
EST-9	0					N/A
EST-10	0					N/A
EST-11	0					N/A
EST-12	Remaining Construction Items					N/A
EST-13	Planning, Engineering, & Design	• Lack confidence on critical cost items?	Current percentage used for PED should be adequate. Thus the likelihood of it increasing is minimal, and the impact would be marginal if it did increase.	Marginal	Unlikely	0
EST-14	Construction Management	• Lack confidence on critical cost items?	Current CM percentage used should be sufficient. However, some of the risks outlined above may cause increases to CM. These risks are not likely to impact CM greatly but could cause marginal increases here.	Marginal	Possible	1

External Project Risks				Maximum Project Growth		40%
EX-1	BES Treatment Plant	• Potential for severe adverse weather? • Political influences, lack of support, obstacles? • Unanticipated inflations in fuel, key materials? • Potential for market volatility impacting competition, pricing?	There are several external risks that could delay the project and/or impact the overall costs. One risk is in regard to the interactions between all the agencies that would be involved in this project. Getting all the agencies on the same page could be a cause for concern moving forward. Also dealing with the multiple project locations could cause some issues. Weather is not anticipated to be a huge risk, but could impact the costs if something drastic occurred. The finding of unexpected cultural resources could also delay construction. Lastly, inflation in fuel and some materials would impact costs. Overall, these are not likely to occur, but most likely would be an impact to schedule and only marginal to costs.	Marginal	Possible	1
EX-2	Kelley Point Park (Fish & Wildlife)	• Potential for severe adverse weather? • Political influences, lack of support, obstacles? • Unanticipated inflations in fuel, key materials? • Potential for market volatility impacting competition, pricing?	See discussion in first box above.	Marginal	Possible	1
EX-3	Kenton Cove	• Potential for severe adverse weather? • Political influences, lack of support, obstacles? • Unanticipated inflations in fuel, key materials? • Potential for market volatility impacting competition, pricing?	See discussion in first box above.	Marginal	Possible	1
EX-4	Oaks Crossing/Sellwood Riverfront Park	• Potential for severe adverse weather? • Political influences, lack of support, obstacles? • Unanticipated inflations in fuel, key materials? • Potential for market volatility impacting competition, pricing?	See discussion in first box above.	Marginal	Possible	1
EX-5	Tryon Highway 43 Culvert (Relocations)	• Potential for severe adverse weather? • Political influences, lack of support, obstacles? • Unanticipated inflations in fuel, key materials? • Potential for market volatility impacting competition, pricing?	See discussion in first box above.	Marginal	Possible	1
EX-6	Tryon Highway 43 Culvert (Fish & Wildlife)	• Potential for severe adverse weather? • Political influences, lack of support, obstacles? • Unanticipated inflations in fuel, key materials? • Potential for market volatility impacting competition, pricing?	See discussion in first box above.	Marginal	Possible	1
EX-7	Tryon Highway 43 Culvert (Roads/Railroads)	• Potential for severe adverse weather? • Political influences, lack of support, obstacles? • Unanticipated inflations in fuel, key materials? • Potential for market volatility impacting competition, pricing?	See discussion in first box above.	Marginal	Possible	1
EX-8	Kelley Point Park (Recreation)	• Potential for severe adverse weather? • Political influences, lack of support, obstacles? • Unanticipated inflations in fuel, key materials? • Potential for market volatility impacting competition, pricing?	See discussion in first box above.	Marginal	Possible	1
EX-9	0					N/A
EX-10	0					N/A
EX-11	0					N/A
EX-12	Remaining Construction Items					N/A
EX-13	Planning, Engineering, & Design	• Potential for severe adverse weather? • Political influences, lack of support, obstacles? • Unanticipated inflations in fuel, key materials? • Potential for market volatility impacting competition, pricing?	See discussion in first box above.	Marginal	Possible	1
EX-14	Construction Management	• Potential for severe adverse weather? • Political influences, lack of support, obstacles? • Unanticipated inflations in fuel, key materials? • Potential for market volatility impacting competition, pricing?	See discussion in first box above.	Marginal	Possible	1

Lower Willamette Ecosystem Restoration
Feasibility (Alternatives)
Abbreviated Risk Analysis

Risk Evaluation

WBS	Potential Risk Areas	Project Scope Growth	Acquisition Strategy	Construction Elements	Quantities for Current Scope	Specialty Fabrication or Equipment	Cost Estimate Assumptions	External Project Risks	Cost in Thousands
01 LANDS AND DAMAGES	**Real Estate**								$5,187
06 FISH AND WILDLIFE FACILITIES	**BES Treatment Plant**	**2**	**1**	**3**	**2**	**0**	**2**	**1**	$581
06 FISH AND WILDLIFE FACILITIES	Kelley Point Park (Fish & Wildlife)	**2**	**1**	**1**	**2**	**0**	**3**	**1**	$5,428
06 FISH AND WILDLIFE FACILITIES	Kenton Cove	**2**	**1**	**1**	**2**	**0**	**1**	**1**	$366
06 FISH AND WILDLIFE FACILITIES	Oaks Crossing/Sellwood Riverfront Park	**2**	**1**	**1**	**2**	**0**	**1**	**1**	$455
02 RELOCATIONS	Tryon Highway 43 Culvert (Relocations)	**3**	**1**	**3**	**3**	**0**	**3**	**1**	$337
06 FISH AND WILDLIFE FACILITIES	Tryon Highway 43 Culvert (Fish & Wildlife)	**3**	**1**	**3**	**2**	**2**	**2**	**1**	$4,235
08 ROADS, RAILROADS, AND BRIDGES	**Tryon Highway 43 Culvert (Roads/Railroads)**	**3**	**1**	**3**	**2**	**0**	**4**	**1**	$1,400
14 RECREATION FACILITIES	**Kelley Point Park (Recreation)**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	$1,103
0	**0**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$0
0	**0**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$0
0	**0**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$0
All Other (less than 10% of construction costs)	Remaining Construction Items	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$0
30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	**2**	**1**	**0**	**1**	**0**	**0**	**1**	$1,743
31 CONSTRUCTION MANAGEMENT	Construction Management	**2**	**1**	**1**	**0**	**2**	**1**	**1**	$1,390
									$17,039
Risk		$ 1,266	$ 356	$ 1,870	$ 485	$ 343	$ 995	$ 356	**$5,671**
Fixed Dollar Risk Allocation		$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$0**
	Risk	$ 1,266	$ 356	$ 1,870	$ 485	$ 343	$ 995	$ 356	**$5,671**
								Total	**$22,709**

APPENDIX H

MCACES Construction Cost Estimate Summary Report

Estimated by	Tetra Tech, Inc
Designed by	Tetra Tech, Inc
Prepared by	Tetra Tech, Inc
Preparation Date	2/20/2015
Effective Date of Pricing	2/20/2015
Estimated Construction Time	560 Days

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Description	Quantity	UOM	ContractCost	ProjectCost	C/O
Project Cost Summary Report			**13,905,858**	**13,905,858**	
Lower Willamette River Ecosystem Restoration	**1.00**	**LS**	**13,905,858**	**13,905,858**	
BES BES Treatment Plant	**1.00**	**LS**	**580,501**	**580,501**	
06 Fish and Wildlife Facilities	**1.00**	**LS**	**580,501**	**580,501**	
06 01 Mobilization and Demobilization	**1.00**	**LS**	**85,152**	**85,152**	
06 02 Site Preparation	**1.00**	**LS**	**91,394**	**91,394**	
06 03 High Water Refugia	**1.00**	**LS**	**20,709**	**20,709**	
06 04 Regrade Bank	**1.00**	**LS**	**286,823**	**286,823**	
06 05 Low-Flow Channel	**1.00**	**LS**	**56,741**	**56,741**	
06 07 Landscape	**1.00**	**LS**	**39,681**	**39,681**	
KENTON Kenton Cove	**1.00**	**LS**	**366,320**	**366,320**	
06 Fish and Wildlife Facilities	**1.00**	**LS**	**366,320**	**366,320**	
06 01 Mobilization and Demobilization	**1.00**	**LS**	**43,500**	**43,500**	
06 02 Site Preparation	**1.00**	**LS**	**207,441**	**207,441**	
06 03 Sand	**1.00**	**LS**	**76,627**	**76,627**	
06 04 Landscape	**1.00**	**LS**	**38,752**	**38,752**	
KELLEY Kelley Point Park	**1.00**	**LS**	**6,531,220**	**6,531,220**	
06 Fish and Wildlife Facilities	**1.00**	**LS**	**5,428,443**	**5,428,443**	
06 01 Mobilization and Demobilization	**1.00**	**LS**	**206,369**	**206,369**	
06 02 Site Preparation	**1.00**	**LS**	**291,733**	**291,733**	
06 03 Regrade Banks	**1.00**	**LS**	**4,358,040**	**4,358,040**	
06 05 Main Channel	**1.00**	**LS**	**363,299**	**363,299**	
06 06 Low-Flow Channel	**1.00**	**LS**	**73,715**	**73,715**	
06 07 Landscape	**1.00**	**LS**	**135,287**	**135,287**	
14 Recreation	**1.00**	**LS**	**1,102,777**	**1,102,777**	
14 01 Foot Bridges	**1.00**	**LS**	**1,102,777**	**1,102,777**	
OAKS Oaks Crossing/Sellwood Riverfront Park	**1.00**	**LS**	**455,424**	**455,424**	
06 Fish and Wildlife Facilities	**1.00**	**LS**	**455,424**	**455,424**	
06 01 Mobilization and Demobilization	**1.00**	**LS**	**52,625**	**52,625**	
06 02 Site Preparation	**1.00**	**LS**	**121,599**	**121,599**	
06 03 Backwatered Wetland	**1.00**	**LS**	**206,073**	**206,073**	
06 04 Landscape	**1.00**	**LS**	**75,127**	**75,127**	

Description	Quantity	UOM	ContractCost	ProjectCost	C/O
TRYON Tryon Highway 43 Culvert	**1.00**	**LS**	**5,972,393**	**5,972,393**	
			336,595.41	*336,595.41*	
02 Relocations	**1.00**	**EA**	**336,595**	**336,595**	
02 00 Mobilization and Demobilization	**1.00**	**LS**	**36,229**	**36,229**	
02 01 Sewer Trunk Relocation	**1.00**	**LS**	**300,366**	**300,366**	
06 Fish and Wildlife Facilities	**1.00**	**LS**	**4,235,369**	**4,235,369**	
06 01 Mobilization and Demobilization	**1.00**	**LS**	**150,113**	**150,113**	
06 02 Site Preparation	**1.00**	**LS**	**555,218**	**555,218**	
06 03 Culvert Replacement	**1.00**	**LS**	**3,517,664**	**3,517,664**	
06 04 Landscape	**1.00**	**LS**	**12,375**	**12,375**	
08 Roads, Railroads and Bridges	**1.00**	**LS**	**1,400,429**	**1,400,429**	
08 00 Mobilization and Demobilization	**1.00**	**LS**	**119,621**	**119,621**	
08 01 Roadway	**1.00**	**LS**	**574,593**	**574,593**	
08 02 Railroad	**1.00**	**LS**	**706,216**	**706,216**	