



November 5, 2014

Floodplain Development Permit Application Narrative:

Riverbend Expansion – Modules 10 and 11 Riverbend Landfill Company

Township 5S, Range 5W, Sections 12
Lat: 45 09 22 N Long: 123 14 38 W
Yamhill County, Oregon

PREPARED FOR:
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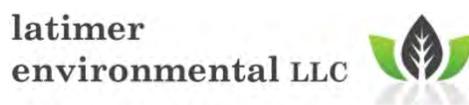


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- Attachment A-1 Riverbend Landfill South Tributary Channel and Floodplain Enhancement
 30% Design Submittal

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 Preliminary Design Memorandum

- Attachment B Preliminary Hydraulic Report for Riverbend Landfill

Introduction

Riverbend Landfill Company (RLC) presents this floodplain development permit application in support of RLC's proposed enhancement and expansion of Riverbend Landfill (Riverbend). In conjunction with this application, RLC is submitting an application for Site Design Review. That specific development proposal seeks site design approval for a total of 37 new acres of landfill area that will be directly incorporated into the existing landfill. The proposed design includes a perimeter berm with a traditional earth fill design containing shallow outside slopes. The proposal does not use a mechanically stabilized earthen berm as RLC used for its most recent expansion. Portions of the proposed berm in that application will lie within the 100-year floodplain, which necessitates this application for a floodplain development permit. Because some of the criteria for site design review overlap with the criteria for a floodplain development permit, RLC is requesting the applications to be processed simultaneously. Further, RLC adopts by reference the information included in the Site Design Review narrative to support this application.

The expansion and enhancement areas of RLC's proposal are defined by the development of two new modules (see Figure 1 and Drawing A-1 [Attachment A] of the Site Design Review Application):

1. Module 10 is an eight-acre disposal cell adjacent to the north slope of the existing landfill and just east of the existing Renewable Energy Facility. Module 10 will be constructed as a contiguous extension of the existing. When this area reaches capacity, it will be capped, closed and planted with grasses and shrubs to blend with the natural landscape.
2. Module 11 is a 29-acre group of disposal cells to be located west of the existing landfill and adjacent to Highway 18, and includes a reconfiguration of the existing berm on the south side of the landfill. This module will be constructed in multiple phases and will also be a contiguous extension of the existing landfill with tree plantings and other landscape features along the newly constructed and reconfigured berms to provide a year-round visual screen. This area, too, will be capped, closed, and planted with grasses and shrubs to blend with the natural landscape when it reaches capacity.

The project includes restoration and enhancement of the un-named stream immediately south of Module 11 (Figure C2; Appendix A-1). In the past, the channel was straightened, narrowed, and deepened to facilitate agriculture. The proposed 3.79-acre project will restore the channel back to a more natural state by re-widening the channel and adding sinuosity and will be designed to enhance fish and wildlife habitat (Appendix A-2). Channel restoration will also compensate for floodplain fill associated with the expansion and increase floodplain storage (Appendix B).

Because the projects will include grading within the floodplain, RLC needs to obtain a Floodplain Development Permit (FDP) from the County. This application narrative addresses Yamhill County Zoning Ordinance (YCZO) Section 901.00 - Floodplain Overlay District (FP). Applicable ordinance sections are set out in bold italic type; inapplicable provisions are referenced as such.

Technical Summary

In preparation for this application, RLC retained the services of a registered professional engineering firm (Waterways Consultants, Inc.) to complete a hydraulic analysis (Appendix B) of the proposed project using methods prescribed by the Federal Emergency Management Agency (FEMA). The analysis utilizes current FEMA floodplain mapping, which was updated via a Letter of Map Revision issued by FEMA in December 2012.¹

RLC proposes that the FDP apply to all areas adjacent to the landfill within the 100-year floodplain of the South Yamhill River outside of the regulatory floodway.

The analysis of the effects of the proposed project indicates no rise of the base flood elevation (Attachment B).

In addition to the information above, this report contains attachments showing the proposed project².

¹ Letter from FEMA to The Honorable Leslie Lewis, Chair, Yamhill County Commissioners, acknowledging the revision of the Flood Insurance Rate Maps as proposed by the County and RLC (Dec. 26, 2012); Effective May 9, 2013; FEMA Case # 12-10-1146P.

² All elevation data submitted for County, FEMA, or other agency review is expressed as feet above mean sea level and based on the North American Vertical Datum of 1988 ("NAVD88"). The base flood level, referred to by the Federal Emergency Management Agency (FEMA) as the "Base Flood Elevation" or "BFE" is expressed in NAVD88.

901.05 Floodplain Development Permit Application.

Except as provided in subsection 901.04, a floodplain development permit shall be obtained before the start of any construction or development, including manufactured homes, within the FP Overlay District. In the event a variance is necessary for construction within the floodplain, such application shall be processed in conjunction with the floodplain permit application, and shall be subject to the provisions of subsection 901.18.

A floodplain development permit may be authorized pursuant to the Type B application procedure set forth in Section 1301 and subject to compliance with the review criteria listed in subsections 901.06 through 901.10. In addition to the notification requirements of Section 1402, written notice of the request and action taken will be sent to the Oregon Department of Fish and Wildlife and the Department of Land Conservation and Development. The following information shall be required to be provided by the applicant:

- A. Elevation in relation to mean sea level of the lowest floor (including basement) of all structures.***
- B. Elevation, expressed in feet above mean sea level, to which any structure has been floodproofed.***
- C. Certification by a registered professional engineer or architect that the proposed floodproofing methods for any nonresidential structure meet the floodproofing criteria in subsection 901.08.***
- D. Specific data regarding the extent to which any watercourse will be altered or relocated as a result of the proposed development. [Amended 2/24/2010; Ord.851]***

Explanation of Compliance

Provisions A-C are not applicable, as they apply to building structures and not to development consisting only of fill. No such structures are proposed within any floodplain or waterway subject to the provisions of the National Flood Insurance Program.

With respect to provision D, earthwork associated with the project is proposed within the 100-year floodplain of the South Yamhill River that will result in a net removal of soils from the floodplain and will not cause a rise in the Base Flood Elevation (BSE), as demonstrated in the Engineer's Certification accompanying the Floodplain Development Permit Application (FDPA), of which this narrative is a part. In addition, earthwork associated with installation and maintenance of utilities and infrastructure that would result in no fill above existing grades or fill certified by a qualified engineer as causing no rise or significant obstruction to flood flows (e.g., utility vaults and poles, well heads, fencing, etc.) is proposed.

901.06 Floodplain Development Permit Criteria.

Prior to issuance of a floodplain development permit, the applicant must demonstrate that:

- A. The proposed development conforms with the permit requirements and conditions of this section and the use provisions, standards and limitations of the underlying zoning district and other overlay district. [Amended 2/24/2010; Ord.851]***
- B. The proposed development, if located within the floodway, satisfies the provisions of subsection 901.09.***
- C. The proposed development will not increase the water surface elevation of the base flood more than one (1) foot at any point.***
- D. All applicable permits have been obtained from federal, state or local governmental agencies, and all applicable National Flood Insurance Program requirements have been satisfied.***
- E. The proposed development is consistent with policies j. and k. of the Comprehensive Plan, as amended by ordinance 471.***

For convenience, Policies j. and k. of the Comprehensive Plan, as amended by Ordinance 471 are reprinted here.

- j. It is the policy of Yamhill County to protect riparian vegetation from damage that may result from land use applications for development that is otherwise permitted outright or conditionally under county zoning regulations. To achieve this goal, Yamhill County will review land use applications for development in riparian areas in an effort to mitigate or prevent damage to riparian vegetation that might result from the development. For purposes of this policy, "riparian areas" refers to areas within 100 feet measured horizontally from the ordinary high water line of streams identified as "Fish Habitat" in the comprehensive plan inventory (Natural Resource Conservation Plan, Yamhill County, Oregon, May 1979 -U.S.D.A. - Soil Conservation Services), that are not regulated under the Forest Practices Act. (Ord 471)***
- k. It is county policy that land use management practices and nonstructural solutions to problems of erosion and flooding are preferred to structural solutions. Water erosion control structures, including riprap and fill, should be reviewed by the appropriate state permitting authority to insure that they are necessary, are designed to incorporate vegetation where possible, and designed to minimize adverse impacts on water currents, erosion, and accretion patterns.***

Explanation of Compliance

A. The project is an allowed use in the Exclusive Farm Use (EFU) zoning district as part of a solid waste disposal facility under YCZO section 402.02(V). Concurrent with this application, RLC is also submitting an application for Site Design Review (SDR). The narrative accompanying the

SDR application explains in more detail how the expansion proposal is consistent with the underlying EFU zone. That explanation is incorporated here by this reference. The proposed project complies with the Floodplain Overlay District (FP), per YCZO section 901.09 – see below.

B. The proposed project is not located in the floodway and complies with YCZO section 901.09 – see below.

C. The proposed project will not increase the water surface elevation of the base flood. Because the project involves net removal of soil from the floodplain and that removal is adjacent to the proposed floodplain encroachment, no increase in the base flood elevation is indicated. A hydrologic and hydraulic analysis of the proposed project has been conducted by a registered professional engineer to ensure that there will be no increase in the base flood elevation – See Appendix A.

D. RLC will obtain all applicable permits from federal, state, and local governmental agencies, and all National Flood Insurance Program (NFIP) requirements will be satisfied: Wetland permits for impacts to non-wetland waters will be obtained from the Oregon Department of State Lands (DSL) and the U.S. Army Corps of Engineers (Corps); a hydrologic and hydraulic analysis of the proposed project will be conducted by a registered professional engineer to ensure all applicable NFIP requirements have been met. RLC has applied for and received wetland permits in the past.

E. The proposed project complies with Policies j and k of the Comprehensive Plan.

With regard to Policy j, the proposed project does require some temporary impacts to existing riparian vegetation in order to restore, enhance, and increase the size of the riparian zone and its vegetation. For instance, much of the current riparian corridor is composed of non-native Himalayan blackberry, which will be removed and replaced with native species. Native trees and shrubs that must be removed to facilitate restoration activities will be salvaged and used during site planting and stabilization, where possible.

With regard to Policy k, the project has been designed to utilize only non-structural, natural materials to minimize adverse impacts from erosion and flooding. In particular, the grading plan is designed to greatly attenuate flood velocities such that only planting with grasses and staking with shrubs will be needed to stabilize soils.

Conclusion

The proposed project meets all applicable requirements of this section of the YCZO.

901.07 Floodplain Overlay District General Standards.

In all areas within the FP Overlay District the following standards shall apply:

A. Manufactured Homes.

- 1. Manufactured homes shall be anchored in accordance with subsection 901.07 B.***

2. No manufactured home park or mobile home subdivision shall be developed in the FP Overlay District.

B. Anchoring.

- 1. All new construction and substantial improvements shall be anchored to prevent flotation, collapse or lateral movement of the structure. Except in the case of a manufactured home, elevation of a structure on fill above the base flood level shall be considered to satisfy the anchoring requirement.**
- 2. All manufactured homes shall be anchored to resist flotation, collapse or lateral movement by providing over-the-top and frame ties to ground anchors, subject to the following specifications:**
 - (a) Over-the-top ties shall be provided at each corner of the manufactured home, with two (2) additional ties per side at intermediate points, or with one (1) additional tie per side for manufactured homes less than fifty (50) feet in length.**
 - (b) Frame ties shall be provide at each corner of the manufactured home, with five (5) additional ties per side at intermediate points, or with four (4) additional ties per side for manufactured home less than fifty (50) feet in length.**
 - (c) All components of the anchoring system shall be capable of withstanding a force of 4,800 pounds per square inch.**
 - (d) Any structure appurtenant to the manufactured home shall be similarly anchored.**

C. Construction Materials Methods and Certification.

- 1. All new construction and substantial improvements to existing structures shall be constructed with materials and utility equipment resistant to flood damage.**
- 2. All new construction and substantial improvements shall be constructed using methods and practices that minimize flood damage.**
- 3. Electrical, heating, ventilation, plumbing, and air-conditioning equipment and other service facilities shall be designed and/or otherwise elevated or located so as to prevent water from entering or accumulating within the components during conditions of flooding.**
- 4. All new construction and substantial improvements with fully enclosed areas below the floor and subject to flooding shall be designed to automatically equalize the hydrostatic forces to exterior walls by allowing entry and exit of floodwaters. A minimum of two openings having a total net area of not less than one square inch for every square foot of floor area subject to the flooding shall be provided. The bottom of all openings shall be no higher than one foot above grade, and may be equipped with screens, louvers, or other devices that automatically permit entry and exit of floodwaters.**

- 5. All floodproofed nonresidential construction shall include certification by a registered professional engineer or architect that the standards of this subsection subsection 901.08 (A) are satisfied based on their development and/or review of the structural design, specifications and plans. Such certification shall be provided to the Yamhill County Planning Director. [Amended 2/24/2010; Ord.851; 10/17/13; Ord 884]**

D. Utilities and Services.

- 1. All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system.**
- 2. New and replacement sanitary sewage systems shall be designed and located to minimize or eliminate flood water infiltration and contamination resulting from discharge of effluent consistent with the requirements of the Oregon Department of Environmental Quality (DEQ).**
- 3. On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding consistent with the DEQ.**

[Amended 2/24/2010; Ord.851]

E. Subdivision Proposals.

No new subdivisions shall be allowed in floodway areas. New subdivisions in flood fringe areas shall be subject to the following:

- 1. All subdivision proposals shall be consistent with the requirement to minimize flood damage.**
- 2. All subdivision proposals shall have public utilities and facilities, such as sewer, gas, electrical and water systems, located and constructed to minimize or eliminate flood damage. [Amended 2/24/2010; Ord.851]**
- 3. All subdivision proposals shall have adequate drainage provided to reduce exposure to flood damage.**
- 4. Base flood elevations in feet above mean sea level shall be provided for all subdivisions and other proposed developments which contain at least 50 lots or 5 acres, whichever is less, in the FP Overlay District.**

F. Fills and Levees.

Except for approved relocation of a water course, no fill or levee shall extend into a floodway area. Fills or levees in a flood fringe area shall be subject to the following:

- 1. Fills shall consist only of natural materials such as earth or soil aggregate and including sand, gravel and rock, concrete and metal.**
- 2. Any fill or levee must be shown to have a beneficial purpose and therefore to be no greater than is necessary to achieve that purpose, as demonstrated by a plan**

submitted by the owner showing the uses to which the filled or diked land will be put and the final dimensions of the proposed fill.

- 3. Such fill or levee shall be protected against erosion by vegetative cover, rip-rap, bulkheading or similar provisions. No fill or levee shall cause additional flood waters on adjacent land. [Amended 10/17/2013; Ord.884]***

Explanation of Compliance

Provisions of subsections 901.07 A, B, C, D and E are not applicable to this project as no manufactured homes, anchoring, construction of new structures or improvements to existing structures, municipal utilities and services, or subdivisions, are proposed or currently exist within the area for which the FDP would apply.

With respect to section F., no fill is proposed to extend into the floodway area. Fill shall include only those natural materials listed and will have the beneficial purposes of allowing the enhancement and expansion of Riverbend. The County has on multiple occasions determined that the continued operation of the landfill is important and beneficial to the citizenry of the County. All fill will be protected from erosion by vegetation, rip-rap, or similar erosion control measures per standard engineering practices. As shown in the attached engineer's hydraulic analysis (Appendix B), proposed fills will not cause additional floodwater on adjacent lands.

901.08 Specified Standards for Areas Where Base Flood Elevation Data are Available.

In the FP Overlay District where base flood elevation data have been provided, as set forth in subsection 901.02 or 901.03, the following standards shall apply:

- A. For any new residential construction and substantial improvement of any residential structure, the lowest floor level shall be a minimum of one (1) foot above the base flood elevation. New construction and substantial improvement of any commercial, industrial or other nonresidential structures and accompanying utility and sanitary facilities shall either have the lowest floor, including basement, elevated to the level of the base flood elevation or together with attendant utility and sanitary facilities be subject to the following: [Amended 10/17/2013; Ord.884]***

- 1. Be floodproofed so that all portions of the structure below the base flood level are watertight, with walls that are substantially impermeable to the passage of water.***
- 2. Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.***

- B. For the placement of a manufactured home the bottom of the longitudinal chassis frame beam shall be one (1) foot above the base flood elevation, and the provisions of section 901.04(C)(4) shall be satisfied, if applicable. In addition, the***

mobile home must be elevated on a permanent foundation and is subject to the anchoring requirements in subsection 901.07 (B). [Amended 10/17/2013; Ord.884]

C. Nonresidential structures that are elevated, not floodproofed, shall meet the same standards for space below the lowest floor as described in Section 901.07(C). [Added 10/17/2013; Ord.884]

D. Recreational vehicles placed on sites are required to either:

- 1. Be on the site for fewer than 180 consecutive days; or***
- 2. Be fully licensed and ready for highway use, on its wheels or jacking system, is attached to the site only by quick disconnect type security devices, and has no permanently attached additions.***

[Amended 2/24/2010; Ord.851]

Explanation of Compliance

YCZO Section 901.08 is not applicable to the proposed project, as no residential structures, manufactured homes, non-residential structures, or recreational vehicles are proposed.

901.09 Floodway or Watercourse Development Provisions.

A. The placement of any dwelling in the floodway shall be prohibited.

B. Except those uses provided for in subsection 901.04, all development, including substantial improvements, in the floodway shall be prohibited unless certification is provided by a registered professional engineer demonstrating through hydrologic and hydraulic analyses performed in conformance with standard engineering practice that the proposal will not result in any increase in flood levels during the occurrence of the base flood discharge. [Amended 10/17/2013; Ord.884]

C. For any proposed alteration of a watercourse a floodplain development permit shall be required, and approval of the permit shall be subject to the following additional requirements:

- 1. Adjacent communities, the State Department of Land Conservation and Development, and other appropriate state and federal agencies shall be notified by the Director of any proposed alteration or relocation of a watercourse, and evidence of such notification shall be submitted to the Federal Insurance Administration.***
- 2. All appropriate state and federal permits shall be obtained.***
- 3. It shall be the applicant's responsibility to maintain the altered or relocated portion of said watercourse so that its flood carrying capacity is not diminished.***

[Amended 10/17/2013; Ord.884]

Explanation of Compliance

A. This provision is not applicable to the proposed project, as no dwellings or other structures are proposed within the floodway.

B. While not required, a hydraulic analysis of the proposed project has been conducted by a registered professional engineer demonstrating that the proposed project will not result in any increase in flood levels during the occurrence of the base flood discharge.

C. The proposed project will alter the un-named stream watercourse in the stream reach south of Module 11 as a consequence of channel restoration and enhancement, e.g., channel width and sinuosity will be increased. Thus, the project will result in either no-rise or a slight reduction in the base flood elevation.

1. RLC will assist the County in notification of the State Department of Land Conservation and Development (DLCD) and all other applicable local, state, and federal agencies, including the Federal Insurance Administration.

2. All applicable state and federal permits will be obtained.

3. RLC will maintain the restored and enhanced watercourse such that the base flood elevation will not increase above the existing level.

901.10 Review of Permits in Generalized Floodplain Areas.

Where specific flood elevation data are not available, pursuant to subsections 901.03 and 901.04, applications for floodplain development permits shall be reviewed to ensure that the proposed development will be reasonably safe from flooding or resistant to flood damage. In determining whether the proposed floodplain development is reasonably safe, historical data, high water marks, photographs of past flooding, etc. shall be utilized, where available. In addition to the applicable requirements of this section, the following factors shall be considered when reviewing a floodplain development permit for any proposal in an area where specific flood elevation data are not available:

A. The danger to life and property due to flooding or erosion damage. [Amended 10/17/2013; Ord.884]

B. The danger that materials may be swept onto other lands or downstream to the injury of others.

C. The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner. [Amended 10/17/2013; Ord.884]

D. The availability of alternative locations for the proposed use which are not subject to flooding or erosion damage. The importance of the services provided by the proposed facility to the community.

E. The necessity to the facility of a waterfront location, where applicable and the compatibility of the proposed use with existing and anticipated development. [Amended 10/17/2013; Ord.884]

F. The relationship of the proposed use to the Comprehensive Plan and any floodplain management program of the area.

G. The safety of access to the property in times of flood for ordinary and emergency vehicles.

H. The expected heights, velocity, duration, rate of rise, and sediment transport of the flood waters and the effects of wave action, if applicable, expected at the site. [Amended 10/17/2013; Ord.884]

I. The cost of providing governmental services during and after flood conditions, including maintenance and repair of public utilities and facilities such as sewer, gas, electrical, and water systems, and streets and bridges. [Added 10/17/2013; Ord.884]

Explanation of Compliance

All provisions of this subsection are not applicable because specific and detailed flood elevation data is available and incorporated into flood elevation modeling.

901.11 Conditions of Approval.

In approving an application for a floodplain development permit, the decision-making body may impose such conditions as it deems appropriate to ensure the intent of this section is carried out. Such conditions shall be reasonably related to the applicable criteria and standards set forth in subsections 901.08 through 901.10.

Explanation of Compliance

As noted above, federal and state wetland permits are required prior to proceeding with the project. RLC requests a condition of approval that would allow review and approval of the Floodplain Development Permit prior to receipt of the state and federal permits, i.e., that execution of the Floodplain Development Permit be conditioned on the receipt of all applicable permits prior to project implementation.

901.12 General Requirements.

Any floodplain development permit authorized pursuant to this ordinance shall be subject to the following additional requirements:

A. An authorized floodplain development permit is not personal to the applicant and shall be deemed to run with the land, provided the subsequent owner or developer adheres to the specific proposal originally approved and complies with conditions of approval.

B. A floodplain development permit involving construction shall become null and void 180 days from the date it is granted unless substantial construction has taken place. The Director may extend the permit for an additional 180 days if there have been no revisions to the FIRM or FIS, upon receipt of a written request for extension from the applicant

demonstrating good cause for the delay and provided that the request to extend the permit is received by the Director prior to the expiration date of the permit. In the event that a permit expires prior to renewal, the Director may require a new application fee. [Amended 10/17/2013; Ord.884]

C. Where base flood elevation data has been provided, as set forth in subsection 901.02 or 901.03, the actual elevation (in relation to mean sea level) of the lowest floor, including basements, of all new or substantially improved structures must be obtained from the applicant and the elevation, together with information regarding whether the structure contains a basement, must be recorded on the building permit and FEMA's current Elevation Certificate form. [Amended 10/17/2013; Ord.884]

D. For all new or substantially improved floodproofed structures, the Planning Director must verify and record the actual elevation of the structure (in relation to mean sea level) and maintain the floodproofing certifications required in subsection 901.07(C)(5).

E. All records pertaining to provisions of this section are to be maintained for public inspection.

Explanation of Compliance

A. RLC understands that an authorized floodplain development permit is not applicant-specific and shall be deemed to run with the land, provided the subsequent owner or developer adheres to the specific proposal originally approved and complies with conditions of approval.

B. RLC's proposal involves construction that is anticipated to occur over a period of time to accommodate a phased approach to the development of individual disposal cells within each module. Given the magnitude of the project, it is also likely that RLC will not necessarily begin substantial construction or complete all floodplain alterations within 180 days of permit issuance due to additional required permitting processes and the relatively short construction season that exists each year. RLC requests that the permit be issued with the understanding that substantial construction of the first disposal cell will constitute substantial construction of the entire project as proposed.

E. RLC will maintain for public inspection all records pertaining to the provisions of this section.

Provisions C and D are not applicable to this application as no new or substantially improved structures or new or substantially improved floodproofed structures are proposed.

901.13 Appeals.

Appeal of any decision made pursuant to this section shall be as provided in Section 1404 of this ordinance.

Explanation of Compliance

RLC understands and accepts the appeals process set forth in this provision.

901.14 Warning and Disclaimer of Liability.

The degree of flood protection required by this ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering methods of study. Larger floods may occur on rare occasions. Flood heights may be increased by manmade or natural causes. This section does not imply that areas outside of the FP Overlay District or uses permitted within such district will be free from flooding or flood damages. This section shall not create liability on the part of Yamhill County or any officer or employee thereof, for any flood damages that result from reliance on this Section or any decision lawfully made thereunder.

Explanation of Compliance

RLC understands and agrees with this provision.

901.15 Map Revisions.

Floodplain/floodway maps may be revised in accordance with provisions of the National Flood Insurance Program outlined in the Federal Register 44 CRF Part 70, upon approval of the Federal Emergency Management Agency.

Explanation of Compliance

RLC understands and agrees with this provision. RLC's proposal does not require the revision of any floodplain or floodway maps.

901.16 Denial of Flood Insurance Coverage.

In the event that the county finds a violation of floodplain ordinance provisions or a violation of other National Flood Insurance Program requirements, a declaration shall be submitted to the Federal Emergency Management Agency, according to the provisions of 44 CRF Part 70, notifying them of the violation(s), and resulting in the denial of floodplain insurance eligibility for the property in violation.

Explanation of Compliance

RLC understands and agrees with this provision.

901.17 Rate Criteria and Notice.

In the event that the lowest floor of proposed construction is not elevated at least two feet above the highest adjacent grade in floodplain areas where elevation data is not available, higher insurance rates may result. [Amended 2/24/2010; Ord.851]

Applicants floodproofing non-residential buildings are hereby notified that flood insurance premiums will be based on rates that are one foot below the floodproofed level.

Explanation of Compliance

This subsection is not applicable to the proposed project as no construction is proposed of the types to which this subsection applies, e.g., buildings with floors.

901.18 Floodplain Variance Criteria

A variance to this Section may be authorized, pursuant to the Type B application procedure set forth in Section 1301 and upon consideration of the factors listed in subsection 901.10. [Added 2/24/2010; Ord.851]

Explanation of Compliance

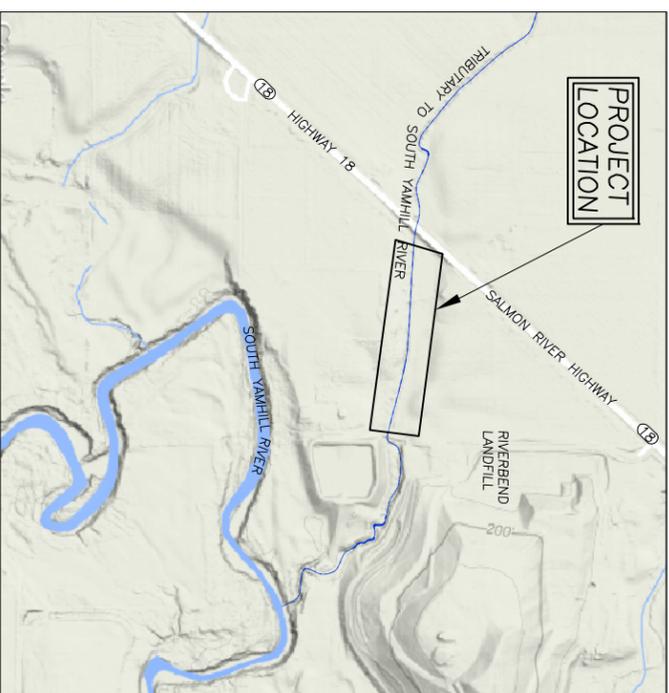
RLC proposes no variances at this time.

ATTACHMENT A-1

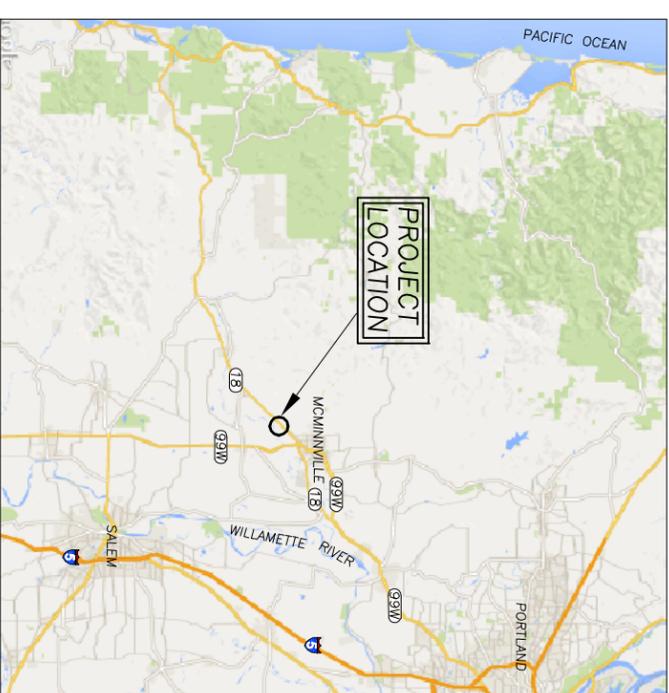
**Riverbend Landfill South Tributary
Channel and Floodplain Enhancement
30% Design Submittal**

RIVERBEND LANDFILL SOUTH TRIBUTARY CHANNEL AND FLOODPLAIN ENHANCEMENT

30% DESIGN SUBMITTAL



VICINITY MAP
N.T.S. (GOOGLE)



REGIONAL MAP
N.T.S. (GOOGLE)

SHEET INDEX

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- C2 EXISTING CONDITIONS
- C3 SITE PLAN AND PROFILE WEST
- C4 SITE PLAN AND PROFILE EAST
- C5 SECTIONS
- C6 EROSION CONTROL AND REVEGETATION PLAN
- C7 EROSION CONTROL AND REVEGETATION DETAILS

GENERAL NOTES

1. TOPOGRAPHIC MAPPING WAS PERFORMED BY: AEROMETRIC GEOSPACIAL SOLUTIONS
FLIGHT DATE: APRIL 22, 2011
SUPPLEMENTAL GROUND SURVEY BY: WATERWAYS CONSULTING, INC.
DATE: OCTOBER 9, 2014
2. ELEVATION DATUM: AN ELEVATION OF 155.78' WAS ESTABLISHED BY LELAND MACDONALD AND ASSOC., LLC AT SURVEY CONTROL POINT #139 (MAG NAIL) SHOWN ON SHIT. C2.
3. BASIS OF BEARINGS: BASIS OF BEARINGS BETWEEN POINTS #139 AND #453 IS N8°03'17.57"W, AS SHOWN ON SHIT. C2.
4. AERIAL PHOTO SOURCE: DATA COLLECTED BY OTHERS PROVIDED BY LATIMER ENVIRONMENTAL, LLC
PHOTOGRAPH DATE: MARCH 22, 2014
5. CONTOUR INTERVAL IS ONE FOOT. ELEVATIONS AND DISTANCES SHOWN ARE IN DECIMAL FEET.
6. THIS IS NOT A BOUNDARY SURVEY. PROPERTY LINES ARE NOT SHOWN HEREON.
7. ALL CONSTRUCTION AND MATERIALS SHALL CONFORM TO THE CURRENT EDITION OF THE OREGON DEPARTMENT OF TRANSPORTATION (ODOT) STANDARD SPECIFICATIONS (HEREINAFTER REFERRED TO AS "STANDARD SPECIFICATIONS").

ABBREVIATIONS

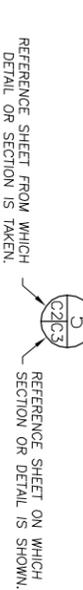
AVG.	AVERAGE
CC	CONCRETE
CY	CUBIC YARDS
DA.	DIAMETER
E.	EXISTING
E.G.	EXISTING GROUND
ELEV.	ELEVATION
ESM	ENGINEERED STREAMBED MATERIAL
D	DRAINAGE
FG	FINISHED GRADE
FT	FEET
INV	INVERT
N	NEW
N.T.S.	NOT TO SCALE
O.C.	ON CENTER
O.D.	RELATIVE COMPACTION
RSP	ROCK SLOPE PROTECTION
SPK	SPIKE
SQ.FT.	SQUARE FOOT
T	TREE
T.B.D.	TO BE DETERMINED
TYP	TYPICAL
UNK	UNKNOWN
WSE	WATER SURFACE ELEVATION
YR	YEAR

PROJECT DESCRIPTION

THESE DRAWINGS PROVIDE 30% DESIGN LEVEL DETAILS FOR THE RESTORATION OF A TRIBUTARY TO THE SOUTH YAMHILL RIVER TO MAINTAIN THE 100 YEAR FLOOD ELEVATION, STABILIZE THE CHANNEL AND IMPROVE HABITAT CONDITIONS.
WORK SHALL CONSIST OF REMOVING TWO EXISTING CULVERTS AND ROAD CROSSINGS ALONG WITH GRADING TO LOWER THE EXISTING FLOODPLAIN AND TO MEANDER THE CHANNEL.

SECTION AND DETAIL CONVENTION

SECTION OR DETAIL IDENTIFICATION
(NUMBER OR LETTER)



**RIVERBEND LANDFILL
SOUTH TRIBUTARY CHANNEL
AND FLOODPLAIN
ENHANCEMENT
30% DESIGN**

DESIGNED BY: J.D.H.
DRAWN BY: A.M.L.
CHECKED BY: M.W.W.
DATE: 11/04/14
JOB NO.: 12-017D

BAR IS ONE INCH ON ORIGINAL DRAWING ADJUST SCALES FOR REDUCED PLOTS.
0" = 1"

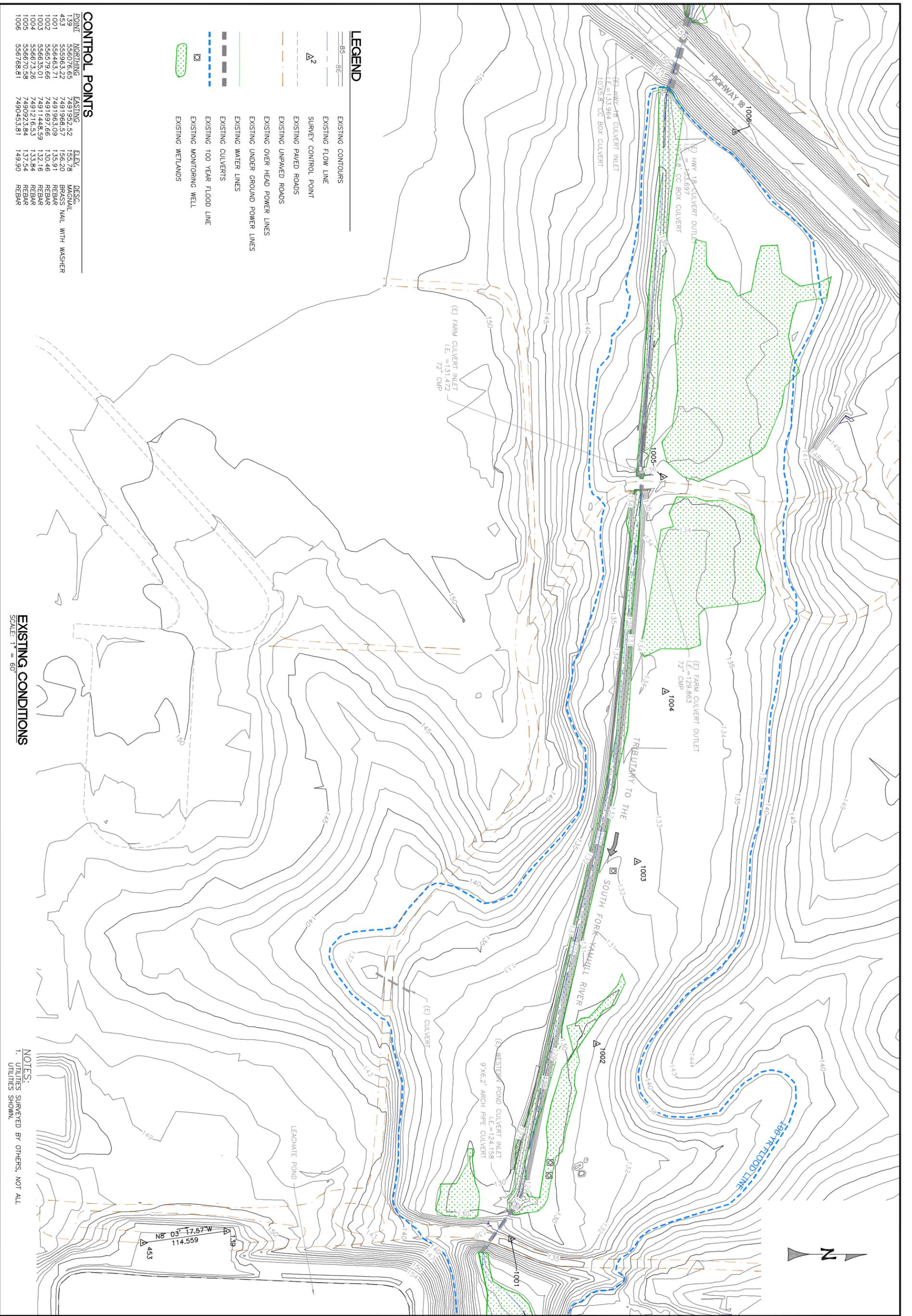
C1 OF 7

PREPARED AT THE REQUEST OF:
**RIVERBEND LANDFILL
COMPANY**

PRELIMINARY
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PORTLAND, OR 97205
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LEGEND

- 85 — 86 — EXISTING CONTOURS
- — — EXISTING FLOW LINE
- △ EXISTING SURVEY CONTROL POINT
- — — EXISTING PAVED ROADS
- — — EXISTING UNPAVED ROADS
- — — EXISTING OVER HEAD POWER LINES
- — — EXISTING UNDER GROUND POWER LINES
- — — EXISTING WATER LINES
- — — EXISTING CULVERTS
- — — EXISTING 100 YEAR FLOOD LINE
- ⊠ EXISTING MONITORING WELL
- ⊠ EXISTING WETLANDS

CONTROL POINTS

POINT	NORTHING	EASTING	ELEV.	DESC.
139	556076.65	7491952.52	155.79	MAGNAIL
453	555963.22	7491968.57	156.20	BRASS NAIL WITH WASHER
1001	556463.71	7491963.09	135.91	REBAR
1002	556579.66	7491697.66	130.46	REBAR
1003	556635.01	74911448.59	132.16	REBAR
1004	556673.26	7491216.53	133.84	REBAR
1005	556701.58	7490923.84	137.54	REBAR
1006	556768.81	7490453.81	149.90	REBAR

EXISTING CONDITIONS

SCALE: 1" = 80'

NOTES:
1. UTILITIES SURVEYED BY OTHERS, NOT ALL UTILITIES SHOWN.

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JOB NO.: 12-017D

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0 1" = 1"

**RIVERBEND LANDFILL
SOUTH TRIBUTARY CHANNEL
AND FLOODPLAIN
ENHANCEMENT
30% DESIGN**

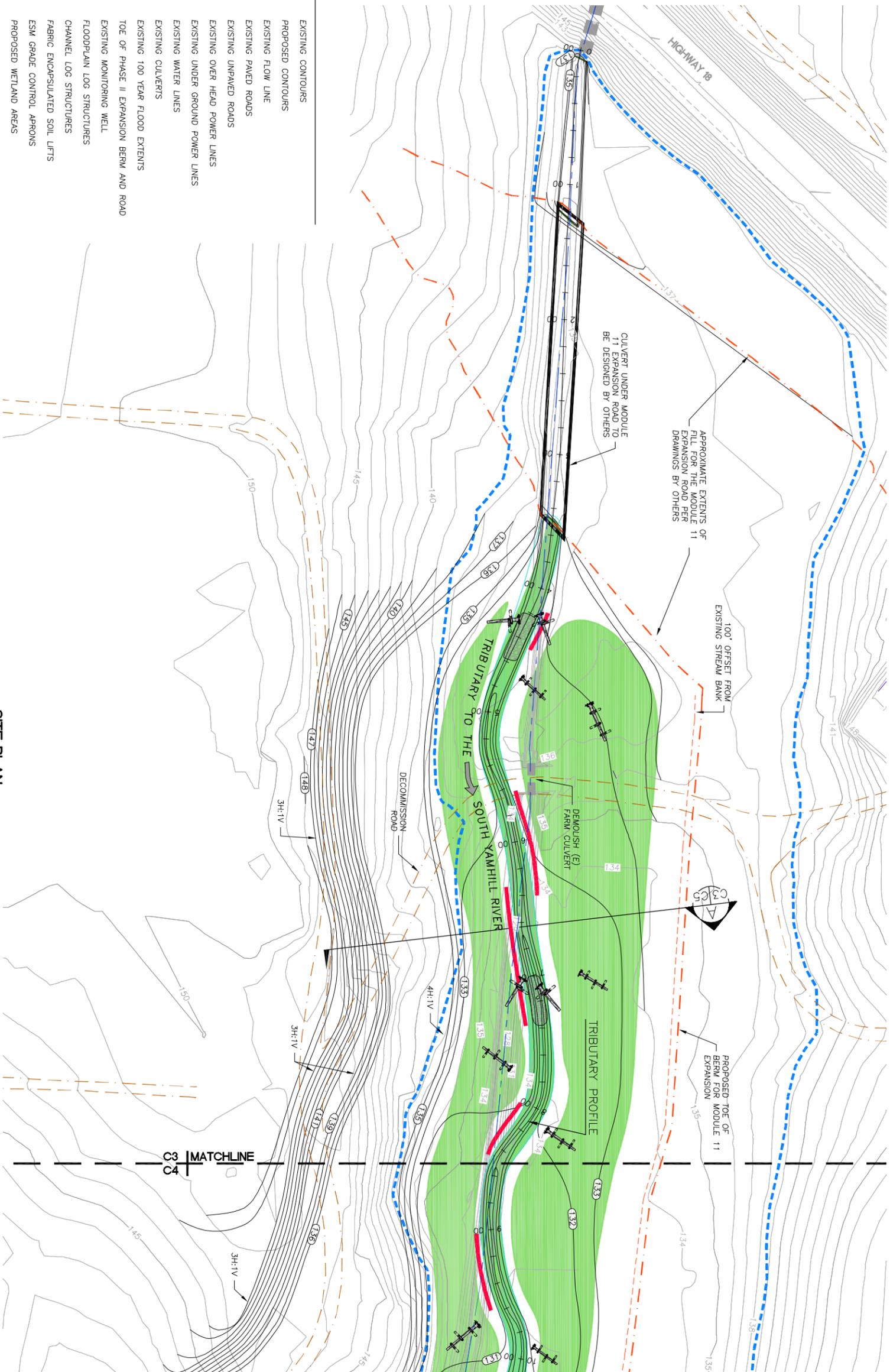
**EXISTING
CONDITIONS**

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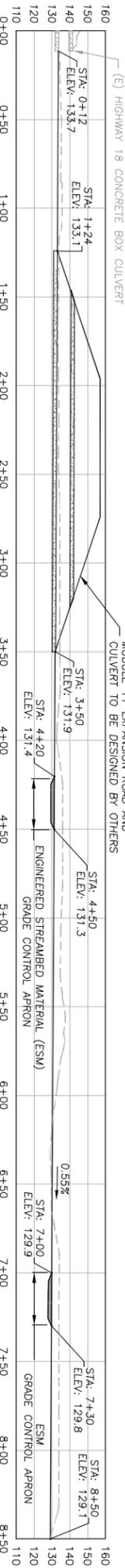
- ### LEGEND
- 85 96
100
107
 - EXISTING CONTOURS
 - PROPOSED CONTOURS
 - EXISTING FLOW LINE
 - EXISTING PAVED ROADS
 - EXISTING UNPAVED ROADS
 - EXISTING OVER HEAD POWER LINES
 - EXISTING UNDER GROUND POWER LINES
 - EXISTING WATER LINES
 - EXISTING CULVERTS
 - EXISTING 100 YEAR FLOOD EXTENTS
 - TOE OF PHASE II EXPANSION BERM AND ROAD
 - EXISTING MONITORING WELL
 - FLOODPLAIN LOG STRUCTURES
 - CHANNEL LOG STRUCTURES
 - FABRIC ENCAPSULATED SOIL LIFTS
 - ESM GRADE CONTROL APRONS
 - PROPOSED WETLAND AREAS

NOTES:
1. UTILITIES SURVEYED BY OTHERS, NOT ALL UTILITIES SHOWN.

2. GRADING SUMMARY:
TOTAL CUT VOLUME = 38,190 CY
TOTAL FILL VOLUME = 1,110 CY

THE ABOVE QUANTITIES ARE APPROXIMATE IN-PLACE VOLUMES CALCULATED AS THE DIFFERENCE BETWEEN EXISTING GROUND AND THE PROPOSED FINISH GRADE, PREPARED FOR PERMITTING PURPOSES ONLY. (DETAILED EARTHWORK QUANTITIES SHALL BE INCLUDED IN THE BID DOCUMENTS.) EXISTING GROUND IS DEFINED BY THE TOPOGRAPHIC CONTOURS AND/OR SPOT ELEVATIONS ON THE PLAN. PROPOSED FINISH GRADE IS DEFINED AS THE DESIGN SURFACE ELEVATION OF EARTH TO BE CONSTRUCTED. THE QUANTITIES HAVE NOT BEEN FACTORED TO INCLUDE ALLOWANCES FOR BULKING, CLEARING AND GRUBBING, SUBSIDENCE, SHRINKAGE, OVER EXCAVATION, AND RECOMPACTION, UNDERGROUND UTILITY AND SUBSTRUCTURE SPOILS AND CONSTRUCTION METHODS.

SITE PLAN
SCALE: 1" = 40'



TRIBUTARY PROFILE
SCALE: 1" = 40'

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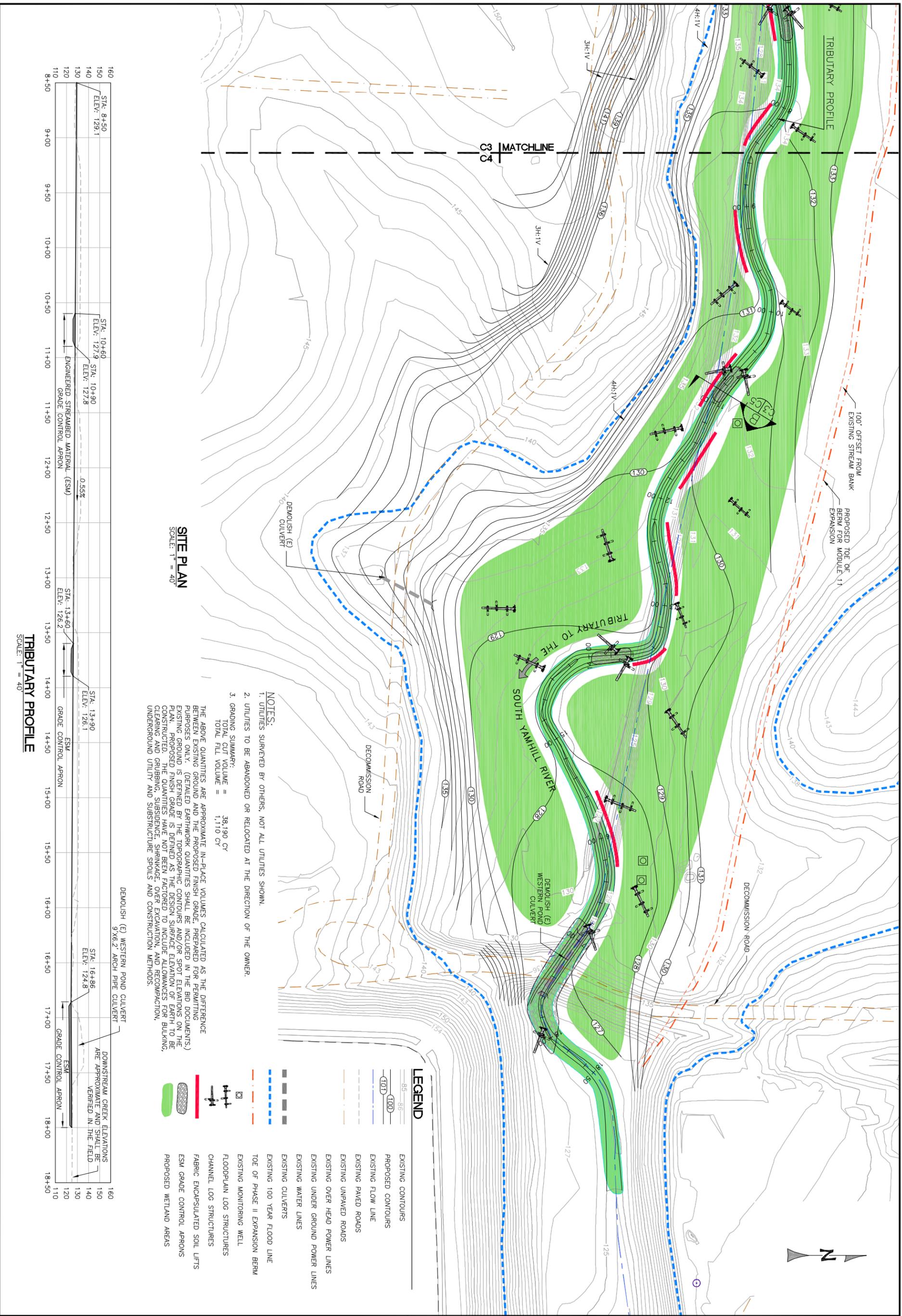
SITE PLAN AND PROFILE WEST

RIVERBEND LANDFILL SOUTH TRIBUTARY CHANNEL AND FLOODPLAIN ENHANCEMENT 30% DESIGN

DESIGNED BY: J.D.H.
DRAWN BY: A.M.L.
CHECKED BY: M.W.W.
DATE: 11/04/14
JOB NO.: 12-017D

BAR IS ONE INCH ON ORIGINAL DRAWING ADJUST SCALES FOR REDUCED PLOTS.

C3 OF 7



SITE PLAN
SCALE: 1" = 40'

NOTES:
 1. UTILITIES SURVEYED BY OTHERS, NOT ALL UTILITIES SHOWN.
 2. UTILITIES TO BE ABANDONED OR RELOCATED AT THE DIRECTION OF THE OWNER.
 3. GRADING SUMMARY:
 TOTAL CUT VOLUME = 38,190 CY
 TOTAL FILL VOLUME = 1,110 CY

THE ABOVE QUANTITIES ARE APPROXIMATE IN-PLACE VOLUMES CALCULATED AS THE DIFFERENCE BETWEEN EXISTING GROUND AND THE PROPOSED FINISH GRADE. PREPARED FOR PERMITTING PURPOSES ONLY. (DETAILED EARTHWORK QUANTITIES SHALL BE INCLUDED IN THE BID DOCUMENTS.) EXISTING GROUND IS DEFINED BY THE TOPOGRAPHIC CONTOURS AND/OR SPOT ELEVATIONS ON THE PLAN. PROPOSED FINISH GRADE IS DEFINED AS THE DESIGN SURFACE ELEVATION OF EARTH TO BE CONSTRUCTED. THE QUANTITIES HAVE NOT BEEN FACTORED TO INCLUDE ALLOWANCES FOR BULKING, CLEARING AND GRUBBING, SUBSIDENCE, SHRINKAGE OVER EXCAVATION, AND RECOMPACTION, UNDERGROUND UTILITY AND SUBSTRUCTURE SPOILS AND CONSTRUCTION METHODS.

LEGEND

- 85-86 EXISTING CONTOURS
- 100-100 PROPOSED CONTOURS
- EXISTING FLOW LINE
- EXISTING PAVED ROADS
- EXISTING UNPAVED ROADS
- EXISTING OVER HEAD POWER LINES
- EXISTING UNDER GROUND POWER LINES
- EXISTING WATER LINES
- EXISTING CULVERTS
- EXISTING 100 YEAR FLOOD LINE
- TOE OF PHASE II EXPANSION BERM
- EXISTING MONITORING WELL
- FLOODPLAIN LOG STRUCTURES
- CHANNEL LOG STRUCTURES
- FABRIC ENCAPSULATED SOIL LIFTS
- ESM GRADE CONTROL APRONS
- PROPOSED WETLAND AREAS

160	STA: 8+50	ELEV: 129.1		9+00	9+50	10+00	10+50	11+00	11+50	12+00	12+50	13+00	13+50	14+00	14+50	15+00	15+50	16+00	16+50	17+00	17+50	18+00	18+50	
150																								
140																								
130																								
120																								
110																								

TRIBUTARY PROFILE
SCALE: 1" = 40'

DEMOLISH (E) WESTERN POND CULVERT
9'x6.2' ARCH PIPE CULVERT

DOWNSTREAM CREEK ELEVATIONS
ARE APPROXIMATE AND STATIONS
VERIFIED IN THE FIELD

DESIGNED BY: J.D.H.
 DRAWN BY: A.M.L.
 CHECKED BY: M.W.W.
 DATE: 11/04/14
 JOB NO.: 12-017D

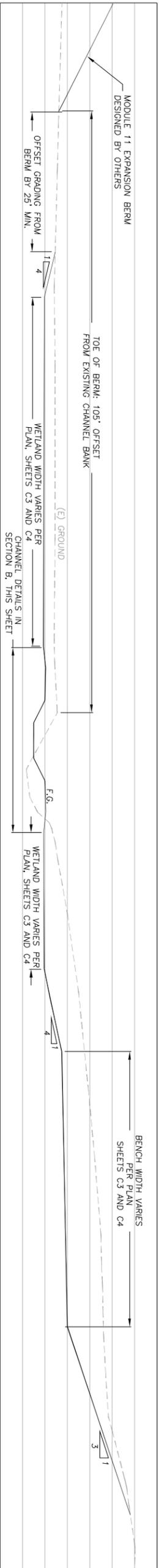
**RIVERBEND LANDFILL
 SOUTH TRIBUTARY CHANNEL
 AND FLOODPLAIN
 ENHANCEMENT
 30% DESIGN**

**SITE PLAN AND
 PROFILE EAST**

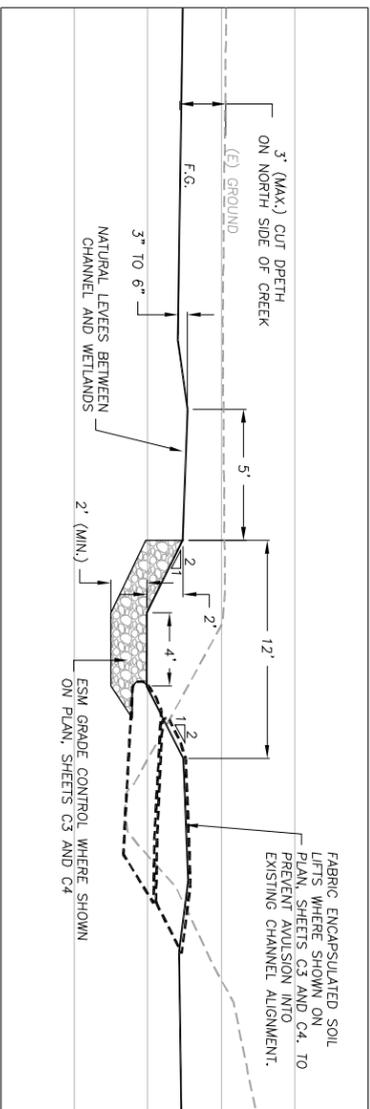
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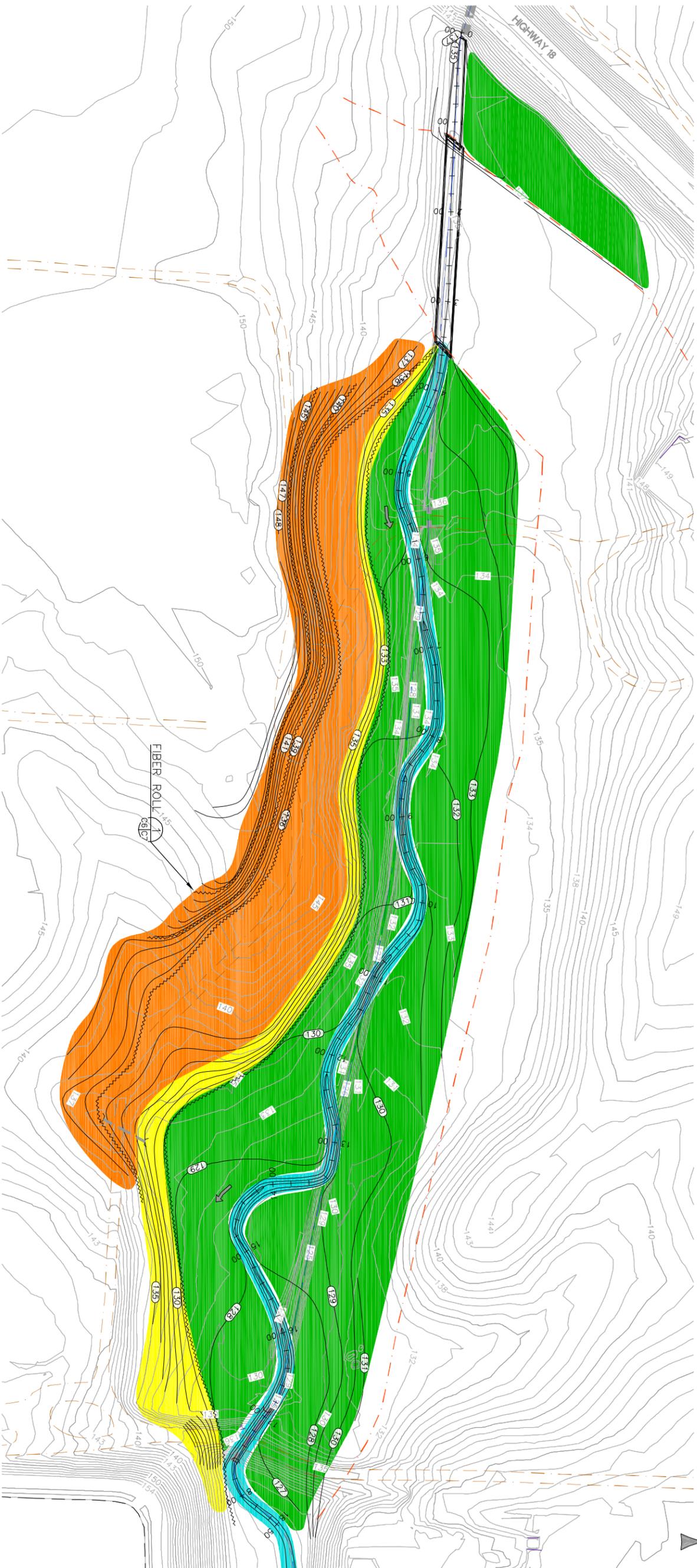
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TYPICAL SECTION OF FLOODPLAIN
SCALE: 1" = 10'



TYPICAL SECTION OF CHANNEL AND WETLANDS
SCALE: 1" = 5'



LEGEND

- 85-86
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EROSION CONTROL AND REVEGETATION PLAN

SCALE: 1" = 60'

NOTES:
 1. SEE TABLE 1 AND TABLE 2 ON SHEET C7 FOR PLANTING AND SEEDING SPECIES AND QUANTITIES ASSOCIATED WITH THE REVEGETATION ZONES.

**RIVERBEND LANDFILL
 SOUTH TRIBUTARY CHANNEL
 AND FLOODPLAIN
 ENHANCEMENT
 30% DESIGN**

**EROSION
 CONTROL AND
 REVEGETATION
 PLAN**

PREPARED AT THE REQUEST OF:
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 DATE: 11/04/14
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 BAR IS ONE INCH ON ORIGINAL DRAWING ADJUST SCALES FOR REDUCED PLOTS
 0" = 11'

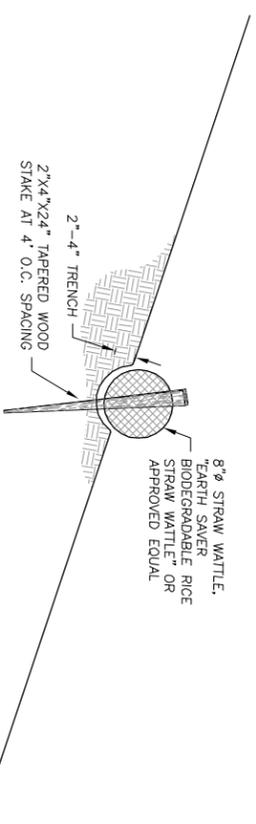
C6 OF 6
 7

TABLE 1: PLANTING LIST

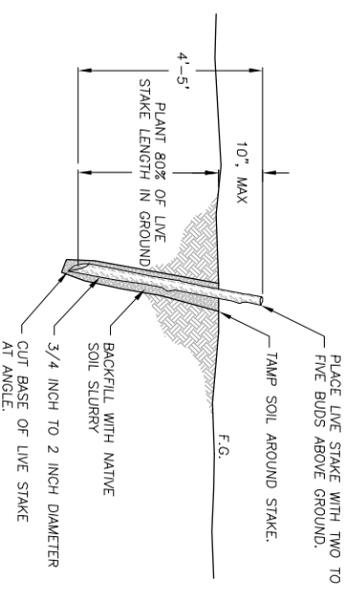
AREA A: RIPARIAN FOREST			
SCIENTIFIC NAME	COMMON NAME	SPACING (FT ON CENTER)	PROPAGATION METHOD
CORNUS STOLONIFERA	RED-OSIER DOGWOOD	4	BARE ROOT
OEMLERIA CERASIFORMIS	INDIAN PLUM	4	BARE ROOT
PHYSOCARPUS CAPITATUS	PACIFIC NINEBARK	4	BARE ROOT
SYMPHORICARPOS ALBUS	SNOWBERRY	4	BARE ROOT
RUBUS SPECTABILIS	SALMONBERRY	4	BARE ROOT
ABIES GRANDIS	GRAND FIR	6	BARE ROOT
PSEUDOTSUGA MENSIESII	DOUGLAS FIR	6	BARE ROOT
AREA B: ASH FORESTED WETLAND			
SCIENTIFIC NAME	COMMON NAME	SPACING (FT ON CENTER)	PROPAGATION METHOD
PHYSOCARPUS CAPITATUS	PACIFIC NINEBARK	4	BARE ROOT
CORNUS STOLONIFERA	RED-OSIER DOGWOOD	4	STAKES
SYMPHORICARPOS ALBUS	SNOWBERRY	4	BARE ROOT
FRAXINUS LATIFOLIA	OREGON ASH	6	BARE ROOT
SPIRAEA DOUGLASSII	DOUGLAS SPIRAEA	4	BARE ROOT
AREA C: SCRUB / SHRUB WETLAND			
SCIENTIFIC NAME	COMMON NAME	SPACING (FT ON CENTER)	PROPAGATION METHOD
SAUX SCOULERANA	SCOULER WILLOW	4	BARE ROOT
CORNUS STOLONIFERA	RED-OSIER DOGWOOD	4	STAKES
SPIRAEA DOUGLASSII	DOUGLAS SPIRAEA	4	BARE ROOT
SAUX LASANDRA	PACIFIC WILLOW	6	STAKES
SAUX SITCHENSIS	SITKA WILLOW	6	STAKES

TABLE 2: SEEDING LIST

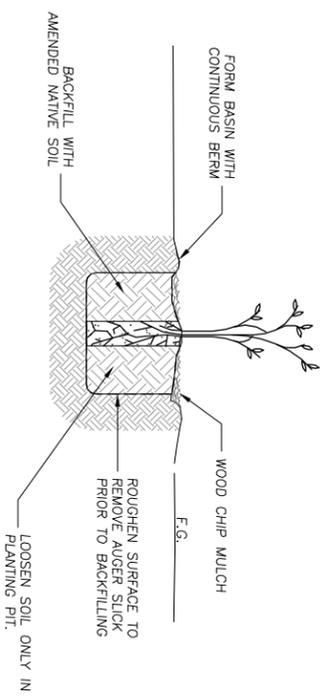
AREA A & AREA C			
SUNMARK NATIVE EROSION CONTROL MIX (1 LB./1000 SQ FT)			
SCIENTIFIC NAME	COMMON NAME	% BY WEIGHT	
HORDEUM BRACHYANTHERUM	MEADOW BARLEY	40%	
BROMUS CARINATUS	CALIFORNIA BROME	35%	
FESTUCA RUBRA RUBRA	NATIVE RED FESCUE	20%	
DESCHAMPSIA CESPIIOSA	TUFTED HAIRGRASS	3%	
AGROSTIS EXERATA	SPIKE BENTGRASS	2%	
AREA B			
SUNMARK NATIVE WETLAND MIX (1 LB./1000 SQ FT)			
SCIENTIFIC NAME	COMMON NAME	% BY WEIGHT	
HORDEUM BRACHYANTHERUM	MEADOW BARLEY	35%	
GLYCERIA ACCIDENTALLIS	NORTHWESTERN MANNAGRASS	20%	
FESTUCA RUBRA RUBRA	NATIVE RED FESCUE	20%	
ALOPECURUS GENICAULTIUS	WATER FOXTAIL	13%	
ELEOCHARIS PALUSTRIS	COMMON SPIKERUSH	5%	
BECKMANNIA SYZIGANCHE	AMERICAN SLOUGHGRASS	4%	
DESCHAMPSIA CAESPITOSA	TUFTED HAIRGRASS	2.50%	
AGROSTIS EXARATA	SPIKE BENTGRASS	0.50%	



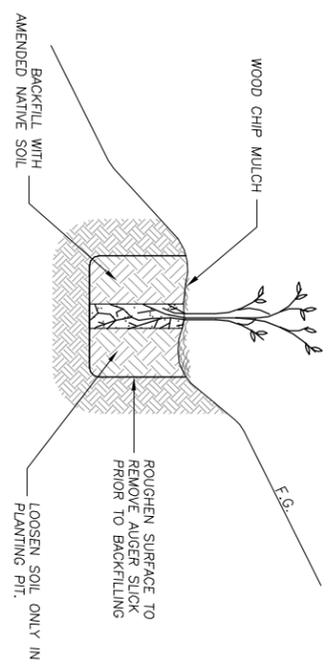
FIBER ROLL
SCALE: 1"=1'



LIVE STAKE
N.T.S.



BARE ROOT PLANTING
SCALE: N.T.S.



BARE ROOT PLANTING ON SLOPES
SCALE: N.T.S.

ATTACHMENT A-2

**Riverbend Landfill South Tributary
Channel and Floodplain Enhancement
Preliminary Design Memorandum**



Ecological Restoration Design ~ Civil Engineering ~ Natural Resource Management

PRELIMINARY DESIGN MEMORANDUM

To: Shane Latimer, Latimer Environmental, LLC.

From: Waterways Consulting, Inc.

Date: November 4, 2014

Re: Riverbend Landfill South Tributary Channel and Floodplain Enhancement — Preliminary Design Memorandum

Introduction

Riverbend Landfill Company (RLC) is currently in the process of planning the expansion of its landfill located off of Highway 18 southwest of McMinnville, Oregon. RLC is constructing a berm to accommodate expansion of Module 11 that impinges on the South Yamhill River floodplain and on the riparian corridor of a small, intermittent tributary that is conveyed under Highway 18. Some existing wetlands are also impacted. To compensate for these impacts, RLC has asked Waterways Consulting, Inc. (Waterways) to evaluate the portion of the tributary channel from Highway 18 downstream to culvert crossing at the West Pond Access Culvert, hereafter referred to as “the site,” and develop a restoration and enhancement plan.

The objectives of the site enhancement plan include the following:

1. Restore a more natural meander pattern to the channel,
2. Improve connectivity between the channel and the adjacent floodplain,
3. Increase the functions and values of adjacent off-channel wetlands, and
4. Restore riparian corridor vegetation to a more natural state.

Existing Site Conditions

The South Tributary channel consists of a low gradient, intermittent stream channel that is incised into a relatively wide, flat floodplain that occurs along the north side of the channel along the entire project reach. The channel enters the site from a culvert under Highway 18. Two additional culverts occur within the project site: One at an agricultural, low-water crossing and one for the western leachate pond access road. Aerial photos obtained from 1936, 1966, and 1977 shows that historically the channel meandered across the wide floodplain. Sometime between 1936 and 1966 the channel was ditched and straightened along the southern edge of the floodplain, likely to drain and farm floodplain wetlands.

The site is not currently in agricultural use. Much of the flatter floodplain area is dominated by reed canary grass and of relatively low function and value. A total of 2.45 acres of wetlands currently occur within the site. Existing riparian areas include a variety of native riparian trees and shrubs with significant undergrowth of Himalayan blackberry. Some upland areas consist of an abandoned orchard.

Due to the straightened condition of the channel, channel morphology through the entire reach was fairly uniform. A bankfull channel with a top width of 7-8 feet and a depth of 2 feet was clearly evident within the larger incised channel. Overall channel dimensions consist of a top width of around 15 feet

and a channel depth of 4-5 feet. The stream bank on the south bank was higher than on the north bank by several feet, supporting the idea that the channel was likely realigned near the south edge of the floodplain to maximize farming opportunities to the north.

Site hydrology was characterized using USGS StreamStats web-based Geographic Information System¹, which estimates flows using regional regression equations. This method was used because the South Tributary lacks any historic gage data or discharge records that would allow for a statistical summary. Estimated peak flows are summarized in Table 1. However, these estimates do not consider that the site is entirely within the backwater flood effect of the South Yamhill River: At flows on the South Yamhill greater than the 2 year event, the site is completely inundated by South Yamhill flood flows, creating a low velocity, backwater condition. The 100-year event on the South Yamhill results in site water depths on the order of 10 feet.

Table 1: Peak flows for the South Tributary (StreamStats 2014).

Return Period	Flow (cfs)
2-Year	89
5-Year	132
10-Year	162
25-Year	201
50-Year	230
100-Year	259
500-Year	328

Proposed Design Approach

Site conditions provide opportunities to greatly enhance channel and wetland function at the site and significantly improve aquatic and wetland habitat. Enhancement opportunities identified during the field evaluation and overall site assessment includes the following:

1. Remove the two existing culverts and associated approach roads within the project area, thereby removing fish passage and hydraulic barriers. The culverts may have also historically contributed to downstream incision by focusing flow and limiting floodplain connectivity.
2. Reconnect the channel to the adjacent, intact floodplain areas by lowering the floodplain by several feet.
3. Restore a geomorphically appropriate bankfull channel and increase the sinuosity by reconstructing the channel in the restored floodplain area.

¹ Cooper, R.M., 2005. Estimation of Peak Discharges for Rural, Unregulated Streams in Western Oregon: U.S. Geological Survey Scientific Investigation Report 2005-5116.

4. Enhance floodplain wetlands by removing non-native, invasive species such as reed canary grass and Himalayan blackberry and replacing with appropriate and diverse wetland species.

The proposed preliminary project design, included as Attachment A, incorporates all of the enhancement opportunities identified during the site evaluation. The existing channel is realigned to mimic a more natural meander pattern and is pulled away, where feasible, from the south margin of the floodplain. The floodplain on the north side is lowered 2-3 feet to allow for overtopping of the channel into floodplain wetlands. Large wood is added to the channel and floodplain to improve habitat conditions and create diversity in flow path conditions when water accesses the floodplain. A comprehensive riparian and wetland revegetation plan is proposed to greatly improve the quality and function of the riparian corridor. A total of 3.79 acres of wetlands are created or enhanced through the project reach.

The most significant benefit of the proposed enhancements at the site is the creation of an appropriately-sized channel that will overtop its banks frequently and inundate adjacent floodplain areas. Under existing conditions, the floodplain is only inundated when the South Yamhill floods and backwaters the site. The result is a completely depositional environment that lacks the processes and range of sediment sizes that are necessary to create a diversity of landforms on the floodplain. Although historically the floodplain areas were frequently backwatered by the South Yamhill, high flow on the South Tributary also inundated the floodplain, delivering coarser-grained sediments and allowing for localized scour and deposition that was non-uniform throughout the floodplain. By reconnecting the channel to the floodplain, those processes will be restored, creating a more diverse mosaic of wetland types.

Although considerable detail still needs to be integrated into the design for the site, the proposed concept is considered feasible, will meet the project objectives, and is constructible. Several specifics of the design that will be included in the next phase of design include the following:

- **New Channel Construction:** Although the new channel will be constructed into cohesive soils, the raw condition following construction will likely require aggressive treatments to resist erosion until vegetation becomes established. Where the new channel intersects the existing channel we have proposed constructing new fill banks using fabric encapsulated soil lifts.
- **Floodplain Erosion Protection:** To minimize risk of post-construction floodplain erosion, we have proposed two key project elements. The first is to bury wood in the floodplain such that a small portion of the wood would stick up above the finished grade and deflect concentrated flow laterally to limit localized channels from forming. The second is to utilize a temporary overhead watering system to facilitate rapid establishment of native shrub, trees and erosion control seed mix. The watering system will be installed immediately following construction in early summer, allowing three months prior to the onset of heavy rains and plant dormancy.
- **Channel Profile Stability:** To protect against channel incision and provide long-term grade control through the project reach, cobble blankets will be placed along the channel and up the banks every 300 feet. Additionally, large wood will be installed at the upstream end of each of the cobble blanket sections. These structures were designed to provide instream cover for fish as well as a stable location for beaver to construct their dams. Small beaver dams were observed throughout the site during the assessment. Encouraging beaver to establish dams in

these locations will protect against downstream bed scour while encouraging more frequent access to the floodplain which will enhance the value of the adjacent wetlands.

Summary

The proposed enhancement plan for the site presents an excellent opportunity to restore stream, wetland, and riparian function and protect an ecosystem that has been significantly impacted by past land use activities. By removing hydraulic barriers and restoring floodplain connectivity the functions and values of the site both as a tributary and backwater forested floodplain habitat to the South Yamhill River will be greatly enhanced. Although additional details will need to be incorporated into the restoration plan as the engineering design process proceeds, all of the restoration elements proposed in the preliminary drawings are feasible and constructible.

ATTACHMENT B

Preliminary Hydraulic Report for Riverbend Landfill

PRELIMINARY HYDRAULIC REPORT FOR RIVERBEND EXPANSION - MODULES 10 AND 11, RIVERBEND LANDFILL COMPANY



prepared for

Latimer Environmental LLC

prepared by

Brian Smith, C.E.



November 5, 2014

1	INTRODUCTION	2
2	PEAK FLOW HYDROLOGY	2
3	PEAK FLOW HYDRAULICS	3
	METHODS.....	3
	RESULTS.....	4
4	REFERENCES.....	5

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Table 1: Summary of 100-Year peak flow hydraulics

List of Figures

Figure 1: Project Vicinity Map

Figure 2: Riverbend Landfill Site Plan and 100-year Flood Boundaries

Figure 3: 100-year Water Surface and Velocity Profiles for the Northern Tributary

Figure 4: 100-year Water Surface and Velocity Profiles for the Southern Tributary

Figure 5: 100-year Water Surface and Velocity Profiles for the South Yamhill River

List of Attachments

Attachment A - Flood Insurance Rate Maps

Attachment B - Hydrologic Calculations

Attachment C - HEC-RAS Model Output

1 INTRODUCTION

Waterways Consulting Inc. (Waterways) has been retained by Latimer Environmental, LLC (LE) to conduct a hydraulic evaluation of the proposed buildout conditions of the Riverbend Landfill – Modules 10 and 11, Riverbend Landfill Company (Project) and a channel and floodplain enhancement plan developed for the southern tributary channel located to the south of the landfill.

The landfill is located in Yamhill County adjacent to the South Yamhill River, approximately three miles southwest of McMinnville (Figure 1). Landfill operation facilities are located on the northern side of the South Yamhill River and bounded by two tributaries to the north and south that originate to the west of Highway 18 (Figure 2).

The landfill is proposing to expand operations by constructing berms along the northern, southwestern, and southern portion of the landfill and build an access ramp across the southern tributary. The access ramp will include a stream crossing structure designed to meet fish passage criteria established by the Oregon Department of Fish and Wildlife (ODFW). The Federal Emergency Management Agency (FEMA) has mapped a portion of the proposed landfill expansion areas within the Special Flood Hazard Area (SFHA) (Attachment A).

The following report has been prepared to support a No-Rise certification and presents our hydraulic analysis of existing and proposed conditions and provides recommendations for design of the crossing structure.

2 PEAK FLOW HYDROLOGY

Peak discharges for the South Yamhill River were obtained from the FEMA Flood Insurance Study (FIS) for Yamhill County, Oregon (Unincorporated Areas), dated March 2, 2010. Peak discharges for the tributary channels to the north and the south of the landfill were developed using USGS regional regression equations (Cooper, 2005). Parameters used in the equations include drainage area and the 2-yr 24-hour precipitation. These parameters were estimated using StreamStats (USGS, 2012), a web-based geographic information system application that provides an interactive map for calculating basin characteristics and peak flow hydrology.

Our analysis used a 100-year peak flow values of 50,000 cfs for the South Yamhill River, 277 cfs for the southern tributary, and 298 cfs in the northern tributary.

3 PEAK FLOW HYDRAULICS

METHODS

Hydraulic modeling was conducted using HEC-RAS version 4.1 river analysis software developed by the United States Army Corps of Engineers (USACE, 2010). An existing conditions (Duplicate Effective) hydraulic model used to prepare a Letter of Map Revision (FEMA Case No. 12-10-1146P) for the South Yamhill River was provided by LE. The LOMR was approved by FEMA with an effective date of May 9, 2013. The duplicate effective model geometry was developed using aerial topographic mapping prepared by Aerometric Geospatial Solutions and dated April 22, 2011. The hydraulic models, topographic mapping, and resulting water surface elevations are referenced to the NAVD88 vertical datum.

Waterways prepared an existing conditions (Corrected Effective) model by revising the duplicate effective model to include the northern and southern tributaries as separate reaches. Fifteen (15) cross sections were used to delineate these tributary channels between the confluence with the South Yamhill River and the Highway 18 crossings (Figure 2). The three culverted crossings along the southern tributary were assumed to be blocked for this hydraulic analysis and were not included in the model as crossing structures. Two additional cross sections on the South Yamhill River were added to the corrected effective model that were not present in the duplicate effective model. These sections were added to correctly model the tributaries and their junctions in the HEC-RAS analysis.

The proposed conditions model was created by updating cross section geometry to depict the Project conditions and a channel and floodplain enhancement plan located on the southern tributary channel. Proposed conditions geometry for the Project was based on a Preliminary Grading Plan prepared by Geosyntec Consultants, Inc. and provided by LE on November 1, 2014. Proposed conditions geometry for the channel and floodplain enhancement on the southern tributary was based on the Riverbend Landfill South Tributary Channel and Floodplain Enhancement Plan prepared by Waterways Consulting Inc. and dated November 3, 2014. A bottomless arch or box culvert was selected as the preferred crossing structure at the access ramp and was used in the proposed conditions modeling.

The models cover approximately 2.9 miles of the South Yamhill River and 1.4 miles of tributary channels from their confluence to the Highway 18 crossings. The existing and proposed conditions roughness values within the tributary channel are set to 0.05 for the channel and 0.1 for the overbank areas. The roughness values for the South Yamhill River were not changed from the LOMR analysis and ranged from 0.05 to 0.12 for the channel and from 0.035 to 0.1 for the overbank areas.

The downstream boundary condition for the South Yamhill River was set to a known water surface elevation corresponding to the FEMA Flood Insurance Rate Map Base Flood Elevation listed at Cross Section AE.

RESULTS

The proposed conditions modeling predicts no rise in water surface elevations or average channel velocities relative to existing conditions (Figures 3, 4, and 5). Water surface elevations on each of the tributaries during the 100-yr flood are largely controlled by backwatering from the South Yamhill River. A proposed 16 foot span x 8 foot rise box culvert below the ramp on the southern tributary would result in no rise to the 100-yr water surface elevation relative to existing conditions. Smaller structures resulted in minor increases to the 100-yr flood profile upstream of the crossing. Fish passage design criteria for road crossings presented by ODFW typically require a structure that has a minimum span of at least the active stream channel width or the width that occurs annually at ordinary high water. Channel measurements upstream of the highway 18 crossing indicate that a 12-foot span culvert would satisfy the ODFW design criteria.

Table 1 presents the 100-year water surface elevations for selected cross sections. Complete hydraulic results are presented in Attachment C.

Table 1. Summary of 100-Year Peak Flow Hydraulics				
100-Year Water Surface Elevation (ft)				
Section ID (River Station)	Location	Existing Conditions	Proposed Conditions	Difference
22.15	S. Yamhill	140.23	140.23	0.00
20.28	S. Yamhill	138.80	138.80	0.00
4449.22	N. Tributary	138.32	138.32	0.00
3365	S. Tributary	139.54	139.54	0.00
2865	S. Tributary	139.50	139.48	-0.02

Figure 2 depicts the 100-year flood boundary for existing and proposed conditions. The 100-year flood inundation area would be increased near the proposed channel and floodplain enhancement area but remains virtually identical in other areas. Flood inundation areas on the tributaries are due to backwatering from the South Yamhill River.

4 REFERENCES

Cooper, R.M., 2005. Estimation of Peak Discharges for Rural, Unregulated Streams in Western Oregon: U.S. Geological Survey Scientific Investigation Report 2005-5116.

Federal Emergency Management Agency. 2010. Flood Insurance Study (FIS) for Yamhill County, Oregon and Unincorporated Areas. March 2, 2010.

U.S. Army Corps of Engineers. 2010, Hydrologic Engineering Center. Computer Program HEC-RAS Version 4.1. Davis, California.

U.S. Army Corps of Engineers. 2010, Hydrologic Engineering Center. Hydraulic Reference Manual. Version 4.1. Davis, California.

U.S. Geologic Survey , 2012, The StreamStats program, online at <http://streamstats.usgs.gov>

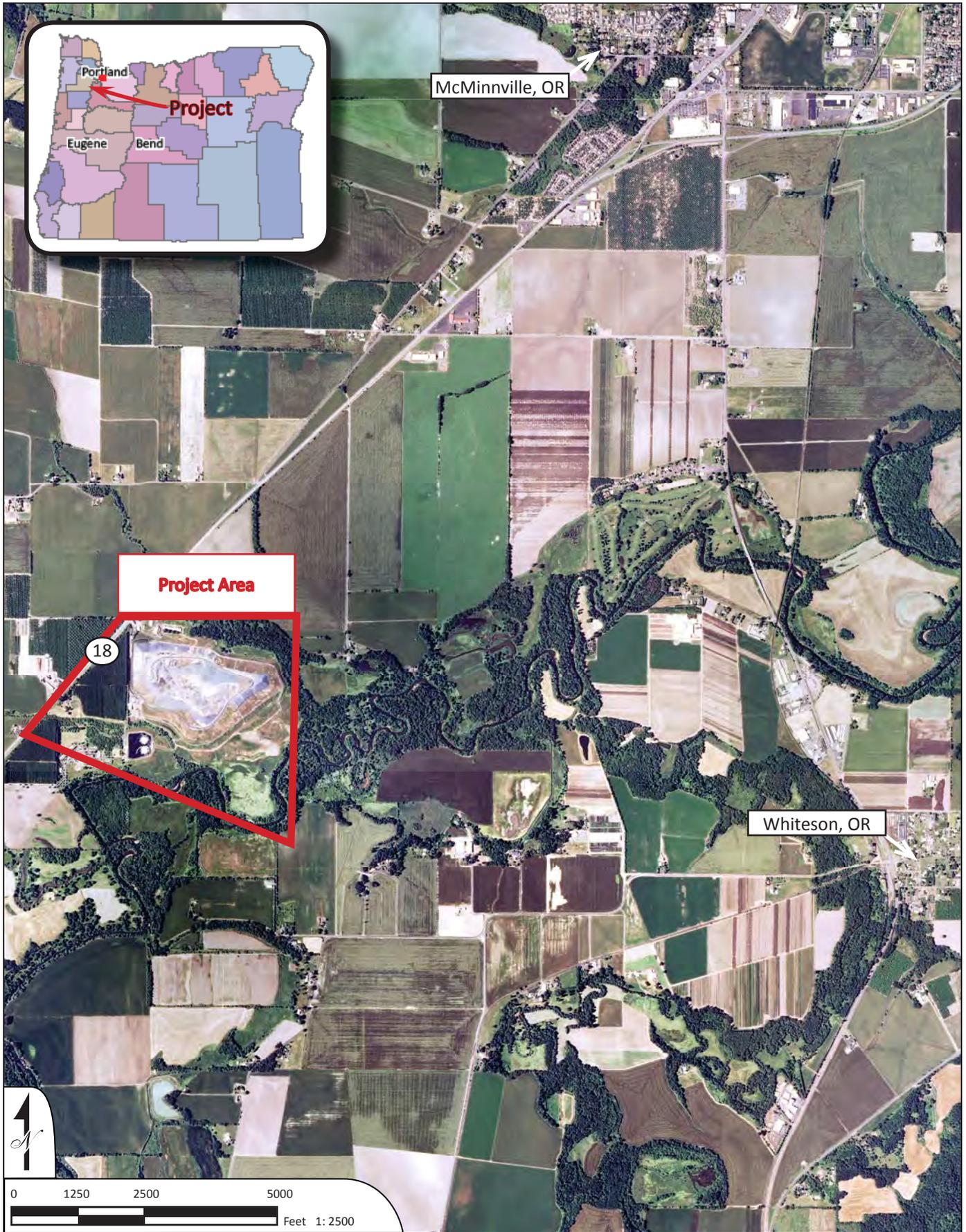
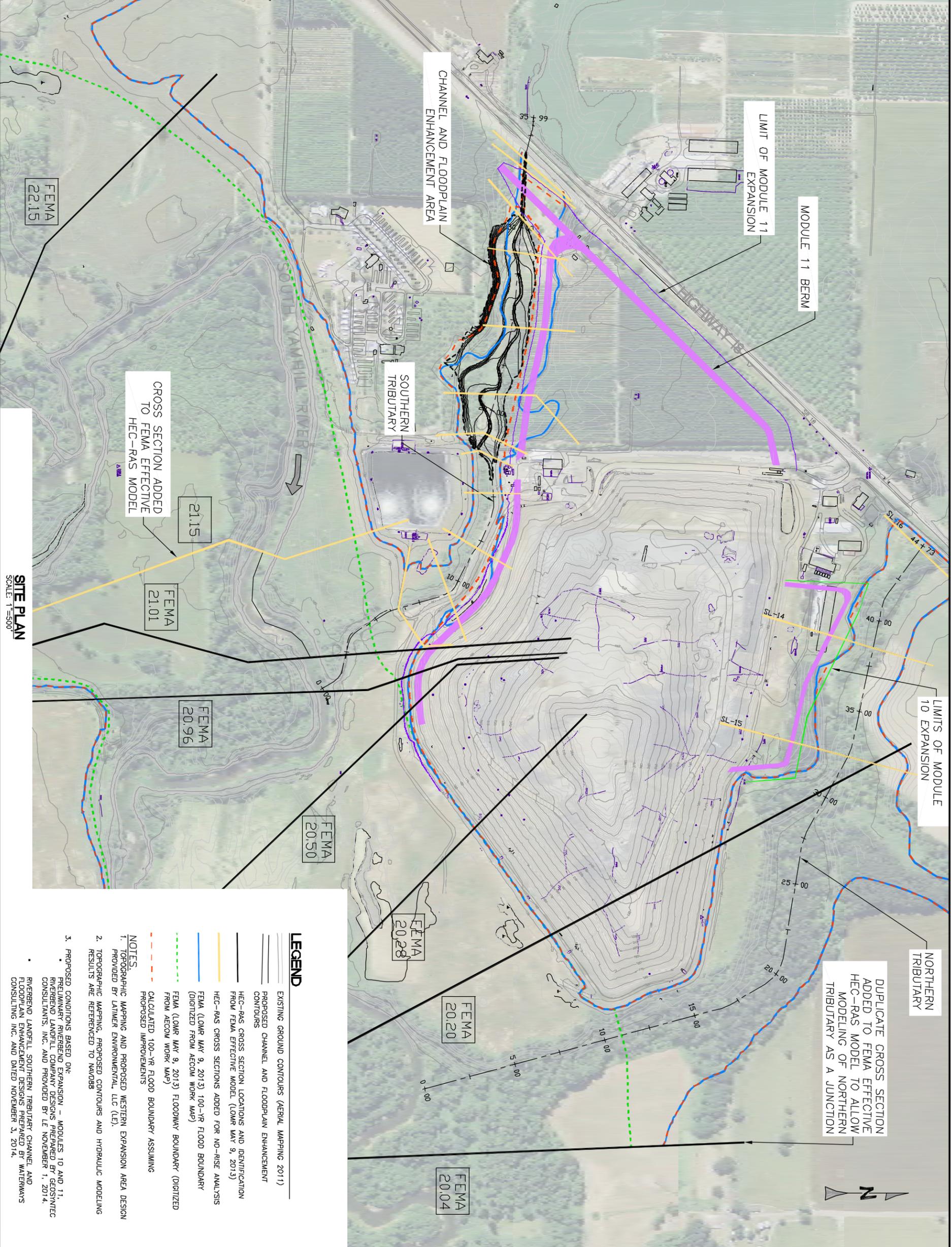


FIGURE 1

Project location for the Riverbend Landfill, located on the South Yamhill River, west of Whiteson, Oregon.



SITE PLAN
SCALE: 1"=500'

LEGEND

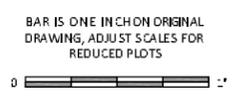
- EXISTING GROUND CONTOURS (AERIAL MAPPING 2011)
- PROPOSED CHANNEL AND FLOODPLAIN ENHANCEMENT CONTOURS
- HEC-RAS CROSS SECTION LOCATIONS AND IDENTIFICATION FROM FEMA EFFECTIVE MODEL (LOMR MAY 9, 2013)
- HEC-RAS CROSS SECTIONS ADDED FOR NO-RISE ANALYSIS (LOMR MAY 9, 2013) 100-YR FLOOD BOUNDARY (DIGITIZED FROM AECOM WORK MAP)
- FEMA (LOMR MAY 9, 2013) FLOODWAY BOUNDARY (DIGITIZED FROM AECOM WORK MAP)
- CALCULATED 100-YR FLOOD BOUNDARY ASSUMING PROPOSED IMPROVEMENTS

NOTES:

1. TOPOGRAPHIC MAPPING AND PROPOSED WESTERN EXPANSION AREA DESIGN PROVIDED BY LATIMER ENVIRONMENTAL, LLC (LE).
2. TOPOGRAPHIC MAPPING, PROPOSED CONTOURS AND HYDRAULIC MODELING RESULTS ARE REFERENCED TO NAD88.
3. PROPOSED CONDITIONS BASED ON:
 - PRELIMINARY RIVERBEND EXPANSION - MODULES 10 AND 11, RIVERBEND LANDFILL COMPANY DESIGNS PREPARED BY GEOSTITEC CONSULTANTS, INC. AND PROVIDED BY LE NOVEMBER 1, 2014.
 - RIVERBEND LANDFILL SOUTHERN TRIBUTARY CHANNEL AND FLOODPLAIN ENHANCEMENT DESIGNS PREPARED BY WATERWAYS CONSULTING INC. AND DATED NOVEMBER 3, 2014.

RIVERBEND LANDFILL SITE PLAN AND 100-YR FLOOD BOUNDARIES

DATE: 10/27/14



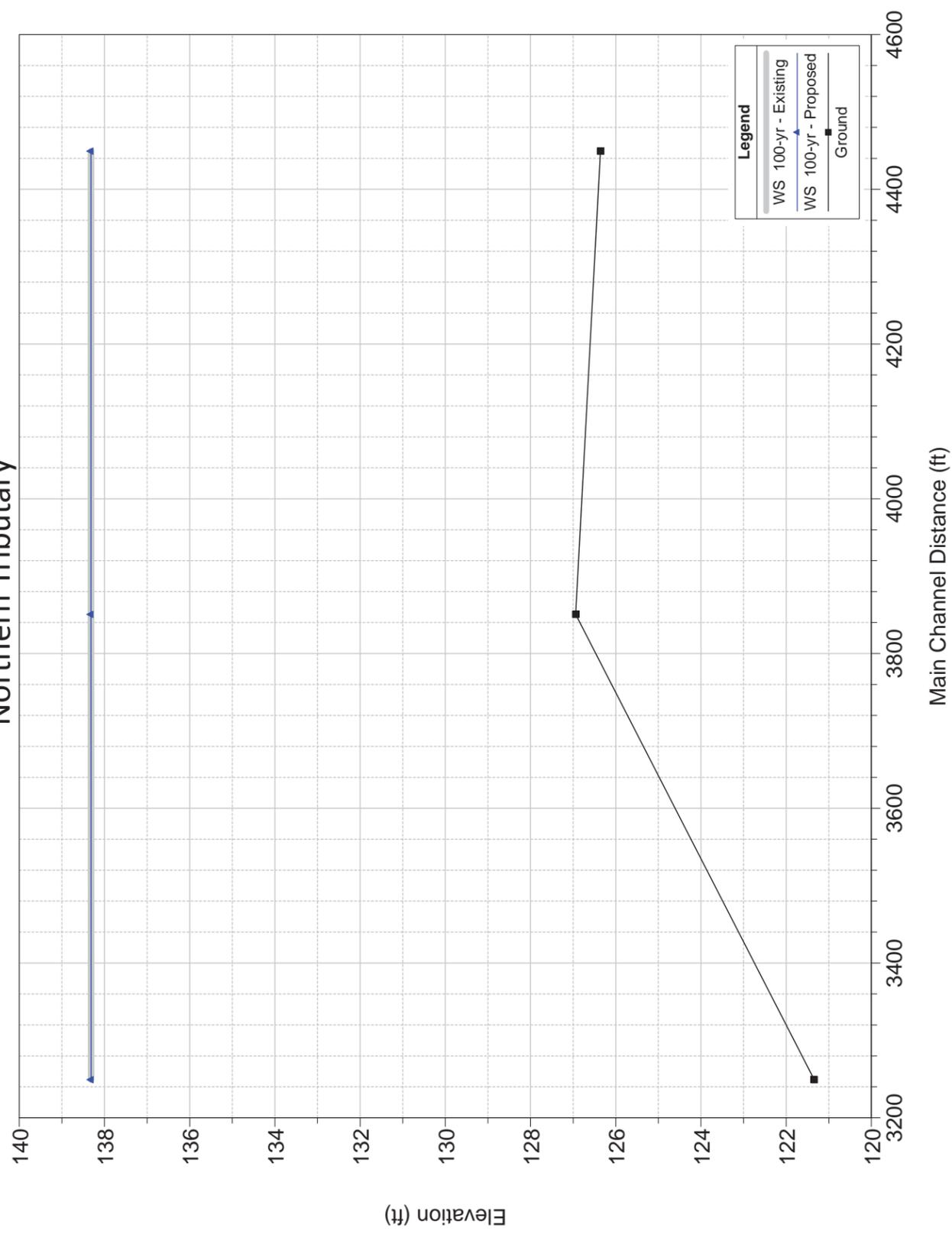
FIGURE

2

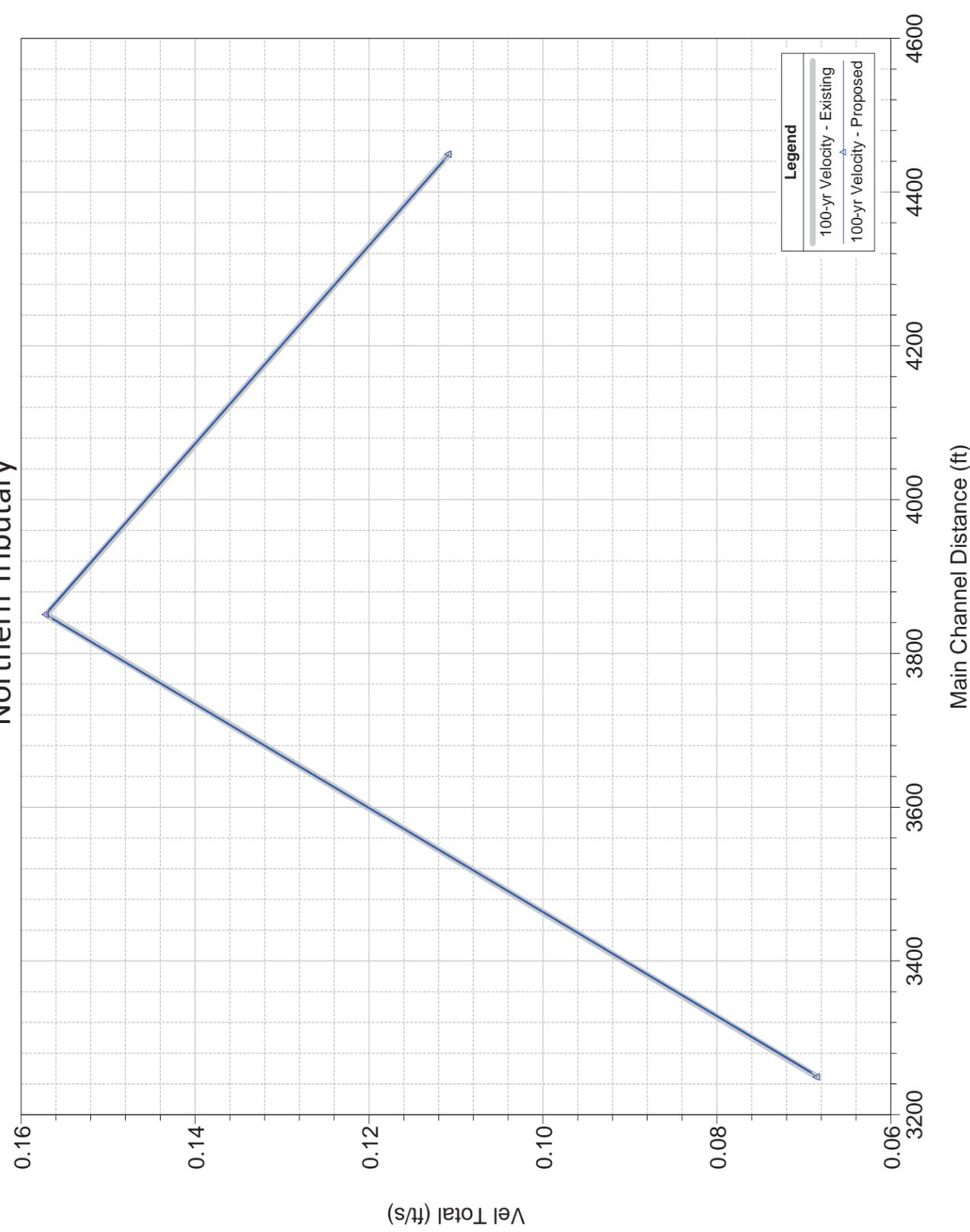
RIVERBEND LANDFILL
McMINNVILLE, OREGON

WATERWAYS
CONSULTING INC.
Santa Cruz, CA waterways.com Portland, OR

100-Year Water Surface Profile Northern Tributary



100-Year Velocity Profile Northern Tributary

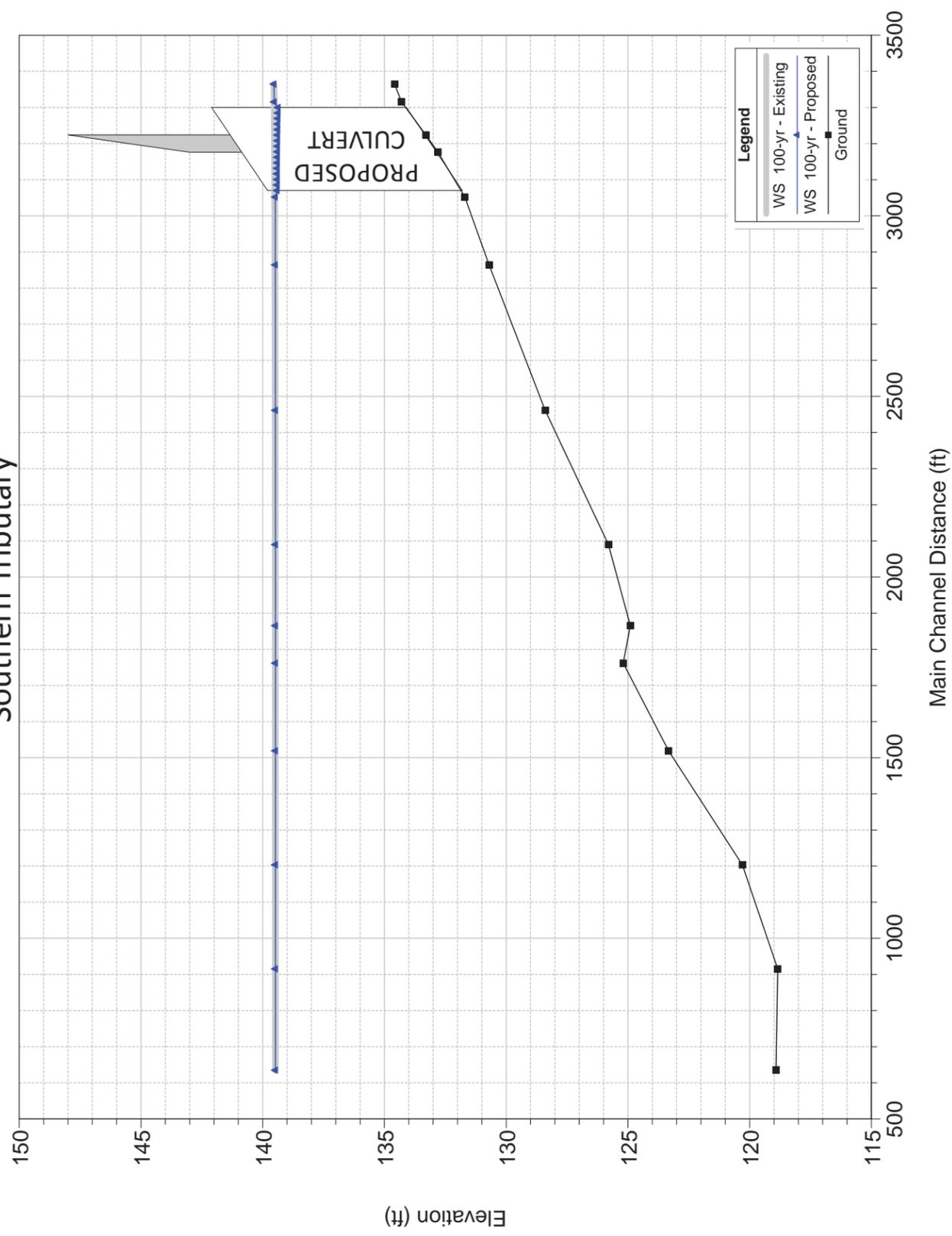


100-year water surface and velocity profiles for existing and proposed conditions on the Northern Tributary. Water surface elevations are controlled by backwatering of the South Yamhill River and are not affected by proposed Landfill Buildout conditions.

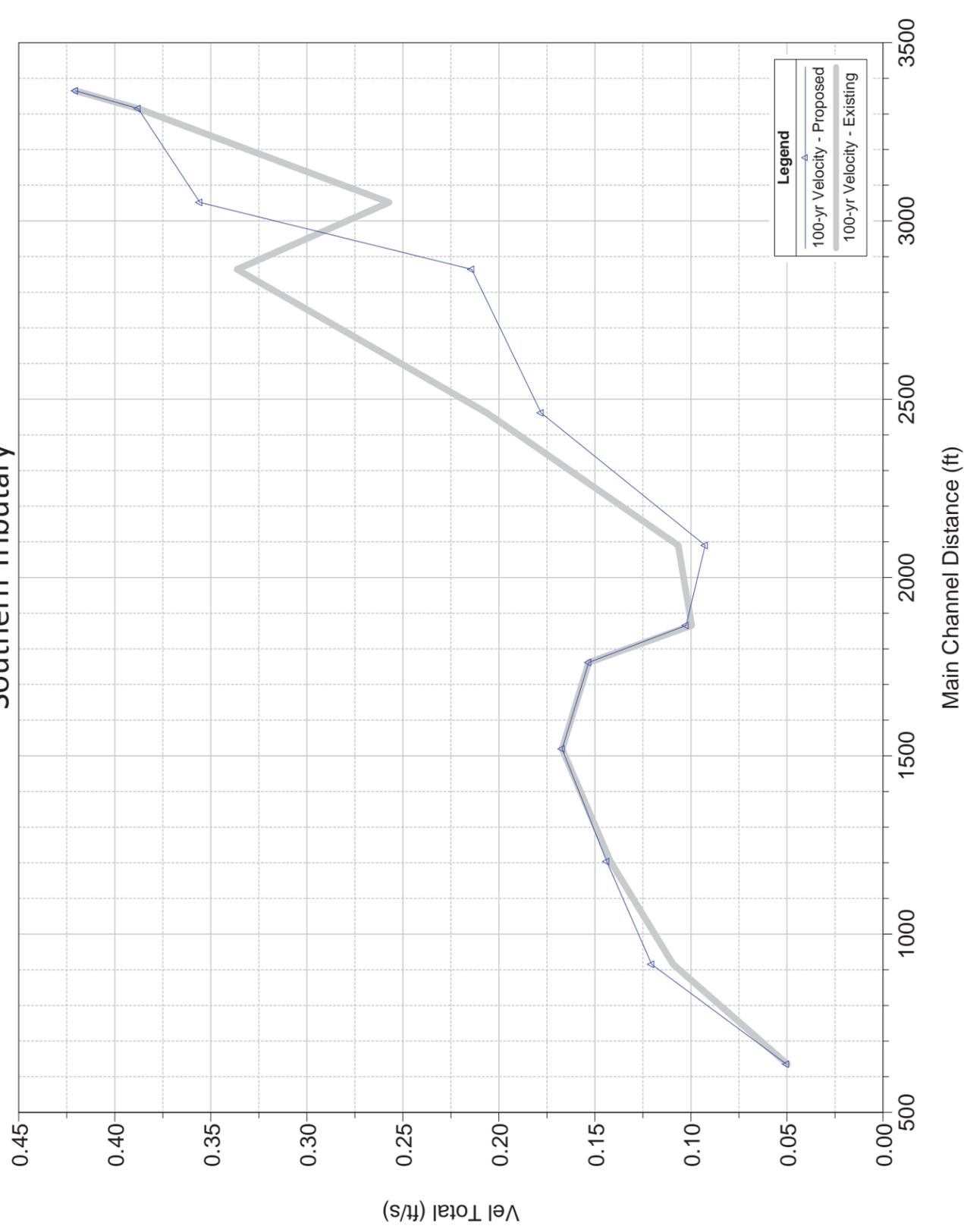
RIVERBEND LANDFILL

HYDRAULIC REPORT

100-Year Water Surface Profile Southern Tributary



100-Year Velocity Profile Southern Tributary



100-year water surface and velocity profiles for existing and proposed conditions on the Southern tributary. Proposed conditions results in a slight (0.02') decrease in the water surface elevation downstream of the proposed culvert. There is virtually no change to the velocity profile except for a slight increase (0.1 ft/sec) due to the proposed culvert crossing.

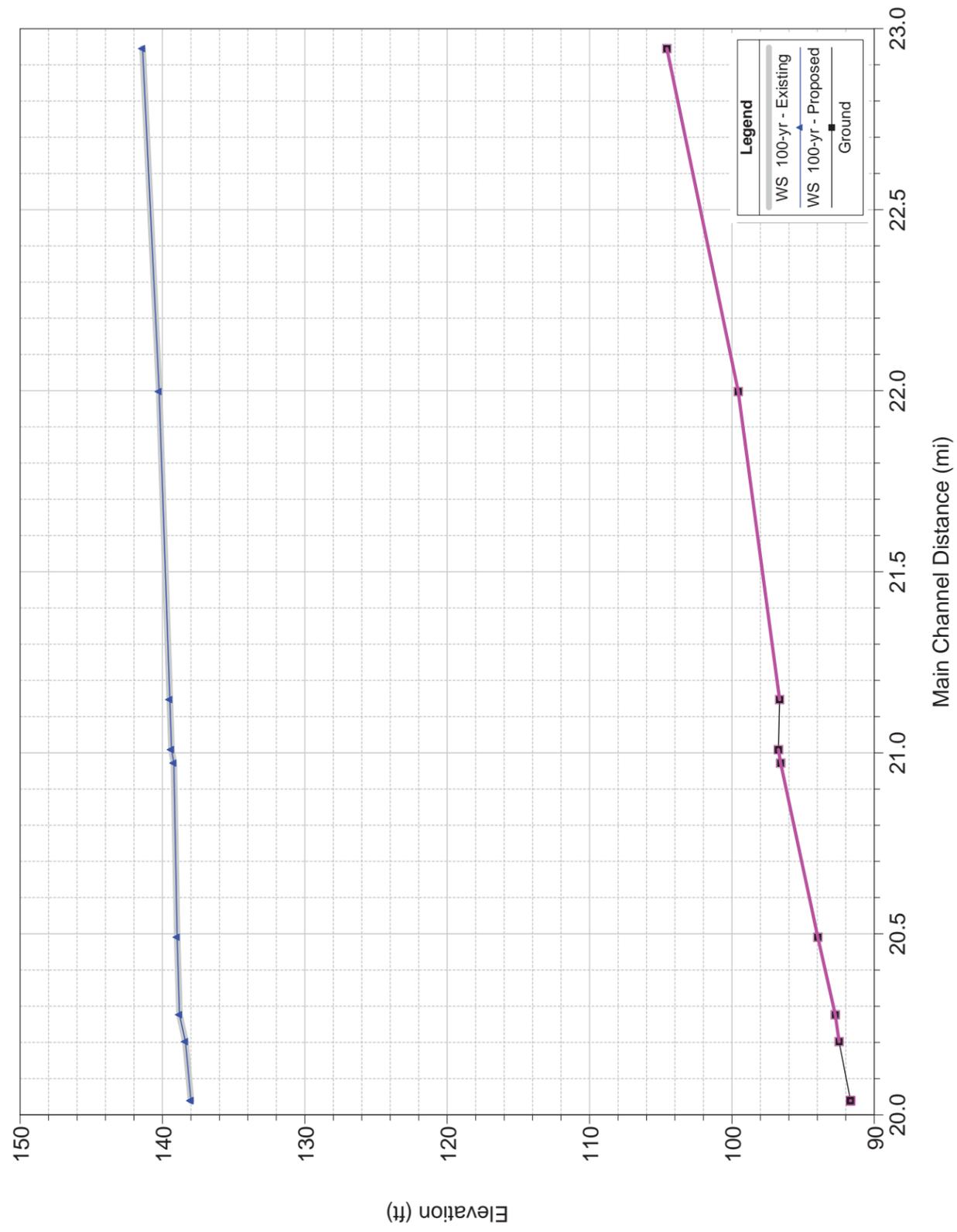
RIVERBEND LANDFILL

HYDRAULIC REPORT

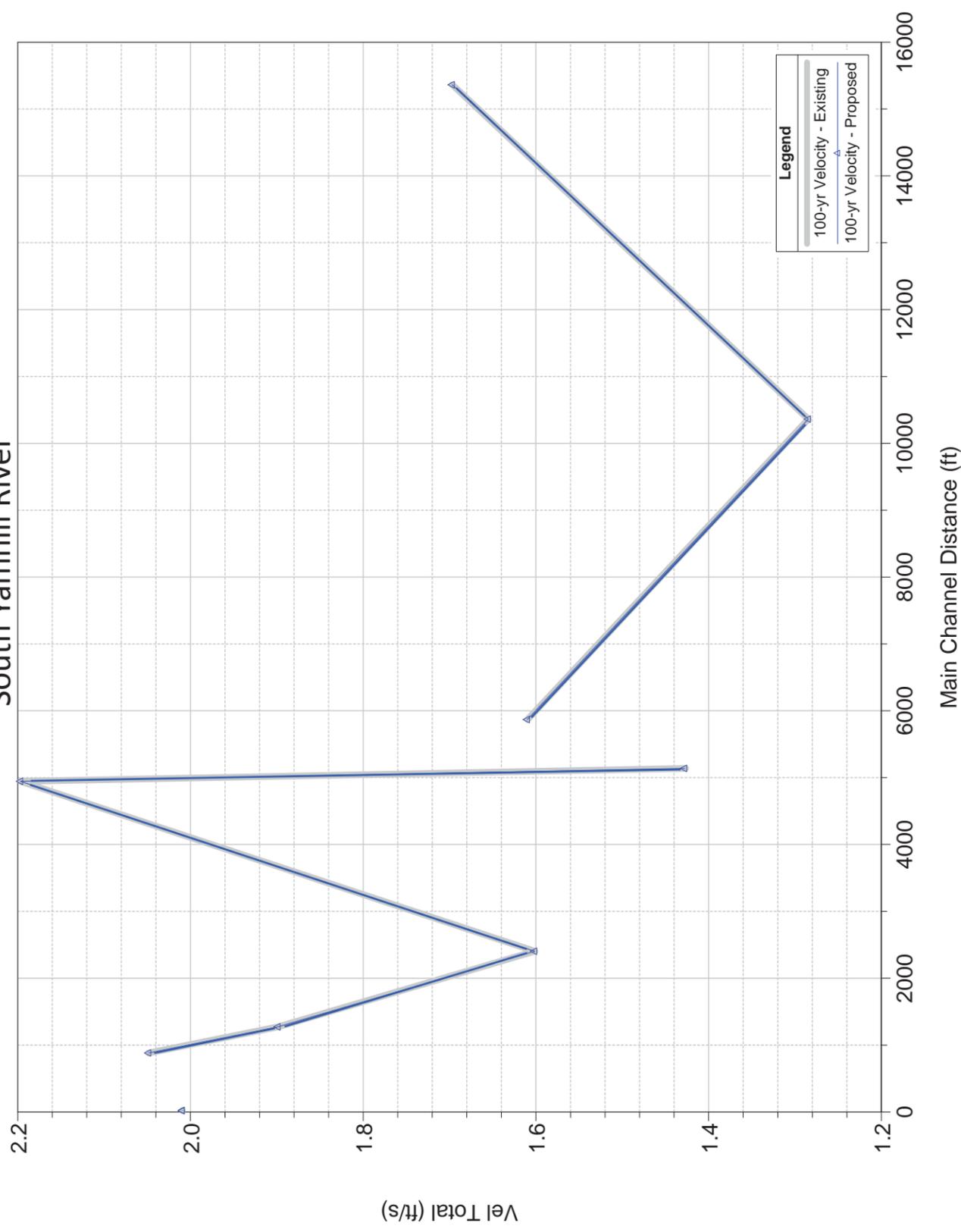


WATERWAYS
CONSULTING, INC.
Santa Cruz, CA | waterways.com | Portland, OR

100-Year Water Surface Profile South Yamhill River



100-Year Velocity Profile South Yamhill River



100-year water surface and velocity profiles for existing and proposed conditions on the South Yamhill River. There are no changes to the water surface elevations or channel velocities relative to existing conditions.

RIVERBEND LANDFILL

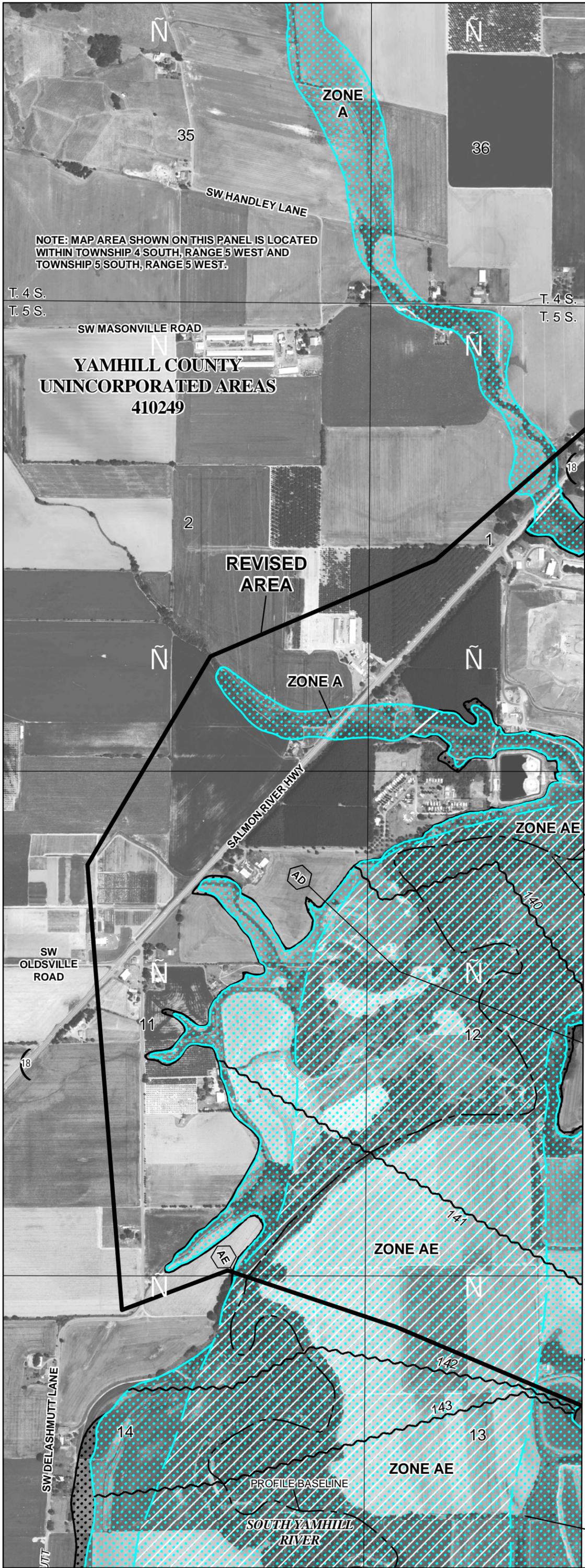
HYDRAULIC REPORT



WATERWAYS
CONSULTING, INC.
Santa Cruz, CA | waterways.com | Portland, OR

Attachment A

Flood Insurance Rate Maps



560000 FT

555000 FT

550000 FT

JOINS PANEL 0415

PROFILE BASELINE

SOUTH YAMHILL RIVER

BLUE HERON RESERVOIR

Legend

- 1% annual chance (100-Year) Floodplain
- 1% annual chance (100-Year) Floodway
- 0.2% annual chance (500-Year) Floodplain

MAP SCALE 1" = 1000'

PANEL 0395D

FIRM

FLOOD INSURANCE RATE MAP
**YAMHILL COUNTY,
 OREGON
 AND INCORPORATED AREAS**

PANEL 395 OF 675
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
YAMHILL COUNTY	410249	0395	D

**REVISION TO
 REFLECT LOMR
 EFFECTIVE:
 May 9, 2013**

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

NATIONAL FLOOD INSURANCE PROGRAM

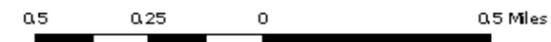
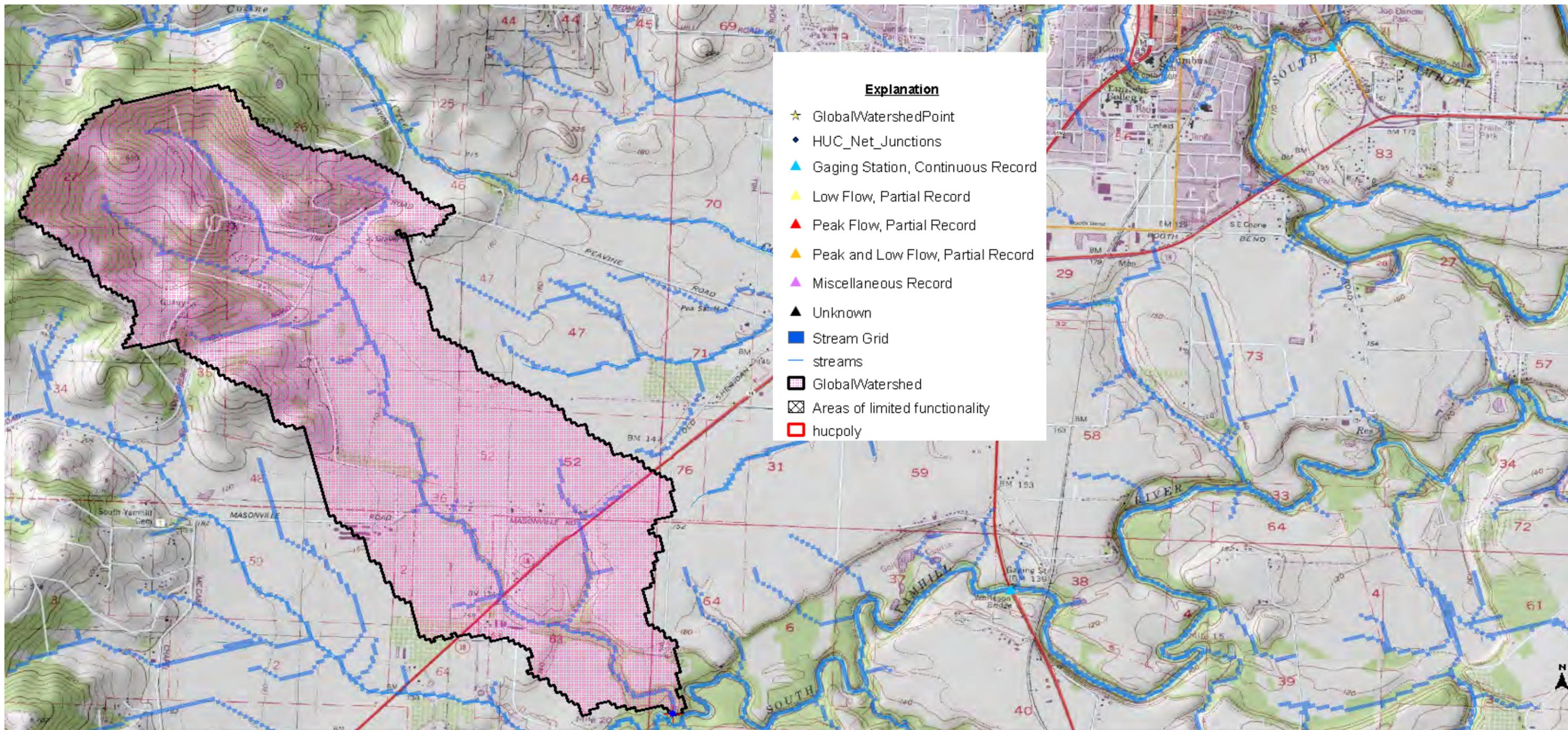
MAP NUMBER
41071C0395D
 EFFECTIVE DATE
MARCH 2, 2010
 Federal Emergency Management Agency

Attachment B

Hydrologic Calculations

Northern Tributary Calculations

StreamStats Print Page





Oregon StreamStats

Streamstats Ungaged Site Report

Date: Tue Oct 14 2014 14:59:54 Mountain Daylight Time

Site Location: Oregon

NAD27 Latitude: 45.1597 (45 09 35)

NAD27 Longitude: -123.2354 (-123 14 07)

NAD83 Latitude: 45.1595 (45 09 34)

NAD83 Longitude: -123.2366 (-123 14 12)

Drainage Area: 3.29 mi²

Percent Urban: 6.19 %

Percent Impervious: 1.85 %

Peak Flows Region Grid Basin Characteristics

Mean Basin Elevation in feet=252

100% Reg 2B Western Interior LT 3000 ft Cooper (3.29 mi²)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	3.29	0.37	7270
Mean Basin Slope from 30m DEM (degrees)	4.8 (below min value 5.62)	5.62	28.3
24 Hour 2 Year Precipitation (inches)	2.04	1.53	4.48

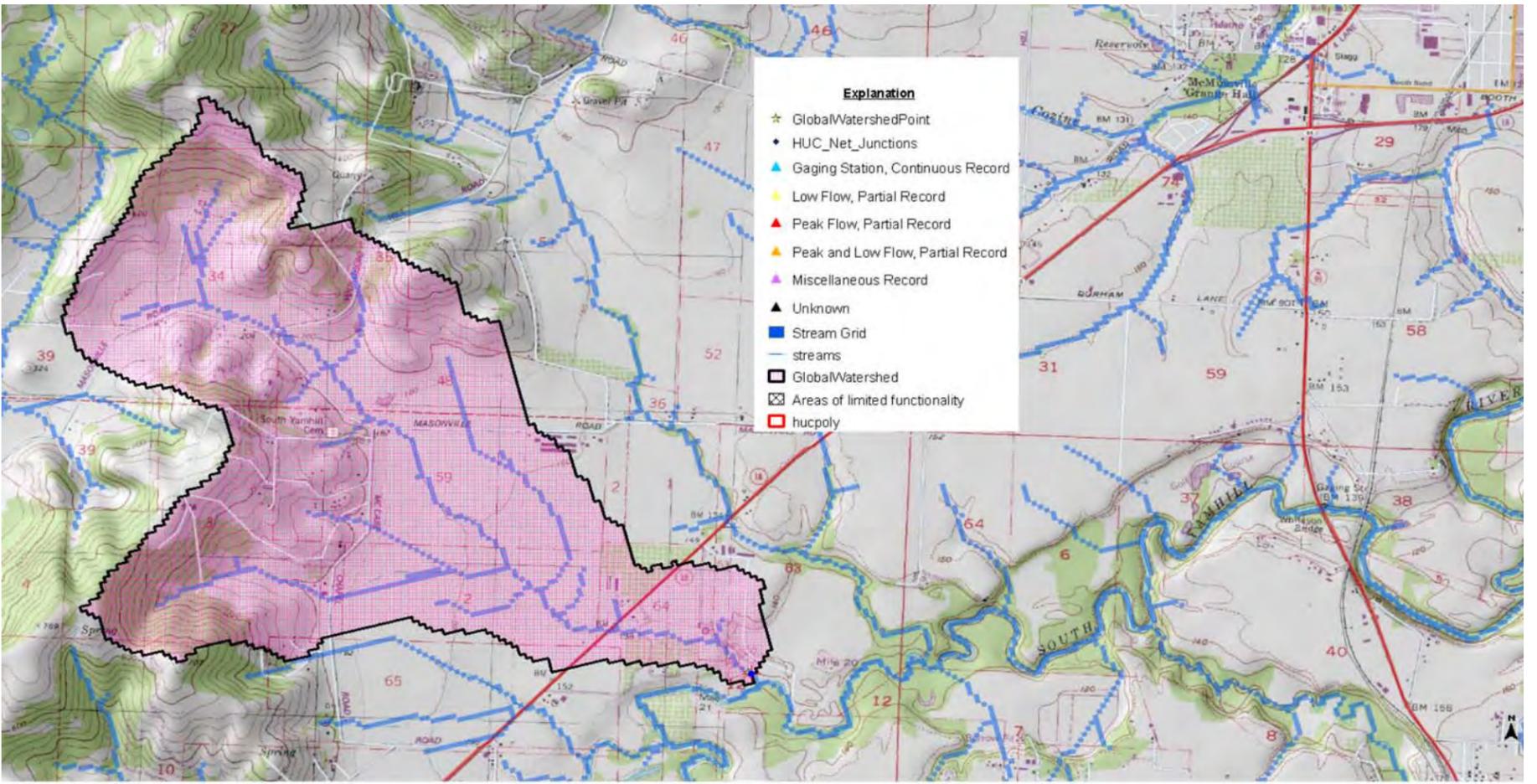
Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Peak Flows Region Grid Streamflow Statistics

Statistic	Flow (ft ³ /s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK2	102		2		
PK5	152		2.8		
PK10	186		3.6		
PK25	231		4.8		
PK50	264		5.5		
PK100	298		6.2		

Southern Tributary Calculations

StreamStats Print Page



6/25/2014 12:42:45 PM



Streamstats Ungaged Site Report

Date: Wed Jun 25 2014 12:49:28 Mountain Daylight Time

Site Location: Oregon

NAD27 Latitude: 45.1584 (45 09 30)

NAD27 Longitude: -123.2484 (-123 14 54)

NAD83 Latitude: 45.1582 (45 09 30)

NAD83 Longitude: -123.2496 (-123 14 59)

Drainage Area: 2.83 mi²

Percent Urban: 6.22 %

Percent Impervious: 1.29 %

Peak Flows Region Grid Basin Characteristics

Mean Basin Elevation in feet=266

100% Reg 2B Western Interior LT 3000 ft Cooper (2.83 mi²)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	2.83	0.37	7270
Mean Basin Slope from 30m DEM (degrees)	5.38 (below min value 5.62)	5.62	28.3
24 Hour 2 Year Precipitation (inches)	2.08	1.53	4.48

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

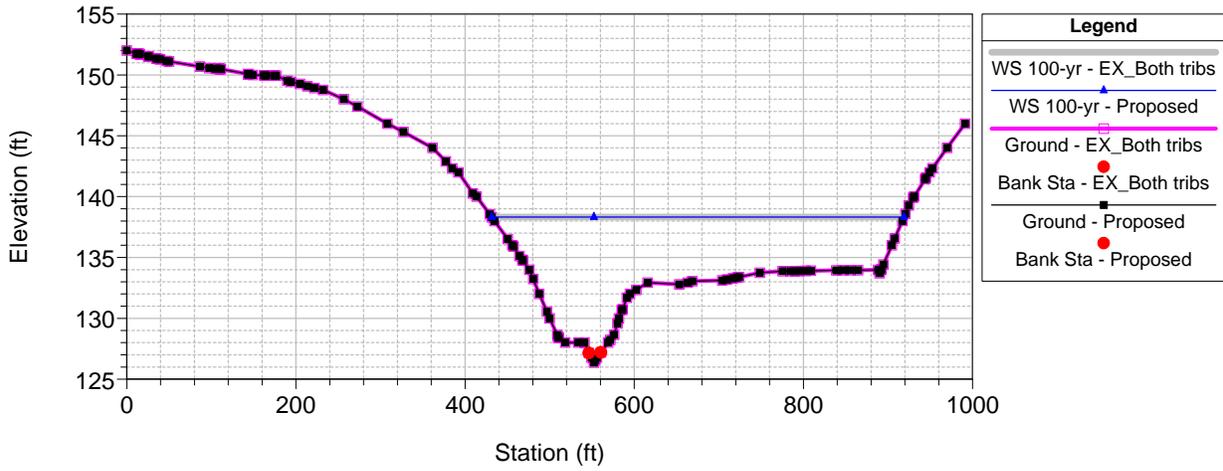
Peak Flows Region Grid Streamflow Statistics

Statistic	Flow (ft ³ /s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK2	95.6		2		
PK5	142		2.8		
PK10	174		3.6		
PK25	215		4.8		
PK50	246		5.5		
PK100	277		6.2		
PK500	351		7.5		

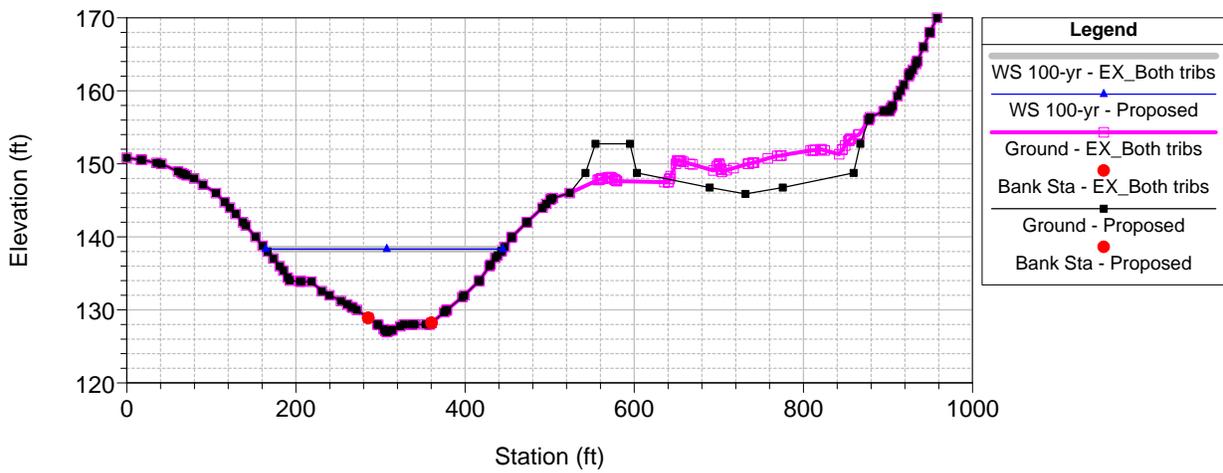
Attachment C

HEC-RAS Model Output

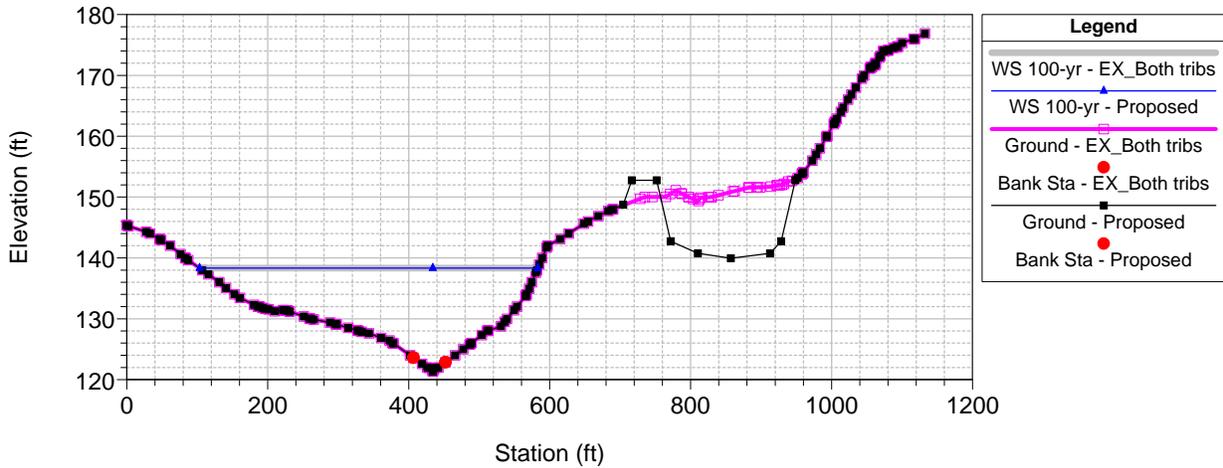
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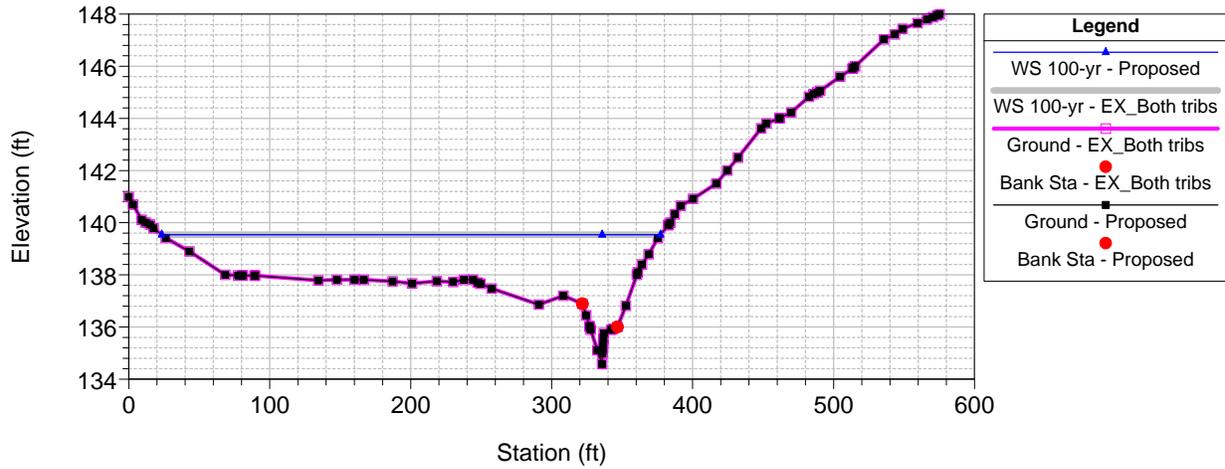
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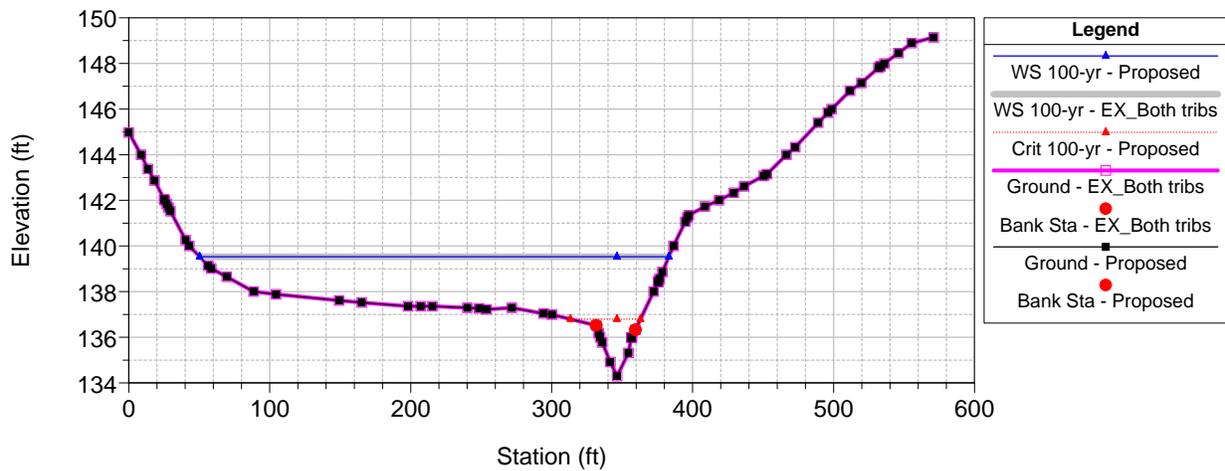
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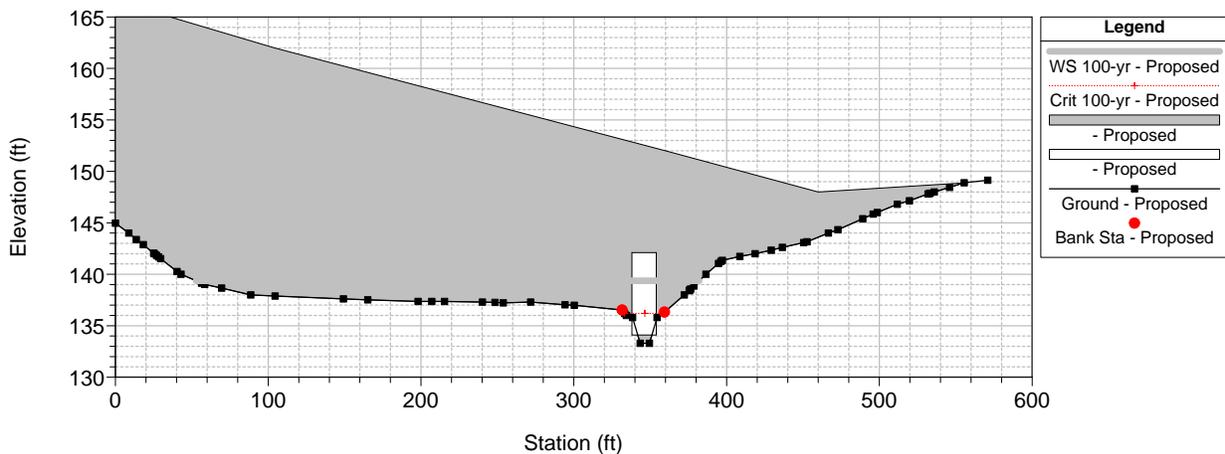
RS = 3365 Southern Tributary



RS = 3316 Southern Tributary

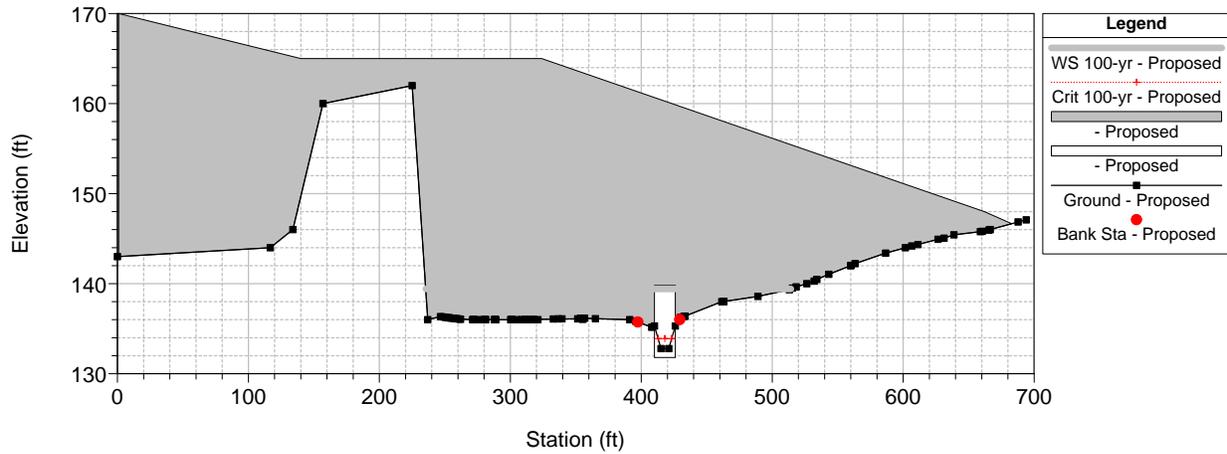


RS = 3200 Culv Southern Tributary

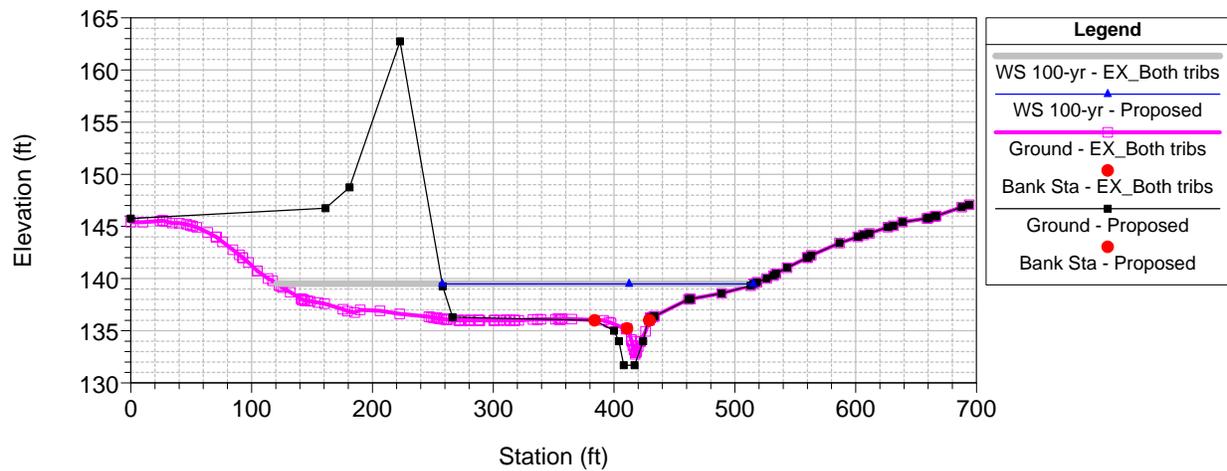


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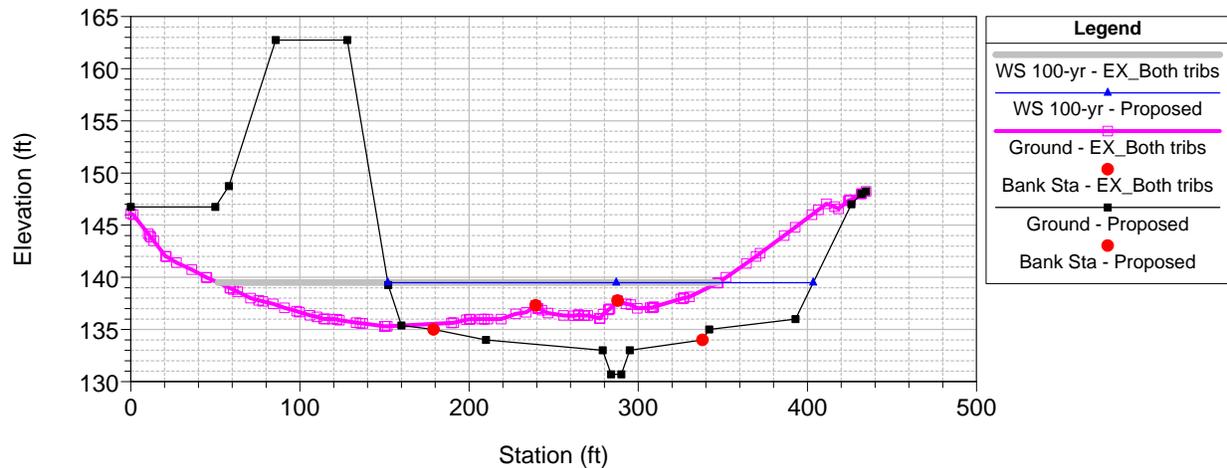
Southern Tributary



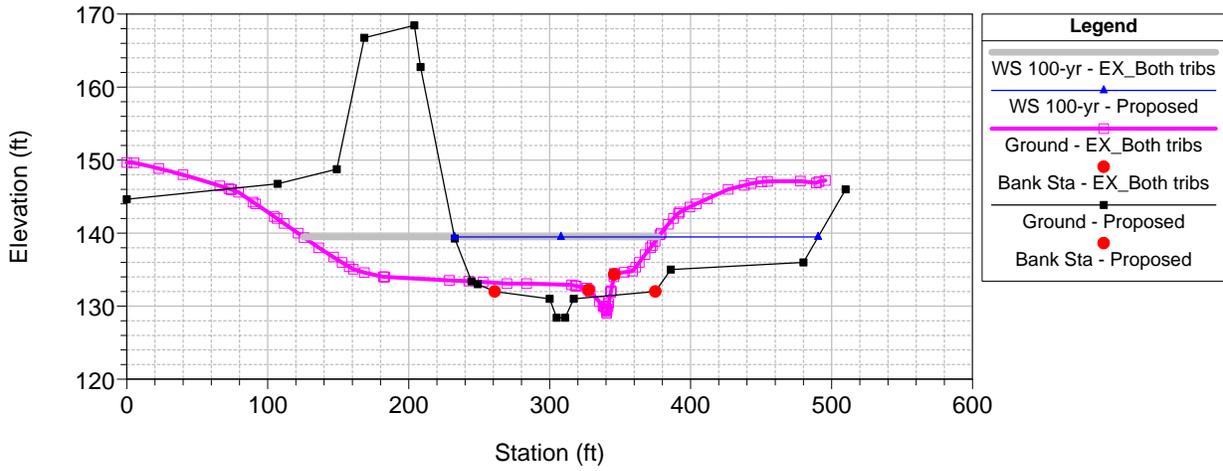
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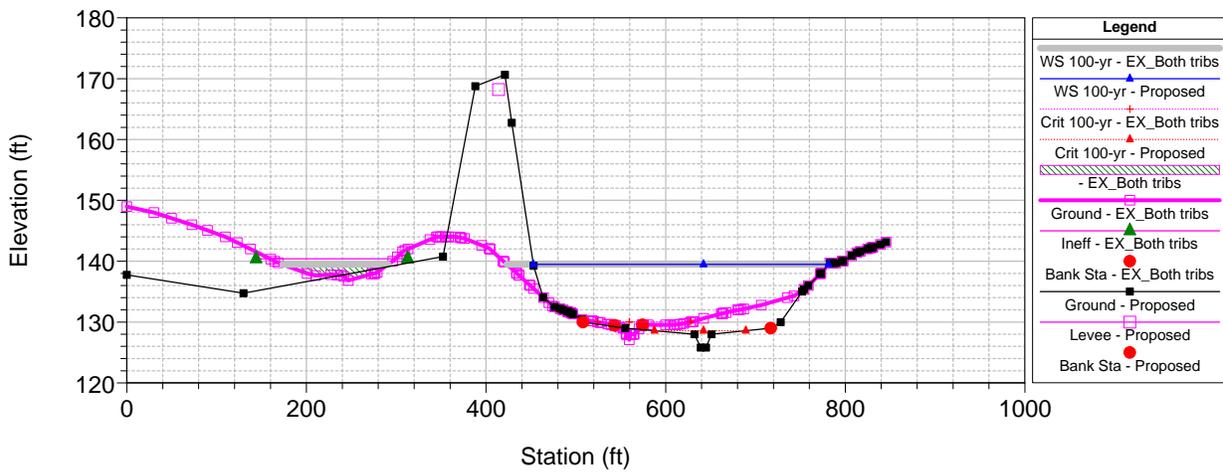
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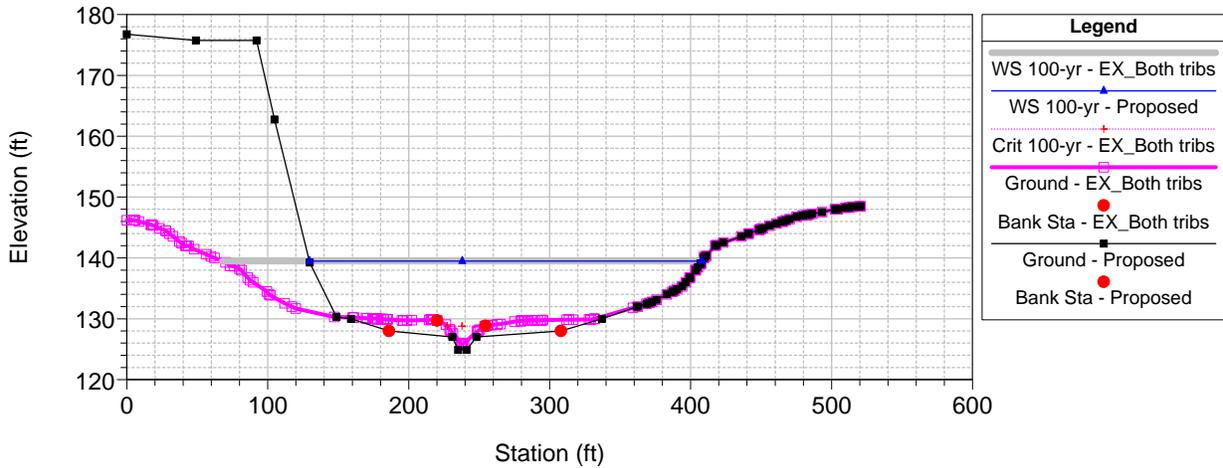
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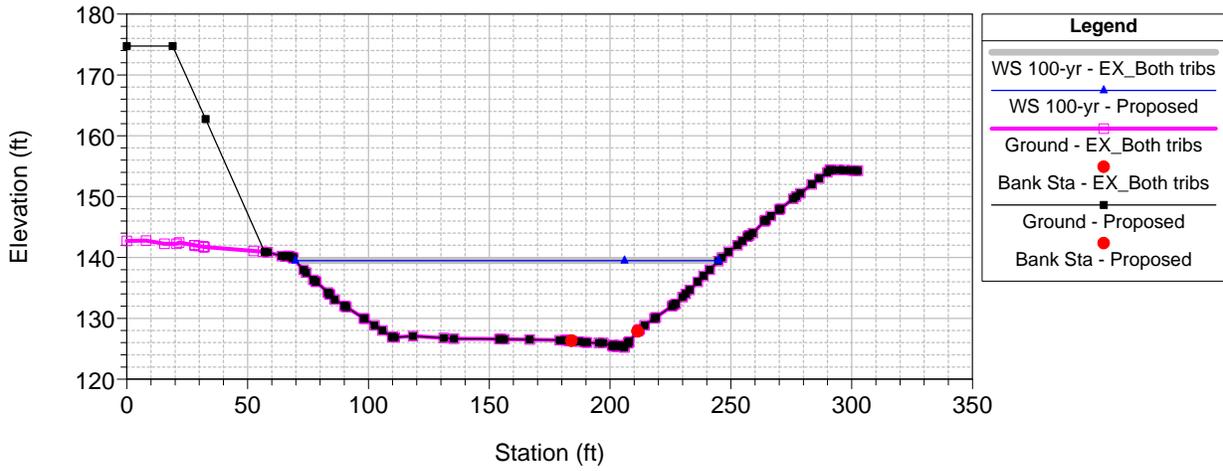
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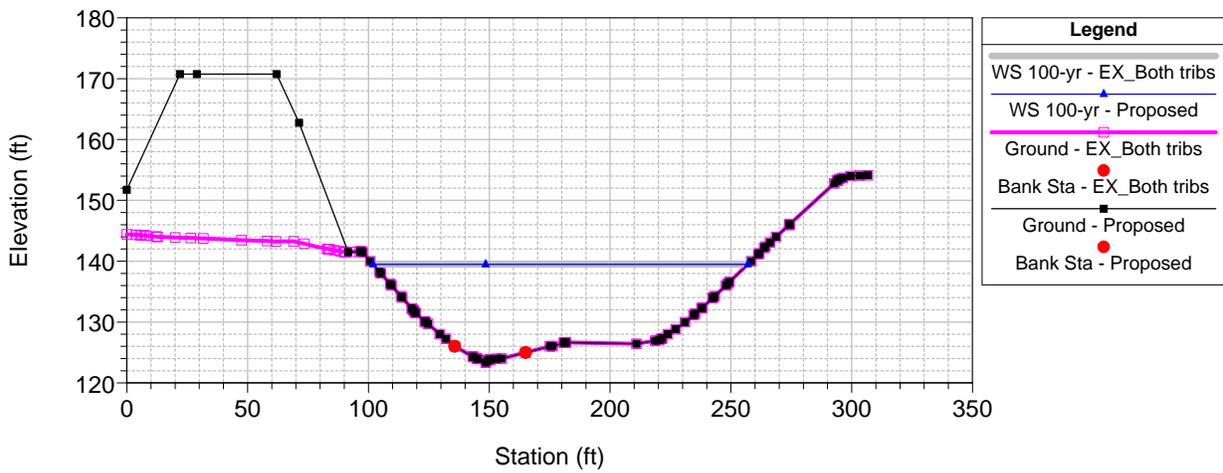
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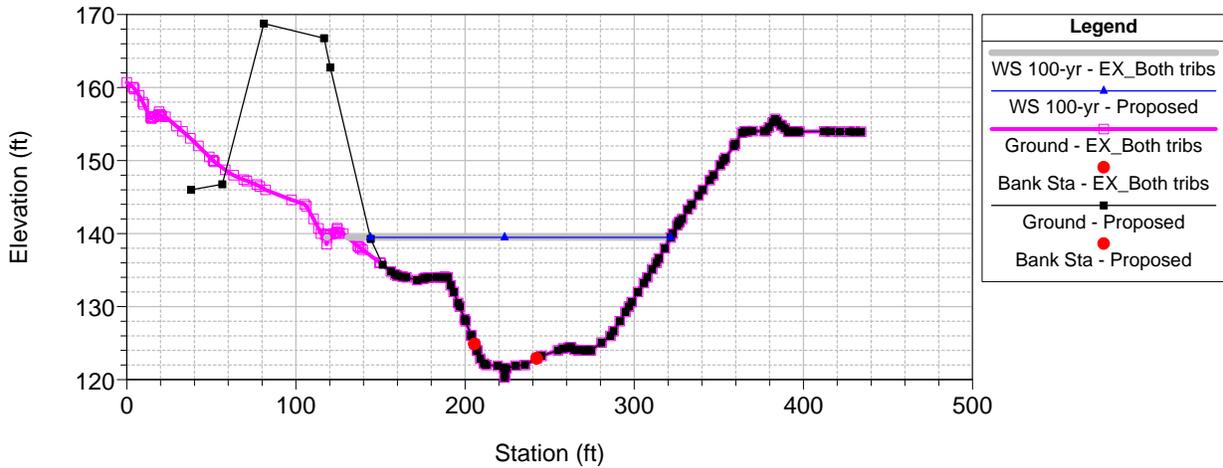
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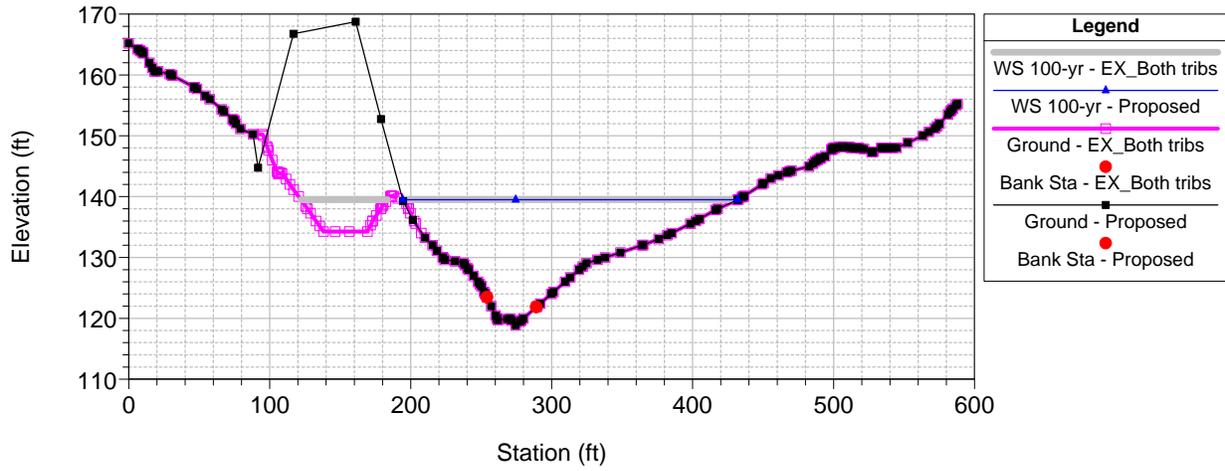
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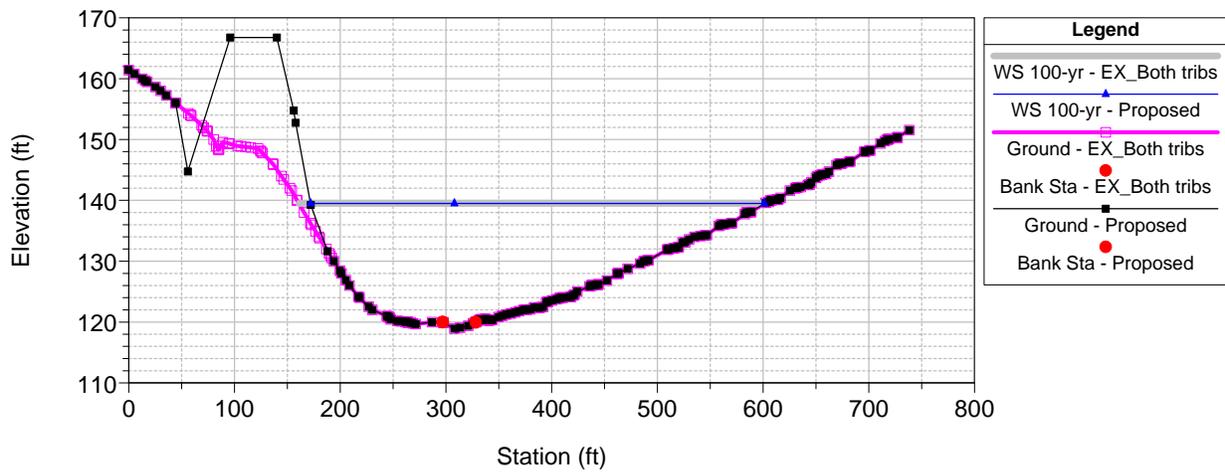
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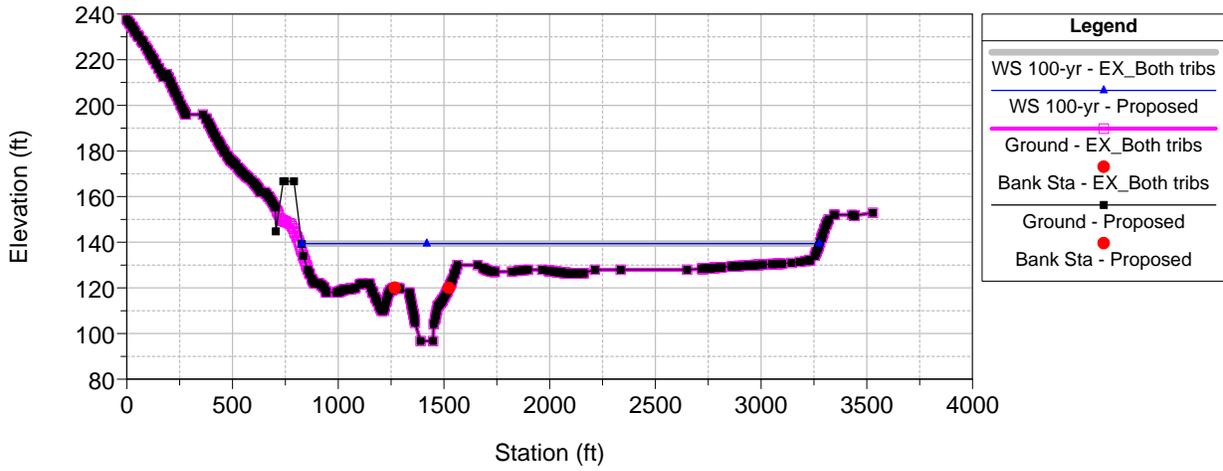
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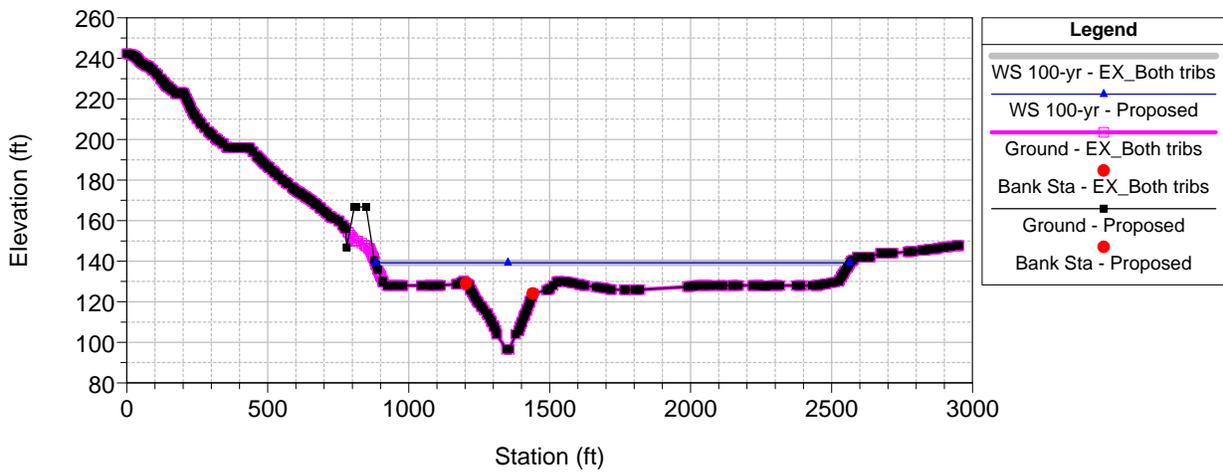
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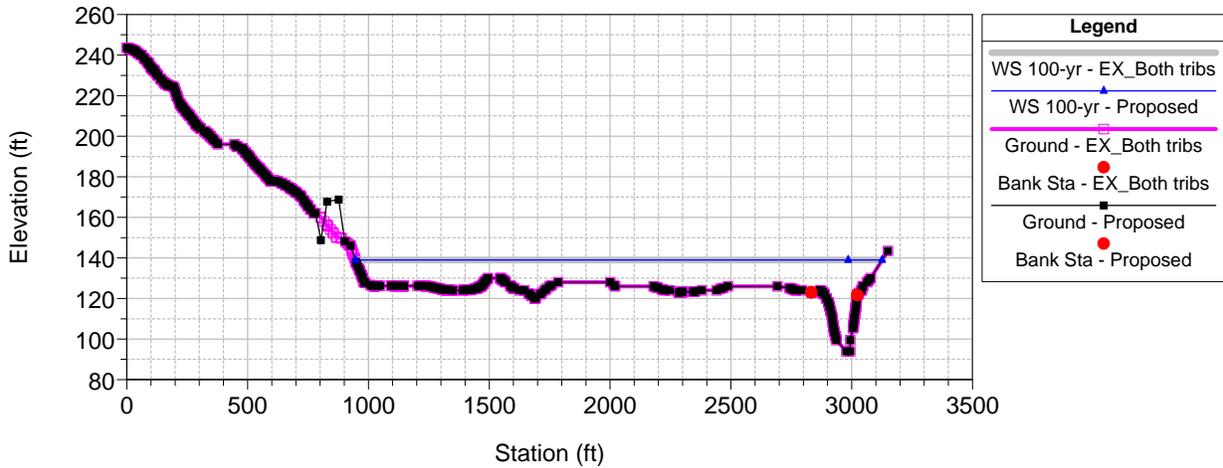
RS = 21.01 South Yamhill River



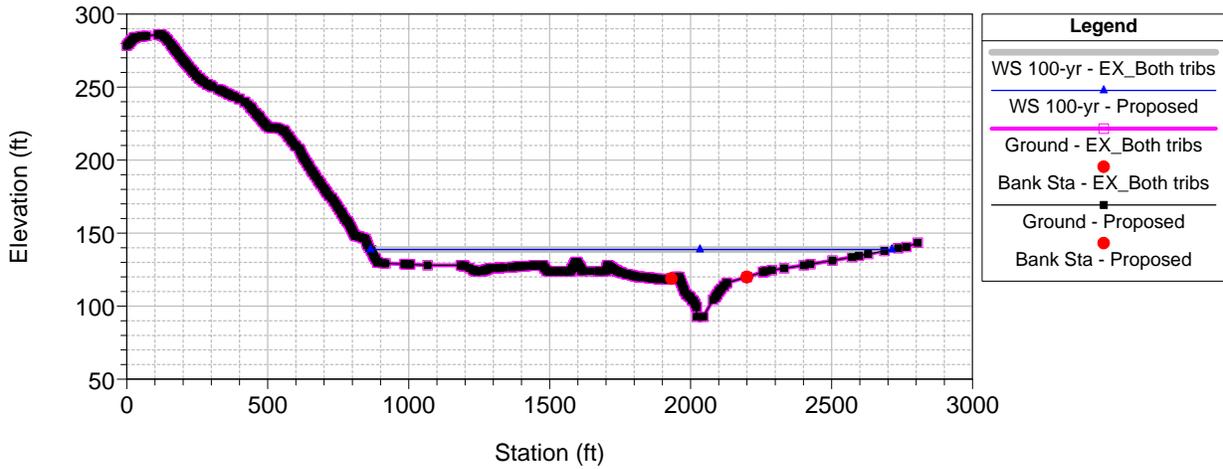
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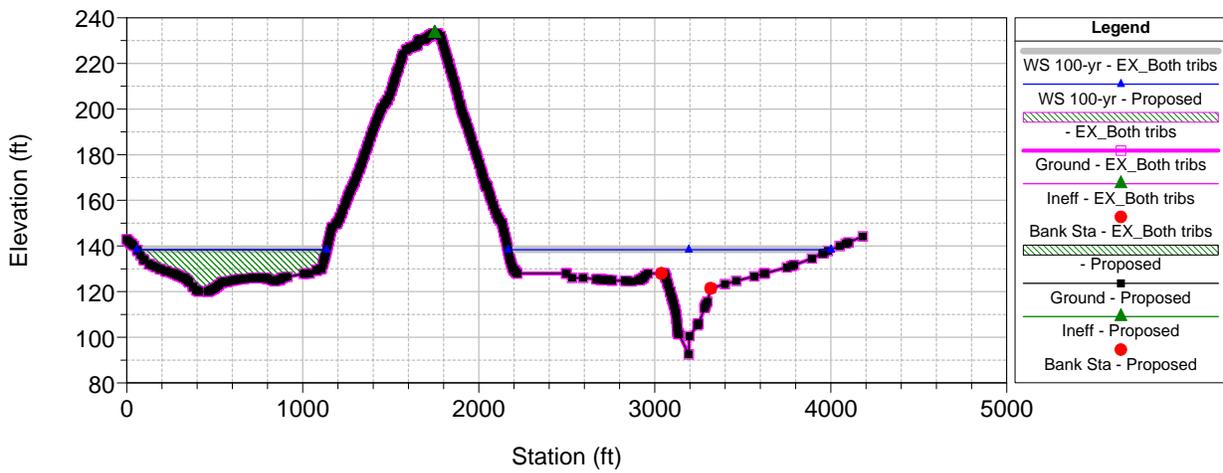
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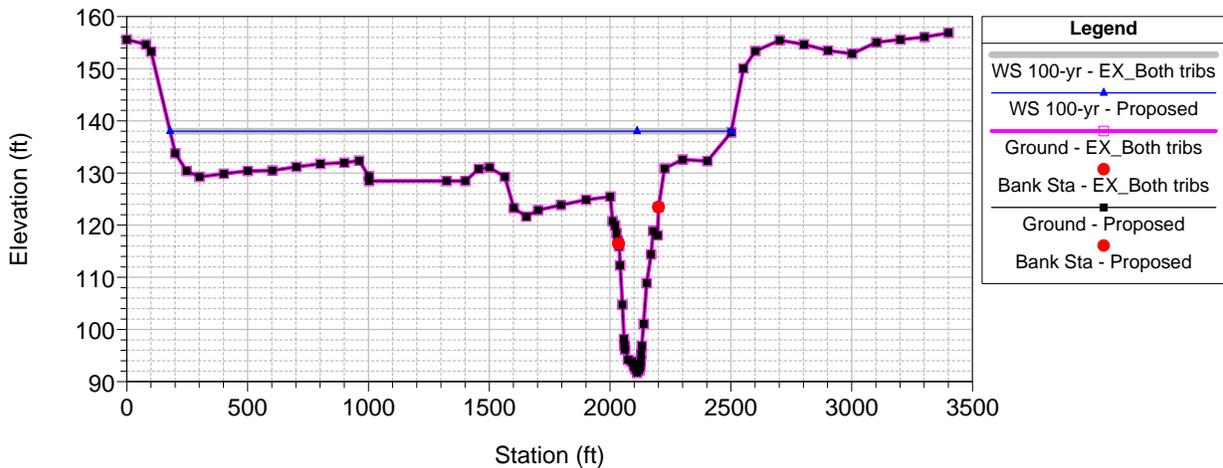
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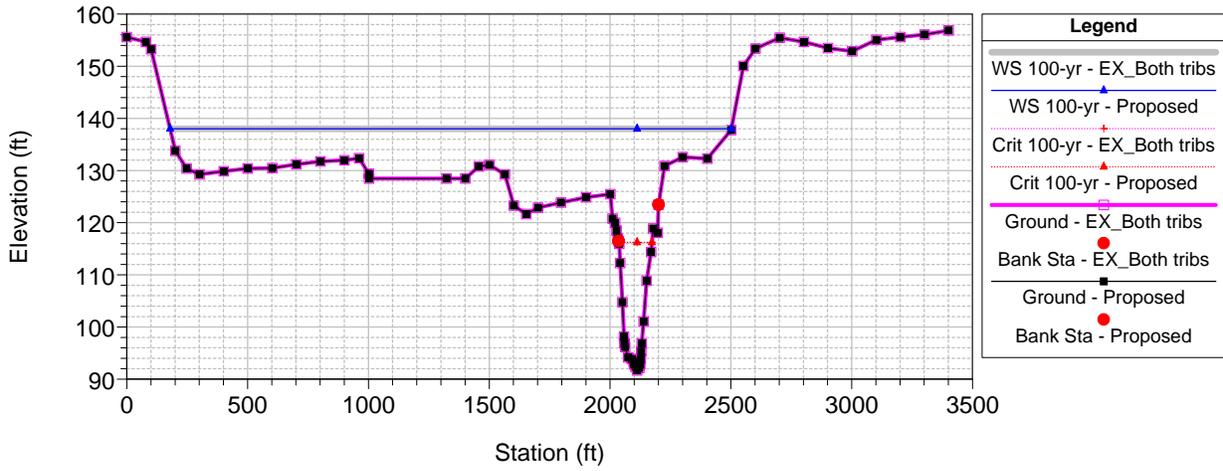
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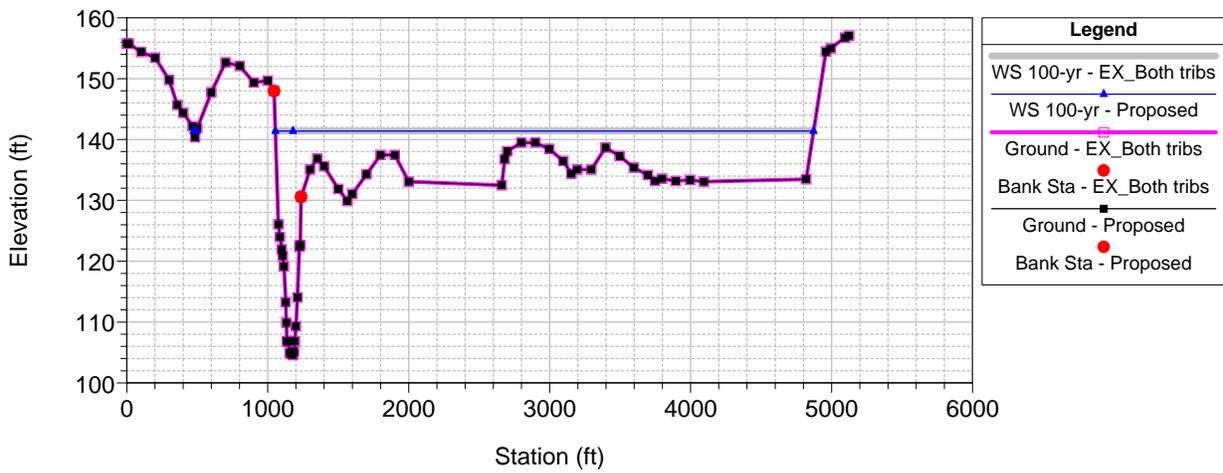
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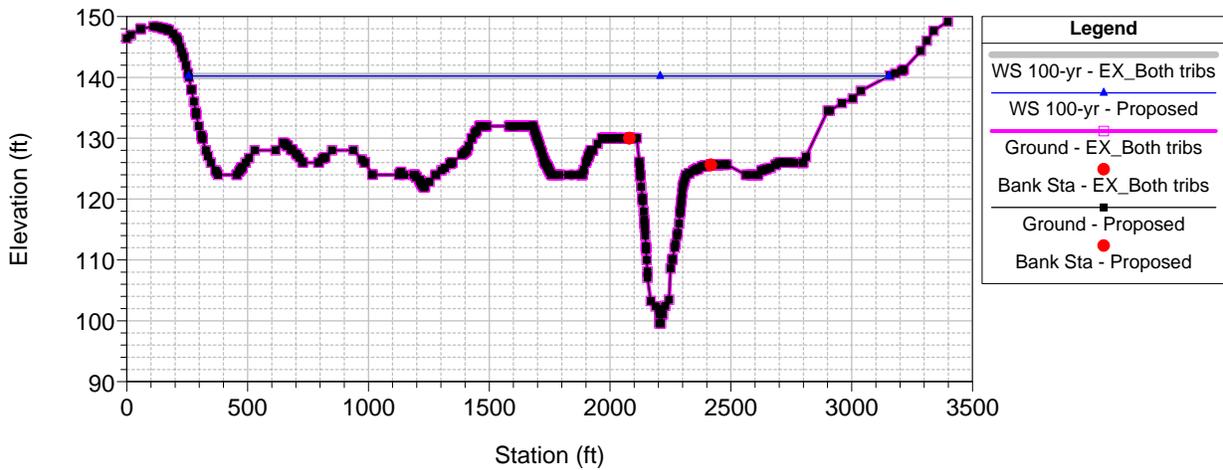
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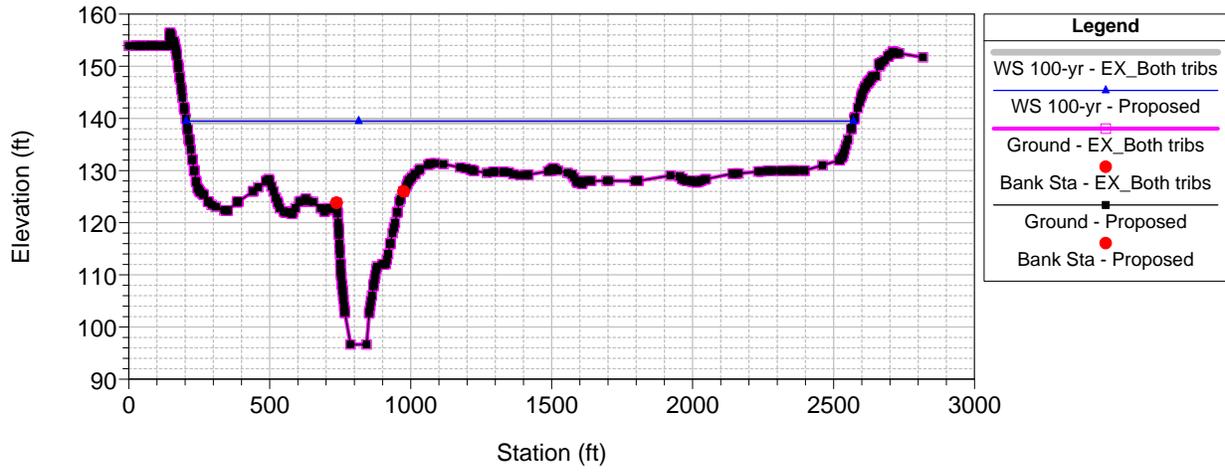
RS = 23.10 South Yamhill River



RS = 22.15 South Yamhill River



RS = 21.15 South Yamhill River



HEC-RAS Profile: 100-yr

River	Reach	River Sta	Profile	Plan	Q Total (cfs)	W.S. Elev (ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)
Yamhill River	Upper	23.10	100-yr	EX_Both tribs	50000	141.39	3.18	29468	3840
Yamhill River	Upper	23.10	100-yr	Proposed	50000	141.39	3.18	29466	3840
Yamhill River	Upper	22.15	100-yr	EX_Both tribs	50000	140.23	1.49	38925	2898
Yamhill River	Upper	22.15	100-yr	Proposed	50000	140.23	1.49	38923	2898
Yamhill River	Upper	21.15	100-yr	EX_Both tribs	50000	139.48	2.33	31060	2367
Yamhill River	Upper	21.15	100-yr	Proposed	50000	139.48	2.33	31058	2367
Yamhill Ri	Lower	21.01	100-yr	EX_Both tribs	50000	139.37	1.97	35050	2460
Yamhill Ri	Lower	21.01	100-yr	Proposed	50000	139.37	1.96	35017	2449
Yamhill Ri	Lower	20.96	100-yr	EX_Both tribs	50000	139.20	3.48	22760	1684
Yamhill Ri	Lower	20.96	100-yr	Proposed	50000	139.20	3.48	22761	1684
Yamhill Ri	Lower	20.5	100-yr	EX_Both tribs	50000	138.97	2.00	31223	2180
Yamhill Ri	Lower	20.5	100-yr	Proposed	50000	138.97	1.99	31223	2180
Yamhill Ri	Lower	20.28	100-yr	EX_Both tribs	50000	138.80	2.47	26334	1850
Yamhill Ri	Lower	20.28	100-yr	Proposed	50000	138.80	2.47	26334	1850
Yamhill Ri	Lower	20.20	100-yr	EX_Both tribs	50000	138.38	3.01	24409	2914
Yamhill Ri	Lower	20.20	100-yr	Proposed	50000	138.38	3.01	24409	2914
Yamhill Ri	Lower Lower	20.04	100-yr	EX_Both tribs	50000	138.00	3.69	24882	2323
Yamhill Ri	Lower Lower	20.04	100-yr	Proposed	50000	138.00	3.69	24882	2323
Yamhill Ri	Lower Lower	20.039	100-yr	EX_Both tribs	50000	138.00	3.69	24881	2323
Yamhill Ri	Lower Lower	20.039	100-yr	Proposed	50000	138.00	3.69	24881	2323
Tributary	Tributary	3365	100-yr	EX_Both tribs	277	139.54	1.05	659	354
Tributary	Tributary	3365	100-yr	Proposed	277	139.54	1.05	659	354
Tributary	Tributary	3316	100-yr	EX_Both tribs	277	139.53	0.93	714	333
Tributary	Tributary	3316	100-yr	Proposed	277	139.53	0.93	714	333
Tributary	Tributary	3052	100-yr	EX_Both tribs	277	139.51	0.65	1077	395
Tributary	Tributary	3052	100-yr	Proposed	277	139.48	0.66	779	257
Tributary	Tributary	2865	100-yr	EX_Both tribs	277	139.50	0.58	824	296
Tributary	Tributary	2865	100-yr	Proposed	277	139.48	0.26	1294	251
Tributary	Tributary	2462	100-yr	EX_Both tribs	277	139.48	0.44	1343	252
Tributary	Tributary	2462	100-yr	Proposed	277	139.48	0.24	1556	258
Tributary	Tributary	2090	100-yr	EX_Both tribs	277	139.48	0.23	2599	476
Tributary	Tributary	2090	100-yr	Proposed	277	139.48	0.11	2991	329
Tributary	Tributary	1866	100-yr	EX_Both tribs	277	139.48	0.21	2780	340
Tributary	Tributary	1866	100-yr	Proposed	277	139.48	0.14	2702	279
Tributary	Tributary	1800			Culvert				
Tributary	Tributary	1763	100-yr	EX_Both tribs	277	139.48	0.29	1808	175
Tributary	Tributary	1763	100-yr	Proposed	277	139.48	0.29	1808	175
Tributary	Tributary	1520	100-yr	EX_Both tribs	277	139.48	0.31	1658	155
Tributary	Tributary	1520	100-yr	Proposed	277	139.48	0.31	1658	155
Tributary	Tributary	1204	100-yr	EX_Both tribs	277	139.48	0.26	1952	191
Tributary	Tributary	1204	100-yr	Proposed	277	139.48	0.26	1926	177

HEC-RAS Profile: 100-yr (Continued)

River	Reach	River Sta	Profile	Plan	Q Total (cfs)	W.S. Elev (ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)
Tributary	Tributary	916	100-yr	EX_Both tribs	277	139.48	0.24	2535	301
Tributary	Tributary	916	100-yr	Proposed	277	139.48	0.24	2300	238
Tributary	Tributary	635	100-yr	EX_Both tribs	277	139.48	0.12	5561	440
Tributary	Tributary	635	100-yr	Proposed	277	139.48	0.12	5517	429
North Tributary	north tributary	4449.22	100-yr	EX_Both tribs	298	138.32	0.32	2689	487
North Tributary	north tributary	4449.22	100-yr	Proposed	298	138.32	0.32	2689	487
North Tributary	north tributary	3850.6	100-yr	EX_Both tribs	298	138.32	0.26	1897	281
North Tributary	north tributary	3850.6	100-yr	Proposed	298	138.32	0.26	1897	281
North Tributary	north tributary	3249.2	100-yr	EX_Both tribs	298	138.32	0.16	4353	480
North Tributary	north tributary	3249.2	100-yr	Proposed	298	138.32	0.16	4353	480