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Westside Trail Master Plan

Connecting Westside Communities Between the Tualatin and Willamette Rivers

March 2014

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CHAPTER 1: INTRODUCTION

Project history and context

A continuous parkway corridor spanning from north to south along the west side of our region has long been memorialized in the region's plans. In fact, even the historic 1904 Olmstead Plan for Portland reflects the desire for a west side trail in proposing a continuous north-south parkway along the West Hills in what was at the time the edge of the city.

The growth of our region in subsequent decades has pushed the limits of continuous urbanization miles to the west of that original Olmstead parkway. Nonetheless, reflecting the same impulse behind the Olmstead Plan, the 1992 *Metropolitan Greenspaces Master Plan* identified the opportunity to create an urban regional trail on the west side using electrical power utility corridors in Washington County, initially called the Beaverton Powerline Trail.

The availability of the power corridor for trail development opens up the opportunity to establish a 25-mile-long trail, though highly developed urban lands, serving recreational and commuter bicyclists, pedestrians and, in some areas, equestrians. The trail will connect neighborhoods to major west side commercial and employment areas and to schools and open spaces. The major parks and natural areas connected by the Westside Trail will include the Tualatin River National Wildlife Refuge, Tualatin River Greenway, Tualatin Hills Nature Park, Terpenning Recreation Center, Bronson and Rock Creek Greenways, Forest Park, and the Willamette River Greenway, as well as numerous local parks.

Today this route is named the Westside Trail. The Westside Trail will establish a regional active transportation link between the Willamette and Tualatin Rivers while enhancing local pedestrian and bicycle connectivity within and between these communities. The development of the trail will also pioneer a new concept for the region's network of bicycle and pedestrian routes – the explicit use of the trail corridor for enhancing and preserving wildlife habitats and movements.

Location

Located in the western portion of the metropolitan Portland region, the Westside Trail corridor stretches from the Tualatin River on the south to Bethany on the north, and then turns east toward Portland's Forest Park and the Willamette River. The trail corridor crosses urbanized and rural portions of Washington County and Multnomah County and passes though the cities of King City, Tigard, Beaverton, and Portland, as well as the jurisdiction of the Tualatin Hills Park & Recreation District (THPRD). Spanning these urban and rural areas, the study corridor includes lands both inside and outside the regional urban growth boundary, as well as within and outside of incorporated municipalities. A map of the entire study corridor is included (see Map 1).

Planning zones

The trail corridor consists of 13 planning segments comprising four zones. Trail segment numbering is adapted from a system developed by THPRD. Trail segments either already developed or funded for development by THPRD (primarily Zone B) were not included in the master planning effort. All illustrated trail alignment alternatives are plan level. Recommended alignments and

crossings have not been subject to survey, final design or engineering. More information on the assumptions and parameters used in determining and estimating costs for different trail alignments are part of Plan Report No. 2, Trail Corridor Analysis (Appendix B). Updates to alignments, assumptions and costs are in Plan Report No. 4, Implementation Strategy (Appendix D).

Zone A

From the Tualatin River to SW Barrows Road, the trail is primarily within a 200- to 225-foot-wide corridor owned or controlled by the Bonneville Power Administration (BPA) and Portland General Electric (PGE). This zone crosses Bull Mountain and includes portions of the city of King City, unincorporated Washington County, and the city of Tigard. This zone includes Segments 1, 2 and 3.

Zone B

From SW Barrows Road (Segment 4.01) north to the TriMet MAX Blue line (Segment 4.11), the Westside Trail is already constructed and operated by THPRD. Segments 4.01, 4.04, and 4.07 are under construction in 2013. Segment 4.11 is under design and should be constructed in 2014. Mapping for this zone is included (see Map 6).

Zone C

From the TriMet MAX line to the Rock Creek Trail the trail is primarily within a 100-foot-wide corridor owned by BPA. The trail follows the street edge of about 1.5 miles of SW 158th Avenue and SW Walker Road through densely developed commercial areas of Beaverton. The trail returns to the power corridor through residential neighborhoods in Beaverton and unincorporated Washington County. Significant portions are within the current jurisdiction of THPRD. This zone includes Segment 4.12 through Segment 4.18.1. Segment 4.18.2 was not included in the study corridor as that segment will be constructed by THPRD in 2014. Mapping is, however, included (see Map 13).

Zone D

The fourth zone – Segments 4.20 to 6 – turns east at the Rock Creek Trail and approximately follows a BPA power line easement across private lands before exiting THPRD jurisdiction and climbing into the West Hills through Multnomah County and entering the city of Portland and Portland's Forest Park. Steep slopes, woodlands, and the absence of suitable power corridors characterize this zone.

The trail exits the east side of Forest Park and connects to the US 30 (St. Helens Road). This zone includes two short stretches of developed trail (Segment 4.20 and 4.22) and existing trails through Forest Park (Segment 6). Portions of Segment 4.21 may be built as part of private residential development in 2014.

Westside Trail Master Plan

Map 1

J:\woodbury\proj\09167_WestsideTrail\SegmentMaps\2013 Spring\Draft11\WestsideTrail_landscape.mxd

Project Date: January, 2014

Project goals and process

Goals and objectives

The Westside Trail Master Plan recommends a comprehensive strategy for the completion of an uninterrupted south-north regional trail corridor from the Tualatin River to the Willamette River. Specific objectives included:

- Engage local jurisdictions, power utilities, property owners, citizens, businesses, and other stakeholders in master plan development.
- Collect and summarize baseline information on the existing conditions within the trail corridor and immediately abutting areas.
- Analyze specific trail segments within the trail corridor addressing major crossings, midblock crossings, steep slopes, and other opportunities and limitations, to best assure segments can be constructed to regional trail standards.
- Recommend a trail design framework.
- Recommend tools and policies for habitat and wildlife restoration and conservation improvements.
- Develop an implementation and phasing strategy identifying potential barriers such as insufficient capital funds, lack of local jurisdictional authority or commitment to build and manage the trail, and uncertainty of right-of-way acquisition.
- Produce a draft master plan document available for jurisdictional, stakeholder, and public review and distribution.
- Produce a final master plan guiding Metro and local jurisdictions in the planning, design, permitting, and development of the trail.

The Westside Trail Master Plan Project Plan details overarching master plan project goals, objectives and processes (Appendix E).

Stakeholder and community engagement

Development of the Westside Trail Master Plan was supported by a public involvement program including outreach to affected public and private landowners, potential trail users, neighborhood associations, utilities, jurisdictional partners, and the general public. Appendices F and G include the public involvement plan and a summary of the public involvement efforts conducted for this master plan, respectively. The following public involvement goals were adopted in the Westside Trail's public involvement plan, created at the beginning of the planning process in 2011:

- Ensure effective coordination and communication between jurisdictional partners and stakeholders and related projects taking place within the trail corridor.
- Engage local jurisdictions, power utilities, neighborhoods, property owners, citizens, bicycle and pedestrian advocates, area nonprofits, businesses, and other stakeholders directly in master plan development.

- Guide Metro and jurisdictional partners on future planning, design, permitting, and development of the trail.
- Host activities and provide tools that will add value to the project and genuinely engage the community in an open and transparent process.
- Keep the public informed with accurate, up-to-date information.
- Build trust and a long-term relationship with the community.
- Maintain a level of flexibility with the process.

Two community open houses were held at each of three major project plan milestones: existing conditions, trail alignment alternatives, and implementation strategy. Postcards were delivered to approximately 18,000 households in advance of each round of project open houses. Open houses were held at Stoller Middle School in the Bethany neighborhood and at Deer Creek Elementary School in King City.

- The May 2012 open houses reviewed master plan goals and existing conditions within the study corridor. Public input on concerns and ideas for trail development was recorded. Approximately 167 individuals attended these sessions and/or provided comments.
- The November 2012 open houses reviewed the preliminary set of trail alignment alternatives and solicited public comments and suggestions for additional alternatives. Approximately 156 individuals attended or provided comments.
- The May 2013 open houses included presentation on the preferred trail route alternatives and reviewed costs, development phasing and implementation actions. Approximately 98 individuals attended or provided comments.

Supplementing the community open houses, the project team met with individual stakeholders throughout the planning process, ranging from local jurisdictions to neighborhood associations to individual property owners. Metro hosted a project website providing opportunities for interested parties to participate at their convenience. Website materials included online surveys and "virtual open houses." The project team also conducted extensive outreach in a variety of formats to further solicit public input and feedback, including publications in local newsletters, feature articles in local and regional newspapers, and information published in Metro's GreenScene publication and disseminated through Metro's social media channels.

Open House Comments

"I really like that it will become a corridor for nature lovers."

"We use the trail now (built section under power lines) and like it a lot. Can't wait for more!"

"Highway 26 bridge will be great for pedestrians walking to work."

"Very excited to see trail here! Great for bike commuting."

Image 1 May 2013 project open house

Photo credit: Doug Vorwaller

Stakeholder advisory committee

The Westside Trail Stakeholder Advisory Committee (SAC) helped to guide the master planning effort. The SAC met six times in the course of the planning effort timed to coincide with the completion of major draft deliverables. The SAC reviewed a full draft master plan at its sixth meeting in late July 2013. SAC membership included representatives from:

- Counties (Washington, Multnomah)
- THPRD
- Municipalities (Portland, Tigard, King City)
- Power utilities (BPA, PGE)

- Citizen Participation Organizations (CPO) and neighborhood associations (CPO 4, CPO 7, Forest Park Neighborhood Association)
- Local nonprofit (Forest Park Conservancy)
- Citizen advisory committees (Multnomah County, THPRD, Tigard)
- Metro (ex officio representing the Southwest Corridor Plan)

The SAC reached consensus-based recommendations at key decision milestones including the public involvement plan; evaluation criteria and measures; preferred trail alignments; trail design recommendations; and implementation. The SAC's role was to:

- Advise the project team (Metro and project consultant) on constituency and community concerns and issues.
- Assist in public outreach by providing advice and using personal networks to disseminate information.
- Serve as a forum to provide information and contacts to help advance the master plan.
- Review and evaluate master plan findings and deliverables.
- Assist in considering options and alternatives.
- Build consensus recommendations as to draft and final master plan recommendations and conclusions.

More information on the SAC is included as Appendix H, SAC Roles, Responsibilities, and Protocols.

CHAPTER 2: EXISTING CONDITIONS

For a complete review of the existing conditions cataloged as part of the Westside Trail Master Plan process see Appendix A, Plan Report No.1, Existing Conditions.

Existing plans

The development of the Westside Trail is impacted by a wide range of regional and local plans and policies including transportation, parks and natural areas, land use, and other trail plans. Various jurisdictions have adopted policies that may serve as important sources of baseline information or direction for the master plan, such as surface water management and active transportation initiatives. In addition to information in this Existing Conditions chapter, Chapter 6, Implementation Strategy, details the probable implications for trail development in applying some of these plans and policies.

Overall, regional and local plans are essentially 100 percent consistent with development of the Westside Trail within the power corridor. The Westside Trail is included in multiple transportation and land use planning documents as a greenway corridor and/or pedestrian and bicycle facility. Local jurisdictional and regional planning and land use documents consistently support the use of the BPA/PGE power corridor as a greenway and/or pedestrian and bicycle facility.

Regional plans

Metro's 1992 *Metropolitan Greenspaces Master Plan,*[1] 2008 *Regional Trails and Greenways*,[2] the current *Regional Transportation Plan*,[3] and THPRD's 2006 *Comprehensive Plan*[4] all identify and support the Westside Trail. THPRD's *Trails Plan*[5] (2006) includes the Westside Trail and THPRD has already built several trail sections. THPRD has scheduled additional trail construction projects through 2014. Metro's recently adopted *Ice Age Tonquin Trail Master Plan*[6] also shows connections to the Westside Trail across the Tualatin River.

Local plans

The City of Portland's Forest Park Natural Resources Management Plan identifies a North Management Unit and a Central Management Unit. A regional multiuser trail would not be allowed to pass through the North Management Unit; therefore, the Westside Trail study corridor was modified to avoid any use of the North Management Unit. The trail corridor passes through the

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[1] http://library.oregonmetro.gov/files//doc10_794_metropolitan_greenspaces_master_plan.pdf

[2] http://library.oregonmetro.gov/files/trailsgreenways.pdf

[3] http://www.oregonmetro.gov/index.cfm/go/by.web/id=137

[4] http://cdn1.thprd.org/pdfs/document18.pdf

[5] http://www.thprd.org/pdfs/document19.pdf

[6] http://www.tualatinoregon.gov/sites/default/files/fileattachments/advisorycommittees/calevents/14176/iattmp.pdf

Central Management Unit which allows multiuser trails. Portland's future Willamette Greenway Trail connects to the Westside Trail on the east side of Forest Park.

The Westside Trail is referenced or supported in several other local jurisdiction master plans, including the City of Tigard's *Park System Master Plan*[7]and *Tigard Greenways Trail System Master Plan*;[8] and Washington County's *North Bethany Subarea Plan*.[9]

Resource protection plans and policies

The Westside Trail study corridor passes through or by several natural resource and park areas that have associated resource management plans and/or to which resource protection policies or practices apply. Several segments are in unincorporated county areas. Various county comprehensive plan policies, zoning classifications, and other land use regulations may apply to trail development in these unincorporated areas. More detail can be found in Chapter 6, Implementation Strategy, and in the associated plan report (Appendix D).

Environmental conditions

The Westside Trail Master Plan proposes a major bridge across the Tualatin River, a smaller bridge across a ravine on Bull Mountain, and crossings of several creeks (Willow Creek, Rock Creek, and Bannister Creek, and other unnamed drainages). Wetland and riparian areas are associated with these systems. Several wetland areas created by prior disturbance of natural surface water drainages by agricultural use or urbanization also will be crossed by the trail.

Steep slopes across Bull Mountain, and steep slopes and wooded areas in the West Hills, will challenge trail development. Most of the trail corridor has the potential for habitat restoration or conservation supporting pollinators, mammals, songbirds, and other wildlife. Prairie grassland restoration is highly feasible within many trail segments, particularly those within BPA- and PGE-controlled lands under power lines.

Key environmental conditions and impacts are summarized in the following table and in Plan Report No.1, Existing Conditions (see Appendix A).

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[7] http://www.tigard-or.gov/community/parks/psmp/docs/park_master_plan.pdf

[8] http://www.tigard-or.gov/community/parks/docs/trail_system_master_plan.pdf

[9] http://www.co.washington.or.us/LUT/Divisions/LongRangePlanning/upload/A-EngOrd739_PRINT_web.pdf

Key environmental conditions and impacts

Condition	Impact
Wildlife movement	The numerous high speed/high traffic road crossings are significant challenges to wildlife movement. Mammals populate and use the trail study corridor, particularly segments surrounded by and near to rural lands and wooded areas. Crossings used by larger wildlife may represent dangerous collision hazards for trail users and passing motorists.
Hazardous materials and slopes	There are only very limited and isolated areas within or near to the trail corridor with hazardous material or unstable slope issues. The one major exception is the petroleum cleanup site on the south bank of the Tualatin River near to Segment 1 but outside of the actual study corridor.
Steep slopes	Steep slopes along Bull Mountain (Segments 2 and 3) and the West Hills (Segments 4.21 and 5) create significant challenges for trail development with respect to providing the most direct trail routes and achieving Americans with Disabilities Act (ADA)-compliant trail grades.
Stormwater runoff	Steep slopes may also contribute to special challenges with stormwater runoff and associated erosion and pollutants.
Flooding	There is flooding potential within the trail corridor, most likely from the Tualatin River (Segment 1). Intermittent winter flooding occurs along Segments 4.20 and 4.21.
Stream crossings	Permitting and design for crossing the Tualatin River and other named and unnamed creeks and drainages may be challenging and potentially costly.
Cultural and archeological resources	There are no documented cultural or archeological resources within the study corridor.
Viewpoints	Steep slopes also represent opportunities for enhancing the trail user experience with the addition of viewpoints and pullouts.
Noise	Higher speed/high traffic road crossings may generate adverse noise impacts.

Trail development opportunities and challenges

Existing conditions within the study corridor present a wide range of opportunities and challenges for trail development. These relate to existing development, property ownership and control, physical features, design, permitting and management of the trail, and to habitat restoration and wildlife conservation.

Ownership, jurisdiction, and existing development

Opportunity	Challenge
Power corridor – BPA directly owns most of the south-north power/trail corridor between the Tualatin River and the Rock Creek Trail, excepting property owned by Nike, Inc. PGE controls, by easement, a corridor parallel to BPA-owned land between the Tualatin River and SW Barrows Road. This power corridor is a unique opportunity to extend the trail through highly urbanized areas. **Connections to existing trails** – Multiple jurisdictions will need to invest in building and maintaining portions of the Westside Trail, but all will benefit from connections to the existing trail segments built and maintained by THPRD and from connecting trails already built and maintained by other local jurisdictions.	**Utility requirements** – Trail alignments and structures will need to avoid both overhead and underground utilities. Trail alignment will be more challenging in parts of the power corridor with multiple power lines, existing nonutility development, and/or narrower power corridor width. **Ownership** – The underlying ownership and/or terms of usage for all utility easements may complicate trail alignments and increase development costs as a result of land acquisitions. The west-east power corridor approaching Forest Park is controlled by BPA only through easement. **User-neighborhood conflict** – The Westside Trail will link to nearby parks, natural areas, residences, schools, and businesses; however, these connections may also generate conflicts between trail users and abutting residents and businesses. **Extra-corridor alignments** – Adjacent land uses, land ownership, and nearby or intersecting roadway configurations may require consideration of trail alignment options that are outside of the power corridor. **Jurisdictional limitations** – Several segments are in unincorporated county areas. Multnomah and Washington Counties do not provide parks services. Alternative providers for building and maintaining these trail sections will have to be identified.

Physical features

Opportunity	Challenge
Compelling scenery – The trail corridor has the potential to provide access to interesting views including the Tualatin River, Willamette River, Bull Mountain, and larger landscapes as seen from higher elevations and steeper areas. Natural areas, smaller stream corridors, parks, and cemeteries are possible points of interest as well. **Partner to make improvements** – Trail crossings and intersections are an opportunity to improve trail functionality and connectivity and to leverage trail and transportation improvements in partnership with the applicable local road, transit or parks authority.	**Balance natural and built environment needs** – Enhancing wildlife habitat in segments of the trail corridor will require investments in restoration and revised municipal and utility maintenance agreements that meet and balance the needs of trail users, local neighborhoods and businesses, and wildlife. **Balance vegetation and utility requirements** – Revegetation and habitat restoration to improve appearance, screen neighbors, frame views, and support wildlife must not interfere with overhead or underground utilities. **Steep slopes** – Trail alignments and construction across the steeper areas of Bull Mountain and the West Hills may be more complex and expensive than for other segments, requiring retaining walls, trail meanders, and/or the use of areas outside of the power corridor to provide accessible routes. **Mode intersections** – Trail intersections with roadways, railways or other transportation modes may generate conflicts between trails users and the users and infrastructure standards of these other modes.

Roadway crossings and intersections

Chapter 3 of this master plan evaluates specific trail alignment options and crossing treatments for major roadways (arterial or collector classification) and the TriMet MAX line. Plan Report No. 2, Trail Corridor Analysis (Appendix B), provides additional detail. In addition, fifteen local or neighborhood streets are crossed by the Westside Trail. Specific crossing locations and treatments will be determined based on the applicable local jurisdiction standards. The major transportation routes crossed or followed by the trail are (south to north):

SW Beef Bend Road	Segments 1 and 2
SW Bull Mountain Road	Segment 2
TriMet MAX Blue Line	Segment 4.11
SW 158th Avenue	Segment 4.12
SW Jenkins Road	Segment 4.12
SW Jay Street	Segment 4.12
SW Walker Road	Segment 4.14
US 26	Segments 4.14 and 4.15
NW Cornell Road	Segments 4.15 and 4.16
West Union Road	Segments 4.17 and 4.18.1
NW Kaiser Road	Segments 4.18.1 and 4.18.2
NW Springville Road	Segment 5
NW Skyline Boulevard	Segments 5 and 6
US 30	Segment 6

Utility corridors

Electrical power corridors

Large electrical power transmission towers and poles challenge trail development alignments, particularly where the power corridor narrows to 100 feet and where steep slopes are present. Both the physical placement and size of the structures and utility maintenance requirements can dictate trail routing. Lattice tower and single-pole footing locations are shown on the segment-by-segment maps included in this master plan. There are also aboveground utility buildings and other small structures along the corridor. Such buildings are few in number and should not pose a significant challenge to trail development.

The Westside Trail corridor within Washington County is primarily a south-north trending BPA-owned power transmission corridor. A PGE power corridor parallels the BPA corridor between the Tualatin River and SW Barrows Road, including lands within King City and Tigard and unincorporated Washington County. The PGE corridor is primarily secured by easement. Use of the PGE corridor for trail development may be less feasible than with the BPA-owned corridor due to

underlying property rights. A separate BPA power corridor crosses Segments 4.20 to Segment 6 including areas within Multnomah County and the Portland. This corridor is secured by easements over private lands.

Other utilities

Underground natural gas lines and a major petroleum pipeline traverse the study corridor in several locations. Trail alignments and surfaces, as well as habitat restoration, will have to assure continued accessibility to these pipelines for maintenance and replacement purposes. Use permissions from the petroleum pipeline operator (Kinder-Morgan) and natural gas operators may be necessary. The petroleum pipeline in particular is buried at shallow depths, and special considerations may have to be made in trail development to assure the integrity of this line.

Just outside of the south end of the study corridor on the south side of the Tualatin River, the Oregon Department of Environmental Quality (DEQ) has a longstanding petroleum fuel spill cleanup underway. This cleanup could influence the siting of any bridge spanning the river and connecting the Westside Trail to the future Ice Age Tonquin and Tualatin Greenway trails.

CHAPTER 3: TRAIL CORRIDOR ANALYSIS

Overview

Working with the SAC, jurisdictional stakeholders, property owners, area residents, and BPA and PGE, an extensive process was undertaken to identify and evaluate trail alignment alternatives.

A set of trail segments was identified to organize the trail alignment analysis. The initial set of Westside Trail segments included in the study corridor were identified in late 2011 based on a review of background information, property research, and input from jurisdictional stakeholders. Built trail sections operated by THPRD or planned for development by 2014 (Segments 4.01 to 4.11 and Segment 4.18.2) were *not* included in the master plan study corridor but maps are included in this master plan report for reference purposes (see Map 6 and Map 13).

Two major mid-study adjustments were made to segments.

- Two segments leading into the North Management Unit of Portland's Forest Park were eliminated from the study in early 2012, as Portland management policies for this portion of Forest Park do not allow multiuser trails.
- Based on discussions with THPRD and Washington County in early 2013, Segments 4.18.3 and 4.19 north of Rock Creek were eliminated from the study corridor. These segments will be developed by THPRD as community-scale trails or as part of North Bethany residential development.

Methodology

The information developed in Plan Report No. 1, Existing Conditions (Appendix A) provides the essential background and context to the trail corridor analysis. Geographic information system (GIS) and other mapping data developed in the master plan's existing conditions phase, and preliminary property ownership information developed by Metro with the assistance of the project partners (particularly BPA and PGE) were used extensively. Additional technical assistance was provided by THPRD, the Oregon Department of Transportation (ODOT), TriMet, Washington County, Multnomah County, and the cities of Tigard and Portland.

All illustrated trail alignment alternatives are plan level. Recommended alignments and crossings have not been subject to survey, final design, or engineering. More information on the assumptions and parameters used in determining and costing different trail alignments are part of Plan Report No. 2, Trail Corridor Analysis (Appendix B). Updates to alignments, assumptions and costs made subsequent to Plan Report No. 2 are included in Plan Report No. 4, Implementation Strategy (Appendix D).

The key parameters in order of preference guiding the selection of trail alignment alternatives were:

- Establish conceptual alignments with longitudinal slopes of 5 percent or less meeting ADA requirements.

- Stay within the 100-foot-wide BPA-owned power corridor (except for those portions of Segments 4.21 and 5 for which there is no BPA-*owned* corridor).
- For other segments where 5 percent slopes cannot be achieved within the BPA-owned power corridor, use easement areas under PGE power towers and lines.
- If 5 percent slopes still cannot be achieved within the BPA-PGE power corridor, use abutting public open spaces or private vacant lands.
- If 5 percent slopes still cannot be achieved within the BPA-PGE power corridor or within abutting public or private lands, or if achieving 5 percent slopes result in extended sections of sharp switchbacks and retaining walls, and/or extensive cut and fill, use an average 8 percent slope standard.
- Where multiuser/bicycle-pedestrian options meeting ADA requirements still cannot be achieved, use shared roadway or bike lane solutions for road bicycles combined with pedestrian-only alternatives and/or facilities such as short bridges or steps.

Washington County standards for determining the location and features for midblock road crossings were applied to crossings in Washington County. Multnomah County standards for NW Springville Road and City of Portland standards for NW Skyline Boulevard were the basis for those conceptual crossing treatments and costing.

Preferred trail alignments

Plan Report No. 2, Trail Corridor Analysis (Appendix B) details the processes, technical influences, and opportunities and challenges that yielded one to four multiuser trail alignment alternatives for each Westside Trail segment, as well as other options such as shared roadway facilities, bike lanes, soft-surface trails, and street-edge trails. See Chapter 4 for definitions and details. Plan Report No. 2 also details the underlying assumptions that went into trail alternatives and costing.

Based on the information developed in Plan Report No. 3, Design Framework (Appendix C) and input from the SAC, public open house, and other public and jurisdictional interactions, modifications were made to some of assumptions and alignment alternatives reported in Plan Report No. 2. These changes are detailed in Plan Report No. 4.

After a second round of SAC review and the third round of public open houses in May 2013, a set of preferred trail alignment alternatives were selected. Following are mapping and summaries of the key elements of each preferred trail alternative south to north.

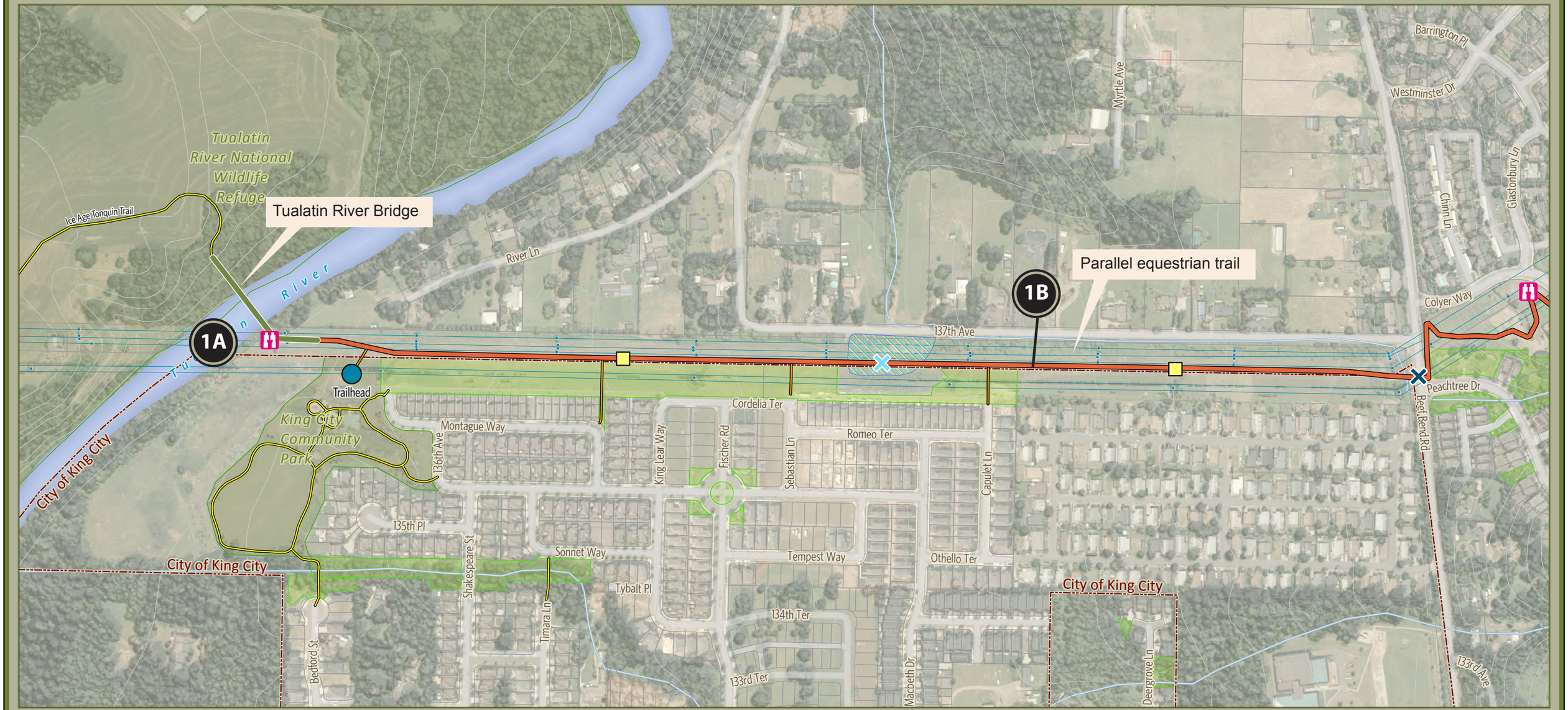
Table 1 Segment 1: Tualatin River to SW Beef Bend Road

1A Tualatin River crossing	
Design: three-span bridge with approach ramp under 5% grade, steel/concrete construction, 18'-wide bridge deck **Use:** pedestrians, bicycles, equestrians **Jurisdiction:** City of King City, City of Tualatin **Length:** 330'-long bridge plus 200'-long north side ramp **Cost:** $3,844,000 **Priority:** near term	Bridge crosses the Tualatin River west of the power corridor; north approach ramp to be built within power corridor; north ramp on piers to avoid impeding floodwaters; connects to other trails and wildlife refuge on south side of river and to Segment 1 and King City Community Park on north side; wildlife habitat features are to be included in bridge design.
1B Tualatin River crossing to SW Beef Bend Road	
Design: asphalt, 10' to 12' wide, up to 5% grades; soil with gravel, 6' to 8' wide, up to 5% grades. **Use:** pedestrians, bicycles, equestrians **Jurisdiction:** City of King City **Length:** 0.74 mile **Cost:** $3,153,000 **Priority:** near term	Within power corridor; two parallel trails – one paved multiuser, one equestrian; relatively flat corridor, no switchbacks required; one wetland crossing requiring boardwalk; trailhead at King City Park; prairie restoration with wetland enhancement and restoration.

Westside Trail Master Plan

Map 2 **Segment 1**

Tualatin River to Beef Bend Rd

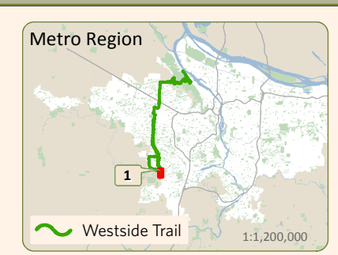


Westside Trail Recommended Alignment

- Multi-user
- Soft surface
- On-street
- Bridge
- Recommended Access Connector Paths
- Existing Westside Trail
- Other Trails
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings
- Schools
- Potential Viewpoints
- Potential Trailheads
- Potential Prairie Restorations
- 3C Subsegment number
- Wetlands
- Taxlots

Parks and natural areas

- Privately owned
- Publicly owned
- Powerlines & Towers
- Streams
- 10 foot contours
- City Boundaries
- County Boundaries



N

0 100 200 300 400
Feet

All illustrated alignments subject to change based on final design, permitting, and engineering.

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Segment Analysis Map - Segment 1

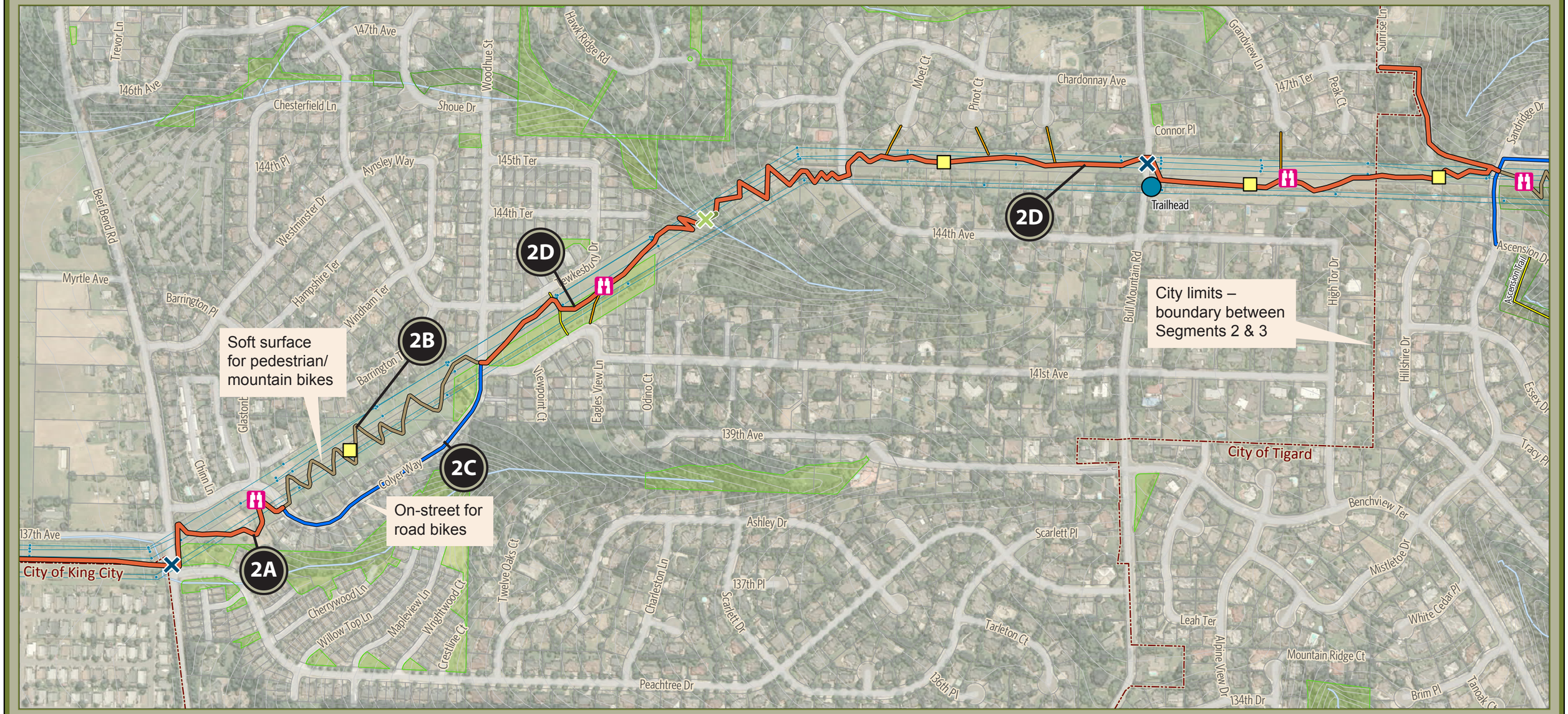
Table 2 Segment 2: SW Beef Bend Road to Tigard city limits

Jurisdiction: Washington County **Total Length:** 1.52 miles **Total Cost:** $4,653,500	Alignment responds to steep slopes and cross slopes. Short shared roadway road bike sections and parallel soft-surface trail mitigate for steep slope impacts. See Map 5 for a secondary route around Bull Mountain that avoids steep slopes. Total length excludes shared roadway section.
2A SW Beef Bend Road to SW Colyer Way	
Design: asphalt, 10' to 12' wide, up to 8% grades. **Use:** pedestrians, bicycles **Length:** 0.16 mile **Cost:** $869,000 **Priority:** medium term	Multiuser trail within power corridor; includes midblock crossing of SW Beef Bend Road using flashing beacon signals and center refuge island; two to three switchbacks; prairie habitat restoration.
2B SW Colyer Way to SW Woodhue Street	
Design: soil with gravel, 6' to 8' wide, up to 8% grades **Use:** pedestrians, mountain bikes **Length:** 0.38 mile **Cost:** $472,000 **Priority:** medium term	Within power corridor; soft-surface option in steepest section of segment; 12 switchbacks; prairie habitat restoration.
2C SW Colyer Way	
Design: shared roadway **Use:** road bicycles **Length:** 0.25 mile **Cost:** $11,000 **Priority:** medium term	Existing street paralleling east side of power corridor; shared roadway solution for road bicycles; add wayfinding signage; add sharrow pavement markings.
2D SW Woodhue Street to Tigard City Limits	
Design: asphalt, 10' to 12' wide, up to 8% grades; **Use:** pedestrians, bicycles **Length:** 0.98 mile **Cost:** $3,301,500 **Priority:** medium term	Multiuser trail within power corridor; 100' bridge span across ravine; midblock crossing of SW Bull Mountain Road using flashing beacon signals and center refuge island; trailhead at SW Bull Mountain Road; 16 switchbacks; possible property acquisition; prairie habitat restoration with possible woodland conservation and stream restoration at ravine.

Westside Trail Master Plan

Map 3 **Segment 2**

Beef Bend Rd to Tigard city limits

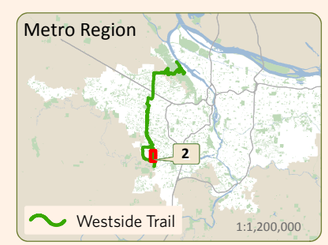


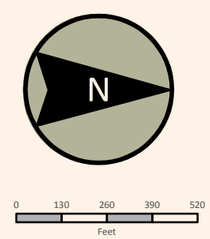
Westside Trail Recommended Alignment

- Multi-user
- Soft surface
- On-street
- Bridge
- Recommended Access Connector Paths
- Existing Westside Trail
- Other Trails
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings
- Schools
- Potential Viewpoints
- Potential Trailheads
- Potential Prairie Restorations
- 3C Subsegment number
- Wetlands
- Taxlots

Parks and natural areas

- Privately owned
- Publicly owned
- Powerlines & Towers
- Streams
- 10 foot contours
- City Boundaries
- County Boundaries





All illustrated alignments subject to change based on final design, permitting, and engineering.

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Segment Analysis Map - Segment 2

Table 3 Segment 3: Tigard city limits to SW Barrows Road

Jurisdiction: City of Tigard **Total length:** 1.26 miles **Total cost:** $2,525,000	Trail alignment responds to steep slopes and cross slopes. Short shared roadway section for road bikes and soft-surface pedestrian trail through adjacent natural area mitigate for steep slope impacts. See Map 5 for a secondary route around Bull Mountain that avoids steep slopes. Total length excludes shared roadway section.
3A Tigard city limits to SW Mistletoe Drive	
Design: asphalt, 10' to 12' wide, 5% to 8% grade **Use:** pedestrians, road bikes **Length:** 0.12 mile **Cost:** $215,000 **Priority:** medium term	Multiuser trail within power corridor; grades primarily less than 5%, some intermittent sections up to 8%; three switchbacks; one local street crossing; prairie habitat restoration.
3B Sunrise Park	
Existing asphalt multiuser trail on private property connecting to Tigard's Sunrise Park; will require acquisition; 0.18 mile length; may require some upgrades to meet design standards; woodland restoration opportunities; near-term priority; not costed or included in total segment length.	
3C Hillshire Woods – SW Mistletoe Drive to SW Creekshire Drive and SW Ascension Drive	
Design: soil with gravel, will vary from 4' to 7' wide, up to 8% grades **Use:** pedestrians, mountain bikes **Length:** 0.55 mile **Cost:** $370,000 **Priority:** near term	Within Tigard's Hillshire Woods; soft-surface primarily 5% or less, some intermittent sections up to 8%; three trail spurs on north end connect to power corridor, SW Creekshire, and SW Ascension; steps may be required to SW Ascension; woodland habitat conservation.
3D SW Nahcotta to SW Ascension via SW Mistletoe	
Design: shared roadway **Use:** road bikes **Length:** 0.47 mile **Cost:** $17,000 **Priority:** medium term	Existing street paralleling west side of power corridor; shared roadway solution for road bicycles; add wayfinding signage; add sharrow pavement markings. Also includes designation of a shared roadway route connecting the trail and SW Nahcotta to the Ascension Trail.
3E SW Catalina to SW Barrows	
Design: asphalt, 10' to 12' wide, up to 8% grades **Use**: pedestrians, bicycles **Length**: 0.59 mile **Cost**: $1,923,000 **Priority**: medium term	Multiuser trail within power corridor; grades primarily less than 5%, some intermittent sections up to 8%; eight switchbacks; three minor stream crossings with low, short bridges (final design may reduce number of crossings); three local street crossings; trailhead at Horizon Blvd; prairie habitat restoration.

Westside Trail Master Plan

Map 4 **Segment 3**

Tigard city limits to Barrows Rd

To Sunrise Park

On-street for road bikes

On-street connection to Ascension Trail

Soft surface for pedestrian/ mountain bikes

3A 3B 3C 3D 3E

Trailhead

City of Tigard

City of Beaverton

THPRD Boundary

Hillshire Woods

Barrows Park

Northview Park

Westside Trail

Barrows Rd

Sunrise Ln
147th Ter
Peak Ct
Sandridge Dr
Seaview Ln
Klipsan Ln
Nahcotta Dr
Catalina Dr
Fern St
Kraft Pl
147th Pl
Metta Ter
Jenshire Ln
Dauer Ct
Horizon Blvd
Barrows Powerline Trail
Barrows Park Trail
Creekshire Pl
Creekshire Dr
Windsong Ct
Lukar Ct
Walnut Ln
Northview Park Trail
Northview Dr
Stardust Ln
Liden Dr
Oxalis Ter
Mitchell Ct
Karley Ct
Ascension Dr
Ascension Trail
Mistletoe Dr
Tracy Pl
Essex Dr
Hillshire Dr
High Tor Dr

Westside Trail Recommended Alignment

- Multi-user
- Soft surface
- On-street
- Bridge
- Recommended Access Connector Paths
- Existing Westside Trail
- Other Trails
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings
- Schools
- Potential Viewpoints
- Potential Trailheads
- Potential Prairie Restorations
- 3C Subsegment number
- Wetlands
- Taxlots

Parks and natural areas

- Privately owned
- Publicly owned
- Powerlines & Towers
- Streams
- 10 foot contours
- City Boundaries
- County Boundaries

Metro Region

3

Westside Trail

1:1,200,000

N

0 90 180 270 360

Feet

All illustrated alignments subject to change based on final design, permitting, and engineering.

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Segment Analysis Map - Segment 3

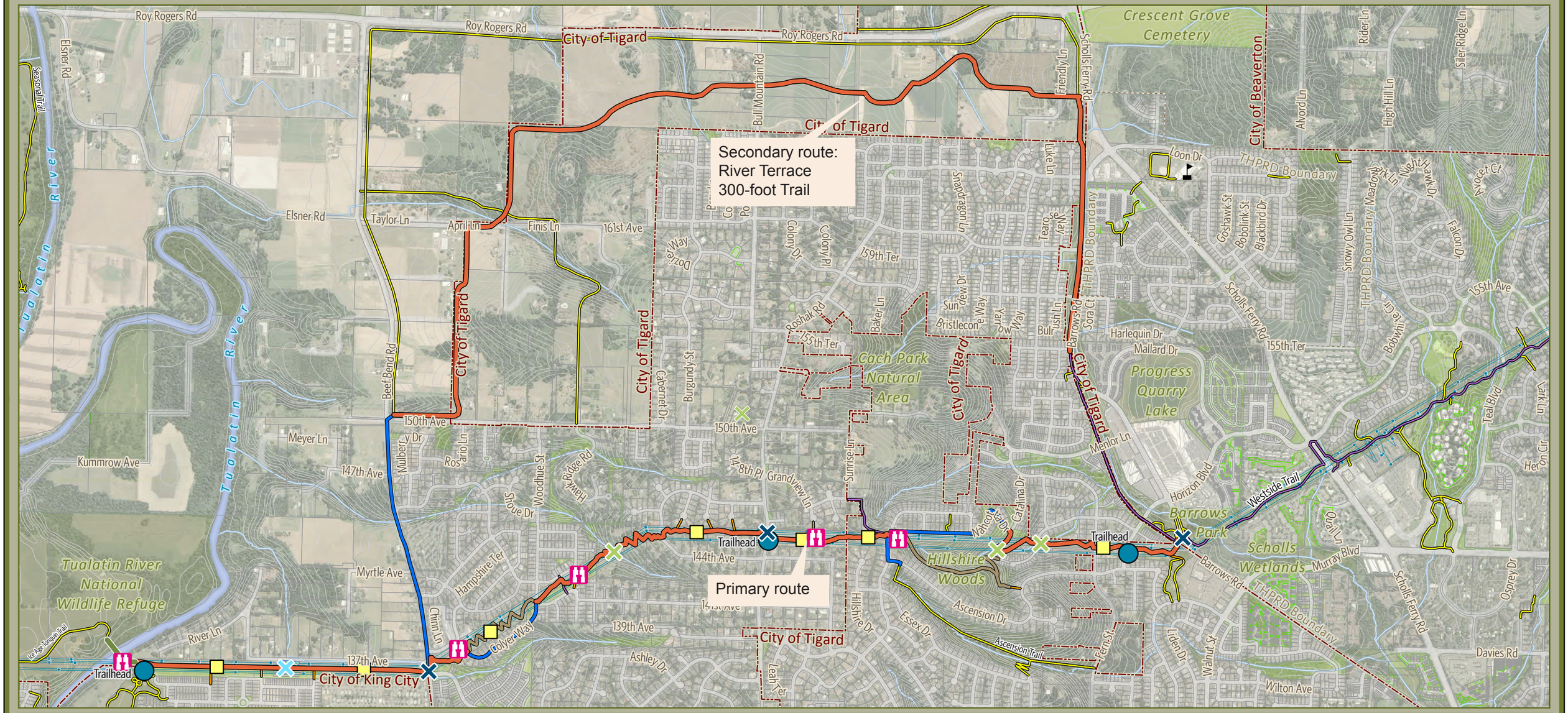
Segments 2 and 3 secondary route: SW Beef Bend Road to SW Barrows Road

Not all trail users may want to use the steep sections that cross Bull Mountain along the power corridor. Development on lands newly annexed to Tigard along the west edge of Bull Mountain will eventually provide a secondary route taking users around Bull Mountain. As part of private development, a series of trails and bikeways will be included in the River Terrace subdivision. One subdivision trail, termed the 300-Foot Trail as it approximately follows the 300-foot elevation line, will provide for a multiuser south-north trail connecting SW Beef Bend Road and SW Barrows Road. With the addition of new bike lanes and sidewalks along SW Beef Bend Road and SW Barrows Road, a longer but relatively flat route around Bull Mountain will be available. This secondary route is illustrated on Map 5.

Westside Trail Master Plan

Map 5 Segment 2 & 3 Secondary Route

Beef Bend Rd to Barrows Rd



Westside Trail Recommended Alignment

- Multi-user
- Soft surface
- On-street
- Bridge
- Recommended Access Connector Paths
- Existing Westside Trail
- Other Trails
- Midblock Crossings
- Wetland Crossings
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- Taxlots

Parks and natural areas

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- Powerlines & Towers
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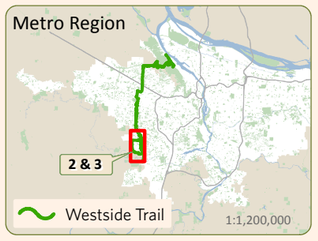
- City Boundaries
- County Boundaries



N

0 250 500 750 1,000
Feet

All illustrated alignments subject to change based on final design, permitting, and engineering.

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Segment Analysis Map - Segment 2 & 3

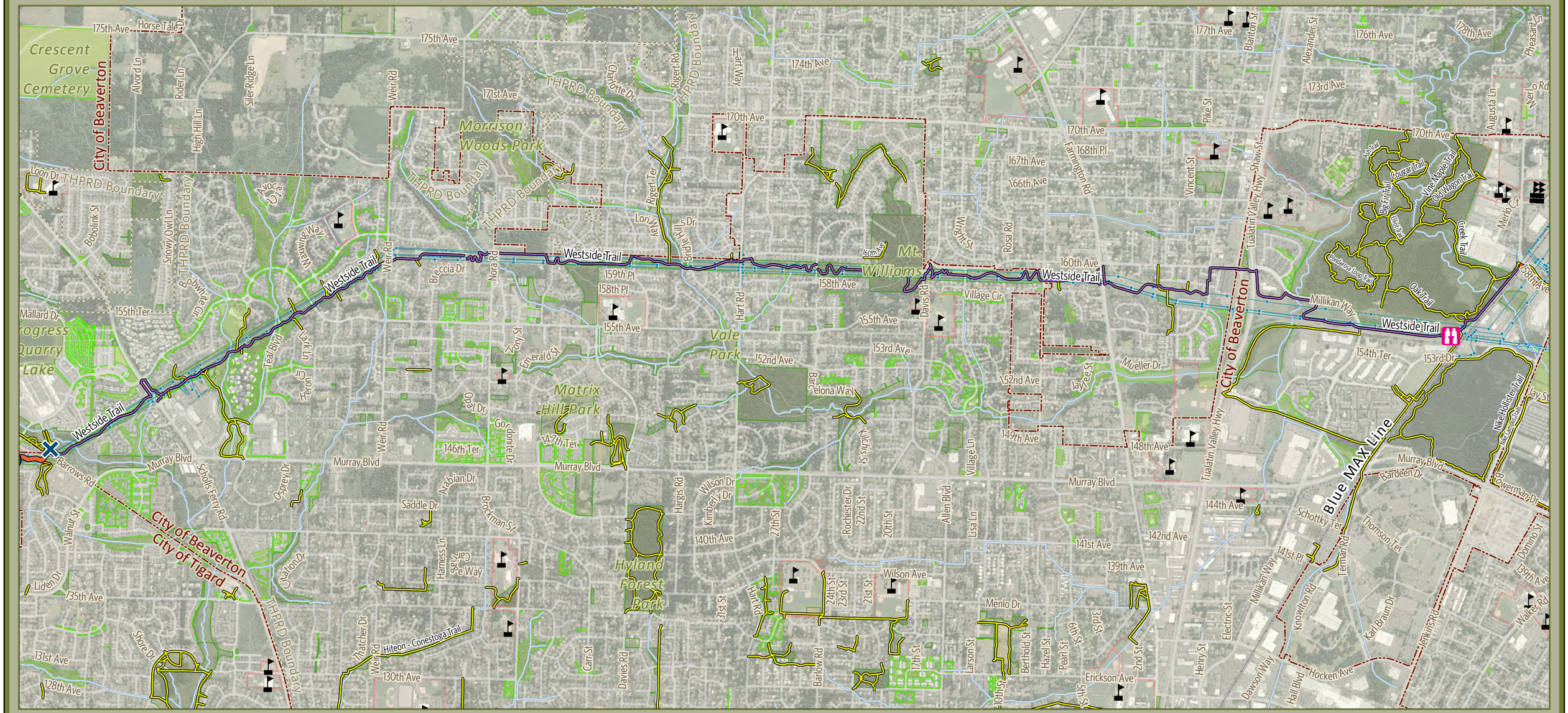
Segments 4.01 to 4.11: SW Barrows Road to Tualatin Hills Nature Park (THNP)

These segments are already built or are scheduled for construction. Segments 4.01, 4.04, and 4.07 were completed by THPRD in 2013. Segment 4.11 is under design with construction probable in 2014.

Westside Trail Master Plan

Map 6 **Segment 4.01-4.11**

Barrows Rd to Tualatin Hills Nature Park



Westside Trail Recommended Alignment

- Multi-user
- Soft surface
- On-street
- Bridge
- Recommended Access Connector Paths
- Existing Westside Trail
- Other Trails
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings
- Potential Trailheads
- Potential Viewpoints
- Schools
- Potential Prairie Restorations
- Wetlands
- Taxlots

Parks and natural areas

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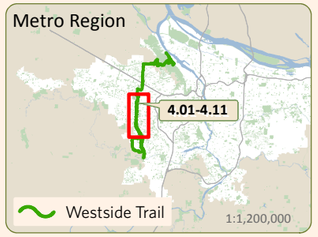
- Powerlines & Towers
- Streams
- 100 foot contours
- City Boundaries
- County Boundaries



N

0 500 1,000 1,500 2,000 Feet

All illustrated alignments subject to change based on final design, permitting, and engineering.

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Segment Analysis Map - Segment 4.01-4.11

Table 4 Segments 4.12 to 4.13: Tualatin Hills Nature Park (THNP) to SW Walker Road

4.12 THNP to SW Walker Road	
Design: asphalt, 10' to 12' wide, plus 3' to 5' wide buffer from street **Use:** pedestrians, bicycles **Jurisdiction:** Washington County **Length:** 0.82 mile **Cost:** $1,355,000 **Priority:** long term	Replace existing sidewalk along east side of SW 158th Avenue with a street-edge trail; property acquisition will be required; existing landscaping will have to be removed and replacement may be required.
4.13 SW Walker Road: 158th to Power Corridor	
Design: asphalt, 10' to 12' wide, plus 3' to 5' wide buffer from street **Use:** pedestrians, bicycles **Jurisdiction:** Washington County **Length:** 0.48 mile **Cost:** $794,000 **Priority:** medium term	Replace existing sidewalk along south side of SW Walker Road with a street-edge trail; crosses to north side at SW 150th Avenue; property acquisition will be required; planned widening to SW Walker Road may build this section.

Westside Trail Master Plan

Map 7

Segment 4.12 & 4.13

Tualatin Hills Nature Park to Walker Rd

Westside Trail Recommended Alignment

- Multi-user
- Soft surface
- On-street
- Bridge
- Recommended Access Connector Paths
- Existing Westside Trail
- Other Trails
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings
- Schools
- Potential Viewpoints
- Potential Trailheads
- Potential Prairie Restorations
- Wetlands
- Taxlots

Parks and natural areas

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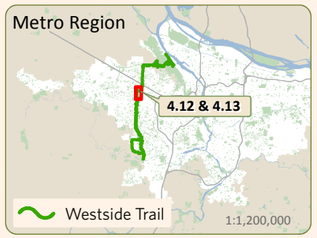
- Powerlines & Towers
- Streams
- 10 foot contours
- City Boundaries
- County Boundaries



N

0 100 200 300 400
Feet

All illustrated alignments subject to change based on final design, permitting, and engineering.

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Segment Analysis Map - Segment 4.12 & 4.13

Table 5 Segment 4.14: SW Walker Road to US 26

Design: asphalt, 10’ to 12’ wide, up to 5% grades. **Use:** pedestrians, bicycles **Jurisdiction:** THPRD **Length:** 0.90 mile **Cost:** $2,320,000 **Priority:** medium term	Multiuser trail within power corridor; if US 26 bridge precedes Segment 4.14, short multiuser trail section connecting bridge ramp to Greenbriar Parkway needed; includes trailhead near Pioneer Park; two switchbacks; one minor stream crossing; all prairie habitat restoration

Westside Trail Master Plan

Map 8 **Segment 4.14**

Walker Rd to Sunset Highway

Westside Trail Recommended Alignment

- Multi-user
- Soft surface
- On-street
- Bridge
- Recommended Access Connector Paths
- Existing Westside Trail
- Other Trails
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings
- Schools
- Potential Viewpoints
- Potential Trailheads
- Potential Prairie Restorations
- Wetlands
- Taxlots

Parks and natural areas

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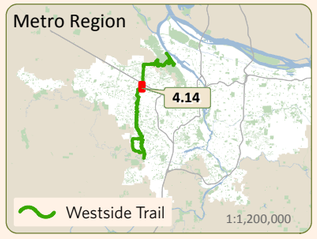
- City Boundaries
- County Boundaries



N

0 100 200 300 400
Feet

All illustrated alignments subject to change based on final design, permitting, and engineering.

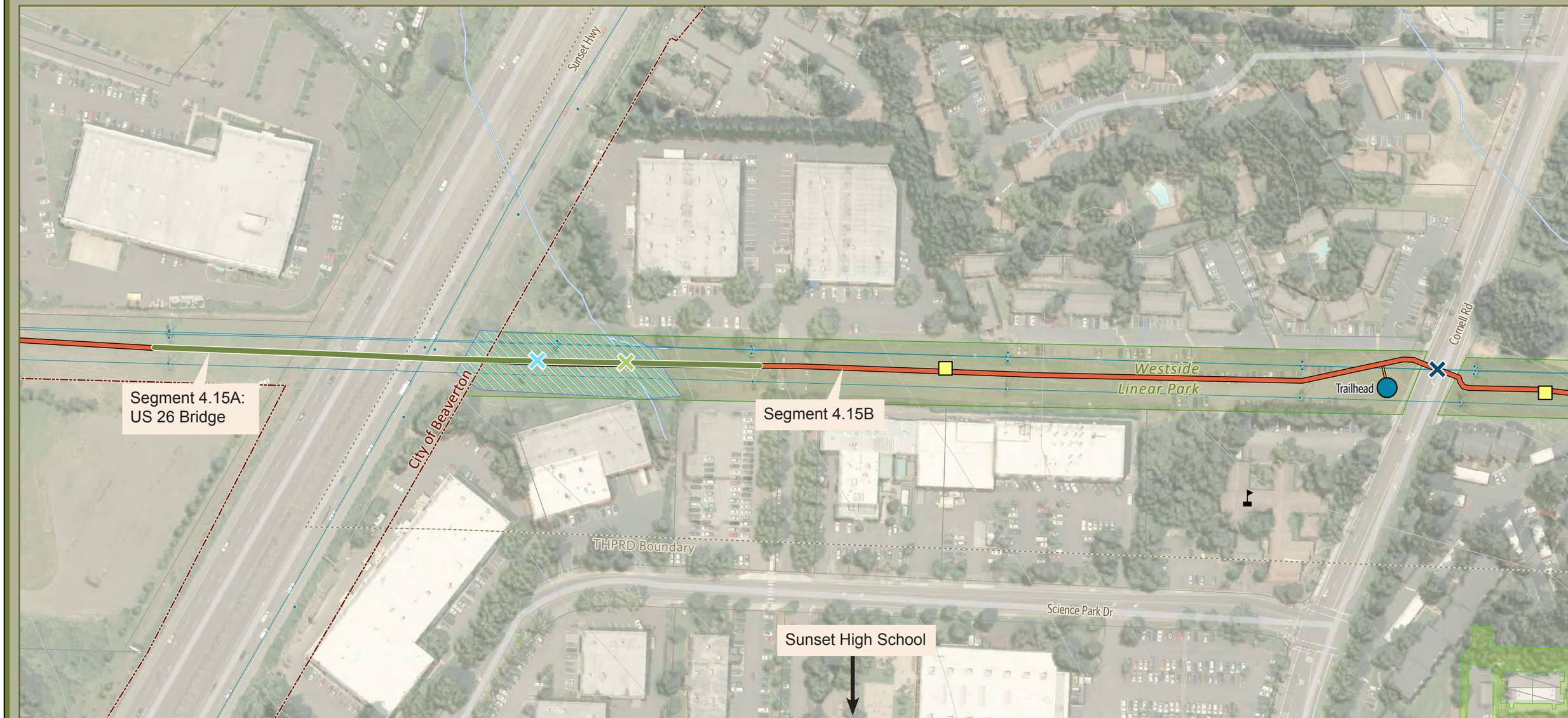
Table 6 Segment 4.15: US 26 to NW Cornell Road

4.15A US 26 crossing	
Design: two-span bridge; switchback north approach ramp; straight south approach ramp; both ramps 5% grade; concrete/steel construction, 18' wide **Use:** pedestrians, bicycles Jurisdictions: ODOT, THPRD **Length:** 230'-long bridge; 175'-long north ramp; 340'-long south ramp **Cost:** $5,430,000 **Priority:** near term	Bridge crosses US 26 at slight angle within the power corridor; north side power pole relocations probably necessary; north ramp on piers to mitigate wetland impacts; north ramp switchbacks may be needed to avoid conflict with industrial service roadway; wildlife habitat features to be included on the bridge.
4.15B US 26 to NW Cornell Road	
Design: asphalt, 10' to 12' wide, up to 5% grades **Use:** pedestrians, bicycles Jurisdiction: THPRD **Length:** 0.20 mile **Cost:** $1,701,500 **Priority:** near term	Multiuser trail within power corridor; relatively flat, no switchbacks required; trailhead on south side of NW Cornell; midblock crossing of Cornell with signal and refuge island; prairie restoration for balance.

Westside Trail Master Plan

Map 9 **Segment 4.15**

Sunset Highway to NW Cornell Road



Westside Trail Recommended Alignment

- Multi-user
- Soft surface
- On-street
- Bridge
- Recommended Access Connector Paths
- Existing Westside Trail
- Other Trails
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings
- Schools
- Potential Viewpoints
- Potential Trailheads
- Potential Prairie Restorations
- Wetlands
- Taxlots

Parks and natural areas

- Privately owned
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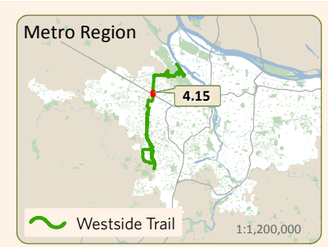
- Powerlines & Towers
- Streams
- 10 foot contours
- City Boundaries
- County Boundaries



N

0 50 100 150 200
Feet

All illustrated alignments subject to change based on final design, permitting, and engineering.

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Segment Analysis Map - Segment 4.15

Table 7 Segment 4.16: NW Cornell Road to NW Oak Hills Drive

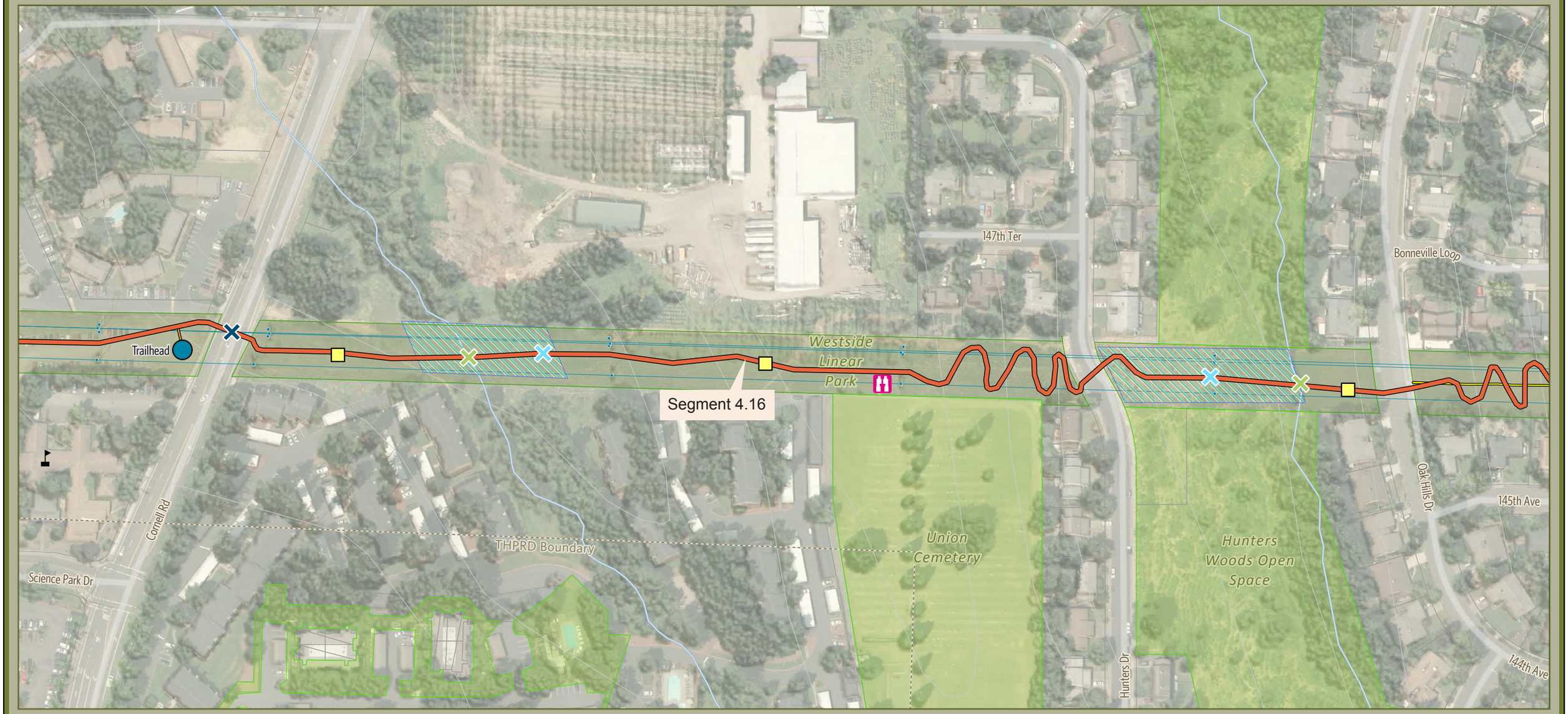
Design: asphalt, 10’ to 12’ wide, up to 5% grades **Use:** pedestrians, bicycles **Jurisdiction:** THPRD **Length:** 0.41 mile **Cost:** $1,318,000 **Priority:** medium term	Multiuser trail within power corridor; passes west side of Union Cemetery and crosses Hunters Woods open space; seven switchbacks south of NW Hunters Drive; two wetland/minor stream crossings requiring boardwalks and short, low elevation bridges; prairie restoration with wetland enhancement and restoration at wetland crossings.

Westside Trail Master Plan

Map 10

Segment 4.16

Cornell Rd to Oak Hills Dr

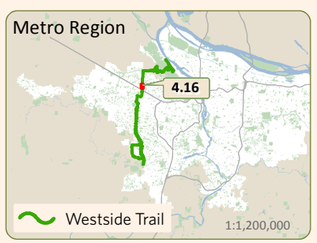


Westside Trail Recommended Alignment

- Multi-user
- Soft surface
- On-street
- Bridge
- Recommended Access Connector Paths
- Existing Westside Trail
- Other Trails
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings
- Schools
- Potential Viewpoints
- Potential Trailheads
- Potential Prairie Restorations
- Wetlands
- Taxlots

Parks and natural areas

- Privately owned
- Publicly owned
- Powerlines & Towers
- Streams
- 10 foot contours
- City Boundaries
- County Boundaries



N

0 50 100 150 200
Feet

All illustrated alignments subject to change based on final design, permitting, and engineering.

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Segment Analysis Map - Segment 4.16

Table 8 Segment 4.17: NW Oak Hills Drive to NW West Union Road

Design: asphalt, 10’ to 12’ wide, up to 5% grades **Use:** pedestrians, bicycles **Jurisdiction:** THPRD **Length:** 0.49 mile **Cost:** $881,000 **Priority:** long term	Multiuser trail within power corridor; existing private trail does not meet Westside Trail width or grade standards; 8 switchbacks at south end of segment required to maintain 5% grades; connections to private trail network in neighborhood subject to homeowners association consent; all prairie habitat restoration.

Westside Trail Master Plan

Map 11 **Segment 4.17**

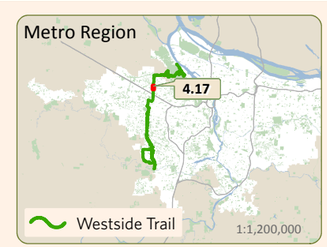
Oak Hills Dr to West Union Rd

Westside Trail Recommended Alignment

- Multi-user
- Soft surface
- On-street
- Bridge
- Recommended Access Connector Paths
- Existing Westside Trail
- Other Trails
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings
- Schools
- Potential Viewpoints
- Potential Trailheads
- Potential Prairie Restorations
- Wetlands
- Taxlots

Parks and natural areas

- Privately owned
- Publicly owned
- Powerlines & Towers
- Streams
- 10 foot contours
- City Boundaries
- County Boundaries



N

0 50 100 150 200
Feet

All illustrated alignments subject to change based on final design, permitting, and engineering.

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Segment Analysis Map - Segment 4.17

Table 9 Segment 4.18.1: NW West Union Road to NW Kaiser Road

Design: asphalt, 10’ to 12’ wide, up to 5% grades **Use:** pedestrians, bicycles **Jurisdiction:** THPRD **Length:** 0.27 mile **Cost:** $1,600,000 **Priority:** medium term	Multiuser trail within power corridor; relatively flat, two wide switchbacks near NW Kaiser needed to maintain 5% grades; midblock crossings at West Union Road and NW Kaiser with flashing beacons and center refuge islands; prairie habitat restoration

Westside Trail Master Plan

Map 12

Segment 4.18.1

West Union Rd to Kaiser Rd

Westside Trail Recommended Alignment

- Multi-user
- Soft surface
- On-street
- Bridge
- Recommended Access Connector Paths
- Existing Westside Trail
- Other Trails
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings
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- Potential Viewpoints
- Potential Trailheads
- Potential Prairie Restorations
- Wetlands
- Taxlots

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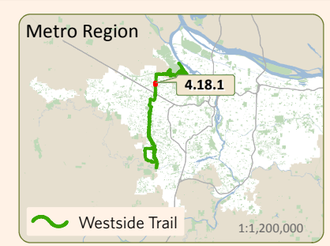

N

0 25 50 75 100
Feet

All illustrated alignments subject to change based on final design, permitting, and engineering.

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Segment Analysis Map - Segment 4.18.1

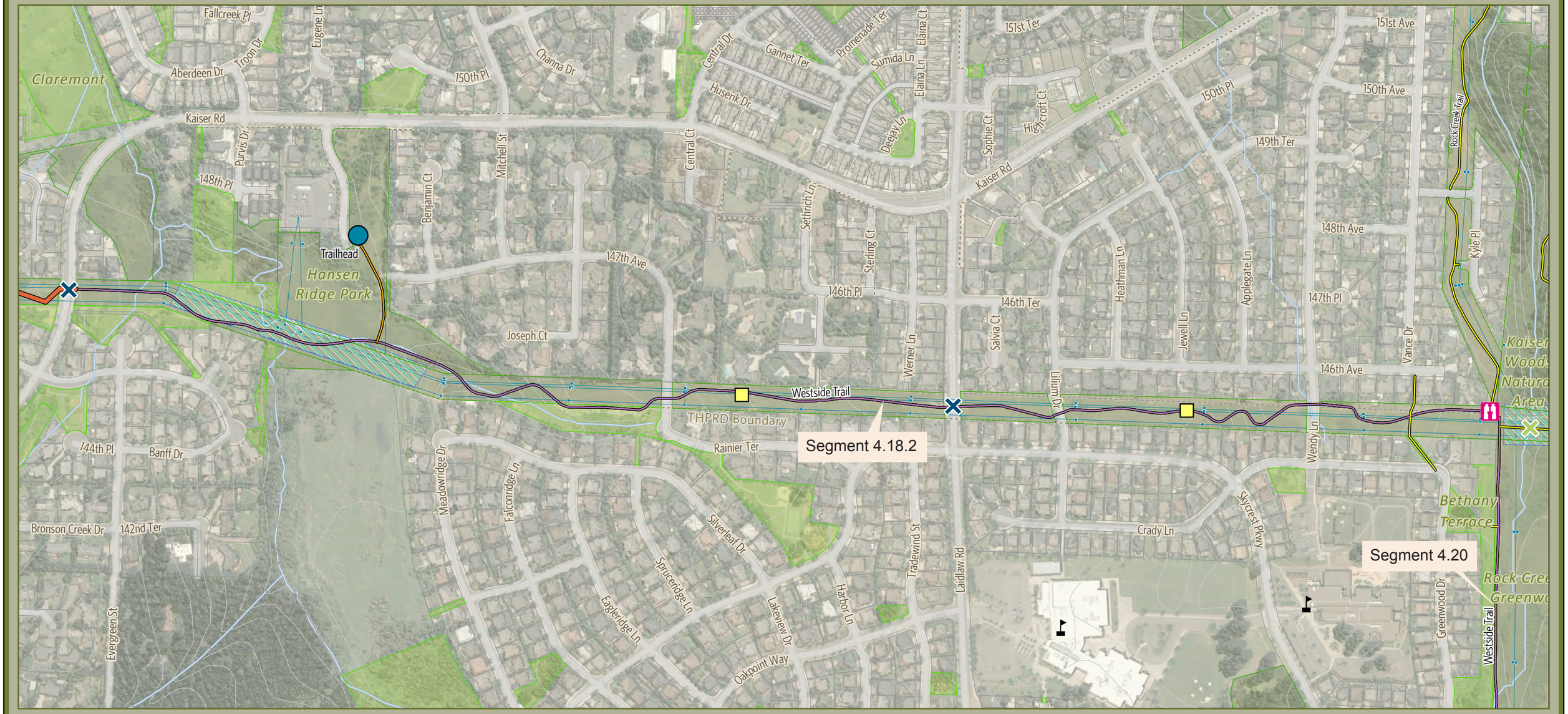
Segment 4.18.2: NW Kaiser Road to Kaiser Woods Park

THPRD will construct this multiuser trail in 2015 (see Map 13).

Westside Trail Master Plan

Map 13 Segment 4.18.2

Kaiser Rd to Kaiser Ridge Natural Area



Westside Trail Recommended Alignment

- Multi-user
- Soft surface
- On-street
- Bridge
- Recommended Access Connector Paths
- Existing Westside Trail
- Other Trails
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings
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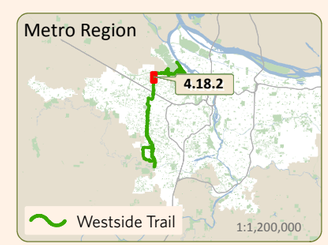

N

0 100 200 300 400
Feet

All illustrated alignments subject to change based on final design, permitting, and engineering.

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Segment Analysis Map - Segment 4.18.2

Table 10 Segment 4.21: NW Skycrest Parkway to county line

Design: asphalt, 10’ to 12’ wide, up to 8%+ grades **Use:** pedestrians, bicycles **Jurisdiction:** THPRD **Length:** 0.55 mile **Cost:** $1,015,000 **Priority:** medium term	Multiuser trail follows power transmission lines crossing private property; acquisition will be required; 9 switchbacks required to maintain 8% grades, grades may exceed 8% for intermittent sections; 1 minor stream crossing with nearby wetlands; otherwise all prairie habitat restoration. The east end of Segment 4.21 is being constructed as part of a planned residential subdivision and is not included in the cost estimate. Map 14 shows the built trail section (Segment 4.22) that takes the system to the county line. These two built/under construction sections are not included in the overall segment length. Newly emerging residential development plans west of this area may result in other trail sections in Segment 4.21 being privately constructed.

Westside Trail Master Plan

Map 14 **Segment 4.21**

Skycrest Pkwy to Multnomah Co. line

Trail right of way dedicated in 2013 – trail under construction

Multnomah County
Washington County

Gargany St

Bethany Meadows Terrace

Westside Trail

THPRD Boundary

Westside Trail

Segment 4.22: Built section

Segment 4.21

New subdivisions may construct trail sections

Bannister Creek Park

Redfox Dr

Greenwood Dr

Larry Ct

137th Ave

Roanoke Ln

135th Ave

134th Ave

Primino Ave

130th Ave

128th Ter

Bannister Dr

127th Ter

126th Ter

Skycrest Pkwy

Westside Trail Recommended Alignment

- Multi-user
- Soft surface
- On-street
- Bridge
- Recommended Access Connector Paths
- Existing Westside Trail
- Other Trails
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings
- Schools
- Potential Viewpoints
- Potential Trailheads
- Potential Prairie Restorations
- Wetlands
- Taxlots

Parks and natural areas

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- Publicly owned
- Powerlines & Towers
- Streams
- 10 foot contours
- City Boundaries
- County Boundaries

Metro Region

4.21

Westside Trail

1:1,200,000

N

0 100 200 300 400
Feet

All illustrated alignments subject to change based on final design, permitting, and engineering.

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Segment Analysis Map - Segment 4.21

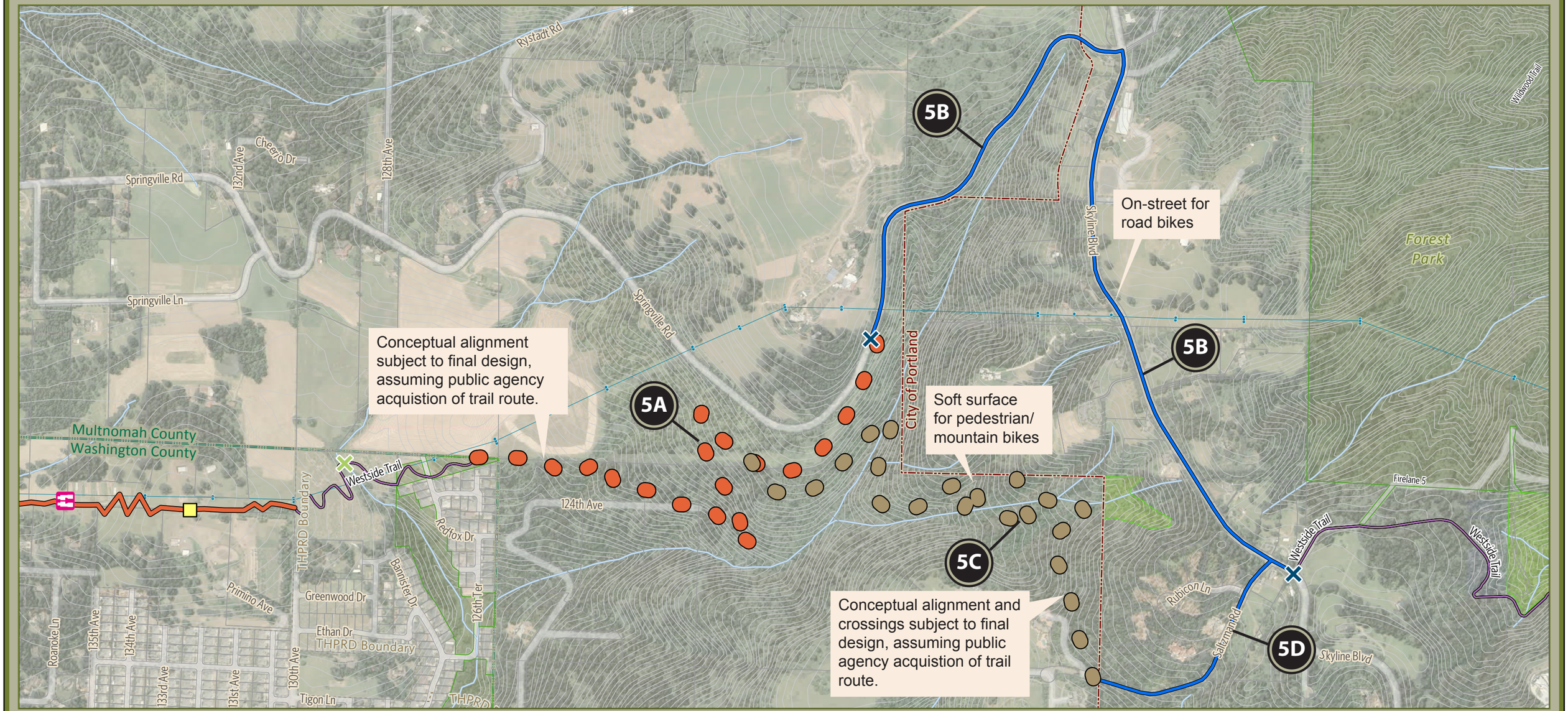
Table 11 Segment 5: County line to NW Skyline Boulevard

Total Trail Length: 2.11 miles **Total Cost:** $6,013,000	Split-mode alignments mitigate for steep slopes and conserve woodland habitat. Multiuser trail for part of route; a narrower soft-surface trail for other users is routed through woodlands; shared roadway sections accommodate road bicycles.
5A County line to NW Springville Road (multiuser pathway section)	
Design: asphalt, 10' to 12' wide, up to 8% grades. **Use:** pedestrians, bicycles **Length:** 0.94 mile **Cost:** $2,214,500 **Priority:** medium term	Multiuser trail; includes five switchbacks; low retaining walls; cost of intersection with NW Springville includes crossing treatments; final crossing type and design is subject to County warrant study at the time of construction; prairie habitat restoration and woodland conservation.
5B NW Springville Road to NW Saltzman Road (shared roadway section)	
Design: shared roadway **Use:** road bicycles **Length:** 1.27 miles **Cost:** $2,384,000 **Priority:** long term	Add 4'-wide shoulders on both sides of NW Springville and NW Skyline Blvd; add wayfinding signage; retaining walls required for approximately 25% of length; possible need for improved stormwater conveyance and treatment; possible ROW acquisition.
5C NW Springville Road to NW Saltzman Road (soft-surface section)	
Design: soil with gravel, 4' to 6' wide, up to 5% grades **Use:** pedestrians, mountain bikes, equestrians **Length:** 1.17 miles **Cost:** $916,000 **Priority:** medium term	Five minor stream crossings; woodland habitat conservation; wooden or stone retaining walls; alignment subject to final design.
5D NW Saltzman Road (shared roadway section)	
Design: shared roadway **Use:** pedestrians, mountain bikes, equestrians **Length:** 0.20 mile **Cost:** $498,500 **Priority:** medium term	Shared roadway solution connecting soft-surface trail (5C) to shared roadway section (5B) at entry to Forest Park; add wayfinding signage; add sharrow pavement markings; potential sidewalk improvements (not costed); midblock crossing of NW Skyline includes a flashing beacon and no refuge island, final crossing design is subject to City determination at the time of construction.

Westside Trail Master Plan

Map 15 **Segment 5**

Washington Co. line to Skyline Blvd

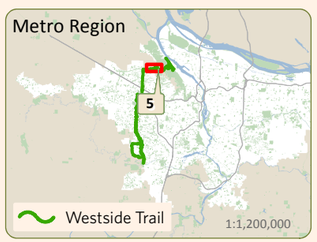


Westside Trail Recommended Alignment

- Multi-user
- Soft surface
- On-street
- Bridge
- Recommended Access Connector Paths
- Existing Westside Trail
- Other Trails
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings
- Schools
- Potential Viewpoints
- Potential Trailheads
- Potential Prairie Restorations
- 3C Subsegment number
- Wetlands
- Taxlots

Parks and natural areas

- Privately owned
- Publicly owned
- Powerlines & Towers
- Streams
- 10 foot contours
- City Boundaries
- County Boundaries



N

0 200 400 600 800
Feet

All illustrated alignments subject to change based on final design, permitting, and engineering.

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Segment Analysis Map - Segment 5

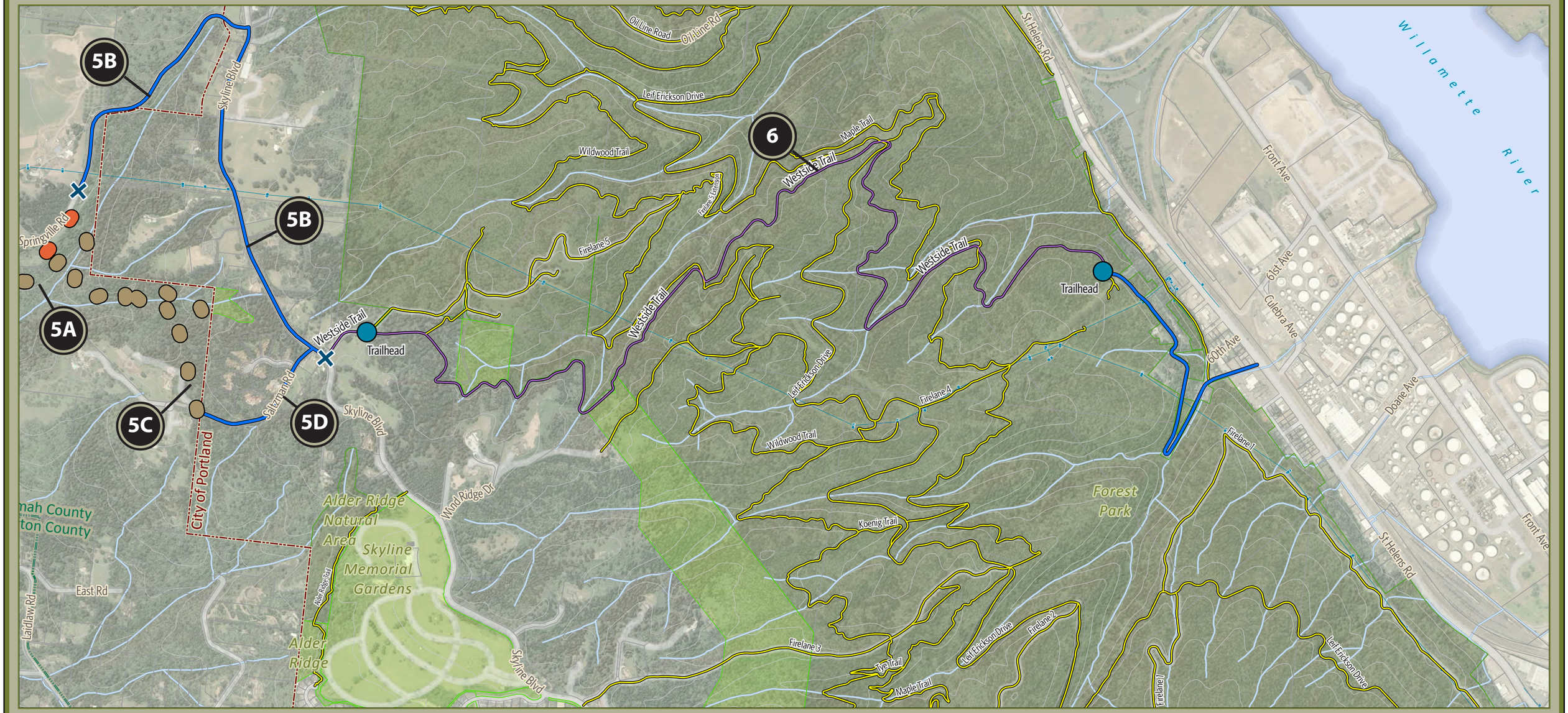
Segment 6: NW Skyline Boulevard to US 30 (St. Helens Road)

The Segment 6 route from NW Skyline Boulevard through Forest Park to the lower Saltzman Road gate will utilize Saltzman Road, an existing City of Portland trail. The current condition (width, grade, and surface) of the Saltzman Road trail through Forest Park is adequate for all trail users, including road bicyclists, and improvements are not required. Trail lighting will not be installed in Forest Park. From the Lower Saltzman Gate to US 30, a shared roadway solution will be used.

Westside Trail Master Plan

Map 16 **Segment 6**

Skyline Blvd to St. Helens Rd



Westside Trail Recommended Alignment

- Multi-user
- Soft surface
- On-street
- Bridge
- Recommended Access Connector Paths
- Existing Westside Trail
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- Midblock Crossings
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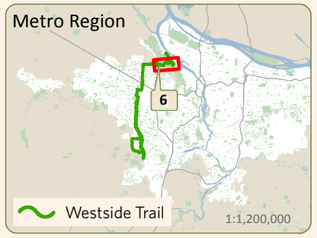
- County Boundaries



N

0 320 640 960 1,280
Feet

All illustrated alignments subject to change based on final design, permitting, and engineering.

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Segment Analysis Map - Segment 6

CHAPTER 4: TRAIL DESIGN FRAMEWORK

Overview

Lengthy multijurisdictional trails such as the Westside Trail face changing opportunities and constraints. Three partner jurisdictions – Tigard, Portland, and THPRD – have trail design standards in place or in development. The region's parks and open space coalition – the Intertwine Alliance – includes these three jurisdictions as members and has initiatives underway to develop unifying design themes and practices that could apply to regional trails. Most other jurisdictions have prior transportation, trail and/or park developments that define local preferences. Design standards should accommodate local jurisdictional preferences and conditions, but should also assure that overall design themes and trail improvements create a uniform sense of place.

Different jurisdictions may want segments of the trail to be consistent with local standards and maintenance practices. Trail width, slope treatments, surface materials, and structures may need to vary to accommodate neighboring development, vegetation, drainage, topography, and roadway patterns. Given this complexity and the length of the trail (almost 25 miles), consistency in trail design themes and features is crucial. A consistent design framework provides trail users with certainty and a sense of place with respect to the trail sections they use and experience. A design framework also provides trail developers and operators with a common template creating economies in both construction and maintenance.

Figure 1 Conceptual view of Segment 1

Illustration credit: Gregg Everhart

This design framework chapter presents recommended design guidelines for the Westside Trail. The design framework accounts for the wide range of conditions through which the Westside Trail will pass, and the treatments that may be necessary to cross steep slopes, roadways, streams, and rail lines. This chapter is in five sections:

- **Trail typology** establishes the basic standards for designing and building different trail types that are compatible with the varying landscapes along the trail corridor.
- **Trail themes** describes two unifying themes and how these themes will be reflected in trail signage, interpretive facilities, amenities such as benches, and in trail surfaces and structural features such as retaining walls.
- **Structural and amenity features,** such as bridges, boardwalks, signage, lighting and trail furniture, make the route accessible, safe, and pleasant to use. These features support an overall trail design framework that communicates a unified sense of place, appearance, and experience.
- **Trail crossings** include conceptual guidelines for crossings at intersections, midblock, and grade-separated crossings employing bridges. Specific treatments should be determined on a case-by-case basis with full design and engineering.
- **Special design requirements** address power utility requirements and ADA compliance.

The design framework for the Westside Trail also addresses three special features of the corridor, one built and two natural.

- **The Westside Trail corridor is primarily within a transmission-level power corridor,** except for the segments entering the West Hills and Forest Park. Power utility requirements for access and vegetation maintenance will greatly influence the alignment and design of the Westside Trail.
- **The Westside Trail crosses Bull Mountain (Segments 2 and 3) and climbs into the West Hills and Forest Park (Segments 4.20 to 6).** The steep slopes and cross slopes and significant natural features in both these areas pose significant challenges with respect to making the trail fully accessible to all potential users. Solutions meeting both habitat conservation and ADA goals are crucial to the success of the Westside Trail.
- **The Westside Trail will serve as a corridor supporting wildlife as well as human use.** Careful consideration of a variety of habitats in trail design and location will enliven the overall trail experience and help sustain urban wildlife populations. The power corridor is a unique opportunity to establish a continuous open space through urbanized areas that is supportive of wildlife. Chapter 5 addresses wildlife corridor development.

Trail typology

The following design typology recommendations (Table 12) are based on a review and merging of the several jurisdictional guidelines and standards detailed in Plan Reports No. 2 and No. 4. The recommendations reflect local conditions and jurisdictional preferences combined with an

estimated level of Westside Trail use extrapolated from traffic count records for nearby local trails and other regional trails.

This design framework chapter and any applicable Metro and Intertwine guidelines should be used to support overall consistency in Westside Trail design and construction. At the time of actual design and engineering of particular trail segments, current standards and updated trail use information should be reviewed. Appropriate changes to the trail typology recommendations in this master plan should be made based on such reviews.

Between the Tualatin River and SW Barrows Road, City of Tigard trail standards should be used along with this design framework chapter and design typology. THPRD standards and practices should apply from SW Barrows Road to the Rock Creek Trail. Between the Rock Creek Trail and Forest Park, those segments within THPRD jurisdiction should also reflect THPRD design preferences. Segments 5 and 6 within Multnomah County and City of Portland jurisdiction will use Portland standards and practices.

Table 12 Trail typology

Trail segment or section	Jurisdiction	Width	Surface	Longitudinal slope	Cross slope	Notes
1B	King City	10'–12' (2' gravel shoulder)	Asphalt	0–5%	2%	• 4'- to 8'-wide parallel equestrian
2A	Washington County	10'–12'	Asphalt	0–8%	1%	
2B	Washington County	6'–8'	Soil with gravel as needed	0–8%	2%	
2D	Washington County	10'–12'	Asphalt	0–8%	1%	• Includes bridge across ravine
3A 3B 3E	Tigard	10'–12'	Asphalt	0–8%	2%	
3C	Tigard	4'–7'	Soil with gravel as needed	0–8%	2%	• Rolling grade to avoid erosion and minimize tree impacts
4.12–4.13	THPRD	10'–12'	Asphalt	0–5%	1%	• Along 158th Ave. and SW Walker Rd.

Trail segment or section	Jurisdiction	Width	Surface	Longitudinal slope	Cross slope	Notes
4.14–4.18	THPRD	10’–12’	Asphalt	0–5%	2%	• All in BPA corridor
4.21	THPRD	10’–12’	Asphalt	0–8%	2%	• May need some short sections at 10–12%
5A	Multnomah County	10’–12’	Asphalt	0–8%	2%	
5C	Multnomah County/City of Portland	4’–6’	Soil with gravel as needed	0–5%	2%	
6	City of Portland	10’–12’	Asphalt	0–5%	2%	• Partly on-street

Multiuser trail

Multiuser trails are separated from roads. This trail type is designed to accommodate a full range of users – including recreational and commuter bicyclists, walkers, runners, and users with mobility devices – at high volumes of usage, at accessible grades, and in all seasons.

The Westside Trail will primarily utilize 10- to 12-foot-wide multiuser paved trails located within the power corridor and separate from vehicular roadways. Key elements of this primary Westside Trail solution are:

- 10- to 12-foot-wide trail surface with 2-foot-wide compacted crushed stone shoulders.
- 5 percent or less trail grade
- 2 percent maximum cross slope (slope running perpendicular to the trail)
- Permeable asphalt surface treatment, though conventional concrete or asphalt treatments may be used.

Major exceptions to this preferred treatment are:

- Over Bull Mountain (Segments 2 and 3) where, soft-surface and shared roadway options are used to address ADA and power utility access requirements.
- Along 158th Avenue and SW Walker Road (Segments 4.12 and 4.13) where a street-edge trail is the preferred alternative.
- In the West Hills (Segment 5) where a combination of multiuser trail, shared roadway and soft-surface sections are recommended to meet the needs of all users.

Refer to AASHTO's *Guide for the Development of Bicycle Facilities* for further guidance on geometric design, especially regarding sight distances and curve radii.

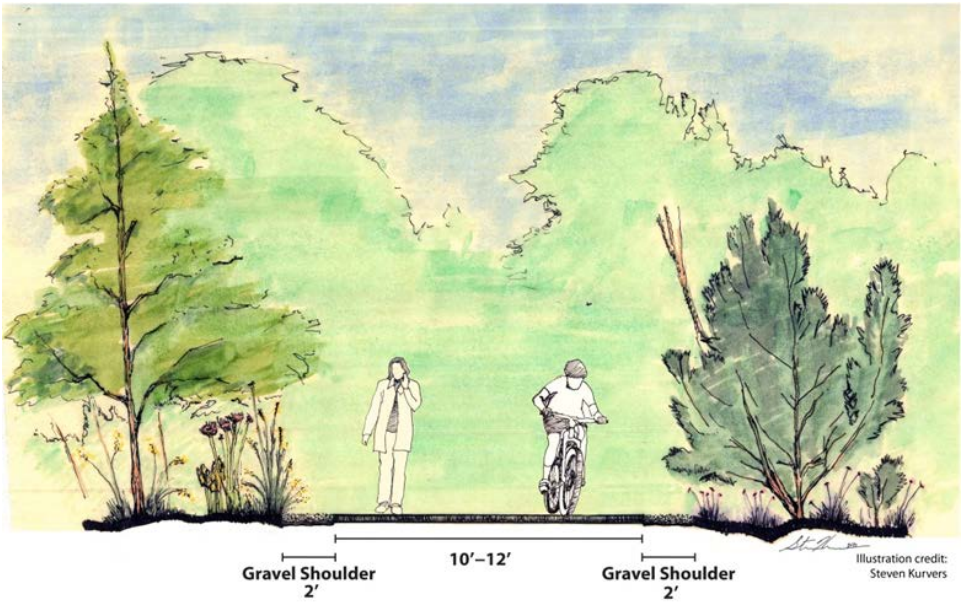

Figure 2 Multiuser trail

Multiuser street-edge trail

A variation of the multiuser trail is the street-edge trail. Street-edge trails accommodate the same types and volumes of users. They follow the edge of built roadways and are separated by a 3- to 5-foot-wide landscaped buffer. This trail type is used where prior development makes siting of a multiuser trail difficult and/or where high traffic volumes render roadways not suitable for shared roadway or bike lane solutions.

Property ownership considerations and existing land uses may limit the feasibility of building multiuser trails within separate corridors. Locating multiuser trails along the edge of road right of way or immediately outside of the right of way may be more feasible. Street-edge solutions should generally not be used where numerous driveways are crossed. For the Westside Trail, street-edge trails will be used along SW 158th Avenue and SW Walker Road in Beaverton.

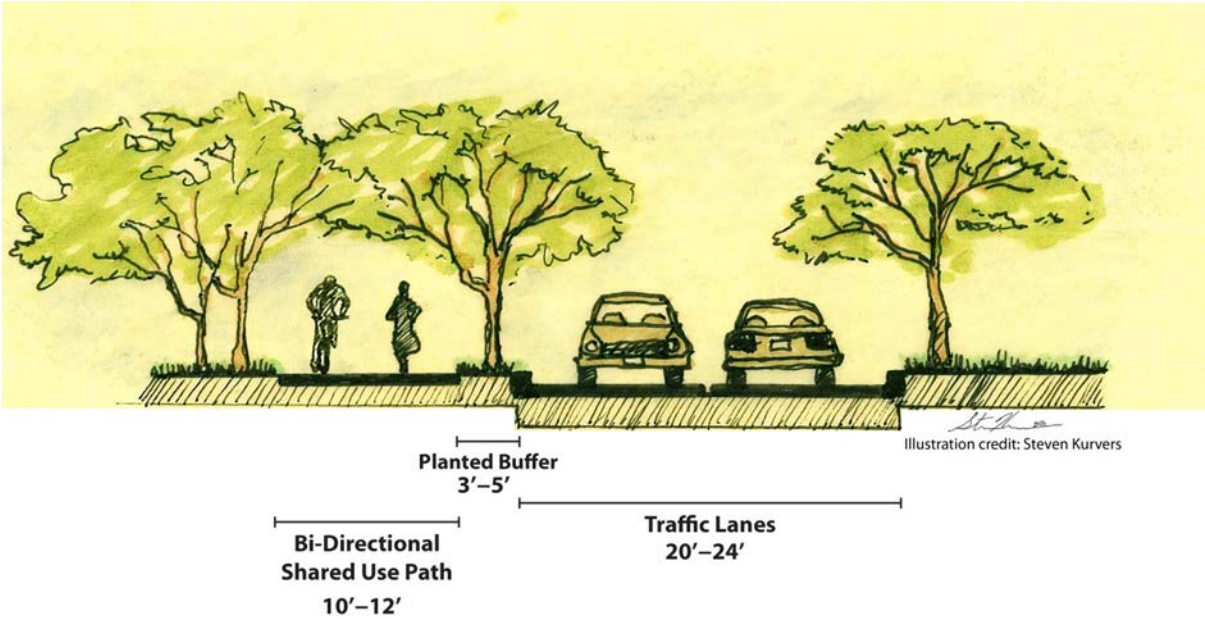

Figure 3 Multiuser street-edge trail

Soft-surface trail

Soft-surface trail sections are recommended along the Westside Trail where steep slopes and habitat preservation considerations make multiuser trails difficult to site. The narrower width and unpaved surfaces provide more options in routing and building trails to avoid adverse habitat impacts. This trail type is always associated with a nearby shared roadway solution to accommodate road bikes and to improve accessibility choices.

The Westside Trail proposes soft-surface trail sections in conjunction with shared roadway options for road bicycles in Segments 2, 3, and 5. These trails are expected to accommodate both pedestrian and mountain bike users and some equestrian use, with road bicycles directed to nearby streets. Westside Trail soft-surface pathways vary between four and eight feet wide, with surface treatments of soil reinforced with compacted gravel to improve trail durability and allow year-round use. The wider (7- to 8-foot) section may be used at intersections with roads and other trails to facilitate maintenance access and reduce congestion.

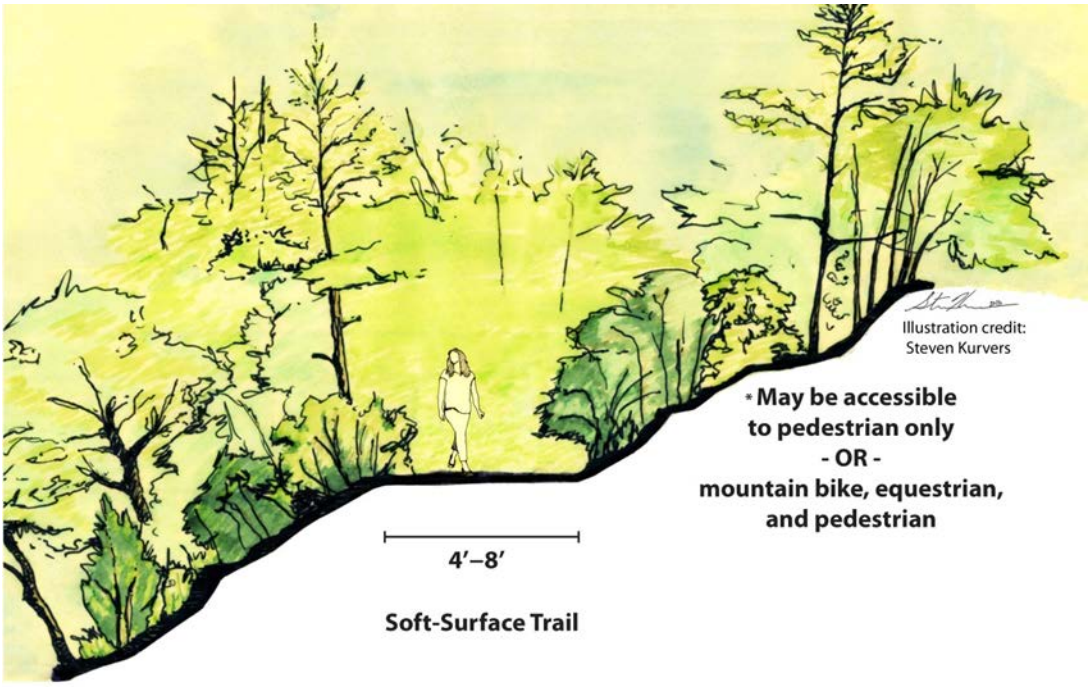

Figure 4 Soft-surface trail

Equestrian trail

The equestrian trail uses essentially the same specifications as the soft-surface trail. In areas of high equestrian use where the trail corridor is wide enough, this trail type is designed to parallel the multiuser trail to provide a more suitable surface for horses and avoid conflicts with bicyclists and pedestrians.

An equestrian trail paralleling a multiuser pedestrian/bicycle path is planned for the Westside Trail segment immediately north of the Tualatin River (Segment 1). In portions of Bull Mountain (Segments 2 and 3) soft-surface trail sections may be designed to accommodate pedestrians, mountain bicycles, and horses.

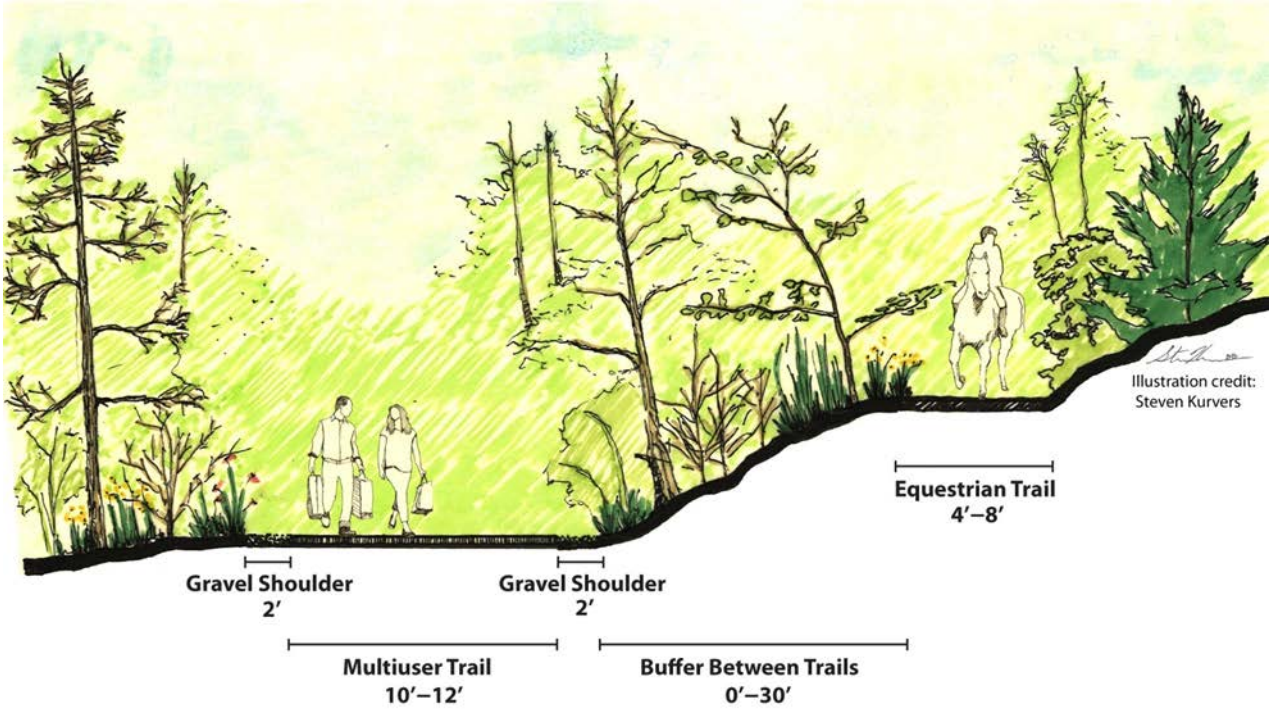

Figure 5 Multiuser trail with parallel equestrian trail

Shared roadway

Shared roadway solutions, through the use of signing and street markings, route bicycle traffic to lower-traffic road surfaces. These lower-volume roads may not have sidewalks. Shared roadways are also used to provide accessible paved surface alternatives for all users in steeply sloped areas and to balance user demands on soft-surface trail sections. The illustration below shows one of many possible variations to shared roadway solutions.

Road bicycle traffic over Bull Mountain (Segments 2 and 3) and from the Lower Saltzman Gate to US 30 (Segment 6) will be accommodated by short shared roadway sections running parallel to trail sections within the power corridor.

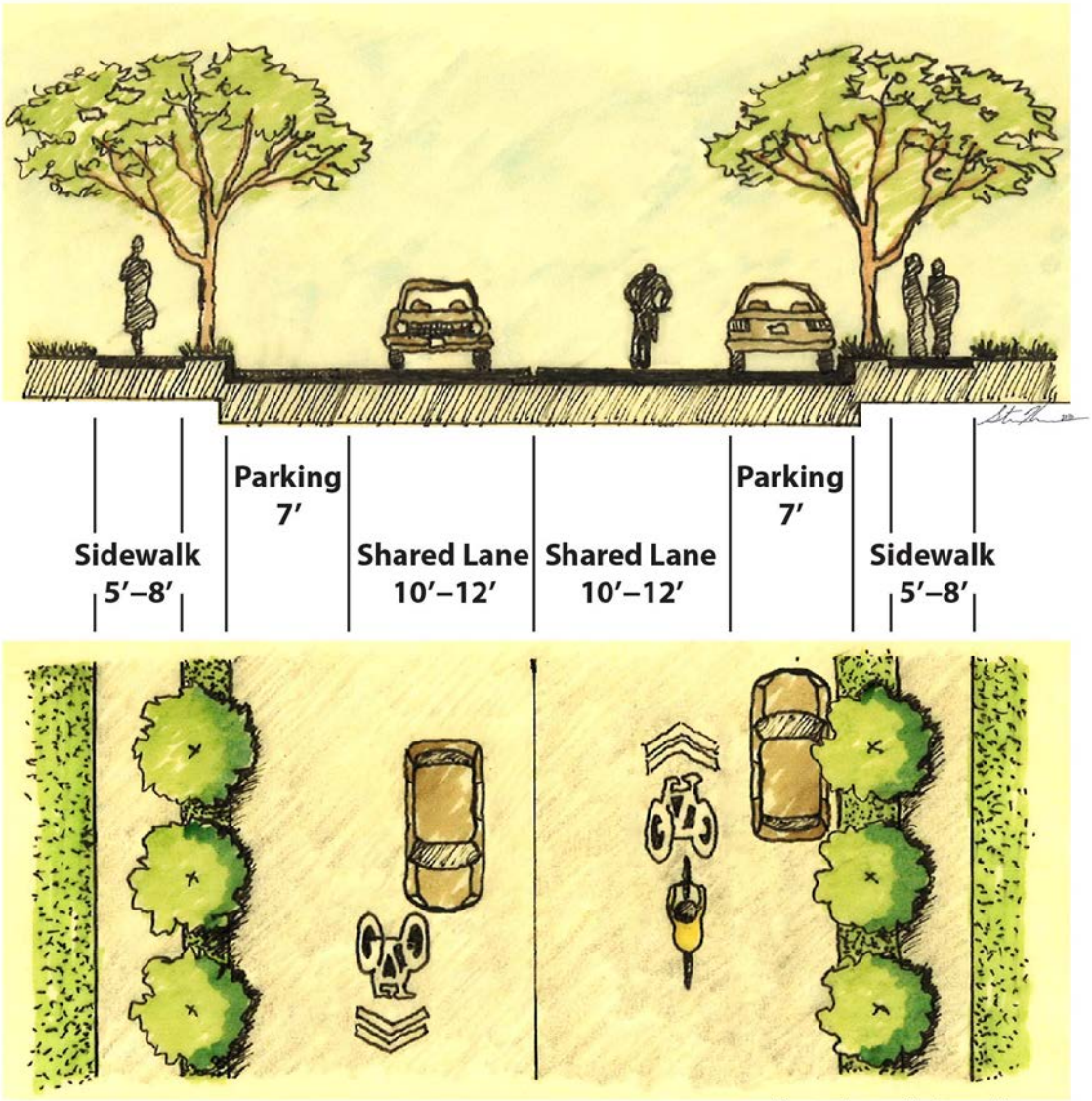

Illustration credit: Steven Kurvers

Figure 6 Shared roadway

Sidewalk-bicycle lane/shoulder widening

Conventional sidewalk-bike lane combinations or shoulder widening are used along higher-traffic roadways where shared roadway solutions would raise safety concerns and multiuser trail solutions are not feasible. This solution ideally includes sidewalks on both sides of the road and bike lanes designated by striping and signing with the street section.

- Recommended solutions around (not over) Bull Mountain (Segments 2 and 3) assume conventional sidewalk-bicycle lane treatments.
- In the West Hills, road bicycle traffic will be accommodated on NW Springville Road and on NW Skyline Boulevard with widened asphalt shoulders on both sides of these roadways.

Trail themes

Two unifying themes are suggested for the Westside Trail: wildlife power and lines. These themes will be reflected in trail signage, interpretive facilities, amenities such as benches, and in trail surfaces and structural features such as retaining walls. Referencing design features and structures already in place, or those proposed for other intersecting regional trails – Ice Age Tonquin Trail, Tualatin River Greenway Trail, Willamette Greenway Trail, and the Rock Creek Trail – and for significant local trail systems connecting to the Westside Trail, will also support a unified trail theme.

Design should also reflect the physical amenities and features in the many major parks, greenways and open spaces along the trail – the Tualatin River National Wildlife Refuge, King City Park, Tigard's Sunrise Park and Hillshire Woods, Tualatin Hills Nature Park, Pioneer Park, Bronson Creek Greenway, Kaiser Woods Park, Forest Park, and so forth.

Wildlife and open spaces

The Westside Trail will be a corridor for people and wildlife. The corridor's restored habitat will be a unique south-north linear open space through highly urbanized communities. Wildlife habitat and open space themes can be emphasized in trail signage, benches, interpretive facilities and graphics, and enhancements to the design of prominent structures such as bridges and retaining walls.

Power lines

Although power towers and lines are a challenge and constraint to trail development, power infrastructure is also a unifying thematic element. The original name of the Westside Trail was the Beaverton Powerline Trail. BPA lines are part of the history of a crucial element in the development of the Pacific Northwest and the metropolitan Portland region – the Columbia River hydropower system. Trail designers and builders should evaluate ways to reflect this inescapable visual part of the trail experience in amenities such as signage and other improvements.

Image 2 Power lines near the Tualatin River

Photo credit: Doug Vorwaller

Structural and amenity features

The Westside Trail will include a variety of structures and improvements making the route accessible, safe, and pleasant to use. These features can support an overall trail design framework that communicates a unified sense of place, appearance, and experience. The photograph at right illustrates the simplicity of making strong thematic statements even with relatively utilitarian structures. A viewing platform is on the Tualatin River in Sherwood, Oregon, with animal tracks imprinted in the concrete platform surface.

Image 3 Viewing platform: Tualatin River NWR

Photo credit: Jim Rapp

Major bridges

The Westside Trail Master Plan includes conceptual specifications for three major bridge crossings: the Tualatin River, US 26, and a ravine on Bull Mountain. The bridge illustrated opposite is an example of a simple but aesthetically pleasing span as might be used to cross the ravine. Other bridge examples are illustrated elsewhere in this master plan and in associated plan reports.

Image 4 Short bridge span

Photo credit: Gregg Everhart

The master plan identifies key major bridge structural design and engineering features, but does not detail aesthetic and design enhancements. In designing and constructing these bridges, enhancements should reflect the power line and wildlife themes established along the trail, and accommodate wildlife passage. Solutions that suggest the possibilities for thematic and wildlife-friendly bridge enhancements are illustrated in this master plan under Chapter 5: Wildlife Corridor and in associated plan reports.

Minor bridges and boardwalks

Several minor streams and wetlands will be crossed by boardwalks and bridges. The image (opposite) is an example of a small wooden bridge crossing connecting to a narrower soft-surface trail.

Image 5 Wooden bridge across minor stream

Photo credit: Gregg Everhart

Other materials such as concrete and steel are options where wider streams or wetlands are crossed, particularly where the boardwalk or bridge connects to multiuser trail sections. THPRD and City of Portland standards may be referenced for details on these types of structures.

The following two illustrations show wooden and steel/concrete solutions connecting wider multiuser trail sections.

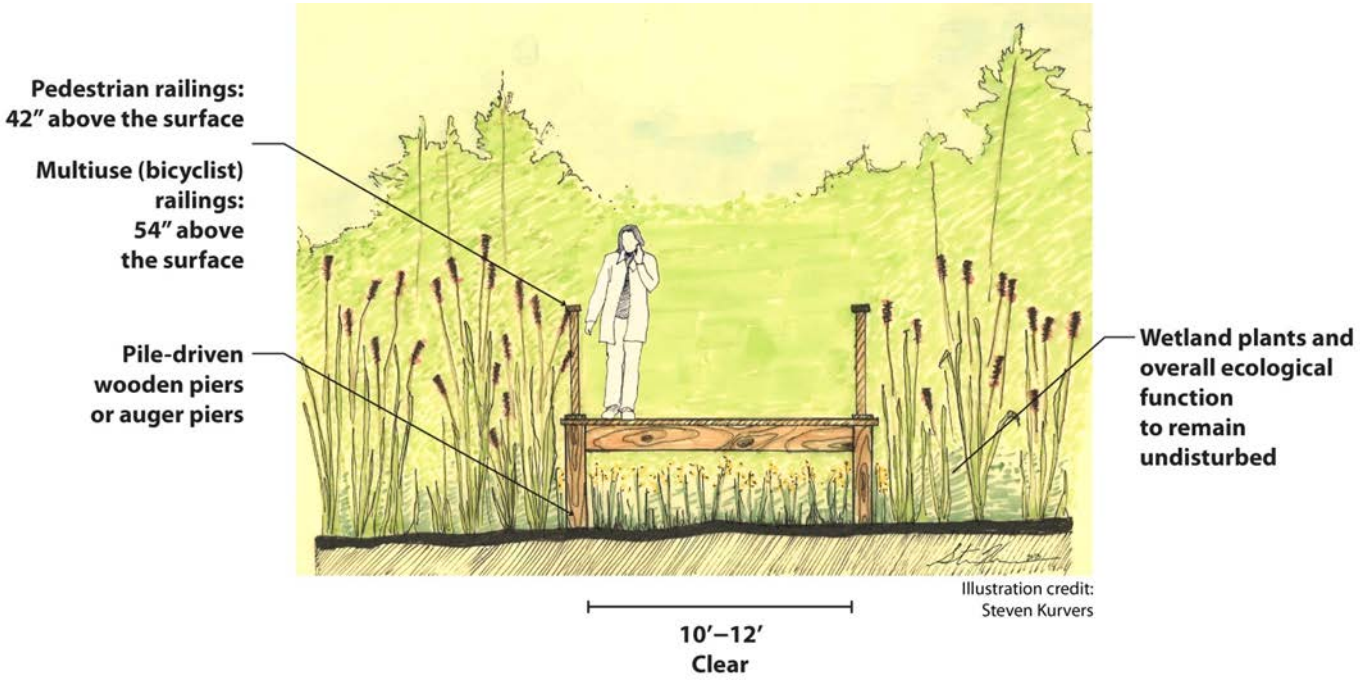

Figure 7 Environmentally friendly boardwalk design

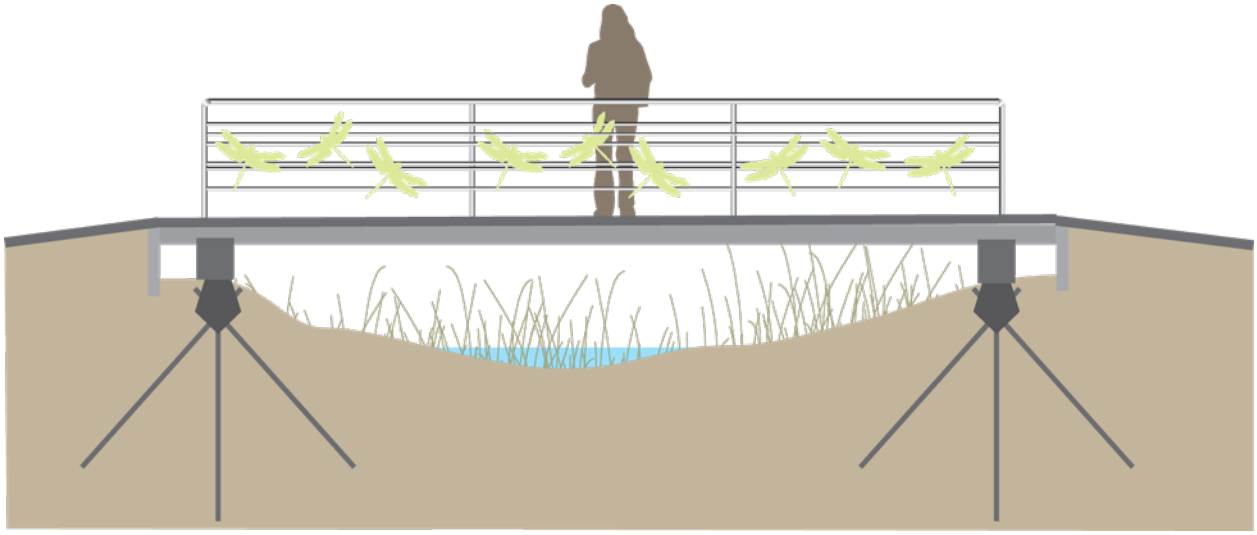

Figure 8 Steel and concrete structure showing anchoring and thematic elements

Courtesy: Ryan Abbots

Steps

Steps may be required or desirable in some steeper trail segments to reduce grades and limit the number of switchbacks, particularly when trail sections will primarily serve pedestrian users. Cost estimates in the Westside Trail Master Plan assume concrete stairs with safety railings on one side and a bike wheel gutter on the opposite side to accommodate the walking of bicycles up and down the steps. Along soft-surface or steeper trail sections, wooden crib steps may be the better choice. The City of Portland has developed wooden step treatments for use within natural areas that could apply to all trail segments (see below and Appendix C).

Retaining walls

The Westside Trail Master Plan assumes concrete retaining walls will be used for multiuser trail switchbacks, ramps, and landings. Large expanses of such walls can be made more visually pleasing and support the trail's thematic elements by using surface designs that reflect the trail's wildlife and habitat or the overhead power line infrastructure. Along soft-surface or narrower trail sections, wood or rock retaining walls may be the better choice. The City of Portland has developed wood retaining wall standards for use within natural areas that could apply to all trail segments (see Appendix C).

Trailheads

The Westside Trail Master Plan conceptually locates trailhead facilities in Segments 1, 2, 3, 4.14, and 4.15. THPRD has identified a trailhead location in Segment 4.18.2. Additionally, a trailhead should be located in or near Segment 4.21 with final siting based on the opportunities that emerge from the pattern of new residential development starting up on the south side of the preferred trail alignment. Conceptual trailhead locations are based on road access (arterial and collector roadways preferred), accessibility to major trail features (for instance the Tualatin River bridge), and the potential for shared use (for example an existing apartment parking lot in the BPA power corridor near NW Cornell Road).

The trailhead could include facilities such as paved or gravel vehicle parking lots; bicycle racks; rest rooms; shelters and picnic areas; information kiosks and signage; and drinking fountains, benches, trash receptacles, pet waste bag dispensers, etc.

Viewpoints

Several potential viewpoints are identified on master plan segment maps. In many areas improvements may simply consist of paved or gravel off-trail pullouts, benches, and signage. In other areas, such as at the Tualatin River, additional features are possible. The viewing platform shown opposite overlooks the river in the nearby Tualatin River National Wildlife Refuge.

Image 7 Viewing platform in the Tualatin River NWR

Photo credit: Jim Rapp

Signage

Wayfinding signage on the Westside Trail should follow the Intertwine's *Regional Trails Signage Guidelines*.[10] Intertwine guidelines will support a consistent look and feel as the Westside Trail moves through multiple jurisdictions. Metro's *Signage Manual* is also recommended for new and retrofitted educational and interpretive signage. Using Metro's signage guidelines for these types of signs will create a consistent look throughout the trail corridor. Regulatory and warning signs should conform to AASHTO's *Guide for the Development of Bicycle Facilities* and coordinate with municipal signage systems.

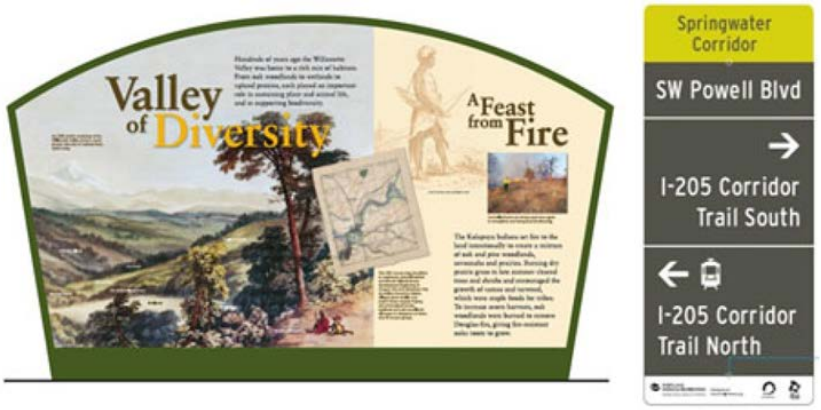

Figure 9 Trail signing

Source: Metro

Lighting

[10] http://theintertwine.org/sites/default/files/file_attachments/Intertwine%20Regional%20Trail%20Signage%20Guidelines.pdf

THPRD has increasingly provided safety and security lighting where trails cross public streets. According to THPRD, this is being done at the request of local road authorities. Lighting may be inappropriate in natural areas, given visual impacts and potential disturbance to wildlife and habitat values. In the wooded West Hills or Tigard's Hillshire Woods, lighting solutions specially adapted for woodland settings may be more applicable.

Another consideration to improve the trail user experience is to utilize "dark sky" compatible lighting. Dark sky lighting illuminates trail surfaces while minimizing upward light pollution. This improves vistas of the night sky. See the lighting section under the Chapter 5 for discussion on the impacts of lighting on wildlife.

Trail furniture

The style of trail furniture already used by THPRD for the extensive areas of the Westside Trail passing through power corridor grasslands can be used for most of the balance of the trail within the power corridor. Furniture should reflect power corridor or wildlife themes whenever possible. The photograph (opposite) shows a themed trail bench in the Tualatin River National Wildlife Refuge, which is close to the south end of the Westside Trail. THPRD's *Trails Plan* includes furniture illustration and specifications. In the wooded West Hills or Tigard's Hillshire Woods, other trail furniture solutions may be more applicable. For instance, rocks and logs can be used for sitting and resting purposes instead of manufactured benches, which are vulnerable to vandalism and deterioration in wooded areas.

Image 8 Themed bench in the Tualatin River NWR

Photo credit: Jim Rapp

Trail crossings

The following sections provide design guidance for a variety of roadway and other trail crossings. The guidelines are conceptual. Specific treatments should be determined on a case-by-case basis with full design and engineering. Plan Report Nos. 2 and 4 provide additional detail on the underlying assumptions and variables for recommended treatments.

Intersection crossings

Where trail crossings at four-way intersections are required, signalized treatments are preferred, particularly for arterial and collector classification roads. Local street intersections will be controlled with four-way stop signs, or with pedestrian activated beacons for more heavily trafficked streets. Appropriate road surface markings and signage indicating shared bicycle and pedestrian use will be installed.

The Westside Trail only uses road intersection crossings between Segments 4.11 to 4.13. The trail will follow SW 158th Avenue and SW Walker Road using a street-edge asphalt pathway. This trail section will cross a series of major streets at signalized intersections – SW Jenkins Road, SW Jay Street, and SW Walker Road.

Midblock crossings

The Westside Trail is primarily within a linear power corridor and crosses numerous roadways midblock. The usual standard for midblock crossings used for the Westside Trail is the Washington County *Pedestrian Mid-block Crossing Policy.*[11] AASHTO standards were also referenced. For NW Springville Road and NW Skyline Boulevard the recommended crossing treatments were modified in consultation with Multnomah County and the City of Portland.

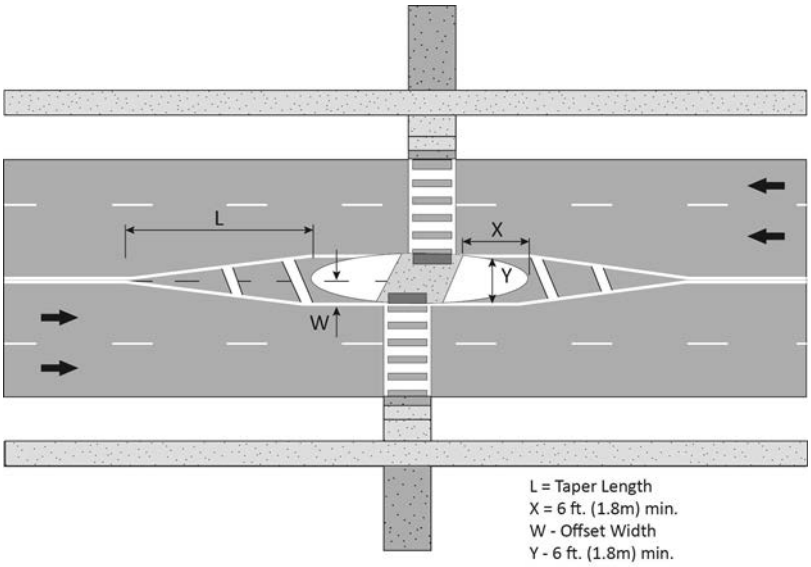

Figure 10 AASHTO midblock crossing treatment

Source: AASHTO

There are seven arterial or collector roadway midblock crossings along the trail corridor including NW Skyline Boulevard, which is a City of Portland special designation local street. Up to 15 other local or neighborhood streets will also be crossed midblock by the trail. All Westside Trail arterial and collector midblock crossing solutions include a center-lane refuge island, except for the crossing of NW Springville Road and NW Skyline Boulevard where the existing right-of-way width may be insufficient to accommodate an island.

The basic recommended typology and estimated costs for each midblock arterial or collector roadway crossing in the Westside Trail corridor are in the preferred trail alternatives tables in Chapter 3 and in Plan Report Nos. 2 and 4. Possible enhancements to midblock crossing to improve wildlife passage are discussed in the Wildlife Corridor chapter of this master plan.

[11] http://www.co.washington.or.us/LUT/upload/MidbockCountyPolicy2010.pdf

Proposed midblock arterial and collector crossings are:

- SW Beef Bend Road Segments 1 and 2
- SW Bull Mountain Rd Segment 2
- NW Cornell Road Segments 4.15 and 4.16
- West Union Road Segments 4.17 and 4.18.1
- NW Kaiser Road Segments 4.18.1 and 4.18.2
- NW Springville Road Segment 5
- NW Skyline Blvd Segments 5 and 6

The primary factor distinguishing Westside Trail collector and arterial midblock crossing solutions is whether a flashing beacon or pedestrian-activated signal is used. Flashing beacons are recommended for collectors. Pedestrian-activated signals are recommended for arterials. Midblock crossing costs for NW Springville Road and NW Skyline Boulevard assume flashing beacons but not refuge islands. This notwithstanding, the City of Portland and Multnomah County will need to conduct warrant studies at the time of construction to determine the appropriate midblock treatment.

For local streets or neighborhood route midblock crossings, the standard used is high visibility marked pavement crossings and warning signage.

Grade-separated crossings

The Westside Trail includes three major grade separated crossings:

- Tualatin River
- Unnamed ravine in Segment 2 (Bull Mountain)
- US 26

All three crossings use bridge solutions. A US 26 undercrossing was also evaluated, but cost and construction complexity were too high.

Special design requirements

Power utilities

BPA and PGE require unimpeded access to power utility infrastructure for maintenance and emergency purposes. This may create significant challenges in developing the Westside Trail in steeper areas such as Bull Mountain (Segments 2 and 3). Although ADA-compliant grades can be achieved for these segments by using extensive trail switchbacks that avoid the actual footprint of power poles and towers, the necessary retaining walls, safety railings, and slope cuts to achieve trail grades of less than 5 or even 8 percent would greatly restrict utility maintenance vehicle access. Soft-surface and split-mode solutions are recommended to avoid utility access conflicts. Trails surfaces if used for maintenance access also need to meet minimum vehicle load-bearing requirements established by both utilities.

Access requirements

BPA disclaims liability for damage to trail property and facilities or injury to trail users during maintenance, reconstruction, or future construction of BPA facilities within the power corridor. PGE retains the right to enter the power right of way or easement "to erect, maintain, repair, rebuild, operate and patrol the power lines, telecommunication lines, structures and appurtenant signal or communications and all uses directly or indirectly necessary to perform its operations." PGE also requires that "for safety reasons, no impediments may be added to the right of way that impede the ability to traverse the right of way with maintenance vehicles on a 24-hour-per-day 7-day-per-week basis." Like BPA, PGE also disclaims any liability with respect to trail user injury or trail or property damage that might occur during maintenance, reconstruction, or future construction of PGE facilities.

Load-bearing requirements

BPA requires that paved asphalt trails be constructed to withstand the loading of vehicles with the front axle carrying 8,000 pounds and the rear axles each carrying 32,000 pounds.[12] PGE requires that paved asphalt trails be constructed to withstand up to a 60,000-pound vehicle weight. Adequate turning radius for such vehicles must also be accommodated.

Accessibility

Meeting ADA standards and providing for the accessibility of a wide range of trail users with different abilities should not be a problem in most segments of the Westside Trail. Paved accessible surfaces and longitudinal slopes of 5 percent or less can be achieved with, at most, a limited number of switchbacks.

The exceptions include some steep trail sections in Segments 2 and 3 (Bull Mountain) and in Segments 4.21 to 5 approaching and entering the West Hills. In Segments 2 and 3, topography and utility access are the primary challenges. In some parts of Segments 4.21 to 5, topography and woodland habitat conservation are the primary constraints. The combination of ADA grade requirements, power utility maintenance access stipulations, and habitat restoration and conservation goals require alternative solutions to constructing multiuser paved trails with numerous switchbacks.

Another approach to ADA compliance involves using nearby developed vehicular streets with sidewalks and/or bicycle lanes. Such streets are in effect "grandfathered." National guidelines state that "the grade of pedestrian access routes within sidewalks is permitted to equal the general grade established for the adjacent street or highway."[13]

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[12] View an illustration of an HS20 truck and trailer at http://precast.org/2010/07/hl93-truck-loads-vs-hs20-truck-loads/.

[13] Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way, July 2011, Architectural and Transportation Barriers Compliance Board, http://www.access-board.gov/prowac/nprm.htm

- For Bull Mountain, accessibility challenges within or near to the corridor are addressed with soft-surface paths combined with shared roadway solutions on adjacent existing streets. A secondary, flatter route in the West Bull Mountain area using a trail being built by private development is also recommended.
- In the West Hills, the combination of a multiuser trail, a soft-surface pedestrian and mountain bicycle trail, and a separate shared roadway bicycle route is proposed.

National guidelines

The U.S. Department of Transportation (DOT) published *ADA Standards for Transportation Facilities* in 2006. These standards are based on 2004 U.S. Access Board *Accessibility Guidelines*. Together with the 2010 U.S. Department of Justice *ADA Standards for Accessible Design*, these documents form the basis for compliance with the ADA and the associated Architectural Barriers Act. ODOT suggests consulting AASHTO's *Designing Sidewalks and Trails for Access*[14] where site conditions preclude compliance with the recommendations for average and maximum grade.

U.S. Forest Service guidelines suggest exemptions from ADA requirements that are particularly relevant to the steeper portions of the Westside Trail on Bull Mountain and in the West Hills where trail grades exceeding 8 percent may be necessary to avoid habitat degradation and impeded access to utility infrastructure. The U.S. Forest Service rules state "compliance would cause substantial harm to cultural, historic, religious, or significant natural features or characteristics; substantially alter the nature of the setting or purpose of the facility; require construction methods or materials that are prohibited by federal, state, or local regulations or statutes; or be infeasible due to terrain or the prevailing construction practices."[15]

Local approaches

A central consideration of trail design is that federal funding comes with a requirement for ADA compliance. Some flexibility is possible if local jurisdictions have ADA compliance review processes. Variance processes must be followed to establish that a given design or alignment accommodates accessibility by other means and/or that there are extenuating circumstances. If local jurisdictions use their own funds for trail construction, accessibility and the degree of ADA compliance becomes a matter of local policy. The approaches used by three Westside Trail jurisdictional partners are summarized below.

City of Portland

The City of Portland's ADA compliance guidelines are approved by the Portland Citizen's Disability Advisory Committee (PCDAC). These guidelines state "public process and PCDAC review helps to determine what type and amount of use is likely and appropriate to each site."[16] PCDAC can approve trails that are not accessible or that are very challenging.

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[14] http://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalk2/index.cfm, publication FHWA-EP-01-027

[15] http://www.portlandoregon.gov/parks/38306?a=250105, *Trail Design Guidelines for Portland's Park System*, p. 7

[16] *Trail Design Guidelines for Portland's Park System*, p. 6

Portland's trail design guidelines include a table showing three different sets of accessibility criteria. One column in this table – Accessible Trail – provides criteria by which trail slopes, cross slopes and other features can vary from baseline ADA requirements. This column is adapted as Table 13 below. Slopes greater than 5 percent are allowable under certain circumstances, for instance 8.33 percent for a maximum run of 50 feet at which point slopes need to return to lesser grades and/or landings must be provided. This City of Portland standard is based on State of Minnesota guidelines originally derived from the U.S. Forest Service guidelines referenced above.

Table 13 Portland technical provisions for accessible trails

Surface	Firm and stable *(Exception*)*
Maximum running slope	1:20 [5%] (for any distance) 1:12 [8.33%] (for max. 50') 1:10 [10%] (for max. 30') 1:8 [12.5%] (for max. 10') *(Exception: 1:7 [14.3%] for 5' maximum for open drainage structures or when * applies)*
Maximum cross slope	1:20 [5%] *(Exception: 1:10 [10%] at the bottom of an open drain where clear tread width is a minimum of 42 inches.)*
Minimum clear tread width	36" *(Exception: 32" when * applies)*
Tread obstacles	2"-high maximum *(Exception: 3" maximum where running and cross slopes are 1:20 [5%] or less.) (Exception*)*
Passing space	Every 1,000' where clear tread width is less than 60", a minimum 60" X 60" space, or a T-shaped intersection of two walks or corridors with arms and stem extending minimum of 48". *(Exception*)*
Resting intervals	60" minimum length, width at least as wide as the widest portion of the trail segment leading to the resting interval and a max. slope of 1:20 [5%] *(Exception*)*

*The provision may not apply if it cannot be provided, because compliance would cause substantial harm to cultural, historic, religious, or significant natural features or characteristics; substantially alter the nature of the setting or purpose of the facility; require construction methods or materials that are prohibited by Federal, state, or local regulations or statutes; or be infeasible due to terrain or the prevailing construction practices.

Adapted from Trail Design Guidelines for Portland's Park System, based on a table in Trail Planning, Design, and Development Guidelines: Shared Use Paved Trails, Natural Surface Trails, Winter-Use Trails, Bikeways by Minnesota Department of Natural Resources Trails and Waterways, 2006.

THPRD

THPRD ADA trail development guidelines are included in the THPRD *Trails Plan*. The THPRD guidelines are based on 1991 U.S. Department of Justice *ADA Standards for Accessible Design.* These standards were revised in 2010. The THPRD guidelines also reference the U.S. Access Board's *Accessibility Guidelines* last updated in 2004. The THPRD *Trails Plan* includes the following table:

Table 14 THPRD ADA trail development guidelines

Item	Recommended treatment	Purpose
Trail surface	Hard surface such as asphalt, concrete, wood, compacted gravel	Provides a smooth surface that accommodates wheel chairs
Trail gradient	Maximum of 5% without landings Maximum of 8.33% with landings	Greater than 5% is too strenuous
Trail cross slope	2% maximum	Provides positive trail drainage, but avoids excessive gravitation to side of trail
Trail width	5' minimum	Accommodates a wide variety of users
Trail amenities, phones, drinking fountains, ped-actuated buttons	Place no higher than 4' off ground	Provides access within reach of wheelchair users
Detectable pavement changes at curb ramp approaches	Place at top of ramp before entering roadways	Provides visual cues for visually impaired
Trailhead signage	Accessibility information such as trail gradient/profile, distances, tread conditions, location of drinking fountains and rest stops	Supports user convenience and safety
Parking	Provide at least one accessible parking area at each trailhead	Supports user convenience and safety
Rest areas	On trails specifically designated as accessible, provide rest areas/widened areas on the trail optimally at every 300'	Supports user convenience and safety

Adapted from Table 2, *Trails Plan for the Tualatin Hills Park & Recreation District*

City of Tigard

The City of Tigard is another local example for managing trail accessibility. Tigard recommends signage explaining trail features that are not standard for accessible trail, and stipulates that if steeper segments are incorporated into a multiuser trail, that less than 30 percent of the total trail length can exceed 8.33 percent slope. Table 15 summarizes recommended Tigard treatments with respect to differing slopes.

Table 15: City of Tigard trail slope standards

Longitudinal slope	Maximum length	Landings
5% max	N/A	N/A
5–8.5%	200’	Every 20’
8.5–10%	30’	Every 30’
10–12.5%	10’	10’

Source: *Tigard Greenways: Trail System Master Plan*

CHAPTER 5: IMPLEMENTATION STRATEGY

Overview

The estimated overall cost of constructing the undeveloped sections of the Westside Trail is approximately $36,608,550. Segment-by-segment costs are provided in Chapter 3. Table 16 provides a detailed breakdown of the factors and assumptions embedded in the cost estimates. The pace and pattern of trail development will be driven by funding availability, jurisdictional priorities, and surrounding development, and may take a decade or longer to complete. An overall implementation and phasing plan will assure that the trail will be developed in the most strategically and thematically consistent and cost-effective manner.

This implementation strategy chapter will provide the developers and operators of the trail with essential tools and guidance in securing funding and anticipating development challenges. This implementation strategy outlines planning and permitting requirements that may have to be satisfied. This implementation strategy is presented in two major sections:

- **Phasing strategy** applies criteria that address jurisdictional authority, connectivity and functionality, and relative benefit/cost, and recommends near-, mid- and long-term priorities. This section also includes information on possible trail construction funding sources.
- **Implementation actions** summarize the planning and permitting requirements and other permissions that may apply to trail development and management. In addition, jurisdictional authority challenges that will be faced in developing the Westside Trail are discussed.

Additional information on the phasing strategy and full details on probable implementation actions can be found in Plan Report No. 4, Implementation Strategy (Appendix D).

Figure 11 Conceptual view of Segment 5

Illustration credit: Gregg Everhart

Phasing strategy

Many factors will influence the actual sequence in which individual Westside Trail sections are built. Property acquisition and construction funding will be two primary drivers. Viable funding opportunities that may emerge as time passes should be pursued irrespective of an overall phasing plan. This notwithstanding, a phasing strategy is important for providing guidance in balancing options and effectively pursuing funding.

Phasing criteria and recommendations

The following phasing criteria (see Table 17) are suggested for use in arriving at decisions prioritizing the development of individual trail sections. The criteria are not in order of importance nor are they weighted. These criteria should be used as a series of questions to ask when determining priorities. Phasing criteria, and overall phasing plans and rankings, should be regularly revisited as trail sections are built and other circumstances change.

Recommendations for the phasing of trail segments and sections are included in the summary tables accompanying the segment maps in Chapter 3. Plan Report No. 4 provides a detailed summary of the trail phasing criteria used to arrive at the phasing recommendations.

Cost estimate details by subsegment

Table 16 **February 2014**

Segment	Route	Total Length	Basic Paved Trail	Length with Switchbacks	# of Switchbacks	Soft Surface Trail (4')	Soft Surface Trail (8')	Length W/ Steps	# of Steps	Wetland Boardwalk	Minor Stream Crossing	Local/Neighborhood Midblock Crossing	On-Street Option (Sidewalks / Shared Use)	4' Paved Shoulders	Trailhead	Appurtenances per 1000'*	Segment Const Cost	PE	CE	Contingency	Total Segment Cost
		Cost	$200 LF	$250 LF	N/A	$75 LF	$150 LF	N/A	$7,000 EA	$840 LF	$23,000 EA	$2,000 EA	$5,000 EA	$228 LF	$500,000 EA	$2,000 EA		25%	15%	15%	
1B	Tualatin River to Beef Bend Road	3913	3639							274					1	4	$1,465,960	$366,490	$219,894.00	$219,894	$2,272,238
2A	Beef Bend to Colyer Way	832	284	548	3							1				1	$197,800	$49,450	$29,670.00	$29,670	$306,590
2B	Colyer to Woodhue Street - soft surface	1991					1991					1				2	$304,650	$76,163	$45,697.50	$45,698	$472,208
2C	Colyer to Woodhue - on-street	1312											1312			1	$7,000	$1,750	$1,050.00	$1,050	$10,850
2D	Woodhue to Tigard city limits	5201	3129	2072	16							1			1	5	$1,655,800	$413,950	$248,370.00	$248,370	$2,566,490
3A	Tigard city limits to Mistletoe	612	366	246	3							1				1	$138,700	$34,675	$20,805.00	$20,805	$214,985
3C	Hillshire Woods - soft surface	2910				2706		204	1		1					3	$238,950	$59,738	$35,842.50	$35,843	$370,373
3D	Ascension-Mistletoe-Nahcotta	2492											2492			3	$11,000	$2,750	$1,650.00	$1,650	$17,050
3E	Catalina to Barrows	3105	2330	775	8						3	3			1	3	$1,240,750	$310,188	$186,112.50	$186,113	$1,923,163
4.12	158th - THNP to Walker Road	4330	4330													4	$874,000	$218,500	$131,100.00	$131,100	$1,354,700
4.13	Walker Road - 158th to Power Corridor	2532	2532													3	$512,400	$128,100	$76,860.00	$76,860	$794,220
4.14	Walker Road to US 26 (Sunset Hwy)	4745	4531	214	2						1	2			1	5	$1,496,700	$374,175	$224,505.00	$224,505	$2,319,885
4.15	US 26 to Cornell Road	1043	1043												1	1	$710,600	$177,650	$106,590.00	$106,590	$1,101,430
4.16	Cornell to Oak Hills Drive	2146	1062	551	7					533	2	1				2	$849,870	$212,468	$127,480.50	$127,481	$1,317,299
4.17	Oak Hills to West Union Road	2610	1877	733	8							2				3	$568,650	$142,163	$85,297.50	$85,298	$881,408
4.18.1	West Union to Kaiser Road	1450	1122	328	2											2	$310,400	$77,600	$46,560.00	$46,560	$481,120
4.21	Skycrest Parkway to THPRD line/130th Av	2889	1924	965	9						1					3	$655,050	$163,763	$98,257.50	$98,258	$1,015,328
5A	County line to Springville	4951	2676	2275	5											5	$1,113,950	$278,488	$167,092.50	$167,093	$1,726,623
5B	Springville & Skyline - on-street	6685												6685		7	$1,538,180	$384,545	$230,727.00	$230,727	$2,384,179
5C	Springville to Saltzman - soft surface	6188				6188					5					6	$591,100	$147,775	$88,665.00	$88,665	$916,205
5D	Saltzman to Skyline - on-street	1047											1047			1	$7,000	$1,750	$1,050.00	$1,050	$10,850

**Note: Appurtenances per 1000' - includes benches, trash receptacles, wayfinding signs*

*** Note: Total costs shown on this table are rounded on Chapter 3 segment map summaries*

Standalone Structures

	Const		25% PE	15% CE	10% Contingency	Subtotal	# Structures	TOTAL	
Segment 1: Parallel Equestrian Trail	$586,950	LF EA	$ 146,738	$ 88,043	$ 58,695	$ 880,425	1	**$ 880,425**	*Note - Construction cost = 3,913 feet of soft surface at $150/ foot*
Segment 1A: Tualatin River Bridge	$ 2,745,444	EA	$ 686,361	$ 411,817	$ -	$ 3,843,622	1	**$ 3,843,622**	*Note - Construction cost includes a 30% Contingency*
Segment 2: Ravine Bridge - 100 feet	$ 115,000	EA	$ 28,750	$ 17,250	$ 11,500	$ 172,500	1	**$ 172,500**	
Segment 4.15 A: US 26 Highway Bridge	$ 3,878,438	EA	$ 969,609	$ 581,766	$ -	$ 5,429,813	1	**$ 5,429,813**	*Note - Construction cost includes a 25% Contingency*
Arterial & collector midblock crossings									
With Beacon	$ 375,000	EA	$ 93,750	$ 56,250	$ 37,500	$ 562,500	4	**$ 2,250,000**	
With Signal	$ 400,000	EA	$ 100,000	$ 60,000	$ 40,000	$ 600,000	1	**$ 600,000**	
Without refuge Island	$ 325,000	EA	$ 81,250	$ 48,750	$ 32,500	$ 487,500	2	**$ 975,000**	

Segments not costed - built or special circumstances (See Chapter 3 segment map summaries)

Segment 3B - Sunrise Park
Segments 2 and 3 - Secondary Route
Segments 4.01 - 4.11 - Barrows Road to Tualatin Hills Nature Park (THNP)
Segment 4.18.2 - Kaiser Road to Kaiser Woods Park
Segment 4.20 - Bethany Meadows Terrace
East end of Segment 4.21 - THPRD boundary (130th Avenue) to Arbor Heights
Segment 4.22 - Bannister Creek / Redfox Drive to County line
Segment 6 - Skyline Blvd to US 30 (St. Helens Road)7

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Table 17 Trail phasing criteria

Criteria	Examples
Jurisdiction	
The trail segment or section is within a jurisdiction that has established authority to fund, develop, own and/or operate trails.	Segment 3 across Bull Mountain is within the City of Tigard city limits, and Tigard builds, owns and operates trails. In contrast, Segment 2 (also Bull Mountain) is within unincorporated Washington County. The County does not have or exercise a parks authority.
Connectivity	
The trail section or crossing structure has a positive impact on regional trail connectivity of the trail beyond the specific segment in which it is located or on the Westside Trail as a whole.	The Tualatin River Bridge (Segment 1), although at the south end of the Westside Trail, is essential to linking into two other regional trails (Tualatin River Greenway and Ice Age Tonquin Trail).
The trail section connects to major activity center(s) that could generate considerable local trail use – schools, regional open spaces, shopping centers, business parks, etc.	Segment 4.14 connects a major Beaverton corporate business park with a city park and considerable business and activities along SW Walker Road.
The trail section extends a built portion of the Westside Trail or other intersecting built trails.	Segment 4.21 extends and connects built portions of the Westside Trail (Segments 4.20 and 4.22).
The trail section connects to other transportation facilities – MAX, bus stops, park and rides – making use of such transportation and transit options more practical.	Improved transportation connectivity will result from building the short 4.11 segment, linking to the Beaverton Creek MAX station, 153rd bike lanes and sidewalks, and SW Jenkins Road transit lines.
Functionality	
Trail section is functional in and of itself.	The trail section between SW Beef Bend Road and SW Bull Mountain Road (Segment 2) would provide an off-street alternative for local bicycle and pedestrian traffic where none now exists.
Trail section or crossing structure is a crucial link, without which intersecting Westside Trail sections would not be functional.	Without a US 26 bridge, trail development in the north end of Segment 4.14 and all of Segment 4.15 would have less functionality.

Criteria	Examples
Benefit/cost	
The benefits of a given trail section are distinctly greater than the relative cost, complexity and/or length of the section.	A paved trail extension from the east end of the Bethany Terrace Trail (Segment 4.20) sets the stage for the more complex extension of the trail system into the West Hills.
Alternatives	
There are no practical or interim alternatives for one or more classes of trail users without constructing a particular trail section or crossing structure.	There is no practical off-street alternative to building trails through Segment 5 approaching the West Hills and Forest Park.

Implementation actions

The Westside Trail will pass through multiple jurisdictions including the cities of King City, Tigard, Beaverton and Portland; Washington and Multnomah Counties; and THPRD. These jurisdictions and the two power utilities that control much of the trail corridor will have to work together to fund, build, and maintain the Westside Trail. The relatively flat Segment 1 at the south end of the study corridor is along King City and includes a major bridge across the Tualatin River estimated to cost almost $4 million. King City has few parks operations resources. The Ice Age Tonquin Trail and Tualatin River Greenway Trail will pass through the City of Tualatin and connect to the Westside Trail across the Tualatin River. Because of this connection, the City of Tualatin could also be a partner in development of the south end of the Westside Trail even though the Westside Trail will not pass through the city limits.

The remaining undeveloped Westside Trail segments are, in many respects, the most challenging to complete, regardless of jurisdictional authority. Segments across Bull Mountain (Segment 2) and into the West Hills (Segment 5) are partly within county jurisdictions that do not have parks authority. These same segments involve major crossing structures, steeply sloped trail corridors, and potentially significant private property acquisitions.

- Among the more important partnership actions will be ensuring that the Westside Trail Master Plan is adopted into local planning policies, such as comprehensive plans, transportation system plans, and trail system plans.
- Determining jurisdictional commitments to build and maintain the Westside Trail is the second crucial implementation action. Metro has regional parks authority. Many of the undeveloped trail segments north of the MAX line and US 26 are within unincorporated Washington County but could be annexed to THPRD. The City of Portland also has a significant trail network in place through Forest Park (Segment 6), and Tigard operates many trails near or on the northwest flank of Bull Mountain (Segment 3).

A variety of federal, state and regional regulatory agencies will have important roles in funding and permitting the Westside Trail. Additional coordination activities, permits and land.use.approvals to

those.identified in this master plan may become evident during trail design and engineering. Local neighborhoods, businesses and property owners, and advocacy groups such as bicycling and open space groups will need to be consulted on an ongoing basis.

Ongoing formal and informal coordination in advancing trail development within this complex set of jurisdictional authorities and stakeholders is critical. The Westside Trail planning process will only end when the final mile of trail is open for traffic.

Permitting and compliance requirements

Engineering, permitting and construction requirements may vary greatly across the trail corridor based on the physical particulars of a given section, varying regulations between responsible jurisdictions, and the source of development funding. Table 18 lists the most likely public agency permitting and compliance processes that will impact trail development. More detail on the specific structures, crossings and other features that may need permitting can be found in Plan Report No. 4, Implementation Strategy (Appendix D).

Table 18 Probable permitting and approval processes

Agency	Method
Federal	
Federal Highway Administration	• National Environmental Policy Act (NEPA)
Executive Orders	• EO 11988 Floodplain Management Compliance • EO 11990 Protection of Wetlands Compliance • EO 12898 Environmental Justice Compliance
National Marine Fisheries Service	• Endangered Species Act Section 7 Consultation • Magnuson-Stevens Fishery Conservation and Management Act Consultation • Fish and Wildlife Coordination Act
U.S. Fish and Wildlife Service	• Endangered Species Act Section 7 Consultation • Migratory Bird Treaty Act Compliance • Fish and Wildlife Coordination Act Coordination
U.S. Army Corps of Engineers	• Clean Water Act Section 404 Permit
State of Oregon	
State Historic Preservation Office	• National Historic Preservation Act Section 106 Consultation
Department of Environmental Quality	• Clean Water Act Section 401: Water Quality Certification • Clean Water Act Section 404 Permit Review • National Pollutant Discharge Elimination System Program Construction • Stormwater Discharge Permit

Agency	Method
Department of State Lands	• Wetland Delineation Clearance • Removal-Fill Permit or General Authorization
Department of Fish and Wildlife	• Oregon Fish Passage Law Compliance • Oregon Endangered Species Act Compliance • Habitat Mitigation Policy
Department of Transportation	• Permit to occupy or perform operations upon state highways
Local government and special district jurisdictions	
Washington County, Multnomah County, King City, Tigard, Beaverton, Portland	• Land use permits and approvals (conditional use, development, and/or environmental) • Natural resource overlay zone reviews • Floodplain development permits • Roadway construction permits, ADA variances (in particular the cities of Tigard and Portland)
Clean Water Services, Portland Bureau of Environmental Services	• Environmental review, development review, stormwater permits

Surface water management

Trail development crossings near to water bodies, wetlands, and associated riparian areas involve many regulatory considerations. Water bodies and wetlands are particularly important as the incubators of many of the wildlife species that will make the Westside Trail corridor "home." Surface water runoff, particularly from paved trail surfaces, will have to be managed for quantity and potentially for quality. Many local partner jurisdictions and state and federal agencies have policies and regulations that may apply to water bodies and wetlands.

The Westside Trail will cross two major stream corridors:

- Tualatin River (Segment 1) – A proposed 330-foot trail bridge span will cross the Tualatin River and connect to the Ice Age Tonquin Trail. Probable permitting agencies include, but are not limited to, the U.S. Army Corps of Engineers, National Marine Fisheries Service, DEQ, the Oregon Department of State Lands, and Clean Water Services.
- Bronson Creek Wetlands (Segment 4.18.2) – This crossing will be constructed by THPRD in 2014. All permitting will be THPRD's responsibility.

Other wetlands and water bodies are within the trail corridor. See Plan Report Nos. 1 and 2 for locations and descriptions. Where impacts from trail construction cannot be avoided, mitigation and restoration or enhancement will have to be undertaken. Many local partner jurisdictions and state and federal agencies have policies and regulations that may apply to water bodies and wetlands. See Plan Report Nos. 3 and 4 for more information. The wetland and other water features crossed by the trail include those listed in Table 19 below.

Table 19 Wetlands, nonwetland waters, and 100-year floodplain crossings

Segment	Wetlands	Streams	Floodplains	Other
1	X	X	X	Tualatin River
2		X		
3		X		
4.14		X	X	
4.15	X	X		
4.16	X	X	X	
4.21	X	X	X	
5		X		

Clean Water Services (CWS) is the surface water management and stormwater regulatory authority for urban Washington County. CWS regulates and manages, and, in some cases, owns stream and riparian corridors, including some within or near the Westside Trail corridor. Trail development may trigger CWS requirements to protect and enhance sensitive areas and vegetated corridors during construction. In addition, mitigation and enhancement may be required.

CWS *Sensitive Areas and Vegetated Corridors*[17] (Chapter 3 of the *Design and Construction Standards*) allows pedestrian or bike trail crossings of vegetated corridors. The standards require that trails be designed and constructed to protect water quality and mitigate any impacts to public stormwater systems. Vegetated swales and/or dry basins are required to provide on-site treatment of all stormwater runoff from paved trails. Paths up to 12 feet in width, including any structural embankments, are conditionally allowed. Paths between 12 and 14 feet wide are allowed if constructed using low impact development approaches in accordance with Chapter 4 of the *Design and Construction Standards* (*Runoff Treatment and Control* [18]).

Portland Bureau of Environmental Services is the surface water management authority for the City of Portland. NW Skyline Boulevard, and a short portion of the proposed soft-surface trail within Segment 5, will be subject to City surface water runoff quality and quantity regulations.

Multnomah County is responsible for stormwater management for the private lands through which a portion of the proposed Segment 5 soft-surface trail may pass and for the multiuser paved trail proposed to connect Segment 4.21 to NW Springville Road. Multnomah County also has jurisdiction over NW Springville Road. The County's Design and Construction Manual would apply stormwater management standards to the widening of NW Springville Road.

[17] http://www.cleanwaterservices.org/Content/Permit/DAndC%20Chapters/Chapter%203%20DC%20Amendment%20RO%2008-28.pdf

[18] http://www.cleanwaterservices.org/Content/Permit/DAndC%20Chapters/Chapter%204%20Amendment%20RO%2007-20.pdf

Multnomah County regulates stormwater on private lands through its land use code, Chapter 33 West Hills Rural Plan Area. Any development that constructs more than 500 square feet of impervious surface requires a stormwater review. The soft–surface trail would not fall under this stipulation. Chapter 33 may not apply if pervious asphalt surfaces are used for the multiuser trail.

Utility requirements

Power utility use permissions

The trail corridor in Washington County is within the power transmission corridor that traverses the eastern portion of the county from south to north. PGE's power transmission facilities are primarily secured by easement in Segments 1, 2 and 3. BPA owns the land underlying its power transmission poles and lines for most of the length of the entire south-north corridor. Where BPA owns the underlying corridor, formal use agreements with the utility will be required. The east-west segments of the trail corridor that approach and enter Forest Park are *partly* within a "branch" BPA power corridor easement. Agreements may be needed with BPA and with the underlying private property owners.

Power utility maintenance agreements

PGE and BPA follow their usual and customary maintenance practices in all undeveloped trail segments and sections. Maintenance practices suitable for undeveloped power corridors may not however be compatible with development for bicycle and pedestrian traffic, nor with the planned dual function of the trail corridor as a wildlife corridor. Plan Report No. 3 details baseline utility standards and limitations.

Existing corridor maintenance agreements between the power utilities and THPRD for developed trail segments should provide adequate precedence for future agreements with respect to basic maintenance, but not for practices compatible with wildlife corridors. Chapter 5 proposes wildlife habitat restoration and conservation principles and practices. These principles and practices will have to be translated to agreements between the power utilities and the jurisdictions that maintain and operate different trail segments (including for existing and planned THPRD operated and maintained sections).

Property ownership considerations

Much of the trail corridor across Bull Mountain (under PGE power lines) and into the West Hills (under BPA power lines), while reserved for power transmission purposes by easements, remains in private ownership. Power utility easements secured across private lands generally permit continued farming and ancillary residential uses provided that power infrastructure maintenance is not impaired. BPA and PGE do not have the right to grant trail development permissions where there is underlying private ownership. Options to acquire rights to privately owned power corridor lands include public access easements and fee title acquisition.

Table 20 Probable trail use permission or acquisition partners

Segment	Utility	TriMet	Public Road Authority	Home Owners Association	Private Owner	Developer
1	X		X	X		
2	X		X	X	X	
3	X		X	X	X	
4.12–4.13			X	X		
4.14	X		X			
4.15	X		X			
4.16	X		X			
4.17	X		X			
4.18.1	X	X				
4.21	X				X	X
5	X		X	X	X	

Construction and maintenance authority

Construction and maintenance agreements will need to be developed with partner jurisdictions, particularly where there is no current parks provider. Agreements may expand the responsibilities of a parks provider, change current maintenance practices, and/or outright assign trail construction or maintenance responsibility outside of usual jurisdictional authority. Two segments within the trail corridor are within county jurisdiction with no parks authority: Segment 2 (Washington County) and Segment 5 (Multnomah County).

Of particular importance is establishing agreements for modified maintenance practices for trail corridor habitat. The goals of restoring and conserving habitat for wildlife along the trail corridor will call for different maintenance practices that should cost less to carry out than conventional approaches.

Full-service parks providers

For trail segments where there are current parks providers and where the providers recognize the Westside Trail in jurisdictional plans, ongoing operation and maintenance agreements may not be required beyond acceptance of jurisdictional responsibility for a trail section. The exception may be for adoption of maintenance practices that establish and sustain wildlife corridor functions.

No parks service providers

Segments 2 and 5 are in unincorporated county areas. Neither Washington County (Segment 2) nor Multnomah County (Segment 5) is a parks provider. Washington County will partner with neighboring jurisdictions or other park providers to build and maintain Segment 2. The on-street

sections of Segment 5 will be built and maintained by Multnomah County and the City of Portland. The off-street sections of Segment 5 will be built and maintained through a partnership between neighboring park providers which could include Metro, Portland Parks and Recreation, and THPRD.

Funding sources

While local financial resources (such as the THPRD park bonds or parks and open space system development charges) may fund some trail construction, it is highly likely that federal and state funding will be the most usual and effective source of funding applied to trail construction. Although other local jurisdictions and agencies may play significant roles in funding the construction of the Westside Trail, ODOT may be the largest single provider of funding, either directly or through a variety of "pass-through" programs with local jurisdictions.

The information included in the Westside Trail Master Plan with respect to alignments, design typology, and costs will be an essential aid in developing competitive and responsive grant applications to ODOT and other funders. ODOT requires that construction projects utilize a project prospectus as part of a request for project construction funding and development. The current (April 2013) ODOT Project Prospectus forms are included in Plan Report No. 4 (Appendix D).

Table 21 summarizes some of the major sources of design and construction funding currently available for trails. Other more locally sourced funds may be available. The terms and conditions of these sources will change from time to time, new programs may emerge or others may sunset, and funding cycles and levels of funds available will vary.

Table 21 Trail construction funding sources

Agency	Program	Funding Cycle	Local Match	Range of Funds Available
Washington County	MSTIP 3d – Opportunity Funds (may include bike/ped projects)	5-year cycle	Undetermined	$5M Total
Metro	Metropolitan Transportation Improvement Program regional flexible funds (2016–2018)	3-year cycle	None	$94.6M Total
Metro	Nature in Neighborhoods Capital Grants	Ongoing	Two times grant value	$16,6000 to $1M but no set top limit
Oregon Department of Transportation (ODOT)	Statewide Transportation Improvement Program – *Enhance* and *Fix-it* (2015–2018)	3-year cycle	10% (Enhance)	$1.3B Total ($720M *Fix-It* & $227M *Enhance*)
FHWA (administered by the Oregon Parks and Recreation Department)	Recreational Trails Program	Annual	20%	Varies

The primary funding source for THPRD trail construction is that agency's current voter-approved bond measure. Although limited to funding extra-capacity improvements to meet the demands generated by new development, transportation and parks system development charges would generally be available to use for regional trail construction. Funding may also be available to underwrite specific elements or types of trail construction or to provide enhancements or mitigation within the trail corridor. This is particularly germane to the Westside Trail's function as a wildlife corridor as well as a trail corridor. Possible funding sources are listed in Table 22.

Table 22 Potential trail enhancement funding sources

Agency	Program	Funding Cycle	Local Match Percentage	Range of Available Funds
Metro	Restoration & Education Grants	Annual	100%	Varies
Metro	Nature in Neighborhoods Capital Grants	Annual	200%	Minimum of $50,000
Metro	Natural Areas Bond Acquisition Funds	Varies	Varies	Varies
Metro	Regional Travel Options	Biannual	10%	Minimum of $50,000
Oregon State Parks	Measure 66 lottery funds for parks and trails	Biannual	Varies	Varies
Oregon State Parks	Local Government Grant	Annual	20% to 50%	$40,000 to $1M
Oregon State Parks	County Opportunity Grant Program	Annual	25% to 50%	$5,000 to $200,000
Oregon State Parks	Recreational Trails Grants	Annual	20%	Minimum of $5,000
Oregon State Parks	Land and Water Conservation Fund	Annual	50%	Minimum of $12,500
Oregon Watershed Enhancement Board	Restoration Grants	Annual	25%	Varies
Oregon Watershed Enhancement Board	Small Grants	Annual	25%	Up to $10,000
Oregon Community Foundation	Oregon Historic Trails Fund	Annual	N/A	Up to $40,000
Oregon Community Foundation	Oregon Parks Foundation Fund	Annual	N/A	$1,500 to $5,000
Bikes Belong	Bikes Belong Grant	Quarterly	N/A	Up to $10,000
Cycle Oregon	Cycle Oregon Signature Grant	Annual	N/A	$50,000 to $100,000
The Trail Keepers Foundation	The Trail Keepers Foundation Grant	Annual	N/A	Up to $3,000

CHAPTER 6: WILDLIFE CORRIDOR

Overview

The Westside Trail will serve as a corridor supporting wildlife as well as bicyclists and pedestrians. Careful consideration of a variety of habitats in trail design and location will enliven the overall trail experience and help sustain urban wildlife populations. In general, the entire power corridor is highly altered from natural conditions as a result of power line maintenance practices, and also due to surrounding urbanization, road crossings, farming, and other activities. This notwithstanding, the power corridor is a unique opportunity to establish a continuous open space through urbanized areas that is supportive of wildlife.

The use of native vegetation can reduce water consumption and operational expenses (mowing, invasives control) in maintaining the trail corridor. The corridor's different combinations of soils, slope, exposure, and moisture can support a broad and diverse range of plants. Grasslands, shrub, riparian areas, woodlands and farmlands all have value for wildlife. Wetlands, smaller streams, and other natural features can be protected and even enhanced with thoughtful trail meanders and amenities and by the use of bridges and boardwalks.

This chapter provides guidance for restoring or conserving three primary habitat types that support wildlife and wildlife movements:

- Prairie grasslands
- Woodlands and forests
- Wetlands and riparian areas

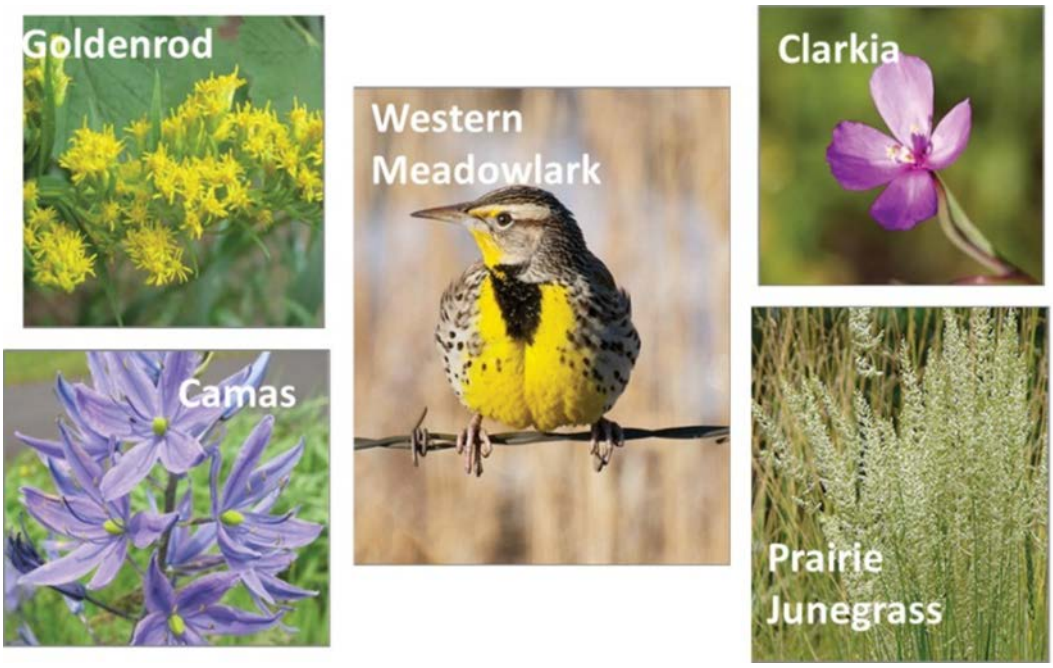

Figure 12 Prairie grassland vegetation and wildlife

Source: Metro

This chapter also describes and illustrates the power utility maintenance requirements that will determine the types of habitat that are possible. Following sections outline approaches and practices for making a variety of trail crossing structures and features more wildlife-friendly. Standards for managing invasive species and general habitat restoration and conservation principles are followed by a prairie grasslands restoration toolbox. Separate sections on stewardship of forested lands and wetlands along the trail conclude the chapter. Plant lists for all three habitats are included in Plan Report No. 3 (Appendix C).

Utility partner standards

Between the Tualatin River and North Bethany, much of the Westside Trail will be within the power transmission corridor controlled by BPA and PGE. Even after the trail turns east and approaches Portland's Forest Park, a substantial portion of the trail will be under or near BPA power lines. Any habitat improvements within the corridor must be compatible with power utility vegetation maintenance standards and access requirements. Vegetation under power lines must be low-growing and cannot exceed the maximum heights at maturity stipulated by BPA and PGE. There may be some trail sections with enough clearance under the power lines to accommodate woody plants, but most of the Westside Trail located under the power lines will be most suitable for prairie grassland habitat, as native grasses and wildflowers seldom reach more than three feet in height. The figure below graphically illustrates BPA and PGE standards for vegetation limits within the power corridor.

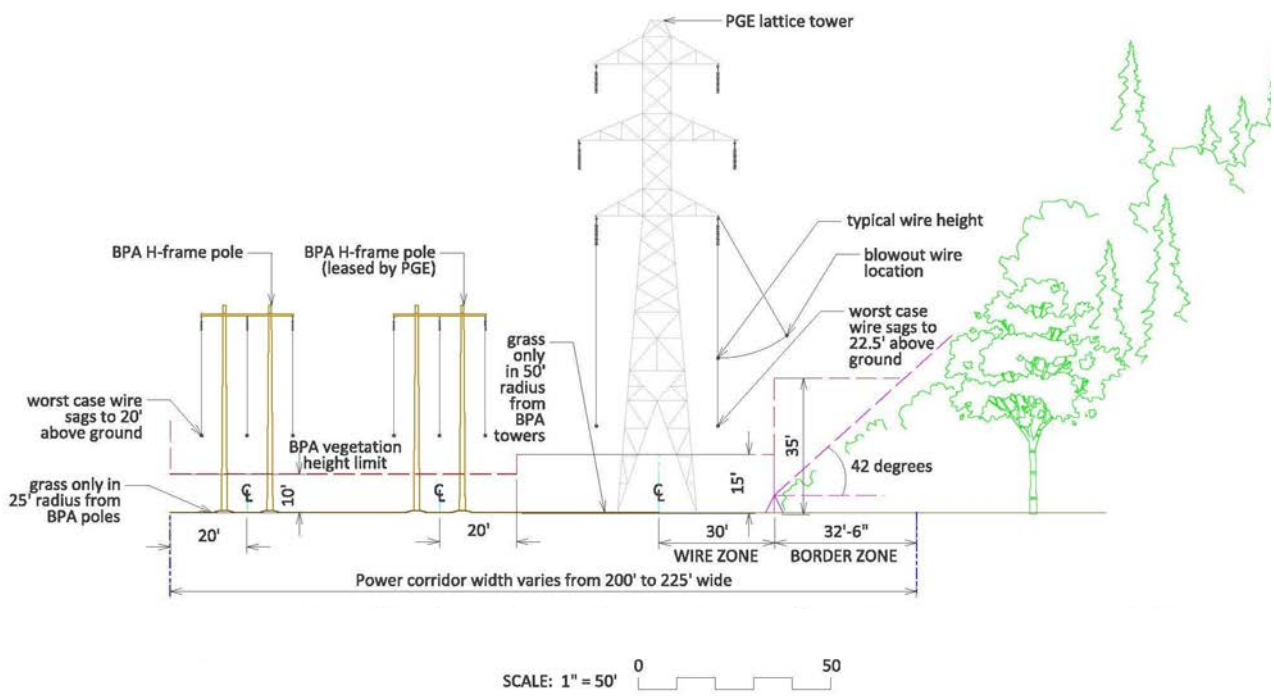

Figure 13 Vegetation limitations in BPA and PGE power corridor

Illustration credit: Gregg Everhart

Bonneville Power Administration

In 1993, BPA established guidelines[19] for revegetation practices to mitigate impacts to visually and environmentally sensitive areas within BPA right of way. Vegetation plans for the Westside Trail will need to be approved by BPA. BPA guidelines include useful principles and plant lists for shrubs and small trees which should be referenced at the time of trail design and engineering and also as part of trail maintenance standards. The BPA list includes exotic plants that can be invasive; the best options for wildlife are the native species on the list.

BPA's Division of Facilities Engineering-Environmental Section is responsible for assessing the physical and visual impacts of transmission facilities. Heights of trees, shrubs, and groundcover in BPA right-of way are limited in order to maintain safe and reliable power transmission service. Reviews of Westside Trail plans with BPA staff in 2012 indicated that a 25-foot radius free from vegetation other than mowed grass should be maintained around wood power poles and a 50-foot radius from steel lattice towers. Utility standards specify grass but the primary parameter is "mowable." Mowable wildflowers and other low vegetation will satisfy utility requirements and greatly increase habitat values. No vegetation that can grow to over 10 feet tall and no tree species whatsoever can be planted in the BPA corridor. Exceptions are possible in areas where power line infrastructure crosses over deep ravines and gullies (such as in Segment 2).

The BPA Transmission Facilities Vegetation Management Program is responsible for management of vegetation in right of way. While the primary purpose of the program is to ensure reliable operation of the transmission system power, it also seeks to ensure public and worker safety, technical and economic efficiency, multiple uses of right of way, protection of environmental quality, and use of integrated pest management. Screening is sometimes allowed near private residences, recreational trail crossings, river and road crossings, or areas of high scenic value. The study states "it is desirable to retain vegetation wherever practical for its aesthetic value, wildlife habitat value, erosion control and other environmental benefits."

Portland General Electric

PGE does not have formal published standards for power corridor vegetation management. PGE's Forestry Department publishes a pamphlet titled *Trees and transmission lines: Planting and maintenance guidelines* aimed at private owners of land near to or under power lines. This pamphlet includes tables of acceptable native tree species and trees to avoid. These two tables are adapted and reproduced below.

[19] BPA (Bonneville Power Administration). 1994. Revegetation guidelines for BPA rights-of-way study. Final document. Prepared by David Evans and Associates, Inc.

Table 23 PGE's allowed trees

Common name	Botanical name	Height at maturity
Sitka willow	*Salix sitchensis*	15'
Coast willow	*Salix hookeriana*	15'
Red twig dogwood	*Cornus stolonifera*	6'
Red elderberry	*Sambucus racemosa*	15'
Vine maple	*Acer circinatum*	15'
Indian Plum	*Oemleria cerasiformis*	12'
Oceanspray	*Holodiscus discolor*	12'
Beaked hazelnut	*Corylus cornuta*	12'
Pacific ninebark	*Physocarpus apitatus*	12'
Mountain alder	*Alnus tenuifolia*	15'
Pacific wax myrtle	*Myrica californica*	15'
Mock orange	*Philadelphus lewisii*	8'
Western mountain ash	*Sorbus sitchensis*	15'
Douglas maple	*Acer glabrum v. douglasii*	12'

Table 24 PGE's trees to avoid (many are nonnative or invasive)

Alder

Ash
- Mountain
- Oregon

Beech

Birch

Catalpa

Cedar
- Deodora
- Incense
- Port Orford
- Western Red

Cherry
- Most native cherry species grow too tall

Chestnut

Cottonwood/Poplar
- Black Cottonwood
- Lombardy Poplar
- Tulip Tree (Yellow Poplar)

Hawthorn

Fir
- Douglas
- Grand
- White

Hemlock
- Mountain
- Western

Locust

Maple
- Big Leaf
- Red
- Norway varieties
- Silver
- Sugar

Oak
- Oregon White
- Pin
- Red

Pines
- Austrian Black
- Japanese Black
- Ponderosa
- Scotch
- Shore
- Sugar
- White

Redwoods/Sequoia

Spruce

Sweetgum

Sycamore

Walnut

Willow
- (most types)

PGE provided specification notes and drawings of lattice tower and H-frame power structures. These were combined with BPA information to create Figure 13.

Vegetation heights are limited as transmission power lines can sag between poles and lattice towers. For wooden H-frame poles, power lines can sag to 20 feet above the ground in worst-case operating conditions. Lattice tower power lines can sag to 22.5 feet above the ground. This input translates to the following principles for vegetation maintenance within PGE power corridors:

- Vegetation is restricted to a height of no greater than 15 feet at maturity within 30 feet of both sides from centerline of transmission towers and lines.
- Vegetation is restricted to a height of no greater than 35 feet at maturity from 30 feet to 62.5 feet of both sides from centerline of transmission towers and lines.

Danger trees are those that when falling could come within 30 feet of the centerline of transmission towers and lines. A sighting line that rises at a 42 degree angle, 30 feet away from the centerline is used to locate and check any tall trees that have obvious signs that indicate a potential failure risk.

Trail crossings

The Westside Trail crosses numerous roads, including US 26, and a light rail line. There will be many opportunities to improve habitat quality and connectivity and provide for safer wildlife movement as road crossings are built. Because accommodations for wildlife can greatly increase the cost of crossings, the implementation strategy for this master plan includes grant resources that could help defray costs. Practices for midblock road crossings, crossing lighting, and bridges and boardwalks are discussed below.

Road crossings

Except for US 26, all Westside Trail road crossings will be at-grade. At-grade crossings are typically the least desirable crossing type for wildlife because few effective enhancements are possible. Metro's *Wildlife Crossings: Providing safe passage for urban wildlife*[20] states "vegetation along roadways and in medians can have both positive and negative effects." Careful selection and management of vegetation can help to offset the negative effects. When crossings are made more wildlife-friendly, overall habitat connectivity is improved. Having both transportation planners and wildlife biologists on the trail design team can ensure that safety and connectivity are optimized for people and wildlife.

- Where power transmission infrastructure restrictions and trail user sight lines allow, existing habitat should be left intact or new habitat provided as close to the crossing as possible to provide for wildlife cover.
- Fencing can direct wildlife toward the safer areas to cross both at-grade and under roads and over bridges and boardwalks.

[20] http://www.oregonmetro.gov/index.cfm/go/by.web/id=38104

Undercrossings designed for wildlife passage using a variety of culvert designs can be very effective. Such undercrossings are not included in Westside Trail Master Plan midblock crossing concepts or cost estimates but could be considered on a case-by-case basis. One useful resource is the *Federal Highway Administration's Wildlife Crossing Structure Handbook*.[21] Undercrossings of roads in highly urbanized areas may be essential to conservation of small animals that need to move along the corridor. Larger animals, such as deer and coyotes, are highly mobile and can navigate roads with relative ease, while small animals, such as turtles and salamanders, move more slowly and can be sensitive to artificial substrates such as asphalt.

Lighting at road crossings

Lighting at road crossing may be used to increase trail user and on-road vehicle safety. Many wildlife species, however, will avoid lighted areas or be more vulnerable to vehicle strikes from being temporarily blinded by lighting. Locating wildlife vegetation cover as far from crossing lighting as possible may provide better conditions for wildlife. This also means that wildlife will be less likely to use the area of the designated crossing where slowing vehicle traffic may reduce the odds of wildlife strikes, further emphasizing the value of safe undercrossings.

[21] http://www.cflhd.gov/programs/techdevelopment/wildlife/documents/01_Wildlife_Crossing_Structures_Handbook.pdf

Major bridge and boardwalk crossings

Three major bridge structures are planned along the Westside Trail. All the bridges planned for the Westside Trail are described in the master plan as conventional structures, as are the numerous minor bridges and boardwalks (see Plan Report No. 2 and the Trail Design Typology chapter of Plan Report No. 3 for more details).

Image 9 Ki-a-Kuts Bridge over the Tualatin River

Photo credit: City of Tualatin

The Tualatin River and US 26 bridge crossings involve estimated spans of 330 feet and 230 feet, respectively, and approach structures. A bridge crossing across a ravine on Bull Mountain in Segment 2 will require a 100-foot bridge span.

The Ki-a-Kuts Bridge (see photo above) connects the cities of Tigard and Tualatin across the Tualatin River and is an example of an attractive and highly effective crossing that primarily accommodates human traffic. The proposed US 26 and Tualatin River bridges could include added design and habitat features to greatly improve wildlife passage. The bridge illustrated below shows how an otherwise conventional highway crossing bridge can also accommodate habitat for wildlife in a simple and straightforward manner.

Image 10 Wildlife friendly highway overpass

Photo credit: Marcel Huijser

Bridge design principles to benefit wildlife include:

- Incorporate contiguous habitat on bridge approaches and the bridge span itself. Plant native grasses and scattered shrubs, and do not mow the grass so it can provide cover.
- Lay small logs, rock piles, brush piles, or pipes along the length of the bridge to provide cover for small animals. Do not build a curb between the bridge's bicycle/pedestrian trail and wildlife habitat.
- There is a relationship between crossing length and willingness to cross – wildlife is more willing to cross short overpasses than long ones. Similarly, animals are more willing to use wide crossings than narrow ones. Make the crossing as wide and short as possible.
- Include natural structure and/or weave native materials into safety and security fencing and barriers along the bridge structure, particularly for birds and arboreal (tree-dwelling) mammals. Ropes or other similar structures extended from fencing or barriers to nearby trees and other natural features can also improve wildlife passage.

Other bridge and boardwalk crossings

Relatively short and low elevation bridges or boardwalks are planned to cross small streams or wetlands in several trail segments. These streams and wetlands are wildlife movement corridors that provide safe connections for wildlife between habitat patches. There are wildlife-friendly features that enhance trail bridges and boardwalks. Some of the ideas below may better and more practically apply to different spans and construction materials and techniques, and the type of area being crossed – wetland, seasonal stream, etc.

- Preserve existing cover habitat or create additional new habitat as close to each end of the crossing as possible.
- Cover habitat could include unmowed native grasses, scattered shrubs, or small logs, pipes, and rock and brush piles.
- Add natural structure to bridge or boardwalk safety fencing by weaving in native materials used by birds and arboreal mammals, and provide connections to adjacent off-bridge habitat in the form of ropes or other structures.
- Span the entire high-water floodway of the stream or wetland being crossed to allow wildlife passage under the bridge or boardwalk and to maintain the highest stream function.
- Maintain a 2-foot minimum width abovewater pathway for wildlife under bridges and a minimum clearance between the pathway and bridge underside of at least two feet.
- Retain as much openness and natural light under the bridge as possible, including grates or slots in the bridge deck to allow light to pass through.
- Retain or enhance native soils and natural flat benches under bridges, and retain or install structures such as boulders, to allow for wildlife passage during high water.
- If light, water, and soils allow, install shrubs and other native vegetation under bridges.

Invasive plant species

Invasive plants are a problem throughout the trail corridor, particularly in grassland areas which have been highly disturbed by prior development, utility maintenance practices, and human activity. Invasive plants can out-compete native species thus limiting or shrinking habitats supporting a wide range of wildlife.

- Efforts at invasive removal and eradication should always be paired with installing native species.
- Follow integrated pest management principles to control invasive plants.
- When working across large landscapes, consider phased removal of invasive plants to provide for continued wildlife cover and structure until restored areas become established.

Image 11 Invasive Himalayan blackberry

Photo credit: Jim Rapp

Habitat restoration and conservation principles

The Westside Trail corridor is a unique open space and wildlife habitat ranging from 100 feet to 225 feet wide and extending south to north across nearly the entire area of urbanized eastern Washington County and then eastward into Multnomah County and the City of Portland. The Westside Trail will be aligned within this corridor to minimize impacts to existing habitat, and trail management will include control of invasive species and establishment of native plant communities. Improved habitat will enhance the trail user experience by providing a pleasant visual appearance and opportunities to view wildlife.

There are existing habitat values to conserve in some segments, and the potential for restoration is substantial. More than 99 percent of the region's prairie habitat has been lost to development and land conversion. Height restrictions for vegetation under power lines make restoration of native prairie habitat elements a natural fit. Ten overarching habitat conservation principles should be followed during trail design, engineering, and construction:

1. Involve natural resources specialists or biologists in the trail design and engineering process, and conduct site visits to identify important habitat features and potential impacts to habitat connectivity.
2. Trail alignments and design should take into account the size (patch size) of existing valuable habitat to avoid adverse impact of fragmenting into narrow or small habitat patches.

3. Trails and trail amenities should be located in already disturbed or highly altered areas to the greatest extent possible.
4. Habitat restoration plans should be developed for all poorer quality habitat areas crossed by the trail.
5. Work closely with the power utilities to understand and comply with vegetation type, location and height limitations in order to establish higher quality habitat.
6. Trail alignments should act as a catalyst for habitat restoration and as opportunities for widening existing buffers – riparian, wetland, and other habitats.
7. Trail alignments should improve access to both restored habitat areas and areas with existing high-quality habitat, provided this habitat can be protected from inappropriate uses.
8. Consider wildlife species' ability to move through or across certain trail features. Certain types of trail surfaces, sun exposure, drying out from lower moisture, lack of cover for hiding from predators, and trail retaining walls are barriers to some species. Road crossings are especially problematic for wildlife, and the impacts of road widths, vegetation and lighting should be considered.
9. Provide interpretive signage along the trail and at crossings informing trail users about the values of wildlife and the restored habitat along the trail corridor, including encouraging trail users to keep pets on leash and providing "wildlife on trail" signage.
10. In woodlands and forested areas, trail alignments should maintain canopy connectivity and cover for arboreal species for shade and to retain moisture at the forest floor.

Prairie restoration toolbox

Prairie was once the dominant habitat type in the Tualatin River Basin through which most of the Westside Trail passes. Almost none of these original grasslands remain. The Westside Trail could provide fifteen or more linear miles of an almost continuous grassland corridor ranging from 100 feet to 225 feet wide. This translates to significant acreage that can support wildlife populations and movements among major natural areas such as the Tualatin River National Wildlife Refuge, Tualatin Hills Nature Park, and other local nature parks, and between east-west riparian corridors that the trail crosses such as Bronson and Rock Creeks.

Image 12 Unrestored prairie habitat in power corridor
Photo credit: Jim Rapp

Open areas within the power corridor can support a wide range of wildlife. Birds, small mammals, and pollinators such as butterflies and bees will take advantage of the restored habitat. Landscaping and habitat restoration activities in grassland habitats can incorporate swaths of wildflowers and shrub patches to provide food and cover for wildlife. The Chicago Wilderness Magazine's article *Power & Plants*[22] describes a successful program.

The following habitat restoration guidelines and practices can be used by a variety of trail stakeholders and users ranging from a design/engineering team developing trail construction specifications to local community groups looking to improve their own particular patch of trail habitat. Figure 14combines habitat patch concepts with power utility limitations.

Prairie restoration general guidelines

General guidelines for enhancing prairie habitat in the trail corridor include:

- When suitable habitat is already present, it should be preserved or replaced if impacted by the trail alignment.
- Use native plants in habitat patches, trailside landscaping, and in screening buffers at corridor edges that are appropriate to soil, exposure, and moisture conditions.
- Vary habitat patch size with an emphasis on larger patches. Wildflowers can be continuous along the trail, or habitat patches can be spaced and placed alongside other landscaping. Large patches are particularly desirable, and a few larger (half-acre or more) patches of suitable habitat should be incorporated into each trail segment.
- Pollinators benefit from large blocks of similarly colored wildflowers. An edging of mixed plantings could be placed around individual patches for a more natural appearance and to visually link the patch with other patches in the trail segment.
- Utilize nearby open spaces to increase patch size and improve function for wildlife. Include nearby parks, natural areas, and residential or commercial native landscaping in the overall restoration plan or activity. Locating new or enhanced habitat patches near to neighboring native plant landscapes will create bigger overall patches and additional foraging areas.
- Consider landscape maintenance needs in determining trail alignments and habitat restoration plans. Low-stature perennials survive mowing better than many annuals will, especially if mowing occurs early in the year before flowers set seed.

[22] http://www.chicagowilderness.org/CW_Archives/issues/summer2005/comed.html

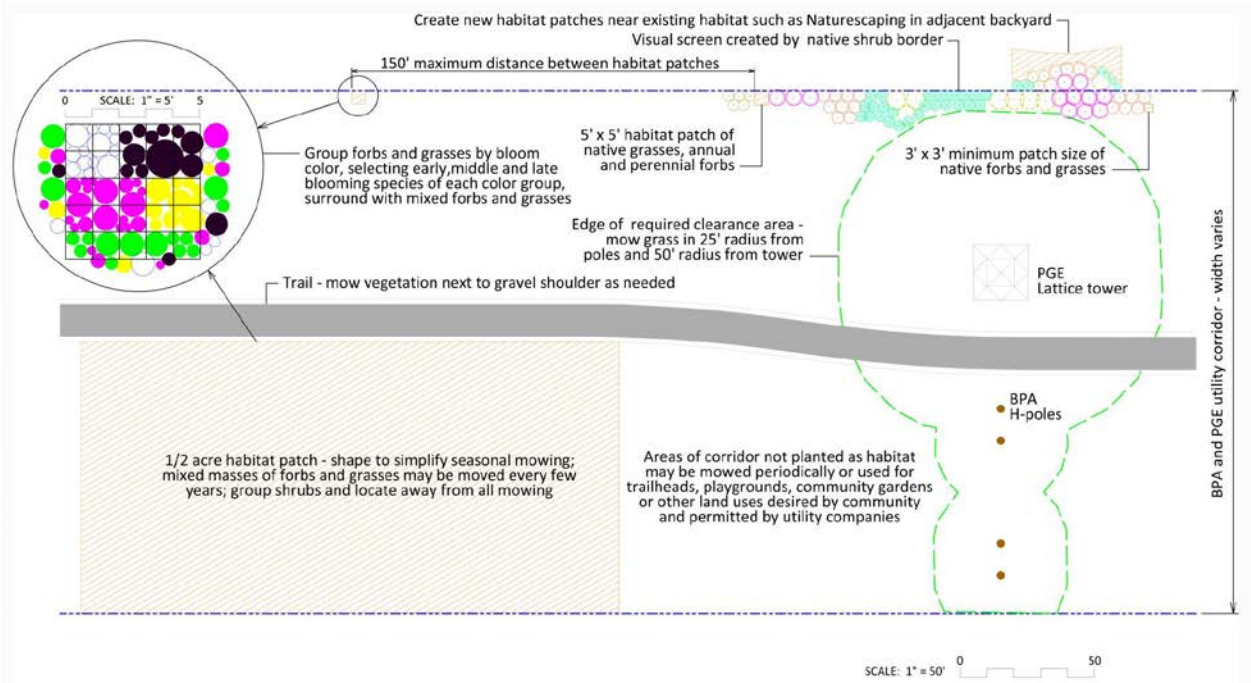

Figure 14 Habitat patches, screening and mowing in BPA and PGE corridor

Illustration credit: Gregg Everhart

Prairie habitat restoration practices and techniques

- The least mobile wildlife (such as bees and butterflies) are best accommodated by suitable habitat patches no more than 50 yards apart.
- A habitat patch that provides effective pollinator foraging habitat should include several flower colors to attract a variety of species.
- For pollinators, install native plants in clumps of a minimum size of three feet by three feet; greater than 25 square feet is better. Having many plants of a single species in a clump increases foraging efficiency.
- Within each color block, several species with different bloom times will provide pollen and nectar throughout the season.
- Retain or create areas of downed wood, rock piles or other similar features near prairie patches to provide nesting habitat for invertebrates, foraging habitat for birds and small mammals, and cover for small mammals and reptiles.
- Provide perches, nest boxes, and nesting structure for birds.
- Evergreen shrubs should be incorporated into habitat patches to provide shelter in winter months.

- Retain or create new unobstructed habitat on each side of the corridor where slopes require the use of switchbacks to meet acceptable trail grades. This provides an alternative route for small animals that do not navigate walls or paved surfaces.

Forests and woodlands conservation toolbox

Forests and woodlands are home to many kinds of wildlife, especially where surface water is available. Along the Westside Trail corridor, substantial stands of woodlands and forests are found in the northeasternmost trail segments approaching Forest Park. There are also woodlands on Bull Mountain. General guidelines for conserving and enhancing wildlife habitat in forest and woodland habitats include:

- Align the trail along forest edges rather than through forests wherever possible to reduce habitat fragmentation.
- Plant the nonforested side of the trail to expand forest habitat.
- If the trail must be aligned through a forested area, retain canopy connectivity to maintain forest climate (shade and moisture) and travel routes for tree-dwelling wildlife.

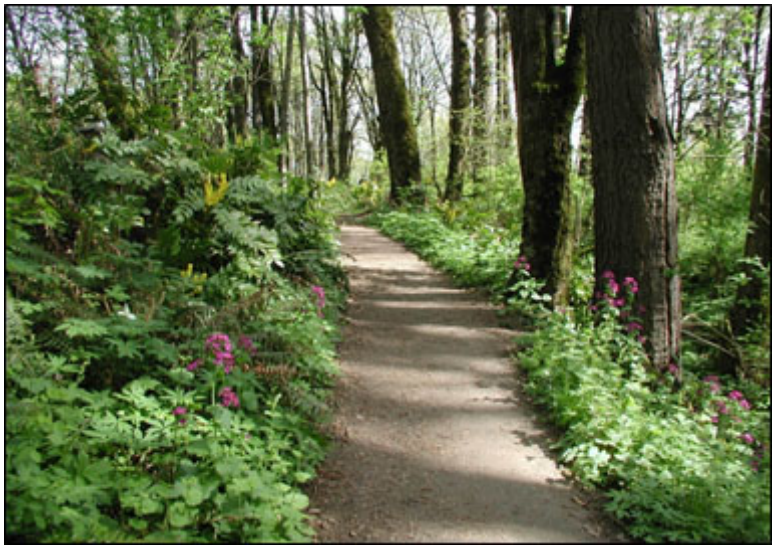

Image 13 Woodland trail in Forest Park

Photo credit: Gregg Everhart

- Design and engineer trail alignments and infrastructure and apply trail construction and maintenance methods that retain and preserve trees wherever possible.
- Consider using existing trails and pathways through forested areas, except where existing alignments create adverse impacts or widening and expansion of the existing pathway may create additional impacts.
- Trees felled during trail construction should be left in place for habitat enhancement.
- Retain or create forest habitat on each side of the trail where slopes require the use of switchbacks to meet acceptable trail grades.
- Use native plants when restoring habitat along trails in forested areas, including native evergreens to provide winter cover for wildlife.
- Retain or create forest floor shrub habitat.

Wetlands, streams, and riparian conservation toolbox

More than 90 percent of the metropolitan Portland region's wildlife species use water-associated habitats at some point in their lives, whether for feeding, traveling, reproducing or other purposes.

Animals such as dragonflies and pond-breeding amphibians start their lives in wetlands and use uplands in their adult phases. Both adequate water and connections to adjacent uplands are important to wildlife lifecycles. General guidelines for conserving and enhancing wildlife habitat in wetland, stream, and riparian areas along the trail corridor include:

- Avoid wetland crossings whenever possible.
- Align the trail so there is a vegetated buffer between the trail and wetland. Buffers provide habitat for wildlife species and help reduce the potential for wetland and stream pollution generated by trail usage.
- If avoiding a wetland crossing is not possible, reduce impacts by using bridges and boardwalks.

Image 14 Bronson Creek wetlands

Photo credit: Jim Rapp

- If wetland views are desired, use viewing platforms or areas with appropriate barriers and signage to discourage off-trail wandering.
- As part of trail construction, enhance or restore degraded or impacted wetlands by removing invasive nonnative plants and replanting with appropriate native plants.
- Where forested areas or woodlands are adjacent to wetlands crossed by the trail, design and construct the trail to maintain functioning wetland and forest connectivity for wildlife species that use both habitats.
- Minimize stream crossings to protect riparian areas.
- Trails along streams should be restricted to one side of the stream outside of existing riparian areas, and the upland side of the trail should be planted to expand the riparian area.
- Provide occasional near-stream viewing areas so trail users desiring water views or access do not create informal trails.
- If a trail must cross a wetland or pass between a wetland and adjacent uplands, align the trail to minimize the crossing and maintain wetland connectivity.