

# East/West Circulation Alternatives Analysis

Kingston Terrace Master Plan  
King City, Oregon

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King City, Oregon

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## **Project Information**

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# 1 EXECUTIVE SUMMARY

King City is planning for the future growth and development of Kingston Terrace, a 528-acre area directly west of the existing city that was formally known as Urban Reserve Area (URA) 6D. The Kingston Terrace Master Plan (KTMP) builds on the work of the 2018 *Concept Plan* for the area to provide additional development detail and implement the community vision resulting in *Comprehensive Plan* and Community Development Code amendments. The KTMP process includes further exploration of future transportation facilities to determine the nature, location and connections that would be served by a preferred east/west collector street concept. An analysis of circulation alignment alternatives has been conducted in sufficient detail to identify a preferred concept that fits with the overall master plan circulation system and can be incorporated into the City's *Transportation System Plan*.

This report has been prepared to document the multi-disciplinary analysis process leading to the identification of a preferred east/west circulation alternative for the KTMP area. Consistent with prior planning work in the study area through the *Concept Plan*, it is intended that this east/west circulation alternative function as a collector street to:

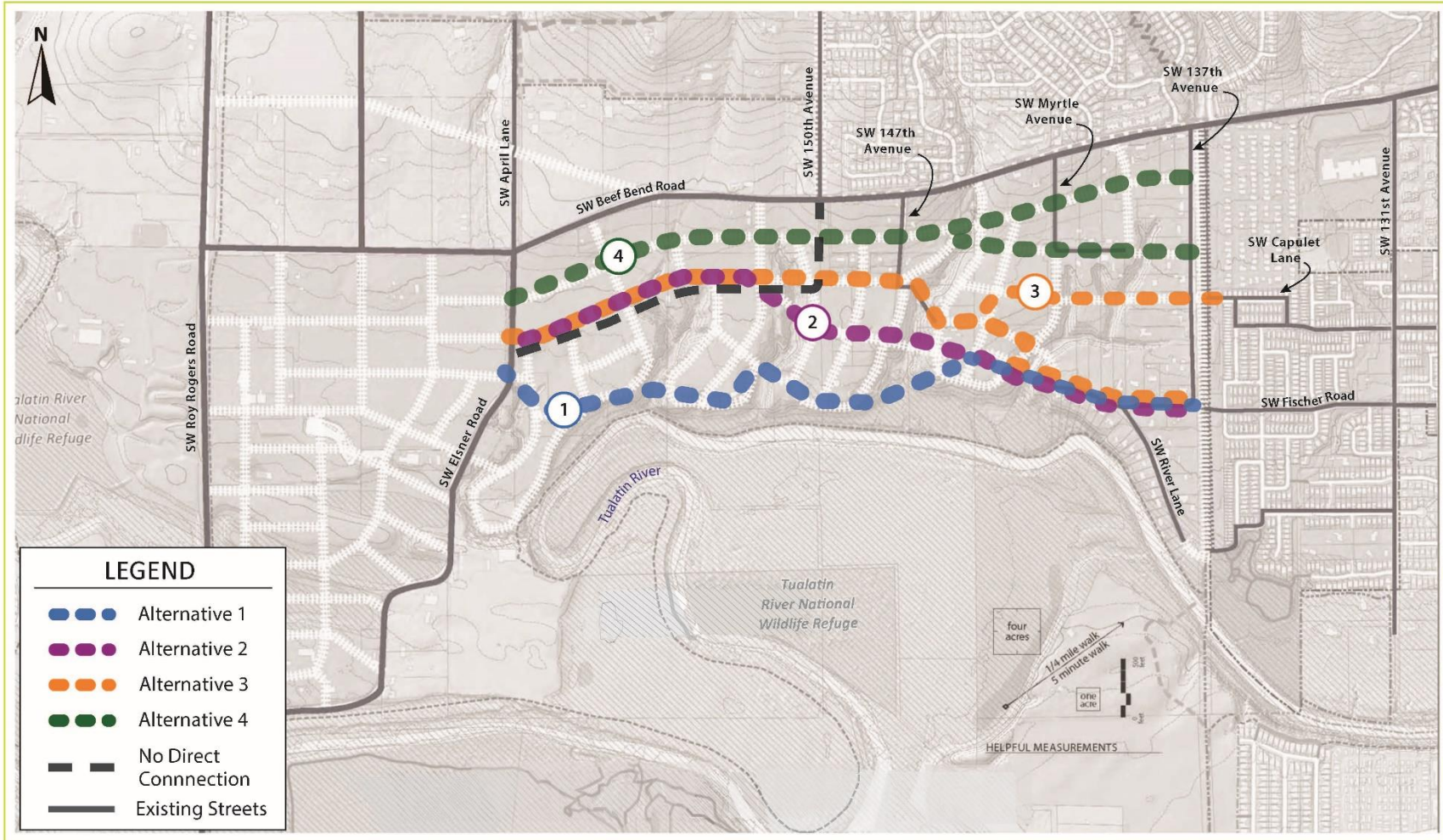
- Link neighborhoods and other destinations across Kingston Terrace with particular focus on connecting residential areas with the proposed Town Center
- Connect Kingston Terrace to destinations within the existing city
- Connect Kingston Terrace to Tigard's River Terrace via an east/west and north/south collector street system.

This report is built on information collected and analyzed for the master planning effort including multimodal Baseline Conditions analyses and the *Draft King City Transportation System Plan (TSP)*. This information has been supplemented by further multidisciplinary research focused on land use, socio-economic and environmental justice considerations, transportation elements, public utilities and services, and natural resources. Order-of-magnitude cost estimates for each east/west circulation alignment alternative have also been prepared and documented.

## Evaluation Process

The evaluation process includes the following steps:

- Establish factors to be used in comparing and contrasting alternatives. Factors included for quantitative and qualitative considerations in a variety of technical disciplines.
- Identify a range of circulation system alternatives based on input from prior community meetings, technical staff input and other sources. Conduct initial screening of these options to create a shortlist of reasonable alternatives for more detailed review. Share the shortlist with the public for review and comment. The shortlisted listed alternatives are illustrated in the figure on the following page.
- Refine, evaluate, and rank circulation alternatives as shown in the table below.
- Identify and incorporate a preferred alternative into the larger master planning process, ultimately leading to a collector street that would be constructed over time as land development activities occur in Kingston Terrace.



Kingston Terrace Master Plan  
King City, Oregon





## Summary of Evaluation Results

Impact Categories	No Direct Connection	Alternative 1	Alternative 2	Alternative 3 (S/N)	Alternative 4 (S/N)
Land Use and Community Design					
Bicycle, Pedestrian and Micro-mobility					
Vehicular Mobility and Accessibility					
Public Services and Utilities					
Natural Resources					
Costs and Implementation					

Based on the results of this analysis, **Alternative 2**, with minor modifications to maximize the use of existing right-of-way and avoid homes, is the preferred east/west connection to be used to complete the Kingston Terrace Master Plan.<sup>1</sup> Alternative 2 has particular advantages that are worth noting including:

- With the small alignment adjustments noted, this alternative does not require demolition of existing homes in the study area.
- Alternative 2 would likely require less linear feet of right-of-way acquisition than Alternatives 3 or 4 due to its use of existing roadway rights-of-way.
- As a collector road providing redundancy for Beef Bend Road and serving a newly developing area, this alternative would likely be effective in securing public funding from state, regional, county or local sources that would reduce the need for developer funding for this key piece of roadway infrastructure.
- The alignment maximizes the effectiveness of gravity sewer through co-location of utilities along an optimal elevation for sewage flow. This would reduce the on-going cost of this public utility. Additionally, the alternative does not create long closed end roadway segments that may require added infrastructure cost to provide potable water.
- The alignment offers both a central spine or backbone roadway through the development linking it most directly with the Kingston Terrace Town Center and the existing city. This has advantages for:
  - Emergency response (TVFR has indicated a preference for Alternative 2),

<sup>1</sup> The “corridor of intention” for Alternative 2 remains the same. The modifications are minor and cannot be seen at the scale of the map.



- Good access to many neighborhoods and new public parks,
- Potential future regional transit service through a developed area when densities are sufficient,
- Good connectivity and minimized travel times for active and vehicular transportation, and
- Minimization of the potential for either long cul-de-sacs or closed end roadways that require out of direction travel, discourage pedestrian and bicycle use, and may result in added utility costs.

There will be additional opportunities for community members to comment on the preferred alternative as the master plan process resumes. As work on the master plan process progresses, Alternative 2 may be adjusted to accommodate land use, environmental, and other factors. The final route that emerges from this process will be integrated as a fundamental element of the draft KTMP and *Transportation System Plan*. Ultimately, the master plan including transportation system recommendations will be incorporated into the City's *Comprehensive Plan*, *Transportation System Plan* and Development Code per City Council approval, where community members will have another opportunity to provide testimony as to the master plan and preferred alternative.

## 2 INTRODUCTION

### Background

King City is planning for future growth and development of Kingston Terrace, a 528-acre area directly west of the existing city that was formally known as Urban Reserve Area (URA) 6D. A *Concept Plan* for the area was completed in 2018, followed by a decision from Metro to include Kingston Terrace in the most recent regional urban growth boundary expansion. The *Concept Plan* for King City Urban Reserve Area 6D included a series of baseline reports addressing housing, land uses, transportation routes, parks and open spaces, public facilities, governance, and infrastructure costs for the area. **Figure 1** illustrates key recommendations of the *Concept Plan* including a four-neighborhood land use plan which is supported by a collector and local street system. Initial collector road concepts are shown in darker black lines in this figure. The Kingston Terrace Master Plan (KTMP) builds on the work of the *Concept Plan* to provide additional development detail and implement the community vision resulting in *Comprehensive Plan* and Community Development Code amendments.

With respect to future transportation facilities and services in Kingston Terrace, the *Concept Plan* provided both a policy framework and a preliminary street system concept for the area. The policy framework emphasized a connected transportation network of streets and paths to accommodate all modes of travel. This network would provide for internal mobility within Kingston Terrace linking residential land uses with the proposed town center, schools, parks, and other resources. The network would also offer connections to the existing City and surrounding communities. A key element of this network is the provision of an east/west multimodal collector street.

The KTMP process includes further exploration to determine the nature, location and connections that would be served by a preferred east/west collector street concept. An analysis of circulation alignment alternatives has been conducted in sufficient detail to identify a preferred concept that fits with the overall master plan circulation system and can be incorporated into the City's *Transportation System Plan*.

### Purpose of this Report

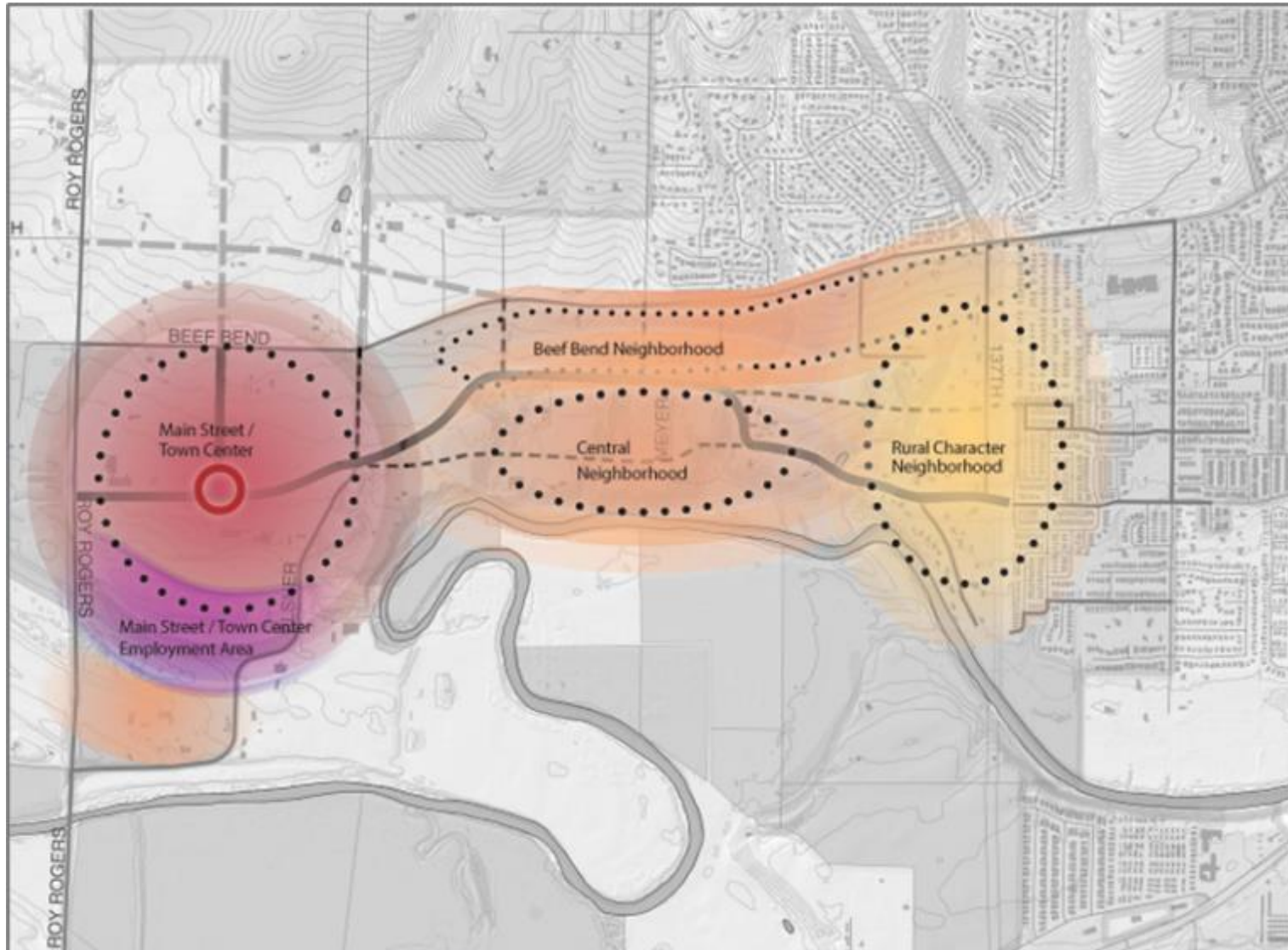
This report has been prepared to document the multi-disciplinary analysis process leading to the identification of a preferred east/west circulation alternative for the KTMP area. Consistent with prior planning work in the study area through the *Concept Plan*, it is intended that this east/west circulation alternative function as a collector street to:

- Link neighborhoods and other destinations across Kingston Terrace with particular focus on connecting residential areas with the proposed Town Center
- Connect Kingston Terrace to destinations within the existing city
- Connect Kingston Terrace to Tigard's River Terrace via an east/west and north/south collector street system.

### Context of the Master Planning Effort

This report is built on information collected and analyzed for the master planning effort including multimodal Baseline Conditions analyses and the *Draft King City Transportation System Plan (TSP)*.

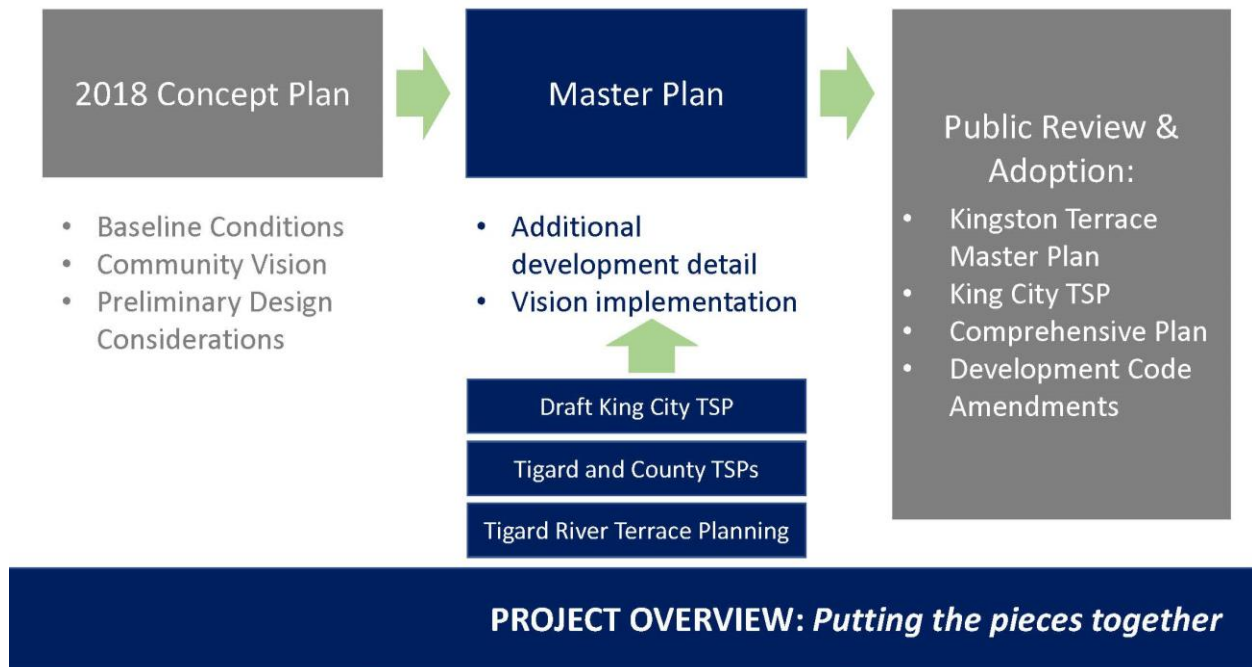
Figure 1. Concept Plan Land Use and Backbone Transportation System Recommendations



This information has been supplemented by further multidisciplinary research focused on land use, socio-economic and environmental justice considerations, transportation elements, public utilities and services, and natural resources. This additional research is documented in separate discipline reports where appropriate and is summarized in this report. Order-of-magnitude cost estimates for each east/west circulation alignment alternative have also been prepared and documented.

A multi-disciplinary evaluation of the Kingston Terrace east/west circulation alternatives, as described in this report, will be used to identify a preferred “backbone” collector street system to serve the study area. The findings and conclusions of this report will be incorporated into the KTMP and will provide a fundamental element of the recommended land use and infrastructure development concept. Ultimately, the master plan including transportation system recommendations will be incorporated into and adopted as part of the City’s *Comprehensive Plan, Transportation System Plan* and Development Code. **Figure 2** shows the context of the KTMP within the larger planning and development process in the study area.

**Figure 2. Context for the Kingston Terrace Master Planning Process**

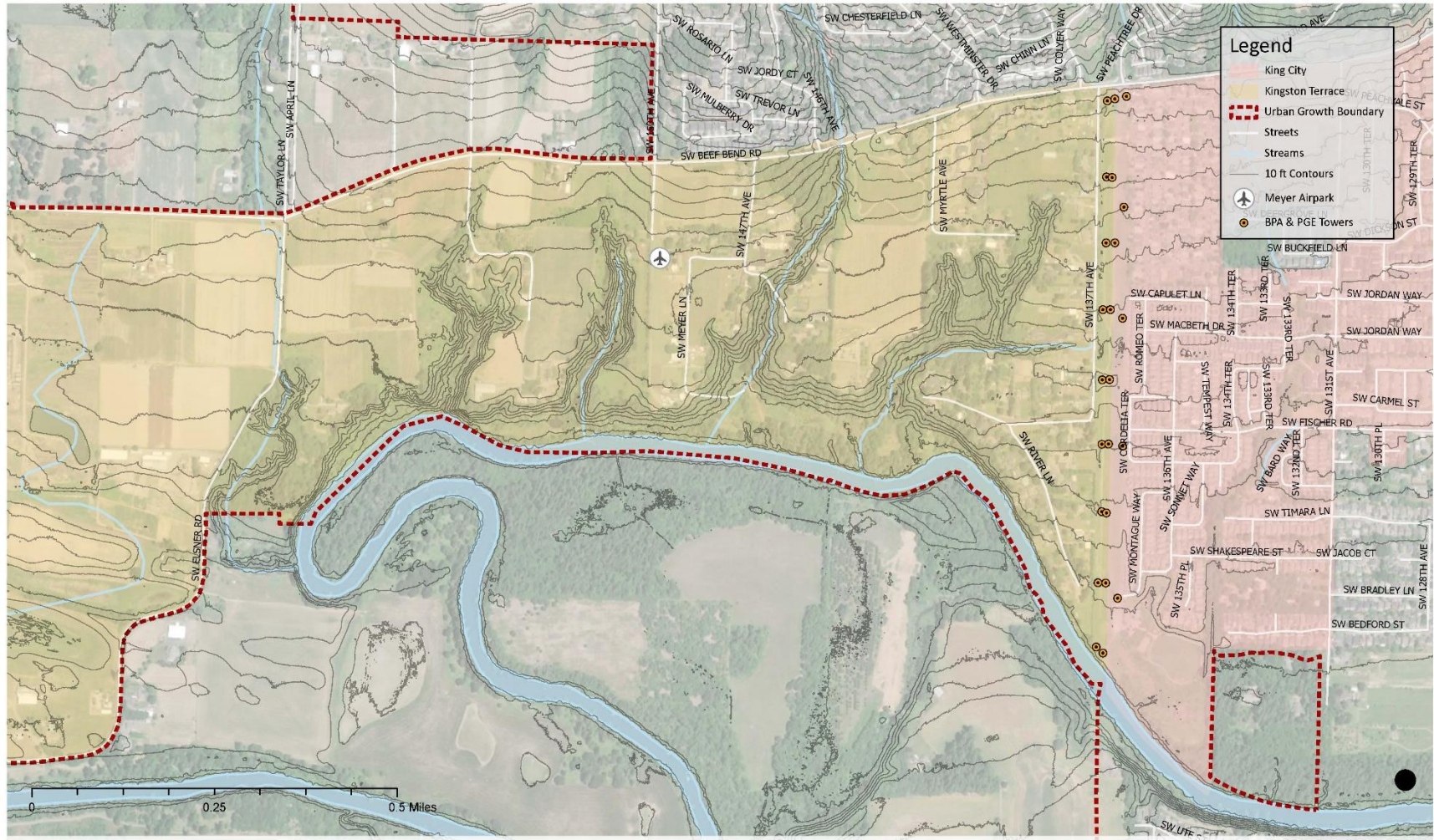


## Study Area

The study area for evaluating future transportation conditions as part of the KTMP includes the area north of the Tualatin River, south of Beef Bend Road, east of Roy Rogers Road, and west of the existing city limits and the BPA/PGE utility corridor. The study area for discussion of east/west collector street alternatives is focused on a subset of the full KTMP study area including the area generally east of Elsner Road and west of 137<sup>th</sup> Avenue. This focused study area (including portions of the larger study area west of Elsner Road to provide context) is illustrated in **Figure 3**, along with the existing boundaries of King City.



Figure 3. Project Study Area



## Report Content and Organization

This report is organized into six chapters. Chapter 1 presents an Executive Summary of the document highlighting key findings, conclusions, and recommendations. Chapter 2 serves as an introduction to the full report.

Chapter 3 presents and discusses the planning principles and regulatory context used to guide the alternatives analysis including identification of evaluation factors used to assess the relative success of the alternatives in meeting community goals, and an outline of steps involved in the planning process.

Chapter 4 documents the development of circulation alternatives including the broad brainstorming of ideas that have been generated since 2018, initial screening of alternatives to eliminate redundancies, and identification of a shortlist of reasonable alternatives that could be carried forward into more detailed analysis.

Chapter 5 documents the evaluation of alternatives for each of the factors identified and discussed in Chapter 3. Information is organized by each category of factors with more detailed information included in tables and text. As appropriate, the summary analysis included in this chapter is supported by more detailed technical memoranda, worksheets, maps, or other related analysis as needed.

Chapter 6 includes a summary of all factors, and a comparison of the alternatives is presented and discussed. This information will be incorporated into and used to guide preparation of the KTMP. Ultimately, the final street system recommendations included in the master plan will be incorporated into the Draft TSP for formal adoption.

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### 3 POLICY GUIDANCE, REGULATORY REQUIREMENTS AND EVALUATION PROCESS

#### Policy Guidance

Building on the vision, goals and objectives for the City’s transportation system as laid out in the *Draft Transportation System Plan*, evaluation factors were identified to use in evaluation and ranking of east/west multimodal circulation alternatives. This evaluation was based on how well the TSP vision could be realized.

The overall vision statement for the Draft TSP is presented below.



The TSP goals and objectives speak not only to transportation-related factors but also to ensuring that the transportation system operates in coordination with other community aspects such as land use and community livability, the built and natural environment, the local economy, and fiscal limitations. These goal-based factors include a broad range of considerations as taken from the Draft TSP and include:

- Goal 1: Accessibility and Connectivity – encourage directness of travel and system connectivity, encourage trips made by walking, cycling, transit or carpooling, connect to popular destinations such as schools, services and parks, and increase job access.
- Goal 2: Safety and Security – reduce crashes for all modes of travel, provide attractive streetscapes to encourage active transportation<sup>2</sup>, and reduce vulnerability to natural disaster and climate change.
- Goal 3: Healthy People and Environment – Reduce Vehicle Miles of Travel (VMT) per capita, improve public health through active transportation options that are welcoming and attractive,

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<sup>2</sup> “Active transportation” is a means of getting around that is powered by human energy, primarily walking and bicycling. Often called “non-motorized transportation,” the term “active transportation” has come into use as it more positively expresses the key connection between healthy, active living and our transportation choices.

increase access to parks, open space and natural areas, use sensitive design and mitigation approaches to natural, cultural and developed resources.

- Goal 4: Equity – Reduce transportation costs through walkable neighborhoods and provision of active transportation options including low stress walk and bike networks, provide transportation connectivity that avoids, minimizes or mitigates negative impacts, and provide transportation resources for those with the least access and greatest mobility needs.
- Goal 5: Reliability and Efficiency – Build an integrated multimodal system that can support emerging technologies.
- Goal 6: Fiscal Responsibility – Maximize the useful life and minimize construction/operational costs associated with transportation facilities, size transportation system appropriately, and align the function of transportation facilities with the appropriate cross-section that enhances adjacent land uses.
- Goal 7: Collaboration – Seamlessly connect to existing and planned infrastructure in surrounding communities, encourage coordination and cooperation with other transportation service providers like transit.

While the TSP vision and policy goals provide context for the development of a circulation system in Kingston Terrace, including a backbone collector road system, the *Concept Plan* and evolving master plan also provide policy context for identifying the role that a backbone collector street system will play within the broader land use development context.

With the guidance provided by TSP and Concept/Master Plan goals, a series of evaluation factors were identified for use in determining which east/west circulation alternatives would best meet the vision of the TSP and KTMP. The selection of evaluation factors was also driven by local, regional, state, and federal policies and regulatory requirements. Factors were chosen based on the likelihood that they would permit a differentiation among alternative highlighting the choices and trade-offs that need to be made to arrive at a preferred alignment alternative(s). These factors were reviewed by the master plan project Stakeholder and Technical Advisory Committees prior to the initiation of analysis.

The effort described in this report is one of many steps leading to the development of Kingston Terrace. This effort started with a *Concept Plan* (completed in 2018), moved into preparation of a master plan which includes a more concentrated evaluation of backbone circulation alternatives (currently underway) and ultimately into design/construction of transportation facilities as land development occurs.

Balance among the evaluation factors is important in the circulation system planning process. The transportation function of a new east/west connection is critical to meeting multimodal circulation needs and providing broader community connectivity to serve residences, employment, school, shopping, recreation, and other trip purposes. The transportation system plays a key role in establishing community form and ensuring the ability to move within the city and its surrounding area via multiple transportation modes. The transportation network also provides a backbone right-of-way for use in accommodating public and private utilities such as water and sanitary sewer service, and to help address stormwater management requirements. The evaluation of alignment alternatives did not rely solely on transportation needs, but considered a range of other influences that affect community livability and environmental preservation.

In summary, the evaluation process was based on a series of factors that attempt to differentiate among east/west multimodal circulation system alternatives that are intended to help achieve the following:

- Encourage and support development consistent with the land use patterns identified in the *Concept Plan* and as they evolve in the master planning process.
- Encourage safe and convenient travel by all modes with particular emphasis on active transportation modes.
- Reduce the need to drive within King City and to neighboring destinations to enhance community sustainability and reduce vehicle miles of travel (VMT).
- Improve safety of the traveling public.
- Provide a continuous east/west connection through the city to integrate the city as a whole community, support the planned land uses and development vision, reduce VMT by encouraging walking, bicycling and transit us, provide a range of modal choices including potential future transit, support better emergency vehicle travel times, and spread the traffic burden throughout the network.
- Minimize adverse impacts to the built and natural environment.
- Consider both the cost of construction as well as long-term operations and maintenance costs for streets and utilities.

## Regulatory Requirements

Both the *Concept Plan* and the *Draft King City TSP* identified an internal street system to serve development in Kingston Terrace. This street system connects the future developing areas of Kingston Terrace to each other, to the existing city and surrounding communities, and to the larger transportation system based on the goals described above, and on the state, regional and local regulatory requirements that govern the development of land and a supportive transportation infrastructure.

Connectivity goals address both vehicle travel including autos, trucks, emergency vehicles, school buses and possibly future transit (both local within and near King City and regional as offered by TriMet), and active or personal transportation modes. In this context, personal transportation can include not only bicycles and pedestrians, but may also include a range of small, low-speed micro-mobility devices such as powered standing scooters, electric-assist bicycles (e-bikes), powered seated scooters (scooter/mopeds), electric personal assistive mobility devices, personal delivery devices, and other small, lightweight, wheeled devices.

Connectivity requirements are clearly identified in several sections of the Oregon Administrative Rules (OAR 660-012) which implement State Planning Goal 12: Transportation (otherwise known as the Transportation Planning Rule or TPR). State-proposed amendments to the TPR are even more specific about intent including:

- OAR 660-012-0810:(1)(c) – “*Cities and counties must plan and design a complete and connected network of local streets.*”

- OAR 660-012-0810:(2) – “Cities and counties must plan collector streets to provide access to property and collect and distribute traffic between local streets and arterials. Cities and counties must plan and design a collector street network that is complete and connected with local streets and arterials.”

The OAR also stipulates that a local, adopted TSP or local street plan in the Portland Metropolitan Area must comply with Metro’s requirements for street connectivity as contained in Title 6, Section 3 of the *Urban Growth Management Functional Plan*.

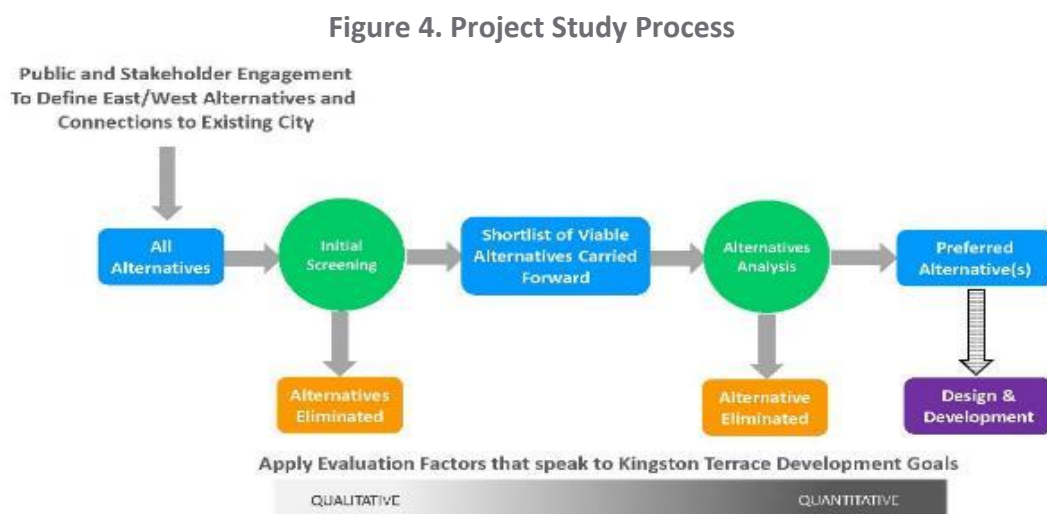
The Metro *Urban Growth Management Functional Plan* (section 3.07.1120 Planning for Areas Added to the UGB) identifies requirements that comprehensive plans shall include “A *conceptual street plan that identifies internal street connections and connections to adjacent urban areas to improve local access and improve the integrity of the regional street system. For areas that allow residential or mixed-use development, the plan shall meet the standards for street connections in the Regional Transportation Functional Plan.*”

The Metro *Regional Transportation Functional Plan* identifies street design guidance for preparation of a conceptual plan map of all new streets in areas of more than five acres that allow for residential and mixed use development. “The map shall identify street connections to adjacent areas to promote a logical, direct and connected system of streets and should demonstrate opportunities to extend and connect new streets to existing streets, provide direct public right-of-way routes and limit closed-end street designs consistent with subsection E” (which speaks to block size and access spacing).<sup>3</sup>

In a memorandum from August 16, 2022, Washington County stated that “a parallel collector roadway to Beef Bend Road is necessary for intracity connectivity and mitigation of additional congestion expected along the Beef Bend Road corridor.”

## Evaluation Process

Figure 4 illustrates the evaluation process conducted to identify a preferred east/west circulation alternative. As shown in the process diagram, the evaluation process included the following steps:



<sup>3</sup> Metro Code, Chapter 3.08, Title 1: Transportation System Design, 3.08.110 Street System Design

As shown in the process diagram, the evaluation process includes the following steps:

- Establish factors to be used in comparing and contrasting alternatives. Factors included for quantitative and qualitative considerations in a variety of technical disciplines.
- Identify a range of circulation system alternatives based on input from prior community meetings, technical staff input and other sources. Conduct initial screening of these options to create a shortlist of reasonable alternatives for more detailed review. Share the shortlist with the public for review and comment.
- Refine, evaluate and rank circulation alternatives.
- Identify and incorporate a preferred alternative into the larger master planning process, ultimately leading to a collector street that would be constructed over time as land development activities occur in Kingston Terrace.

Each of these steps is described in greater detail throughout this report. A discussion of the selection of evaluation factors is presented in the following section. Other activities are discussed in the remaining chapters of this report.

## Identification of Evaluation Factors

Evaluation factors were identified and used to assess the benefits, impacts and trade-offs that should be considered for the various east/west circulation alternatives. Factors have been grouped into categories as follows:

- **Land Use and Community Design** – Consideration of land use, recreational, social/environmental justice, and cultural impacts.
- **Bicycles, Pedestrians and Micro-mobility** – Accommodation of all users of the transportation system with a specific emphasis on active transportation and sustainable/healthy outcomes, safety, performance, connectivity and accessibility related to a broad definition of active transportation modes (including micro-mobility choices), and fiscal responsibility.
- **Vehicular Mobility and Accessibility** – Accommodation of all vehicular users of the transportation system including autos, trucks, transit, school buses and emergency vehicles with a specific emphasis on transportation safety and performance, broader community connectivity and accessibility, and fiscal responsibility.
- **Public Utilities and Services** – Consideration of impacts on stormwater/water quality, steep slopes and erosion potential, emergency services, and public utilities such as water and sewer service. Also consider opportunities for co-location of utilities with a street alignment.
- **Natural Resources** – Consideration of wetlands, stream corridors and riparian areas, and upland habitat.
- **Cost and Implementation** – Consideration of order of magnitude cost for each circulation alternative including likelihood of TDT (Washington County Transportation Development Tax) or other public financing. Also consider magnitude of cost effects on public utilities, particularly sewer and stormwater, as well as implementation phasing.

Each of these categories includes an array of more specific factors which were used to determine the effect of a circulation alternative on the various impact categories. Trade-offs within and between categories have been identified and assessed using the process described in the following section.

## Summary of Chosen Evaluation Factors

### *Land Use and Community Design*

These factors assess the effect of each alternative on existing and potential future land use patterns, neighborhoods, and marginalized populations, as well as cultural, historic and parks resources. Specific factors include:

- Land Use Patterns – Impacts to or support of land use patterns as envisioned in the Concept Plan and evolving KTMP.
- Neighborhood Cohesion – Protects existing and new neighborhood cohesion.
- Access to Transportation – Minimizes adverse impacts and provides circulation benefits to those with the least access to transportation resources and the greatest mobility needs.
- Marginalized Populations – Order of magnitude impact to historically disadvantaged or marginalized populations.
- Cultural/Historic Resources – Avoid/minimize damage to cultural and historic resources.
- Recreational Resources – Effect on the quality of access or direct impacts to parks and recreational resources. Consider regulatory consequences of alternatives as applicable.

### *Bicycles, Pedestrians and Micro-mobility*

These factors measure the effectiveness of alternatives on active transportation and sustainable/healthy outcomes, safety, performance, connectivity and accessibility related to a broad definition of active transportation modes (including micro-mobility choices), and fiscal responsibility. Specific factors include:

- Provide Facilities – Accommodation of bicycle and pedestrian system users to achieve sustainable and healthy outcomes.
- Safe Travel – Safety for bicycle and pedestrian users.
- Connect Destinations – Connectivity and accessibility to significant destinations such as shopping, parks, schools, etc. as well as within neighborhoods.
- Travel Time – Travel time comparisons between selected trip Origin and Destination (O-D) pairs for bicyclists.
- Limit Cul-de-Sacs and Guides Block Spacing – Ability to meet 330 feet bike/ped access spacing standards where feasible, or 530 foot spacing where 330 foot spacing is not feasible per Metro guidance. Metro guidance also provides block size goals and limits on long cul-de-sacs (which are defined to include other closed end streets) to 200 feet or serving 25 households<sup>4</sup>.
- Connectivity – Supports providing a seamless connection to existing/planned infrastructure in existing King City and surrounding communities.

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<sup>4</sup> Metro *Regional Transportation Functional Plan*, Title 1: Transportation System Design, 3.08.110.E.7

### ***Vehicular Mobility and Accessibility***

These factors measure the effectiveness of alternatives on all vehicular users of the transportation system including autos, trucks, transit, school buses and emergency vehicles with a specific emphasis on transportation safety and performance, broader community connectivity and accessibility, and fiscal responsibility. Specific factors include:

- Connectivity – How accommodates desired block size and spacing, as well as physical connections and directness of route.
- Traffic Operations – Levels of service/delays/volume-to-capacity ratios at key intersections.
- Travel Time – Vehicular travel time comparisons between selected trip origin/destination (O-D) pairs (longer travel times would be indicative of greater VMT).
- Beef Bend Access Spacing – Effect on Beef Bend Road 600-foot intersection spacing standards .
- Transit – Transit supportive based on TSP goals and potential for future service.
- Limit Cul-de-Sacs – Limitations on long cul-de-sacs greater than 200 feet or serving less than 25 dwelling units.
- Seamless Connection – Supports providing a seamless connection to existing/planned infrastructure in existing King City and surrounding communities.

### ***Public Utilities and Services***

The assessment of public utilities and services covers a variety of functions including stormwater management and water quality, erosion, water, sewer, emergency services, transit and school buses and others. Specific factors include:

- Stormwater/Water Quality – Consideration of stormwater and water quality. CWS requirements must be addressed as the project moves into design and construction.
- Steep Slopes/Erosion – Identify relationships between alternative and existing steep slopes and areas with potential for future erosion. More detailed analysis will need to be undertaken prior to construction.
- Emergency/Transit Accessibility – Consider effects of the alternatives on the provision of emergency services, public transit and school bus routing with an emphasis on creating an interconnected road network and minimizing dead end roads.
- Water/Sewer/Other Utilities – Consider the effect of street alignments on the provision of water, sewer, gas and other utilities and services including opportunities to co-locate facilities. CWS requirements for locating regional sanitary sewer conveyance facilities through the area must be included in the consideration.

### ***Natural Resources***

These factors are based on typical regulatory and conservation principles of *“first avoid impacts. and then minimize impacts (if avoidance is not possible).”*

- Wetlands – including impacts to both higher and lower quality wetlands.
- Streams and Riparian Areas – number of stream crossings, particularly for full street cross-sections, affecting areas of both higher and lower sensitivity/higher quality.



- Other Habitat Considerations – impacts to upland habitats of conservation concern (these are absent along the transportation corridor alternatives with exceptions as extensions of forested riparian areas beyond the typical widths used to delineate riparian buffers in the Metro Area).
- Impacts to wildlife corridors – primary and secondary corridors in the project area. Primary corridors include the Tualatin River and its floodplain habitats, secondary include tributary streams and riparian corridors.
- Effect on the Bankston Easement – according to the conservation easement agreement, the protected property includes forest and forested wetlands that provide wildlife habitat for birds and animals, several creeks that provide cool water to the Tualatin River and habitat for fish and amphibians, riparian forest and floodplain that shade the river and hold the soil from eroding into the river, and view of undeveloped natural area from the Tualatin River for river users. Metro Condition of Approval E.8 for King City’s UGB expansion states that “King City shall work with the Columbia Land Trust to protect, to the maximum extent possible, the portion of the Bankston property covered by the conservation easement.”

### *Costs and Implementation*

These factors consider construction and operating cost elements related to the alignment alternatives, as well as factors related to implementation of the recommended improvements including potential funding and system phasing. Specific factors include:

- Roadway/Bridge Costs – Order of magnitude cost estimate for alignment alternative road and bridge construction (assuming common beginning and end points).
- Mitigation Costs – Costs for habitat restoration, stormwater management and erosion control.
- Sewer Service Costs – Magnitude of costs for sewer service extensions.
- Public Funding Potential – Potential for funding using TDT or other public resources vs. developer-financing.
- Public Utilities – Order of magnitude construction and operations/maintenance effects on the provision of public utilities that rely on transportation rights of way for their location and alignment.
- Phasing of Development – Effect of expected transportation system phasing, particularly on utilities.

## Summary of Evaluation Process

As noted in Chapter 2, the more detailed evaluation process was based on a list of factors that will most clearly identify the differences among the shortlisted alternatives. This evaluation process was based largely on qualitative, order-of-magnitude comparisons for which precise results are less important than differences among the alternatives. As appropriate, some quantitative data, which is available at the level of detail proscribed by this analysis, has also been provided for the comparisons.

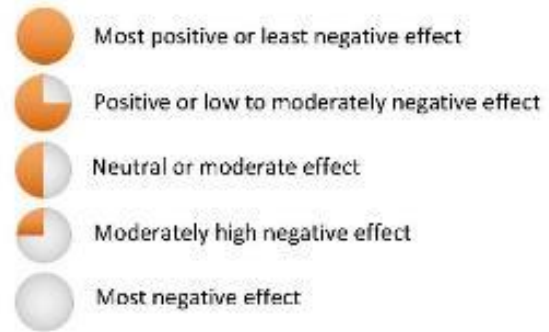
## Ranking of Alternatives Using Evaluation Factors

Circulation alternatives were evaluated for each factor based on five levels of impact ranging from most negative effect to most positive (or least negative) effect as illustrated in the graphic on the following page. For some disciplines (such as transportation) impacts ranged from positive to negative and the

range identified should reflect that. For other disciplines (such as natural resources) all impacts are potentially negative, so the ranking system reflects various degrees of adverse impact.

In considering how best to rank a circulation alternative relative to a specific factor or among categories of factors it was important to consider how the alternatives compare with each other.

Absolute numbers from a quantitative evaluation or the more general qualitative assessments are less important than the comparison among alternatives.



The evaluation of impacts associated with various circulation alternatives considered the quantitative and qualitative factors described in the following section in determining a ranking score.

### Application of Ranking Factors

Using each of the evaluation factors, a summary of the key findings and conclusions for each alternative has been prepared and documented in Chapter 4. The key findings of this analysis are presented in summary tables which are supported by a more detailed information where appropriate in the appendices. Based on the summary of both quantitative and qualitative data, each alternative has been ranked relative to each factor. Determination of rankings is based on quantitative analysis data where available. Otherwise, a qualitative assessment of the relative merits of each alternative for each factor has been determined.

It is also important to recognize that there is no perfect solution – all alternatives will have varying degrees of positive benefits and negative impacts. Existing plans, policies and the regulatory context were considered in evaluating trade-offs among alternatives, as was the magnitude of identified adverse impacts and positive benefits. An attempt was made to identify a balance among the factors so that no single category would outweigh another but that they were considered on the basis of their merits. It is also important to remember that the selected east/west circulation alternative will need to accommodate all travel modes and must support and integrate with the broader transportation network that will ultimately serve Kingston Terrace. Emphasis will be on accommodating local circulation needs rather than regional through traffic.

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## 4 DEVELOPMENT OF EAST/WEST CIRCULATION ALTERNATIVES

This chapter presents a short discussion on how east/west circulation alternatives were identified including initial screening that led to a shortlist of reasonable alternatives that could be reviewed by the public and evaluated in greater detail using the evaluation factors discussed in Chapter 2.

### Identification of Alternatives

The development of east/west circulation alignment alternatives involved a multi-step process that included:

- **Step 1:** Brainstorming and collecting a wide range of ideas about how multimodal connectivity could be achieved.
- **Step 2:** Initial screening of alternatives to develop a shortlist of reasonable alternatives that could achieve the goals and vision of the City for Kingston Terrace.
- **Step 3:** Evaluation of the remaining alternatives using the factors identified in Chapter 2.

The importance of having good east/west connections cannot be over-emphasized. The value that they bring includes:

- Integrating King City through quality circulation from one end of town to the other, offering connectivity and accessibility.
- Supporting proposed land uses and development in Kingston Terrace to achieve the vision.
- Reducing the number of auto trips and vehicle miles of travel (VMT) and enhancing community sustainability.
- Encouraging walking, bicycling and other active transportation modes to provide a range of quick and efficient choices for residents and visitors.
- Supporting of potential future transit that touches the heart of the community.
- Supporting better emergency vehicle travel times.
- Spreading the traffic burden throughout the network.

### Initial Screening of Alternatives

An initial screening of alternatives was conducted that built on the wide range and variety of east/west connections that have been suggested through various planning efforts including the Concept Plan development process and the early stages of the master plan. The initial screening was conducted prior to the preparation of this report, whose purpose is to document the more detailed screening of shortlisted alternatives based on the chosen mobility factors. Other reports have been prepared that address the other factors used in producing a more comprehensive assessment of the benefits, impacts and trade-offs of each shortlisted alternative.

The initial screening of alternatives involved a qualitative assessment of each option using high level factors drawn from the goals of the master planning process. These included determining how well an alternative met the following objectives:

- Consistency with Concept Plan principles (connectivity, multimodal, etc.) and proposed land use patterns.
- Multiple east/west alignments to spread out the traffic and more effectively serve walking and bicycling travel modes, particularly in response to Metro and City requirements for block size and intersection spacing to create a finer-grained and more walkable system.
- Redundancy to Beef Bend Road so no one facility carries the full traffic load. As an arterial street, Beef Bend Road is intended to accommodate regional through traffic while the new east/west corridor would serve primarily localized circulation needs. Optimally, these two types of trips (regional vs local) would be served by separate facilities.
- Avoid high value natural resources, or other adverse effects on the built and natural environment
- Accommodate needs of public utilities, particularly gravity-fed sewer.<sup>5</sup>
- Identify range of alternatives for more in-depth analysis.

## Identification of Shortlist of Reasonable Alternatives

Considering all of the community and stakeholder input on alternative east/west corridor alignment alternatives, the initial evaluation process identified a shortlist of alternatives to be considered for further, more detailed evaluation. This shortlist was identified based on the following guidance from initial evaluation to include alternatives that:

- Generally, support the land use and transportation network patterns identified in the Concept Plan which are further evolving in the master planning process.
- Collectively provide the opportunity for redundant east/west corridors to spread out the traffic burden, offer alternative corridors for non-vehicular travel modes, and reduce complete reliance on Beef Bend Road for intra-city travel.
- Provide the basis for considering the effects of topography on east/west corridor alignments.
- Integrate with and support infrastructure necessary to serve future urban development, particularly allowing for gravity-flow sanitary sewer.
- Integrate with and support or enhance the preservation of natural resources in Kingston Terrace.

**Figure 5** illustrates the shortlist of reasonable east/west circulation alternatives that were reviewed by the public before more detailed evaluation was conducted. These alternatives include:

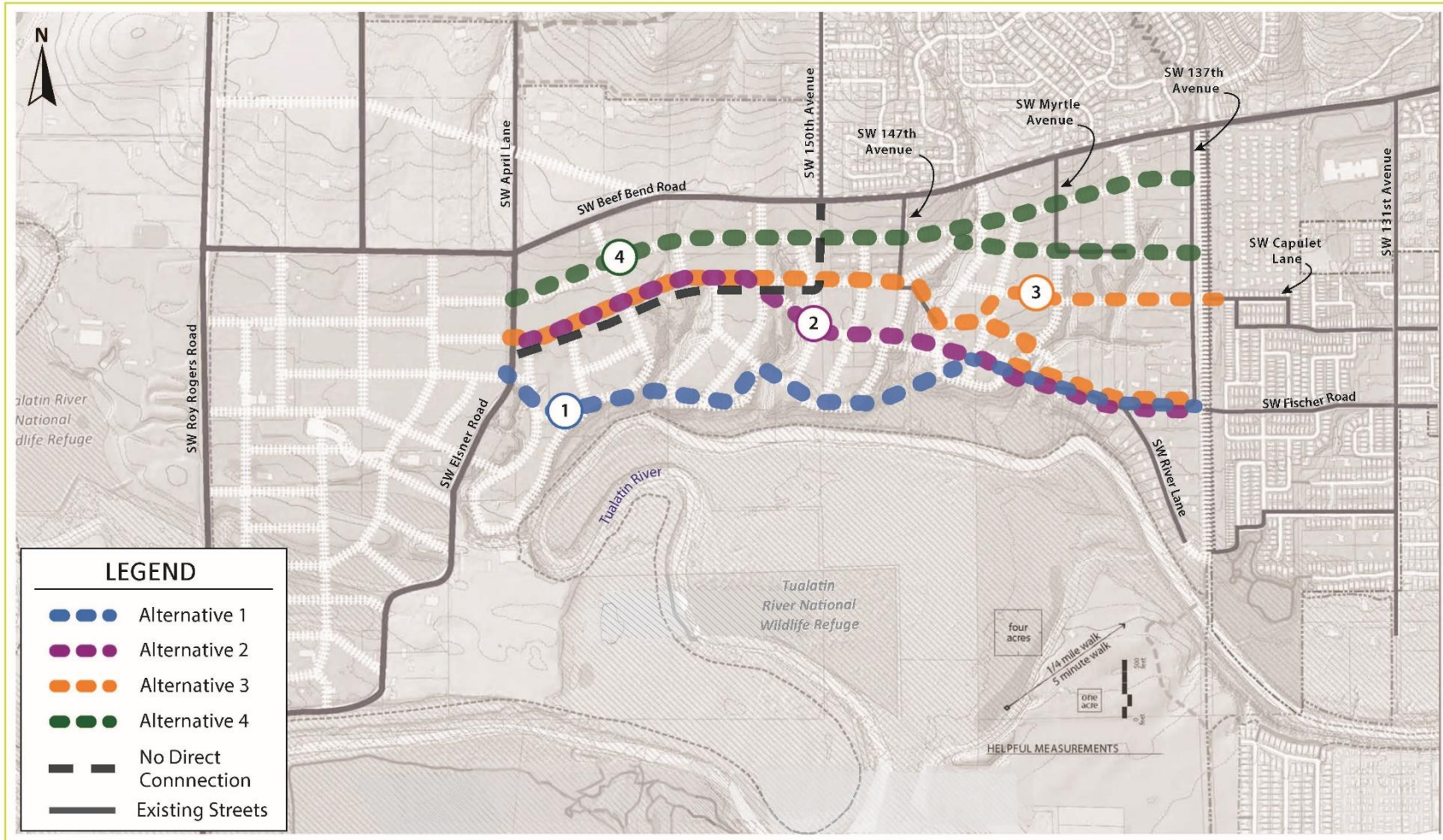
- **Alternative 1:** follows a southern-most alignment between Elsnor Road and the extension of existing Fischer Road connecting future neighborhoods across ravines near the Tualatin River.
- **Alternative 2:** follows an alignment between Elsnor Road and Fischer Road that is more central to the proposed Kingston Terrace study area than Alternative 1. At a point just to the west of 150<sup>th</sup> Avenue, this alignment drops to the southeast and continues directly to Fischer Road.

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<sup>5</sup> Gravity-fed sewer is the approach preferred by Clean Water Services as the operations and maintenance costs are lower than the costs for a pump station.



Figure 5. East/West Circulation Alternatives in Context of Proposed Concept Plan Street System



Kingston Terrace Master Plan  
King City, Oregon

- **Alternative 3:** follows the same alignment as Alternative 2 until a point to the west of 150<sup>th</sup> Avenue when the two alternatives separate. Alternative 3 continues due east where, between 147<sup>th</sup> Avenue and Myrtle Avenue it splits into two further alignments. Alternative 3 South continues southeast to connect with Fischer Road at the same locations as Alternatives 1 and 2. Alternative 3 North continues directly east to connect with Capulet Lane in the existing city.
- **Alternative 4:** runs between Elsner Road and 137<sup>th</sup> Avenue from which a traveler would head either south to connect with an extension of Fischer Road or north to connect with Beef Bend Road. This alignment generally runs parallel to and about 300 to 500 feet south of Beef Bend Road. To the east of 147<sup>th</sup> Avenue, this alternative splits into two alignments with Alternative 4 South continuing directly east to meet up with 137<sup>th</sup> Avenue about 350 feet north of Alternative 3 North. Alternative 4 North continues to parallel Beef Bend Road intersecting 137<sup>th</sup> Avenue approximately 450 feet south of Beef Bend Road.
- **No Direct Connection Scenario:** As shown in **Figure 5**, this scenario is based in part on recommendations from community members and is intended to avoid providing a full collector street cross-section between Kingston Terrace and existing King City. For purposes of this report, it is assumed that this scenario would generally follow the same alignment as Alternative 3 west of 150<sup>th</sup> Avenue but then would turn north along the 150<sup>th</sup> Avenue corridor to an intersection with Beef Bend Road. No collector streets would be provided east of 150<sup>th</sup> Avenue and there would be no direct connection into the existing city. This scenario is not considered an “Alternative” because it does not achieve the established value/objectives/guidance described on the previous pages.

Alternatives 1 through 4 and the No Direct Connection Scenario have been overlaid on a street system map (see white lines) as proposed in the Concept Plan. It should be noted that the alignments illustrated in this figure are both generalized and preliminary. As the analysis process was conducted, alignment modifications have been considered and some options may ultimately be rejected for all travel modes. There exists the potential that one or more of these preliminary alignment alternatives may be flagged solely for active transportation which could also include low-powered, low-speed micro-mobility modes as noted earlier in the report.

It should also be noted that the precise alignment of a preferred circulation alternative(s) will be identified through a future design and construction process. This effort will be conducted largely by landowners/developers and will identify the location of individual parcels for each proposed land use. This effort will also include development of a fine-grained local street and pathway system. As site level planning transitions into site engineering the location of a proposed east/west collector roadway and any north/south collector streets that connect Kingston Terrace to Beef Bend Road may be further refined as site environmental and geo-technical studies are completed.



## 5 EVALUATION OF CIRCULATION ALTERNATIVES

This chapter presents a summary of the evaluation of circulation alternatives identified in Chapter 3. The evaluation was conducted using the factors outlined in Chapter 3 and presents the ranking results for each discipline. A summary of results and recommendations on a preferred east/west circulation alternative are presented in Chapter 6.

Chapter 4 is organized by category of evaluation factors including:

- Land Use and Community Design
- Bicycles, Pedestrians and Micro-mobility
- Vehicular Mobility
- Public Utilities and Services
- Natural Resources
- Costs and Implementation

The information presented in this chapter includes both a qualitative and quantitative assessment of alternatives as appropriate. Alternatives are compared for each evaluation factor and an overall ranking for each evaluation category is presented. The analysis focuses on identifying the differences among the alternatives with the objective of identifying an improvement that best meets the goals and policies of King City, Washington County, and Metro for a high quality and well-connected transportation system.

### Land Use and Community Design














































This section provides a comparison among the alternatives for their potential benefits to and impacts on land use patterns and community design considerations in Kingston Terrace and the adjacent existing city. The discussion includes:

- Support of planned land use patterns
- Existing and new neighborhood cohesion
- Effect on existing property boundaries with the goal of minimizing awkward parcel splits
- Ability to serve those with the greatest transportation need and the least resources
- Effect on disadvantaged or marginalized (environmental justice) population groups
- Effect on historic and cultural resources
- Effect on the quality of access to recreation sites
- Potential impacts on Section 6(f) resources (generally refers to parkland funded by the federal Land and Water Conservation Fund (LWCF) grant program)
- Potential impacts on Section 4(f) of the US Department of Transportation Act of 1966 resources (generally refers to publicly owned parks or wildlife refuges or historic sites that may be impacted by a federally funded or permitted project)

Scoring results for all alternatives and factors related to land use and community design are presented in **Table 1**. The summary text presented in **Table 2** is intended to provide a short explanation of the considerations behind the ranking shown in **Table 1**.

Based on the evaluation of land use and community design factors, Alternative 3 south and Alternative 2 would be the most desirable options, followed closely by Alternatives 1, 3 north, 4 and the no direct east/west connection.

**Table 1. Comparative Ranking of Land Use and Community Design Factors**

Evaluation Factors	No Direct Connection	Alternative 1	Alternative 2	Alternative 3 (S/N)	Alternative 4
Support planned land use patterns					
Existing and new neighborhood cohesion					
Serve those with greatest transportation needs and least resources					
Impacts to disadvantaged or marginalized population groups					
Historic/cultural impacts					
Effects on quality of access to recreational sites					
Section 6f impacts to recreational sites					
Section 4f impacts to recreational sites					
OVERALL RANKING					

### Planned Land Use Patterns

This section evaluates how each alternative would impact or support land use patterns as envisioned in the Concept Plan and the evolving KTMP. As noted in Chapter 4, both the Concept Plan and the *Draft King City Transportation System Plan* prescribe connections to existing and planned infrastructure in the areas surrounding the study area. Providing no direct east/west connection as outlined in the No Direct Connection scenario would not support these future land use plans as it lacks a collecting level street system to funnel local traffic between neighborhoods and the arterial street system. Alternatives 1 and 4 are farther from the center of the overall study area, and Alternative 4 additionally provides no direct connection to the existing city to the east. Alternatives 2 and 3 are more central to the study area and planned future development and provide a direct easterly connection.

### Neighborhood Cohesion

This evaluation looks at how well each of the alternatives would support existing and new neighborhood cohesion. Neighborhood cohesion is an important community design and social/economic justice factor in that it reflects a common local vision, level of trust and sense of belonging to a community that make it a great place to live. Transportation systems can either unite or divide communities; connectivity that maintains cohesion is vital to successful communities. This factor also considers potential impacts on existing neighborhoods, such as an increase in traffic and noise.

**Table 2. Summary of Key Findings from Evaluation of Land Use and Community Design Impacts**

<b>Evaluation Factors</b>	<b>No Direct Connection</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>
Support planned land use patterns	<i>Would not support future land use patterns as envisioned in Concept Plan and KTMP due the lack of a collecting level street system to move local traffic between neighborhoods and arterial streets .</i>	<i>Peripheral to center of development and farther from higher density planned land uses in northern portion of site, but provides direct east/west connection to existing city.</i>	<i>Central to development; serves both higher-density planned land uses in northern portion of site and lower-density planned uses in southeastern portion of site; provides direct east/west connection to existing city.</i>	<i>Central to development; serves both higher-density planned land uses in northern portion of site and lower-density planned uses in southeastern portion of site; provides multiple direct east/west connections to existing city. No substantive difference between North and South alignments.</i>	<i>Closer to higher density planned land uses in northern portion of site, but peripheral to center of overall development; no direct connections to existing city. No substantive difference between North and South alignments.</i>
Existing and new neighborhood cohesion	<i>Reliance on indirect routes outside of the immediate neighborhood would reduce community cohesion. Minimal negative impacts to existing neighborhoods.</i>	<i>Would provide connection to existing neighborhoods to the east linking Kingston Terrace to the larger community. Connection to Fischer Road has some negative impacts to residents of existing neighborhoods.</i>	<i>Would provide connection to existing neighborhoods to the east linking Kingston Terrace to the larger community. Connection to Fischer Road has some negative impacts to residents of existing neighborhoods.</i>	<i>Would provide multiple connections to existing neighborhoods to the east; some opportunity for connections to the north providing a strong link to the greater community. Connection to Fischer Road has some negative impacts to residents of existing neighborhoods. No substantive difference between North and South alignments.</i>	<i>No direct connection to the east of 137th, but provides opportunities for connections to the north. Connection to Fischer Road has some negative impacts to existing neighborhoods. No substantive difference between North and South alignments.</i>

<b>Evaluation Factors</b>	<b>No Direct Connection</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>
Serve those with greatest transportation needs and least resources	<i>Would cause travelers to use circuitous, likely longer routes reducing potential for future transit service.</i>	<i>Serves population with highest percentage of households below poverty level; not central to development but provides direct east/west connection which could potentially see some form of transit service.</i>	<i>Serves population with relatively high percentage of households below poverty level; central to development and provides direct east/west connection. Greater potential for transit service.</i>	<i>Serves population with relatively high percentage of households below poverty level; central to development and provides direct east/west connection. Greater potential for regional transit service. Little substantive difference between North and South alignments but South would be more transit friendly.</i>	<i>Serves population with lowest percentage of households below poverty level; not central to development and provides no direct east/west connection. Could see some form of localized transit but not regional service. No substantive difference between North and South alignments.</i>
Impacts to disadvantaged or marginalized population groups	<i>No impacts in the short term unless widening of Beef Bend Road east of 137<sup>th</sup> is necessary, then could have substantial impacts to low income and/or elderly population groups; long-term impacts via lack of connections to the region as a whole.</i>	<i>Temporary (construction) impacts to population with highest percentage of minority residents and households below poverty level, but long-term benefits via increased connection to the region as a whole.</i>	<i>Temporary (construction) impacts to population with relatively high percentage of minority residents and households below poverty level, but long-term benefits via increased connection to the region as a whole.</i>	<i>Temporary (construction) impacts to population with relatively high percentage of minority residents and households below poverty level, but long-term benefits via increased connection to the region as a whole. No substantive difference between North and South alignments</i>	<i>Temporary (construction) impacts to population with relatively high percentage of minority and LEP residents, but long-term benefits via increased connection to the region as a whole. No substantive difference between North and South alignments.</i>
Historic/cultural impacts	<i>Least likely to disturb potential cultural resources.</i>	<i>Closest to the river and less likely to disturb potential cultural resources.</i>	<i>Located on developable land and therefore more likely to disturb potential cultural resources.</i>	<i>Located on developable land and therefore more likely to disturb potential cultural resources. No substantive difference identified between North and South alignments.</i>	<i>Located on developable land and therefore more likely to disturb potential cultural resources. No substantive difference between North and South alignments.</i>

<b>Evaluation Factors</b>	<b>No Direct Connection</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>
Effects on quality of access to recreational sites	<i>Would increase reliance on local roads to reach area recreational sites, likely creating more circuitous routes for park and trail users to reach their destinations.</i>	<i>Provides closest physical proximity and access to the Tualatin River and adjacent open space corridor. Supports a well-defined edge between developed areas and open space with access off all north/south corridors.</i>	<i>Provides close physical proximity and access to the Tualatin River and adjacent open space corridor via Elsner, 150<sup>th</sup> and 147<sup>th</sup> corridors. Good access to planned Kingston Terrace parks.</i>	<i>Provides close physical proximity and access to the Tualatin River and adjacent open space corridor via Elsner and 147<sup>th</sup> corridors. Good access to planned Kingston Terrace parks. South alignment is closer to the river.</i>	<i>Provides furthest physical proximity and access to the Tualatin River and adjacent open space corridor. No substantive difference between North and South alignments.</i>
Section 6f impacts to recreational sites	<i>No impact.</i>	<i>No impact.</i>	<i>No impact.</i>	<i>No impact.</i>	<i>No impact.</i>
Section 4f impacts to recreational sites	<i>No impact.</i>	<i>If federal funds are used, and/or a federal permit is required (assuming one or the other) then some potential impact.</i>	<i>No impact.</i>	<i>No impact.</i>	<i>No impact.</i>

Providing no direct east/west connection as the KTMP study area is developed would lead to reliance on indirect routes, reducing neighborhood cohesion. Alternative 4 would provide some opportunities for connections to the north across Beef Bend Road, but provides no direct connection to the existing city. Alternatives 1, 2, and 3 would all provide direct connections to the existing city, helping to support neighborhood cohesion among new and existing neighborhoods. Of these three, the location of Alternative 3 provides some opportunities for northern connections as well, boosting its potential to support neighborhood cohesion.

## Serve Greatest Transportation Need

This factor evaluates the extent to which each alternative would serve those with the greatest transportation needs and least resources. To assist in this evaluation, low-income households within a quarter-mile radius of each east/west alternative alignment were identified using the EPA's EJ Screen methodology. This methodology is described in the Land Use and Community Design report that is included in **Appendix A**. This report also presents the evaluation results for each alternative.

As described in the Land Use and Community Design report, demographic data was assembled and analyzed in focused study areas that lie within one-quarter mile of each alternative alignment. Looking at data in these areas allows for a finer assessment of the populations that might be affected by each alternative. It's important to note that data includes both existing Kingston Terrace and portions of the existing city to the east of the BPA/PGE utility corridor (including the Mountain View Mobile Estates mobile home park) and along city streets such as Capulet Lane and Fischer Road. The extent of data included for that development or for other parts of existing King City depends on the alternative under study.

Review of the data indicates that Alternative 4 would serve the smallest percentage of low-income households among the east/west alignments; it is also not central to the development and also provides no direct connection to the existing city to the east. While local transit service could be offered, similar to what is currently offered in existing King City, regional TriMet service is not expected. The No Direct Connection scenario is expected to cause travelers to use circuitous, likely longer routes thus reducing the potential for future transit service in the area. Alternative 1 would serve the highest percentage of low-income households and provide a direct connection to the east, although it is not central to the development. Localized transit service opportunities could exist. In the long term, the population with the greatest transportation need would be better served by Alternatives 2 and 3 that offer direct, central routes and ample connections to the surrounding neighborhoods where there exists the potential for regional transit service.

## Marginal/Environmental Justice Populations

The EPA defines environmental justice as *"the fair treatment and meaningful involvement of all people regardless of race, color, national origin or income with respect to development, implementation, and enforcement of environmental laws, regulations, and policies."* This factor evaluates the extent to which each alternative would impact existing disadvantaged or marginalized population groups in the study area to determine if the alignment alternatives create unfair hardship. To assist in this evaluation, minority, and limited English speaking (LEP) populations within a quarter-mile radius of each east/west alternative alignment were identified using the same EJ Screen methodology as referenced above and more fully described in the Land Use and Community Design report included in **Appendix A**.

An assessment of the data indicates there is relatively little difference among the four east/west alignment alternatives with regard to minority and LEP populations. Although all alternatives would present short-term construction impacts to those in the immediate vicinity, they would also provide long-term benefits via increased regional connectivity. Because its construction impacts would potentially reach a larger percentage of minority and low-income populations, Alternative 1 is slightly less desirable than Alternatives 2, 3, and 4. The No Direct Connection scenario would be the least desirable in the long term, causing impacts to disadvantaged populations via lack of regional connectivity. Additionally, if widening of Beef Bend Road is necessary due to the increase in traffic volumes east of 137<sup>th</sup> Avenue above the level anticipated with the other alternatives, there could be substantial impacts to low income and/or elderly population groups located in apartments, mobile homes or other dwellings along this corridor.

### Historic/Cultural Impacts

The KTMP area lies within the Tualatin River watershed to the west of Portland. The Tualatin tribe called the river, and themselves, Atfalati and lived here for thousands of years before European epidemics swept through in the 1700s, decimating most of the tribe (Cope, 2012). Today, the Atfalati are part of the Confederated Tribes of Grand Ronde. This area lies within ceded CTRG homelands that provided ecologically and culturally valuable land prior to European settlement and conversion to agricultural uses.

There is no known historical landscape assessment or survey of the study area for cultural and historic resources. 3J Consulting and King City met with the Confederated Tribes of Grand Ronde who indicated that any resources of cultural significance in the study area would likely be in the areas King City is looking to develop. In other words, Alternatives 2, 3, and 4 go through areas where people may have lived in the past, while Alternative 1 is close to the river and bluffs and less habitable than upland areas.

3J Consulting consulted with the Oregon State Historic Preservation Office (SHPO) and reviewed the Oregon Historic Sites Database to see if any known historic resources or sites have been documented in the area. The Oregon Historic Sites Database includes properties listed in the National Register of Historic Places. However, the database is limited to areas in which previous work has already occurred. The only site included in the database is the Plieth, Gustave House, a single dwelling built around 1890 located just south of Beef Bend Road between Elsner Road and Roy Rogers Road. The Plieth, Gustave House is eligible but not currently listed in the National Register. The area surrounding the Plieth, Gustave House is included in a Washington County Historic and Cultural Overlay District, which requires County review to alter, repair, demolish, or relocate the identified historic structure and to partition or subdivide the property. SHPO was unable to assist with any information about potential archaeological resources in the area.

Based on the information currently available, two assumptions were made in order to assess the four east/west connector alternatives:

- Cultural resources – either objects or places – are more likely to be found upland from the river.
- All alternatives can avoid the Plieth, Gustave House if required to do so.

Alternative 1 is closest in proximity to the river and therefore least likely to disturb potential cultural resources. Alternatives 2, 3, and 4 scenario are upland from the river where people may have lived and more likely to disturb potential cultural resources.



## Recreation Access and Impacts

The project evaluated potential impacts to recreational resources, including the quality of access to and impacts on recreational sites. The KTMP area is an important link in the larger regional network of connected trails and green spaces. There are a number of existing and planned trails and parks within close proximity of the study area, including:

- ◆ King City Community Park to the southeast
- ◆ Beef Bend Natural Area to the south
- ◆ Tualatin National Wildlife Refuge to the south and west
- ◆ Tualatin River Greenway along the southern site border (connecting to points east and west)
- ◆ Westside Trail along the eastern site border (connecting to points north and south)
- ◆ River Terrace Trail system to the north

The locations of these parks and trails are shown in **Figure 1** of the report in **Appendix A**. The specific location of potential future parks has not been determined at this stage in the planning process. However, **Figure 6** shows a generalized location and expected service areas of various categories of future parks in Kingston Terrace including a community park, neighborhood parks, and urban park (in the proposed Town Center) and a linear park or multiuse trail running from the Town Center to and along the Tualatin River. Portions of this multiuse trail follow the general alignment of Alternative 1.

### *Recreational Access*

It is not expected that any of the alternatives would alter access to existing city parks or other recreational facilities. Further, it's anticipated that all alternatives could be constructed to avoid impacts to future park locations as urban development occurs within the study area. Alternative 1 provides closest physical proximity and access to the Tualatin River and adjacent open space corridor and it supports a well-defined edge between developed areas and open space. Alternatives 2 and 3 would provide close physical proximity and access to the Tualatin River and the adjacent open space corridor, offering a link to recreational opportunities for the region. Alternative 4 would improve access to some recreational sites, but would not provide the opportunity for more direct connections to the Tualatin River Greenway due to its distance. The alternative would provide access to the Westside Trail. The No Direct Connection scenario would likely cause park and trail users to use more circuitous routes to reach their destinations, which is not ideal particularly for the transportation disadvantaged.

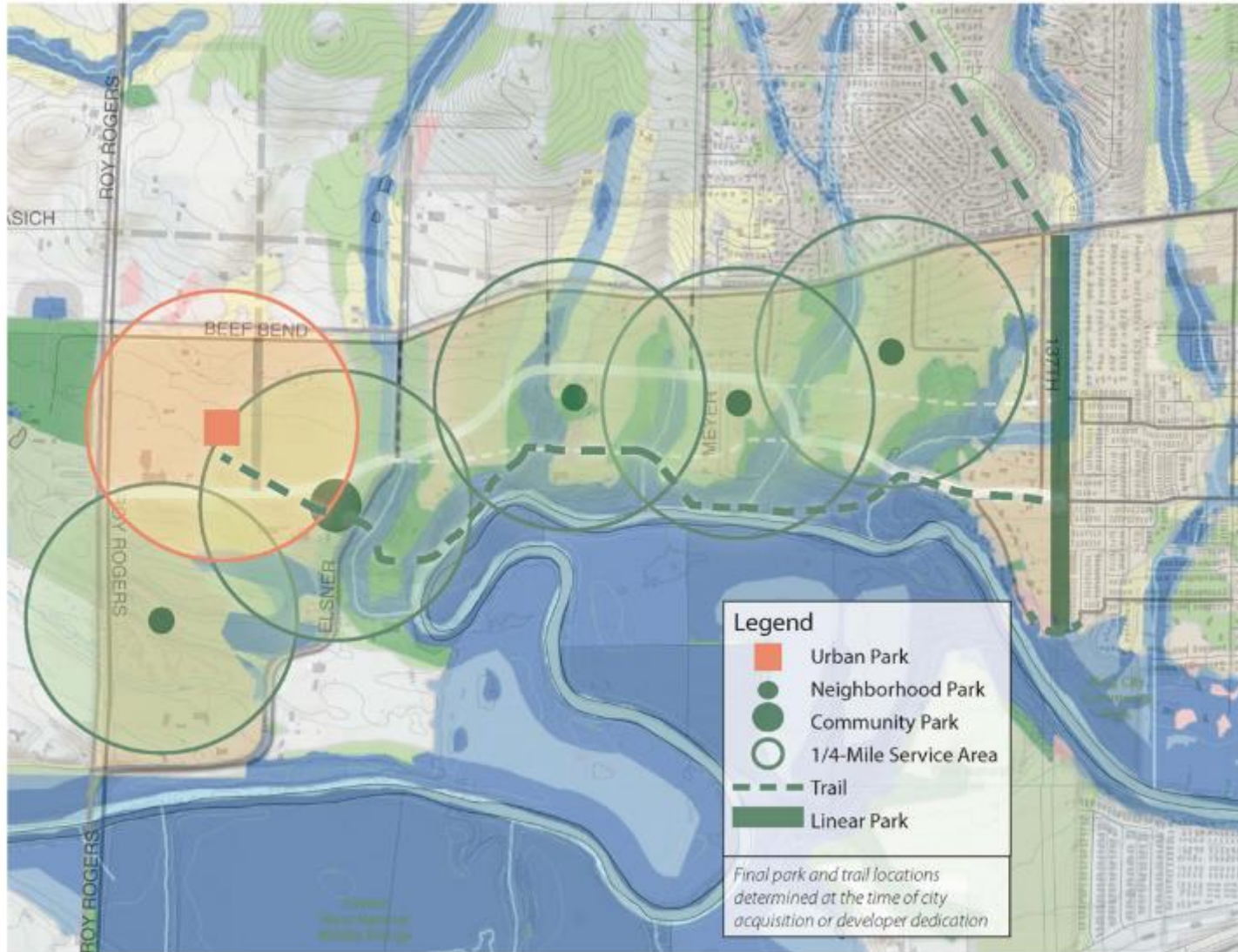
### *Recreational Impacts*

Consideration of regulatory consequences of alternatives focused on applicable Section 6(f)(3) or Section 4(f) resources. This evaluation is based on generally accepted best practices in urban design and community planning, including open space variety, ease of connection and walking distance to open spaces, human and wildlife access, topography, urban forestry. 'New Urbanism' principles such as *"conservation areas and open lands should be used to define and connect different neighborhoods and districts"* and *"a range of parks, from tot-lots and village greens to ballfields and community gardens, should be distributed within neighborhood"*<sup>6</sup> were also considered.

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<sup>6</sup> Congress for the New Urbanism. 1996. The Charter of the New Urbanism. <https://www.cnu.org/who-we-are/charter-new-urbanism>

Figure 6. Future Parks in Kingston Terrace as Proposed in Concept Plan



Conceptual park and trails map for the URA 6D

Any conversion of any portion of a park or outdoor recreation area to non-recreation use, including to right-of-way or easement, which was funded by the Land and Water Conservation Fund (LWCF) grant program (Section 6(f)(3) of the Land and Water Conservation Fund Act of 1965), even if the conversion indirectly affects the funded area/facility, must comply with the conversion requirements. However, no Section 6(f)(3) resources are identified in the project study area. Neither Orchard Park, north of Beef Bend Road, off SW Hawks' Ridge Road, nor King City Community Park, east of SW 137<sup>th</sup> Avenue, are on the Oregon Parks and Recreation Department (OPRD) Oregon LWCF Viewer online map tool. (OPRD 2022). Accordingly, no Section 6(f)(3) impacts are expected for any of the alternatives evaluated.

Section 4(f) of U.S. Transportation Act only applies to transportation projects that receive federal transportation funds from and/or require a federal approval (permit or review) from an agency of the U.S. Department of Transportation (most often, FHWA, FTA, or FAA). Section 4(f) applies to three categories of property:

1. Publicly owned park or recreational lands that are open to the general public
2. Publicly owned wildlife and waterfowl refuges
3. Publicly or privately owned historic sites

No publicly owned parks or recreation areas are within the project study area. The Meyer Riverside Airpark is within the project study area but is privately owned (AirNav 2022). The conservation easement on the Bankston property is a voluntary legal agreement that the property owner developed in partnership with Columbia Land Trust and Clean Water Services. It is privately owned property. (Tualatin Soil and Water Conservation District 2022). **Figure 7** shows the location of this easement in relation to the remainder of Kingston Terrace and the existing city.

Two portions of the Tualatin River National Wildlife Refuge (NWR) are adjacent to the project study area: one south of the Tualatin River and the other west of SW Roy Rogers Road. (USFWS 2022) The Tualatin River NWR is a Section 4(f) property. Transportation facilities that use federal funds or require a federal review that may affect, either permanently or temporarily and either directly or indirectly, the Tualatin River NWR will require a Section 4(f) evaluation to determine whether a "use" would occur (an adverse impact to, or occupancy of, a Section 4(f) property that disrupts the 4(f) function). It is expected that only Alternative 1 may require this consideration; no impacts are anticipated with the other alternatives.

As noted, the Meyer Riverside Airpark is a privately-owned, private-access airport in the Kingston Terrace study area. The airpark runway is oriented north/south and is located immediately east of 150<sup>th</sup> Avenue to the south of Beef Bend Road. According to FAA records, the runway is 1,580 feet long but, based on aerial photography, it appears to be shorter when viewed using aerial photography. At 1,580 feet, all east/west circulation alternatives would bisect the runway. The No Direct Connection scenario may impact the airpark depending on how the local street system is organized on the east side of 150<sup>th</sup> Avenue.

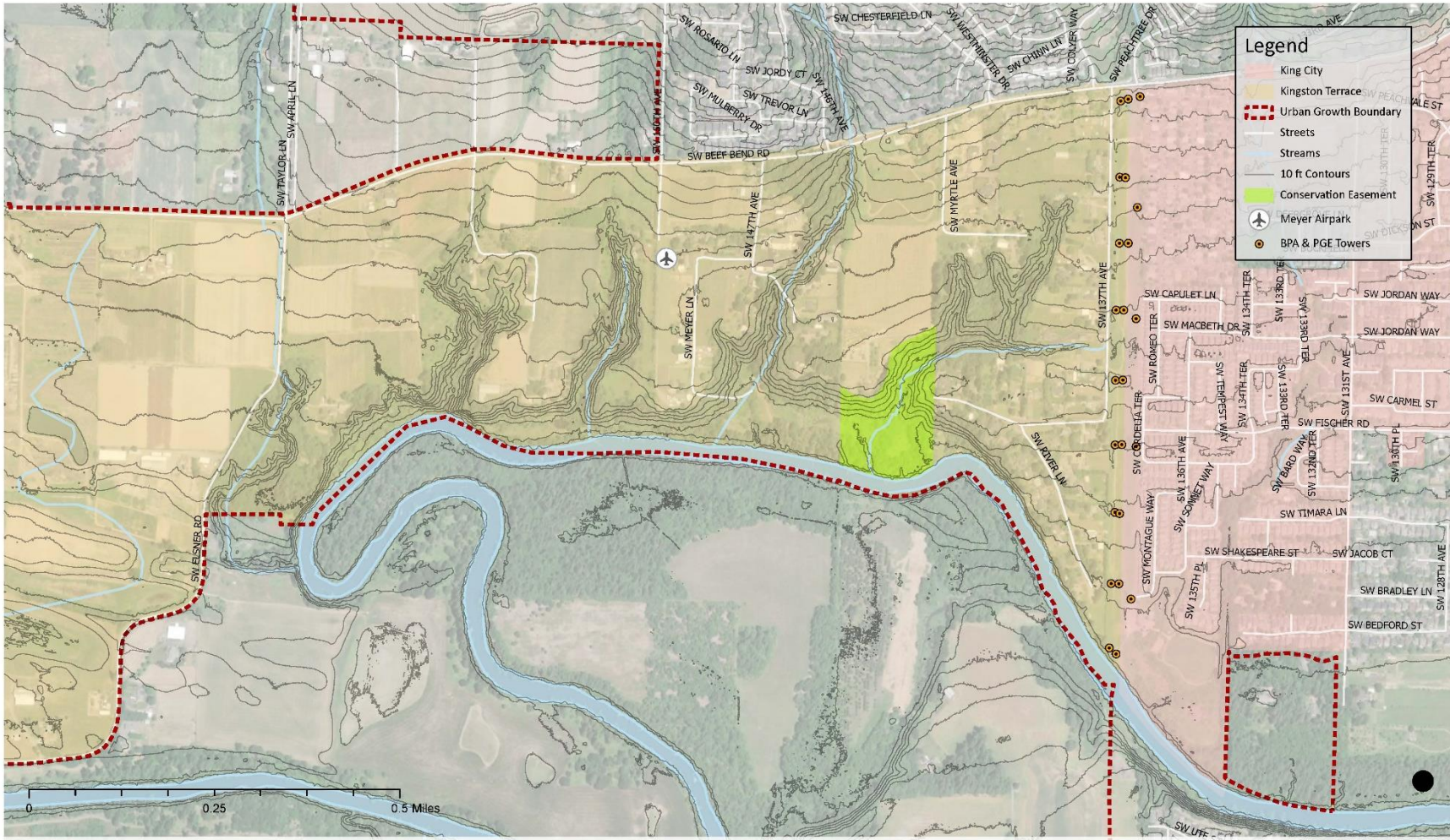
## References

- AirNav. 2022 (FAA information effective May 19). Meyer Riverside Airpark.
- Oregon Parks and Recreation Department. 2022. Oregon LWCF Viewer.
- Tualatin Soil and Conservation District. 2022. Bankston Family Nature Preserve.  
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<https://www.fws.gov/refuge/tualatin-river/map>
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Figure 7. Kingston Terrace Including Bankston Easement



## Bicycle, Pedestrians and Micro-mobility

This section focuses on the effectiveness of shortlisted alternatives on active transportation modes (including micro-mobility choices). The evaluation was conducted using the factors identified in Chapter 2 and summarized below as they related to sustainable/healthy outcomes, safety, performance, connectivity, and accessibility. These factors were considered to be the most significant in identifying differences among the alternatives and for ranking their relative effectiveness in meeting community goals for a high-quality pedestrian and bicycle circulation system. A more detailed assessment of the impacts of the alternatives on active transportation is provided in a separate transportation technical report that is attached to this report as **Appendix B**.

Scoring results for all alternatives and factors related to bicycle and pedestrian mobility are presented in **Table 3**. The summary text presented in **Table 4** is intended to provide a short explanation of the considerations behind the ranking shown in Table 3.

**Table 3. Comparative Ranking Active Transportation Mobility Factors**

Impact Categories/Criteria	No Direct Connection	Alternative 1	Alternative 2	Alternative 3 (S/N)	Alternative 4
Accommodation of bicycle/ped system for healthy outcomes					
Safety for bicycle & pedestrian users					
Connectivity to key destinations					
Travel time comparisons for bikes					
Ability to meet spacing standards and limit length of cul-de-sacs					
Supports providing a seamless connection to existing/planned infrastructure in surrounding communities					
OVERALL RANKING					

As noted in the table, Alternatives 1 and 2 would have the highest overall ranking purely from an active transportation system perspective. This would be followed by Alternative 3 south, then Alternative 3 north, then Alternative 4 and the No Direct Connection scenario.

### Alternatives 1 and 2

Alternatives 1 and 2 are expected to rank equally high among the alternatives for their effectiveness in providing a high quality, safe, comfortable, and attractive active transportation system. Not only do these alternatives provide for both bicycle and pedestrian travel within the recommended collector street cross-section, they also provide direct connectivity and generally the shortest travel times between destination within Kingston Terrace and to the existing city. Additionally, they would limit the



**Table 4. Summary of Key Findings from Evaluation of Bicycle, Pedestrian and Micro-mobility**

<b>Evaluation Factors</b>	<b>No Direct Connection</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>
Accommodation of bicycle/ped system for healthy outcomes	<i>No difference for pedestrians. Reliance on local streets east of 150<sup>th</sup> which may include no or lesser quality bicycle facilities.</i>	<i>Collector status would include some form of high-quality bikeway.</i>	<i>Collector status would include some form of high-quality bikeway.</i>	<i>Collector status would include some form of high-quality bikeway. No substantive difference between North and South alignments.</i>	<i>Collector status would include some form of high-quality bikeway. No substantive difference between North and South alignments.</i>
Safety for bicycle & pedestrian users	<i>Relies largely on local streets within Kingston Terrace and is assumed to use 137<sup>th</sup> or Westside Trail to connect with streets in existing King City such as via Capulet or Fischer. May not have bikeways on local streets.</i>	<i>Lower stress, relatively safe connections would be available.</i>	<i>Lower stress, relatively safe connections would be available.</i>	<i>Lower stress, relatively safe connections would be available. No substantive difference between North and South alignments.</i>	<i>Sidewalks and bikeways to be provided, connection to existing city is assumed to use 137<sup>th</sup> or Westside Trail to connect with streets in existing King City such as Capulet or Fischer. Likely no bikeways on local streets like Capulet but would be added to Fischer and King Lear as a couplet. No substantive difference between North and South alignments.</i>
Connectivity to key destinations	<i>Likely the most circuitous as would largely rely on local connections or Beef Bend Road to get to the existing city.</i>	<i>Most direct connectivity across Kingston Terrace with link to town center, parks/trails, and schools.</i>	<i>Most direct connectivity across Kingston Terrace with link to town center, parks/trails, and schools.</i>	<i>South alignment is similar to #1 and #2. North alignment is less direct due to circuitous routing.</i>	<i>More circuitous than #1, #2 or #3 to reach destinations in existing city. No substantive difference between North and South alignments.</i>

<b>Evaluation Factors</b>	<b>No Direct Connection</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>
Travel time comparisons for bikes	<i>Would have a longer travel time than other alternatives due to distance. Analysis assumes that most bicyclists would use the facilities on Beef Bend to 137<sup>th</sup> and then travel south to connect to existing streets.</i>	<i>Would generally experience the lowest travel times connecting to more destinations in the existing city.</i>	<i>Would generally experience the lowest travel times connecting to more destinations in the existing city.</i>	<i>Southern alignment would generally experience the lowest travel times connecting to more destinations in the existing city. Northern alignment would have a slightly longer travel time due to distance.</i>	<i>Would have a slightly longer travel time than other alternatives due to distance. No substantive difference between South and North alignments.</i>
Ability to meet spacing standards and limit length of cul-de-sacs	<i>No substantive differences related to spacing or block sizing. Vulnerable to long cul-de-sacs unless local street system is built to provide connectivity across ravines.</i>	<i>Minimizes any cul-de-sacs with the most ravine crossings.</i>	<i>Guarantees more east/west connectivity across ravines.</i>	<i>Guarantees more east/west connectivity across ravines. No substantive difference between South and North alignments.</i>	<i>Vulnerable to long cul-de-sacs unless local street system is built to provide connectivity across ravines. No substantive difference between South and North alignments.</i>
Supports providing a seamless connection to existing/planned infrastructure in surrounding communities	<i>Would rely on local streets which may not have bikeways to reach Beef Bend Road crossings.</i>	<i>Would have designated bikeways to reach Beef Bend Road connections, but forces collector level traffic the farthest south. Provides good connection to potential Tualatin Riverside trail.</i>	<i>Would have designated bikeways to reach Beef Bend Road connections.</i>	<i>Would have designated bikeways to reach Beef Bend Road connections. No substantive difference between South and North alignments.</i>	<i>Would have designated bikeways to reach Beef Bend Road connections. No substantive difference between South and North alignments.</i>

development of long cul-de-sacs which hinder the achievement of good pedestrian and bicycle circulation through potentially extensive out-of-direction travel.

### Alternative 3

Alternative 3 is ranked in second place among the alternatives (after 1 and 2 which are tied for first place). Generally, the southern alignment of Alternative 3 would be similar to Alternative 2, while the northern alignment would provide a slightly more circuitous connection to the existing city and would involve slightly longer travel times.

### Alternative 4

Alternative 4 is ranked last in comparison to the other alternatives with longer travel times, more circuitous connectivity to the existing city due to the lack of east/west street connectivity in the area north of Fischer Road, particularly to reach destinations in the OR 99W corridor. However, there is an existing bicycle connection between Jordan Way and Morocco Drive at 128<sup>th</sup> Avenue which could connect walkers and bicyclists between 131<sup>st</sup> Avenue and King Charles Avenue. Ultimately this connection could be linked to Capulet Lane near the BPA/PGE easement on the west and Royalty Parkway on the east, offering some cross-connectivity for these travel modes. There is also a short connection between Rosebery Lane and Jordan Way at the 131<sup>st</sup> Avenue intersection. Due to its location approximately 300 to 600 feet from Beef Bend Road (depending on alignment and location), this alternative is vulnerable to development of long cul-de-sacs to serve development which results in a significant adverse impact on the use of active transportation to reach non-neighborhood destinations.

#### No Direct Connection Scenario

### No Direct Connection Scenario

The No Direct Connection scenario is ranked last when considering its effectiveness in meeting community goals for active transportation. It would have no separated bicycle facilities on the local streets in Kingston Terrace which may result in a more stressful cycling environment. It's connectivity to the existing city is circuitous and it would likely have the greatest potential for the developing long cul-de-sacs. Typically, active transportation travel times would be among the longest with this alternative except for the northern part of the existing city which could be reached from Beef Bend Road. However, this would require that bicyclists use the existing narrow and winding street system which lacks bicycle facilities and carries higher speed traffic.

## Vehicular Mobility and Accessibility

This evaluation measures the effectiveness of alternatives on all vehicular users of the transportation system including autos, trucks, transit, school buses and emergency vehicles with a specific emphasis on transportation safety and performance, broader community connectivity and accessibility, and fiscal responsibility. A more detailed assessment of the impacts of the alternatives on active transportation is provided in a separate transportation technical report that is attached to this report as **Appendix B**.

Scoring results for all alternatives and factors related to vehicular mobility are presented in **Table 5**. The summary text presented in **Table 6** is intended to provide a short explanation of the considerations behind the ranking shown in **Table 5**.

As noted in the table, Alternatives 2 and 3 south would have the highest overall ranking purely from a transportation system perspective. This would be followed by Alternative 1 and Alternative 3 north, then Alternative 4, and lastly by the No Direct Connection scenario.

**Table 5. Summary Evaluation of Vehicular Mobility**

Evaluation Factors	No Direct Connection	Alternative 1	Alternative 2	Alternative 3 (S/N)	Alternative 4
Connectivity & potential for out of direction travel					
Level of service/delays at key intersections					
Travel times/VMT effects					
Beef Bend Road spacing standards					
Transit supportive (primarily regional but some local)					
Ability to meet standards to limit long cul-de-sacs					
Provides at least one continuous connection through the study area for all travel modes					
OVERALL RANKING					

### Alternatives 2 and 3

As indicated in **Tables 5 and 6**, Alternatives 2 and 3 are expected to rank equally high among the alternatives for their effectiveness in providing a high quality, safe, comfortable, and attractive multimodal transportation system. These alternatives provide direct connectivity and generally the shortest travel times between destination within Kingston Terrace and to the existing city. Additionally, they would be supportive of future TriMet transit service into the heart of Kingston Terrace and would limit the development of long cul-de-sacs which hinder the achievement of good circulation through potentially extensive out-of-direction travel.

**Table 6. Summary of Key Findings from Evaluation of Vehicle Mobility**

<b>Evaluation Factors</b>	<b>No Direct Connection</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>
Connectivity & potential for out of direction travel	<i>Poorest connection to existing city, relies on Beef Bend and local streets built to lower standards than an internal collector. School bus routing may be more circuitous and likely more bike connections. No redundancy to Beef Bend Road in east/west connections across King City.</i>	<i>Peripheral route to center of development but offers complete east/west connection. May require more walking or circuitous school bus routing. Offers reasonable redundancy to Beef Bend Road.</i>	<i>Offers complete east/west connection. Central to development so may have better options for school bus pick-up and drop-off. Offers reasonable redundancy to Beef Bend Road.</i>	<i>Offers complete east/west connection. Central to development so may have better options for school bus pick-up and drop-off. Offers reasonable redundancy to Beef Bend Road. No substantive difference between North and South alignments.</i>	<i>Less direct connection to existing city. Also, peripheral to center of development so may require more circuitous school bus routing or walking. Offers redundancy to Beef Bend Road but not in a way that serves the bulk of future development. No substantive difference between North and South alignments.</i>
Level of service/delays at key intersections	<i>All intersections would operate worse than the alignment alternatives except at OR 99W/Fischer which would operate substantively better.</i>	<i>All intersections would operate better than No Connection except OR 99W/Fischer. Some differences are substantial.</i>	<i>All intersections would operate better than No Connection except OR 99W/Fischer. Some differences are substantial.</i>	<i>All intersections would operate better than No Connection except OR 99W/Fischer. Some differences are substantial. No substantive difference between North and South alignments.</i>	<i>All intersections would operate better than No Connection except OR 99W/Fischer. Some differences are substantial. No substantive difference between North and South alignments.</i>
Travel times/VMT effects	<i>Slower travel times for most destination except for northern part of the city which would be fastest via Beef Bend Road.</i>	<i>Most destinations are well served. Travel times to the northern part of the city would be slower.</i>	<i>Most destinations are well served. Travel times to the northern part of the city would be slower.</i>	<i>Most destinations are well served. Travel times to the northern part of the city would be slower. No substantive difference between North and South alignments.</i>	<i>Expected to have the slowest travel times if connections into the city are made via Fischer Road. Only destinations in the north part of the city might be quicker but not as fast as the No Direct Connection scenario. No substantive difference between North and South alignments.</i>

<b>Evaluation Factors</b>	<b>No Direct Connection</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>
Beef Bend Road spacing standards	<i>Standards could be met west of 150<sup>th</sup> but will require collector street designation to access Beef Bend Road east of 150<sup>th</sup>.</i>	<i>Standards could be met.</i>	<i>Standards could be met.</i>	<i>Standards could be met.</i>	<i>Standards could be met.</i>
Transit supportive (primarily regional but some local)	<i>Likely no internal TriMet service to Kingston Terrace except perhaps to town center.</i>	<i>Provides through connections for TriMet service to Kingston Terrace Town Center but peripheral to development.</i>	<i>Provides through connections for TriMet from existing city to Kingston Terrace Town Center.</i>	<i>Southern alignment provides through connections for TriMet from existing city to Kingston Terrace Town Center. Northern alignment likely too circuitous.</i>	<i>Too circuitous, likely rely on Beef Bend Road for TriMet service. No substantive difference between North and South alignments.</i>
Ability to meet standards to limit long cul-de-sacs	<i>Vulnerable to long cul-de-sacs unless local street system is built to provide connectivity across ravines.</i>	<i>Minimizes any cul-de-sacs with the most ravine crossings.</i>	<i>Guarantees more east/west connectivity across ravines.</i>	<i>Guarantees more east/west connectivity across ravines.</i>	<i>Vulnerable to long cul-de-sacs unless local street system is built to provide connectivity across ravines. No substantive difference between North and South alignments.</i>
Provides at least one continuous connection through the study area for all travel modes	<i>Connected only west of 150<sup>th</sup>, would rely on local streets to the east. There may be issues with connections to Beef Bend Road due to County policy of limited arterial access to collectors.</i>	<i>Provides a connection to existing King City. Forces collector level traffic the farthest south.</i>	<i>Provides good opportunities for connections to existing King City.</i>	<i>Provides good opportunities for connections to existing King City. The South alignment provides a more direct connection than the North alignment.</i>	<i>Provides good opportunities for connections to existing King City but proximity to Beef Bend Road would limit its effectiveness as a collector street. No substantive difference between North and South alignments.</i>



### *Alternative 1*

Alternative 1 bears many of the same characteristics as Alternatives 2 and 3 and is highly ranked because of this. Where alternative 1 is less effective in meeting community goals for a high-quality transportation system lies in its location near the southern periphery of Kingston Terrace. The alternative offers a complete east/west connection but may require more walking or circuitous school bus routing to reach the center of development. Additionally, it would likely be less attractive for future TriMet service given the lower densities and fewer destinations that it would directly serve.

### *Alternative 4*

Alternative 4 would be substantively less effective in meeting transportation goals than alternatives 1, 2 or 3. It has a less direct connection to the existing city and is generally peripheral to the center of development which may require more driving, walking, or biking to reach destinations. Its proximity to Beef Bend Road would limit its effectiveness as a collector street. This alternative is expected to have the slowest travel times of any alternative and would likely not be attractive for future TriMet transit service. This alternative may lead to the development of long cul-de-sacs unless local street connectivity across some ravines is built.

### *No Direct Connection Scenario*

From a transportation perspective, the No Direct Connection scenario is the least affective option in achieving the city's goals for a well-connected, high quality transportation system to serve the developing areas of Kingston Terrace. There would be no redundancy provided for Beef Bend Road in the event of an emergency and the lack of a collector facility may place through traffic onto local streets that have not been designed to accommodate it. This alternative would have slower travel times than Alternatives 1, 2 and 3 except for the northern edge of the existing city where access would be fastest via Beef Bend Road. There would likely be no TriMet transit service provided to internal Kingston Terrace destinations except perhaps to the Town Center. This alternative is very vulnerable to the development of long cul-de-sacs due to the lack of solid east/west connections across any of the ravines.

## Public Utilities and Services

This section provides a comparison among the alternatives for their potential impacts to and effectiveness at service the public utilities and services that will be required to develop property for urban uses in Kingston Terrace. The discussion includes:

- Potential stormwater and water quality effects
- Effect on steep slopes and erosion potential
- Accommodation of emergency services, transit, and school bus routing<sup>7</sup>
- Effect on the provision of sanitary sewer service including opportunities for co-location with proposed street improvements
- Effect on the provision of potable water including opportunities for co-location
- Effects on franchise utilities such as gas and electric<sup>8</sup>

Scoring results for all alternatives and factors related to public services and utilities are presented in **Table 7**. The summary text presented in **Table 8** is intended to provide a short explanation of the considerations behind the ranking shown in **Table 7**.

**Table 7. Summary Evaluation of Public Services and Utilities**

Evaluation Factors	No Direct Connection	Alternative 1	Alternative 2	Alternative 3 (S/N)	Alternative 4
Stormwater and water quality impacts					
Effect on steep slopes and erosion potential					
Accommodation of emergency services, transit, and school bus routing					
Effect on sanitary sewer including opportunities for co-location					
Effect on potable water including opportunities for co-location					
Effect on franchise utilities such as gas, electric, fiberoptic, etc. including opportunities for co-location					
OVERALL RANKING					

As noted in the table, Alternative 2 would have the highest overall ranking with high scores related to accommodation of emergency services, transit and school bus routing, as well as sanitary sewer alignment and the location of franchise utilities due to its central alignment in Kingston Terrace.

<sup>7</sup> Pending information from Tualatin Valley Fire & Rescue.

<sup>8</sup> Pending information from Kinder Morgan Energy Partners

**Table 8. Summary of Key Findings from Evaluation of Public Services and Utilities**

<b>Evaluation Factors</b>	<b>No Direct Connection</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>
Stormwater and water quality impacts	<i>Until further analysis is completed, expected to be the same as other alternatives.</i>	<i>Expected to be the same as other alternatives.</i>	<i>Expected to be the same as other alternatives.</i>	<i>Expected to be the same as other alternatives.</i>	<i>Expected to be the same as other alternatives.</i>
Effect on steep slopes and erosion potential-	<i>Likely least effect of the alternatives due to use of an existing corridor which will manage its runoff.</i>	<i>Greatest bridge cost and spans the longest areas with the most crossings. Likely the highest effect and mitigation needs.</i>	<i>Second lowest bridge costs and stream impact areas. Likely lower impacts than Alternatives 1 and 3 but still has significant ravines and sloped areas.</i>	<i>North alignment has second highest bridge cost and stream impact area. Likely lower effect and mitigation needs than Alternative 1. South alignment has a reduced impact.</i>	<i>Lowest bridge costs and stream impact area. Likely the least effect among the alternatives. Avoids most of the ravines and steep slopes. No substantive difference between North and South alignments.</i>
Accommodation of emergency services, transit, and school bus routing	<i>Would not provide redundancy for emergency access. If results in long cul-de-sacs these may delay service.</i>	<i>Provides adequate spacing from Beef Bend Road and a direct route across the study area. Does not provide a direct route to Deer Creek Elementary.</i>	<i>Provides adequate spacing from Beef Bend Road and a direct route across the study area. Does not provide a direct route to Deer Creek Elementary.</i>	<i>North alignment provides adequate spacing from Beef Bend Road, but a more circuitous route across the study area. 3 north provides a more direct route to Deer Creek Elementary. South is similar to #1 and 2.</i>	<i>Does not provide adequate spacing from Beef Bend Road. If results in long cul-de-sacs these may delay service. Most direct route to Deer Creek Elementary. No substantive difference between North and South alignments.</i>

<b>Evaluation Factors</b>	<b>No Direct Connection</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>
Effect on sanitary sewer including opportunities for co-location	<i>Will require local pump stations to serve Kingston Terrace areas between the ravines and near the river, or east of SW 150<sup>th</sup> Avenue. Provides no co-location opportunity for regional gravity needed for flows from areas north and west of Kingston Terrace.</i>	<i>Most of route not likely feasible for gravity sewer, as it would necessitate several aerial crossings of deep ravines, and fill for a roadway in this area is not feasible. Possible option for smaller-diameter pressure sewers from local pump stations. Easternmost portion of alignment provides good co-location opportunity for local gravity sewer service, similar to Alignments #2 and #3South.</i>	<i>Provides best opportunity to use gravity and minimize need for pumping in local sanitary sewer system. Similar to a regional gravity trunk sewer alignment explored by CWS in prior studies. West of 150<sup>th</sup>, this is best co-location opportunity for gravity sewer service to existing regional pump station on Roy Rogers Road.</i>	<i>Offers good co-location potential for much of route. East of 150<sup>th</sup>, would require greater construction depth for gravity, and/or local pumping may be required. Eastern portion of alignment split into two options, Alt #3North and #3South. #3South is same as Alternative #2. #3North may not be cost-effective for all gravity option due to depth required. West of 150<sup>th</sup>, similar to Alternative #2, best co-location opportunity for gravity sewer service to River Terrace South PS at Roy Rogers Road.</i>	<i>Will require local pump stations to serve Kingston Terrace areas between the ravines and near the river, or east of SW 150<sup>th</sup> Avenue. Provides co-location opportunity for regional gravity sewer for flows from west Bull Mountain area but not within Kingston Terrace. #4South alignment can be used for local collector sewer for pump stations.</i>
Effect on potable water including opportunities for co-location	<i>Would need to co-locate looping backbone waterline in local street network. Off-roadway waterline crossings of ravines are needed to minimize dead ends.</i>	<i>Best location to co-locate looping backbone waterline to connect areas between ravines and minimize dead ends.</i>	<i>Good location to co-locate looping backbone waterline to connect areas between ravines and minimize dead ends.</i>	<i>Neutral – can co-locate looping backbone waterline here, but would result in small areas with dead-end service. No substantive difference between North and South alignments.</i>	<i>Provides co-location opportunity for backbone waterline, but would increase dead-end areas unless off-roadway ravine crossings constructed. No substantive difference between North and South alignments.</i>

<b>Evaluation Factors</b>	<b>No Direct Connection</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>
Effect on franchise utilities such as gas, electric, fiberoptic, etc. including opportunities for co-location	<i>Does not impact the utility corridor. No opportunity for co-location of utilities.</i>	<i>Does not require infrastructure to be relocated. Provides opportunity for franchise utility colocation.</i>	<i>Does not require infrastructure to be relocated. Provides opportunity for franchise utility colocation.</i>	<i>Does not require infrastructure to be relocated. Provides opportunity for franchise utility colocation. No substantive difference between North and South alignments.</i>	<i>May require the relocation of two smaller transmission towers. Does not provide sufficient spacing from Beef Bend Road for franchise utility colocation. No substantive difference between North and South alignments.</i>

The ranking of this alternative is closely followed by Alternatives 1 and 3 which scored slightly lower from the perspective of emergency and other routing and sanitary sewer alignment. This would be followed by Alternative 4, and lastly by the No Direct Connection scenario.

## Stormwater and Water Quality Impacts

In an area such as Kingston Terrace with its physical patterns of runoff from Bull Mountain and other developed areas on the north side of Beef Bend Road, stormwater management is a critically important issue. As shown in **Figure 1**, Kingston Terrace is segmented by five large north/south-oriented ravines, four of which could be impacted by the choice of an east/west circulation alternative. Clean Water Services (CWS) has responsibility for regional stormwater management in urban Washington County, in cooperation with the County and twelve member cities. CWS builds, maintains, and enhances the public drainage system to meet public needs, protect fish habitat, and comply with water quality standards affecting Tualatin River drainage.

CWS is currently studying stormwater and water quality issues in the project area and has advised that *“Until further analysis is completed, each alternative is assumed (to have a) neutral impact on stormwater and water quality, as any alternative must comply with current and future CWS requirements. These requirements address not only water quality but also water quantity by way of hydromodification. Additionally, stormwater retention could be a future requirement depending on the outcome of CWS’ pending MS4 Stormwater permit.”* CWS has further indicated that *“any alternative or approach to road design that optimizes the considerations below would be preferred to those that do not. Further, assuming an optimized approach could provide a more accurate expectation for cost and design related to CWS current and future standards.”*

The following questions and others will need to be addressed as design and project development of a future east/west corridor occurs.

- Approximate amount of impervious area created or redeveloped/replaced for each alternative (acres)
- Does the circulation alignment provide opportunities to co-locate stormwater facilities in the right-of-way? (Yes/No)
- Does the circulation alignment cross a stream corridor that could be enhanced with the crossing as part of a regional stormwater strategy? (Yes/No)
- Does the alignment pass through areas of soil types that would facilitate infiltration (hydrologic soil group B)? (Yes/No)
- Average distance for stormwater to travel, as measured between the circulation alignment where it crosses each drainage crossing to the Tualatin River (in feet)

It should also be noted that, the cost of stormwater management has been assumed as part of the overall construction costs for each alternative which is discussed more fully in the section on Costs and Implementation.

## Steep Slopes and Erosion Potential

Over time and with continued erosion, some portions of the north/south ravines that cut through Kingston Terrace have become large and deep. This evaluation factor is intended to offer a better understanding of the relationship between each of the alternatives and opportunities to address the



existing steep slopes and areas with a potential for future erosion. Each of the alternatives offers some benefit to mitigate existing erosion through better hydrological management and slope/stream bank stabilization. CWS is currently investigating potential strategies which could be implemented in conjunction with increasing urbanization in the area.

As they are located near the center of development, Alternatives 2 and 3 might offer more potential for effective control through implementation of a community erosion control strategy. However, as indicated by CWS, more analysis will need to be undertaken to fully characterize mitigation opportunities prior to construction. At the planning level the comparison among alternatives focused on the estimated costs for bridge and culvert improvements as a surrogate for more in-depth analysis. This information is discussed in **Table 8**. More detailed back-up information related to the cost estimates for stormwater management and erosion control is included in **Appendix E**.

## Accommodation of Emergency Services, Transit, and School Bus Routing

### *Emergency Services*

The KTMP area is served by Tualatin Valley Fire and Rescue (TVF&R). Station 35 near the intersection of OR 99W and Fischer Road is the nearest fire station to the study area. As part of a 10-year plan, the Fire District has identified a possible future Bull Mountain station near the vicinity of Beef Bend Road and Roy Rogers Road.

TVF&R indicates a preference for Alternative 2 followed by Alternative 3. In terms of response times, the proximity of Alternative 4 to Beef Bend Road makes it less effective in providing access to the southern portions of the study area. Alternative 3 provides better spacing from Beef Bend Road and access to the area, but appears to be a more circuitous route. Alternatives 1 and 2 provide the same benefits with more direct routes. The No Direct Connection and Alternative 4 may result in long-cul-de-sacs serving development between ravines. Without cross-connection, response times may be impacted.

Additionally, in the event of temporary road closure (such as for a storm event) emergency access may be constrained.

### *Schools*

The KTMP area is served by the Tualatin-Tigard School District. There are currently no school facilities in the KTMP area, though Deer Creek Elementary School is located just east of the study area within city limits on 131<sup>st</sup> Avenue. With new schools being added to the Tigard South River Terrace area to the north, the School District does not anticipate adding a school in the study area at this time. Each connector alternative should provide sufficient access to Deer Creek Elementary and any new schools added north of Beef Bend Road, though Alternative 4 and Alternative 3 north provide the most direct connections to Deer Creek Elementary.

### *Transit*

Three fixed bus routes operate on Highway 99W connecting King City to the rest of the Portland Metropolitan Area. Bus stops are located at most major intersections along the highway. TriMet transit service is not currently provided within King City and no plans have been made to add new service. Should future TriMet transit service come to and through the study area and existing King City, it would likely occur on some combination of Roy Rogers Road, Beef Bend Road, and River Terrace Boulevard. It is unlikely that any of the alternatives would serve future transit.

## Effects on Sanitary Sewer Including Opportunities for Co-Location

CWS provides sanitary sewer conveyance and treatment for the Bull Mountain region, including King City. Wastewater from the area generally flows west to east to the Durham Advanced Wastewater Treatment Plant via a network of pipes and pumps adjacent to and crossing the Tualatin River.

In 2017, CWS began upgrading the Upper Tualatin Interceptor, their regional sanitary sewer system in the Bull Mountain area, to serve new growth planned for areas west and south of Bull Mountain (Tigard, King City) and for south Cooper Mountain (Beaverton). Since then, CWS has constructed facilities in Roy Rogers Road and Beef Bend Road, and through the western portion of King City, in the first phase in this system expansion. These were done to accommodate the River Terrace developments in the City of Tigard. The District has plans to expand capacity to the west of SW 137<sup>th</sup> Avenue to Roy Rogers Road, and north to Bull Mountain Road for growth in the Kingston Terrace area, and the Urban Reserve area north of Beef Bend Road.

CWS is currently conducting a study on how to implement this necessary capacity upgrade. Options include a new gravity trunk sewer through the Kingston Terrace area, which could be co-located with an East-West Collector Road. This option would rely on gravity to convey flow, and would therefore minimize the need for pump stations, which are costly to operate and maintain. Other options to be explored include smaller gravity pipelines located closer to Beef Bend Road, with pump stations required in the southern portions of Kingston Terrace where gravity service would not be available.

It has been anticipated that CWS will co-locate their regional facilities within an east-west transportation corridor (E/W Connector) that would be constructed in conjunction with development in Kingston Terrace. The timing and routing of the E/W Connector is expected to have a significant impact on the final configuration of the sanitary sewer system in the area.

## Effects on Potable Water Including Opportunities for Co-Location

The City of Tigard provides potable water to the City of King City for consumption and fire protection. A 16-inch diameter “backbone” waterline is planned for Beef Bend Road to serve the vicinity, with a waterline network constructed into Kingston Terrace as development occurs. These lines will generally be co-located in transportation corridors.

Since Kingston Terrace is entirely located within a single Tigard pressure zone, there is flexibility in where the backbone waterline is installed, though cost will increase with distance south from Beef Bend Road.

A looped waterline network, with minimal dead-end lines, is highly desired to maximize capacity and redundancy for fire protection and to maintain good water quality for all customers. The ravines of Kingston Terrace present the biggest challenge to constructing a looped system. Ravine crossings will be necessary to minimize dead-end waterlines to developments in the area. An East-West Collector Road will provide the best opportunity to co-locate a waterline for looping with the existing waterline in Beef Bend Road. Fewer dead-end lines would result as the alignment is moved further south from Beef Bend Road.

Regarding operation and maintenance of potable water facilities, the least cost alternatives are those where pipelines are buried rather than suspended on a bridge, are within the public right-of-way, and are readily accessible by public works vehicles.

## Effect on Franchise Utilities, Including Opportunities for Co-Location

There is a utility corridor owned by the Bonneville Power Administration (BPA) in fee that runs north/south along 137<sup>th</sup> Avenue at the eastern edge of the study area. The corridor contains four transmission lines. The western easement contains two 230kV lines operated by Portland General Electric (PGE): Murrayhill-Sherwood #1 and Murrayhill-Sherwood #2. The eastern portion of the corridor contains two 115kV lines operated by the Bonneville Power Administration (BPA): the Scholls Ferry-Sherwood line and the Keeler-Oregon City line. A map illustrating these lines is included in **Appendix C**.

The primary potential impact to utilities would be any route that affects physical structures. Utilities need to access and maintain existing towers in their current locations. BPA indicates a 30-foot setback from wood towers and a 50-foot setback from steel towers. PGE's larger steel towers are located just south of the SW Capulet Lane and SW Fischer Road alignments, but do not appear to require the relocation of those facilities for Alternatives 1, 2, and 3. There do not appear to be any structures directly west of C Street in the southern alignment of Alternative 4. There are some smaller wood towers in the northern alignment of Alternative 4, west of B Street. It is possible that these structures could be avoided.

A secondary consideration is sag in the wires which could interfere with activities below. Engineers from BPA or PGE must determine if the clearance is sufficient. A need to raise the poles could be a multi-year process.

There is an 8-inch high-pressure gas and diesel line operated by Kinder Morgan running through the utility corridor. The line serves all of Southern Oregon from the Eugene Terminal. The pipe is likely buried three to four feet deep, but tests would have to be done to know for sure. A future crossing of the pipeline is feasible. New utilities should be designed to go under the pipeline. All alternatives should be treated equally for the purposes of this study.

Regarding the colocation of franchise utilities, Alternatives 1, 2, and 3 provide ample opportunity for above and below ground utilities, such as power and fiberoptic lines. The proximity of Alternative 4 to Beef Bend Road makes it somewhat redundant in extending utilities to the south since there are already power lines along the Beef Bend Road alignment.

## Natural Resources

The study evaluated potential impacts of the circulation system alternatives on natural resources, including the following:

- Wetlands
- Streams
- Riparian areas
- Upland habitats, and
- The Bankston Easement.

Evaluation is based on typical regulatory and conservation principles of *“first avoid impacts and then minimize impacts (if avoidance is not possible).”* As noted by Clean Water Services when the project enters final design, permitting and construction, it will be important to keep in mind CWS requirements for buffers, vegetated corridors, etc. as these could add additional cost and regulatory complexity to a project. Further detailed information concerning natural resources in the study area is included in **Appendix D**.

## Baseline Conditions

This evaluation is based primarily on a desk top analysis using existing publicly available data supplemented by field observations in spring of 2021. The majority of the project area along the transportation alternatives consists of land in agricultural production, residences and outbuildings, and weedy areas most likely dominated by non-native vegetation such as blackberry thickets. Generally speaking, wetland, riparian, stream, and upland habitat quantity and quality increases from north to south, following the various Tualatin River tributaries to their confluence with the Tualatin River. **Figure 8** shows the locations of these tributaries and estimated sensitive areas and protected buffers.

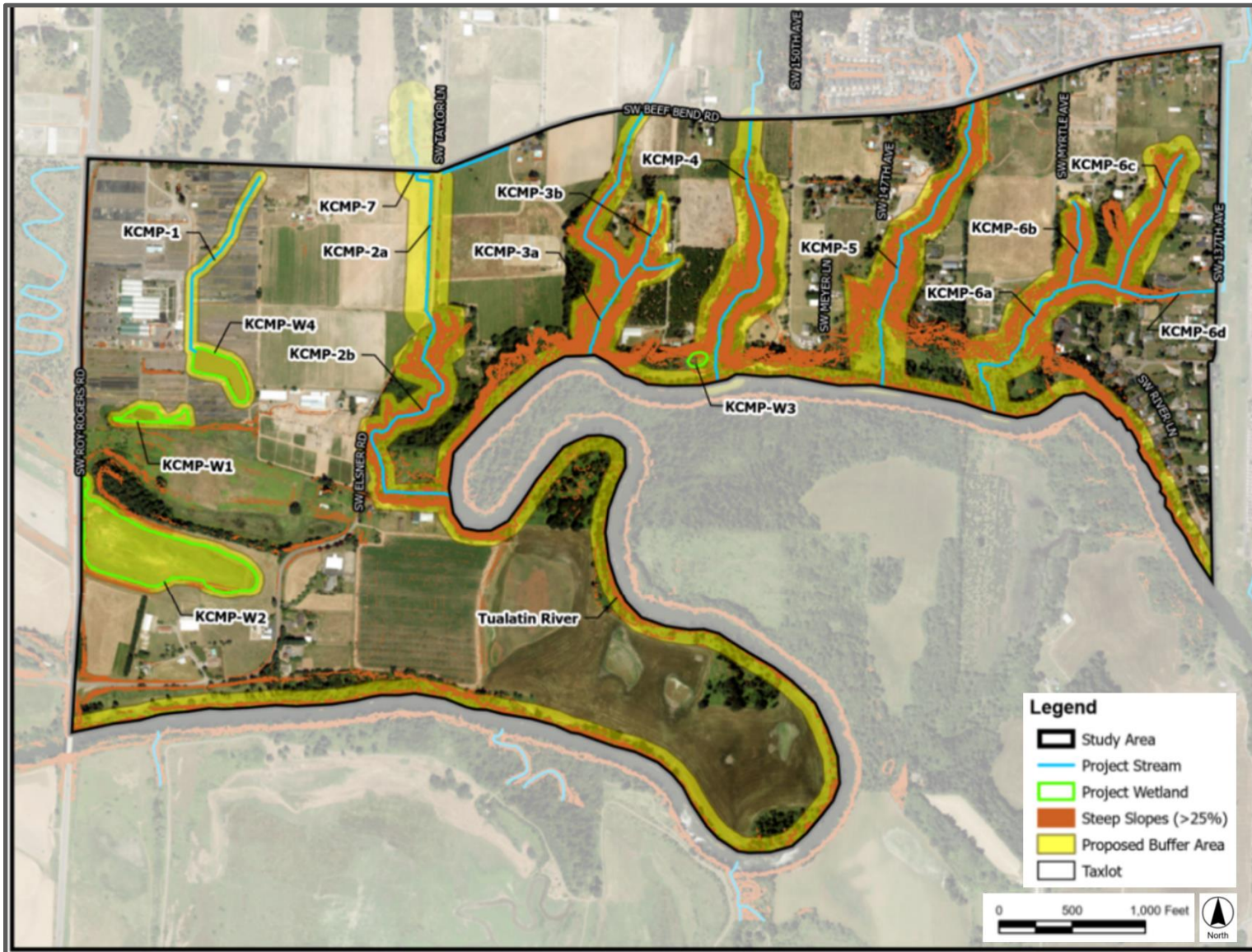
The National Wetland Inventory (NWI) maps very few wetlands in the project area and this matches with the Washington County soil survey documenting a low presence of mapped hydric (i.e., wetland) soils along the alternative transportation corridors. Wetlands are generally mapped along the small north to south draining tributaries to the Tualatin River and may occur as fringe wetlands along these stream corridors. Following these drainages from north to south, the potential for more wetland to be present likely increases with the potential for steep and narrow floodplain wetlands occurring along the base of the steep ravine slopes in the southern portion of these drainages.

Riparian habitat widens and is assumed to improve along these tributaries as they flow south as well, with forested slopes covering much of the ravine side slopes. Tributary stream flow persistence (e.g., ephemeral, intermittent, perennial) is presumed to be greater further downstream in these tributaries, and thus provide higher quality habitat for aquatic organisms. That said, anecdotal evidence of excessive scour has been noted along these tributaries, particularly in the steep gradient sections. The KTMP will be looking at opportunities to improve stormwater management, which could help alleviate excessive scouring and may include stream restoration efforts.

Upland Oregon Conservation Strategy Habitats historically found in the general area include upland prairies and Oak Woodlands. These habitats are absent from the King City study area. However, per mapping by The Intertwine Alliance’s OakQuest 2029 GIS database, a few Oregon oak trees are scattered around the study area. Outside of the study area, a high concentration of oak is mapped south



Figure 8. Kingston Terrace Natural Resources



of the Tualatin River. A notable stand of oaks is also mapped north of Beef Bend Road, but based on aerial photo review, it appears that about one-third of this stand is no longer present. Other quality upland habitat in the study area consists of upland forest adjacent to riparian corridors, which provides additional width to the corridors beyond that typically mapped per Goal 5 riparian corridor criteria.

The Bankston Conservation Easement occurs in the southeastern portion of the study area and includes portions of the Tualatin River floodplain, adjacent forested bluffs and along a tributary stream and associated riparian areas.

Potential project impacts to natural resources used the symbology/rating system, which acknowledges that for natural resources roadway work will either have no impact or some degree of impact, but will not result in benefits to the resources

Scoring results for all alternatives and factors related to natural resources are presented in **Table 9**. The summary text presented in **Table 10** is intended to provide a short explanation of the considerations behind the ranking shown in **Table 9**.

**Table 9. Summary Evaluation of Natural Resource Effects**

Evaluation Factors	No Direct Connection	Alternative 1	Alternative 2	Alternative 3 (S/N)	Alternative 4
Wetlands impacts					
Stream crossings and riparian area impacts					
Impacts to upland habitat					
Impacts to wildlife corridors					
Effects on Bankston Easement					
OVERALL RANKING					

Overall, the No Direct Connection scenario is considered the least impactful to natural resources as it avoids any impacts to natural resources. Of the alternatives evaluated, Alternative 4 scores the best because it impacts resources where they are the narrowest (lower acreage impacts and likely lower quality), are typically furthest from the principal wildlife corridors, and do not impact the Bankston Easement at all. Alternative 1 is considered to potentially be the most impactful to natural resources because it crosses resources at their widest locations, habitat quality is likely the most intact, it runs adjacent to the principal wildlife corridor, and it also runs through the Bankston Easement. Alternatives 2 and 3 are fairly similar to one another and rated at intermediate levels of impact, with Alternative 3 slightly more impactful because it crosses additional drainages.



**Table 10. Summary of Key Findings from Evaluation of Natural Resources Effects**

<b>Evaluation Factors</b>	<b>No Direct Connection</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>
Wetlands impacts	<i>Stream courses are narrowest in area between Elsner Rd and 150<sup>th</sup> Avenue; wetlands presumed to be narrow and of lower quality.</i>	<i>Presumed to impact highest quality wetlands along ravine bottoms. Although bridging, uncertain if bridge footings or piles would be needed in wetlands.</i>	<i>Similar to Alternative 1; however, the quantity of wetland (if present) may be less.</i>	<i>Similar to Alternative 2; however, Alternative 3 crosses additional drainages, with 3 North crossing more.</i>	<i>Stream courses are the narrowest along this alternative; therefore, fringe wetlands also presumed to be narrow and of lower quality. No substantive differences between North and South alignments.</i>
Stream crossings and riparian area impacts	<i>Least impact on streams and habitat.</i>	<i>Crosses the widest and highest quality habitats.</i>	<i>Intermediate between Alternatives 1 and 4, but crossings are relatively wide.</i>	<i>Intermediate between Alternatives 1 and 4, but crossings are relatively wide. Crosses a few more drainages than Alternative 2, with 3 North crossing more.</i>	<i>Crosses the narrowest and lower quality habitats. No substantive differences between North and South alignments.</i>
Impacts to upland habitat	<i>No impact.</i>	<i>Habitat mostly lacking, but small amount may be present along the top of bluff adjacent to the high-quality habitats associated with the Tualatin River and floodplain.</i>	<i>Habitat mostly lacking, but small amount may be present adjacent to tributary corridors.</i>	<i>Habitat mostly lacking, but small amount may be present adjacent to tributary corridors. No substantive differences between North and South alignments.</i>	<i>Habitat mostly lacking; however, upland forest does occur where the two legs of this alternative merge and thus impacts are likely. No substantive differences between North and South alignments.</i>

<b>Evaluation Factors</b>	<b>No Direct Connection</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>
Impacts to wildlife corridors (primary=Tualatin River and floodplains, secondary=tributary streams and riparian corridors)	<i>May impact wildlife movement in secondary stream corridors between Elsner Rd and 150<sup>th</sup> Avenue.</i>	<i>Runs adjacent to primary wildlife corridor, resulting increased noise, humans, and pet disturbance to wildlife using the corridor. Also, intersects secondary corridors although crossing by high bridges could reduce this impact.</i>	<i>Situated away from primary wildlife corridor is a plus. But still intersects secondary corridors. Crossing by high bridges could reduce some impact.</i>	<i>Situated away from primary wildlife corridor is a plus. But still intersects secondary corridors. Crossing by high bridges could reduce some impact. 3N crosses three more ravines than 3S.</i>	<i>Situated away from primary wildlife corridor is a plus. But still intersects secondary corridors. High bridge crossings may not be an option due to grades, but habitat is of lower quality so may be less of a concern. No substantive differences between North and South alignments.</i>
Effects on Bankston Easement	<i>Easement is completely avoided.</i>	<i>Crosses through the easement.</i>	<i>Crosses through the easement.</i>	<i>Crosses through the easement.</i>	<i>Easement is completely avoided.</i>

## Cost and Implementation

This section presents a discussion of costs and implementation considerations that can be used to help compare and contrast the various circulation alternatives. Topics covered in this discussion include:

- Planning level cost estimates for road and bridge construction
- Costs for habitat restoration, stormwater management and erosion control
- Magnitude of costs for sewer service extensions
- Potential for public funding
- Magnitude of costs for construction and operation of public utilities
- Effect of transportation system phasing, particularly on utilities

Scoring results for all alternatives and factors related to public services and utilities are presented in **Table 11**. The summary text presented in **Table 12** is intended to provide a short explanation of the considerations behind the ranking shown in **Table 11**. Further details about the cost estimates are included in **Appendix E**.

**Table 11. Summary Evaluation of Cost and Implementation Factors**

Evaluation Factors	No Direct Connection	Alternative 1	Alternative 2	Alternative 3 (S/N)	Alternative 4 (S/N)
Order of magnitude construction costs- roadways and bridges/culverts					
Order of magnitude construction costs- pathways <sup>9</sup>	---		---	--	--
Order of magnitude costs for habitat restoration, stormwater management and erosion control					
Order of magnitude costs for sewer service extensions related to the range of roadway/pathway alternatives					
Potential for funding using TDT or other public resources (i.e., for connected, collector level streets) vs developer-financing					
Order of magnitude construction and operations/maintenance effects on public utilities					
Effect of transportation system phasing, particularly related to public utilities					
OVERALL RANKING (Excluding pathway)					

<sup>9</sup> Alternative 1 was the only alternative also evaluated for development as a pathway.

**Table 12. Summary of Key Findings from Evaluation of Costs and Implementation Issues**

<b>Evaluation Factors</b>	<b>No Direct Connection</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>
Order of magnitude construction cost – roadways and bridges	\$14,285,300 <i>Excludes local streets that may act as collectors. Uses Alt 3 west of 150<sup>th</sup>.</i>	\$47,874,200	\$34,275,900	North = \$37,860,400 South = \$31,187,200	North = \$10,751,500 South = 15,741,800
Necessary collector improvements on 137 <sup>th</sup> Avenue	--	--	--	North = \$1,404,000	North = \$2,731,400 South = \$1,876,200
Order of magnitude construction cost – trail	--	\$9,563,200	--	--	--
Order of magnitude costs for habitat restoration, stormwater management and erosion control	\$861,700	\$2,981,600	\$2,164,900	North = \$2,472,700 South = \$1,987,700	North = 964,600 South = \$1,196,900
Order of magnitude costs for sewer service extensions related to the range of roadway/pathway alternatives	<i>Too far north to serve southern areas by gravity, so pump stations would be needed.</i>	<i>Would require aerial crossings of ravines on a bridge (higher maintenance cost).</i>	<i>Best option to minimize pump stations.</i>	<i>Would reduce need for pump stations. . No substantive differences between North and South alignments.</i>	<i>Too far north to serve southern areas by gravity, pump stations would be needed. . No substantive differences between North and South alignments.</i>
Potential for funding using TDT or other public resources (i.e., for connected collectors vs developer-financing)	<i>Dependence on local streets for circulation reduces opportunity to utilize TDT funds.</i>	<i>Significant permitting and capital costs would create largest funding gap that would require supplemental SDCs or LIDs from developers.</i>	<i>Good – option could mostly be funded using TDTs but would likely require some supplemental SDC or LID funding from developers.</i>	<i>Good – option could mostly be funded using TDTs but would likely require some supplemental SDC or LID funding from developers. . No substantive differences between North and South alignments.</i>	<i>Best – Relatively lower capital costs would likely be recovered by TDT funding without supplemental SDCs or LIDs. . No substantive differences between North and South alignments.</i>

<b>Evaluation Factors</b>	<b>No Direct Connection</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>
Order of magnitude construction and operations/maintenance effects on public utilities	<i>Would require more pump stations for development, which have relatively high O&amp;M costs. Minimal waterline looping could increase O&amp;M costs due to increased flushing.</i>	<i>Higher O&amp;M costs expected due to pipe crossings on bridges.</i>	<i>Best - option offers best opportunity to avoid pump stations, minimize waterline dead-end areas.</i>	<i>Good - option offers some opportunity to avoid pump stations, minimize waterline dead-end areas. . No substantive differences between North and South alignments.</i>	<i>Would require more pump stations, which have relatively high O&amp;M costs. Minimal waterline looping could increase O&amp;M costs due to increased flushing. . No substantive differences between North and South alignments.</i>
Effect of transportation system phasing on utilities	<i>Doesn't provide opportunities for looped connections across ravines (water quality and pressure issues). Too far north for co-located sewer.</i>	<i>Good for co-location of backbone waterline and gravity sewer to existing pump station at Roy Rogers Road, may require aerial crossing of ravine.</i>	<i>Good for co-location of backbone waterline and sewer trunk to existing pump station at Roy Rogers Road.</i>	<i>Good for co-location of backbone waterline and sewer trunk to existing pump station at Roy Rogers Road. . No substantive differences between North and South alignments.</i>	<i>Good for co-location of backbone waterline but doesn't provide opportunities for looped connections Too far north for co-located sewer. No substantive differences between North and South alignments.</i>

## Roadway and Bridge Construction Costs

Cost estimates were prepared at the planning level using broad assumptions about roadway and bridge cross-sections consistent with a collector street status as defined in the Draft King City TSP (see **Appendix E** for illustrations). As noted in the illustrations it is assumed that a collector street would have the following attributes:

- Right-of-way width = 75 feet
- Curb-to-curb Pavement Width (two travel lanes and two parking lanes) = 38 feet
- Sidewalk width (including 0.5-foot setback) = 6.5 feet
- Bikeway width = 6 feet
- Landscaped buffer = 6 feet

Bridge crossings assume a 22-foot curb-to-curb pavement width and a 12-foot combined bicycle path and sidewalk on both sides of the structure. Pavement width on the bridge would be transitioned from the full street cross-section on either side of the structure. This shared use path cross-section was excerpted from the Draft TSP and was identified as a low use facility. This is appropriate given the relatively short ravine crossing distances on the bridges and culverts.

Roadway cost estimates for each alternative include all elements of roadway and bridge construction including an allowance for stormwater management (assumed to be 10 percent of the total roadway or bridge cost per direction from CWS) and environmental mitigation (assumed to be 5 percent of roadway or bridge cost also per direction from CWS). This is further discussed below under in the relevant section.

It should be noted that cost estimates do not include right-of-way acquisition since that impact is unknown at this time. It is likely that right-of-way will be dedicated as part of larger development activity to build the necessary collector and local street system. However, if land acquisition is necessary, particularly if condemnation is being considered for land needed to the transportation system, this cost will need to be addressed in the future. An initial assessment of right-of-way acquisition needs shows that Alternative 2 does the best job of maximizing existing public rights-of-way.

A comparison of the information included in **Table 12** shows that costs for the various alternatives could run from a low of about \$10.8 million (for Alternative 4 North) to a high of \$47.9 million (for Alternative 1). Alternative 4 South is estimated to cost about \$15.7 million, while Alternatives 2 and 3 range between \$31 and \$38 million. The differences among the alternatives are largely related to the number of stream crossings that will require bridge structures or culverts with Alternative 1 having the longest crossing distances.

Costs for the No Direct Connection scenario assume a collector street cross-section along the Alternative 3 alignment between Elsner Road and 150<sup>th</sup> Avenue, as well as 150<sup>th</sup> between the new corridor and Beef Bend Road. Costs for these improvements are estimated to be in the general range of Alternative 4 South but more than Alternative 4 North. It should be noted that the costs associated with this scenario do not reflect the potential costs of any widening on Beef Bend Road, particularly east of 137<sup>th</sup> Avenue as this facility would be carrying not only regional trips but also local trips that would need to divert from more direct connection to the existing city. With this scenario, the road would carry substantially higher traffic volumes than the other alternatives and may require partial or full widening to five lanes. This could entail a significant cost and relocation of impacted properties.



## Pathway Construction Costs

Cost estimates were prepared for the option of developing Alternative 1 as a multi-use path instead a full collector street roadway. The general alignment of this alternative is similar to a portion of the pathway near the Tualatin River that is shown in **Figure 4** which illustrates potential future parks and trails in Kingston Terrace. Given the very high cost of constructing this alternative as a full roadway, consideration as a multi-use path in lieu of a roadway was appropriate.

The cross-section assumed for this multi-use path is a 17-foot walk/bike facility that was also excerpted from the Draft TSP (**Figure 30**). This facility was identified for high demand conditions. The cost estimate calculation for this facility is included in **Appendix E** and is estimated at \$9.6 million for the entire distance including bridge/culvert crossing structures.

## Costs for Habitat Restoration, Stormwater Management and Erosion Control

Costs for habitat restoration, stormwater management and erosion control were included as line items in the overall construction cost estimates for the various alternatives. As noted in the cost estimation approach and assumptions discussed earlier in this chapter, guidance was provided by CWS on how best to calculate these factors in the absence of a regional stormwater strategy (which is currently under development) and/or environmental mitigation (which is not known in specific detail at this time). It should be noted that these cost estimates represent a very high level of understanding about the potential resources that may be impacted by the various alignments and presumed challenges with addressing the elements of this evaluation factor.

For purposes of this report, it has been assumed that cost of stormwater management and erosion control would represent 10 percent of the estimated roadway construction cost, while environmental mitigation would represent 5 percent of estimated roadway construction cost. The 10 percent assumption for stormwater/erosion control assumes that each area and roadway project will be responsible for handling its own stormwater. However, as noted above, if a regional strategy is developed and implemented, the costs for individual projects would likely be reduced.

## Magnitude of Costs for Sewer Service Extensions

CWS owns and operates all public sewer pump stations in the service area. Pump stations are more costly to operate and maintain than gravity sewers, due to costs for energy, labor, and mechanical equipment needed for monitoring and maintenance. Current CWS policy is to maximize use of gravity to the extent practicable for all developments, and minimize the need for pump stations, which must be approved by CWS on a case-by-case basis.

A comparison was conducted of planning level order-of-magnitude costs for sewer service extension using the alignments provided by the various alternatives. This assessment indicates that Alternative 2 would likely be the least costly option as it would minimize the need for pump stations. This alternative would be closely followed by Alternative 3 which would reduce the need for pump stations, but not to the extent of Alternative 2.

Due to the need to cross numerous large ravines, Alternative 1 would require costly aerial piped crossings on bridges. Alternative 4 and the No Direct Connection scenario would likely too far north to serve the southern portions of Kingston Terrace by gravity, so pump stations would be needed.

## Potential for Public Funding

This factor considers the likelihood that an alternative could be financed by Washington County's Transportation Development Tax (TDT) program or other public funding given the expected costs of the alternative.

Funding public collector streets (and adjacent utilities) is an important consideration when evaluating alternatives, particularly with respect to utilizing existing funding resources, obtaining market/developer support, and understanding the resulting impacts on home prices and rents required for developers and property owners to achieve a desired rate of return. If capital construction costs are too high, there will be significant funding gaps between current TDT revenues and required upfront infrastructure investment. Such a scenario would likely result in insufficient funding to advance construction on future roadways and could lead the City to adopt supplemental funding resources (such as system development charge overlays or local improvement districts) to make up the funding gap. This in turn could lead to higher costs for developers, which would impair their ability to raise equity needed to pay for TDTs combined with supplemental charges, and lead to higher housing costs and rents.

Ideally, the construction of major streets (including collectors and arterials) would rely upon existing TDT revenues (public funding) without new supplemental funding sources. While each of the Alternatives should be eligible for public funding, Alternative 4 is the best alternative for attaining that objective since its overall capital cost is among the lowest of the alternatives.

Alternative 2 and Alternative 3 both provide collector street network that could be funding primarily using TDT revenues, yet both would require some form of supplemental transportation funding to close projected funding gaps.

Alternative 1 is expected to have significant permitting and the highest capital costs. It is expected that this alternative would have the largest funding gap of any alternative and would require supplemental System Development Charges (SDCs) or Local Improvement Districts (LIDs) from developers.

While the No Direct Connection scenario has among the lowest capital cost requirements, it would rely primarily upon a local street network that would not be eligible for TDT funding. Hence, this scenario would be dependent primarily on private developers to advance funding for roadways, which could lead to a piece meal approach to project delivery, with potential gaps in connectivity over time.

## Magnitude of Costs for Construction and Operation of Public Utilities

As with some of the other cost evaluation factors, it is challenging to estimate the magnitude of costs for construction and operation of public utilities that would/could use the various alternative corridors. As the planning process continues and more information is known, particularly for sanitary sewer service, better estimates can be made. At the very higher planning process undertaken for this report, it is only possible to indicate how the alternatives might compare, given the experience of the consulting team in providing both local and regional sewer service in the project vicinity.

Comparison of the alternatives indicates that Alternative 2 is likely the least expensive options as it would offer good options for co-location of services and minimize the need for pump stations which have relatively high operations and maintenance costs when compared to gravity-fed sewer. They would typically have greater land acquisition costs to locate and operate the pump stations including on-going

access for maintenance. Alternative 3 is also a good option for co-location of facilities and reducing long-term operations and maintenance costs and maximizing the use of gravity.

Alternative 1 would have comparatively higher operations and maintenance costs due to the more difficult access and the need for aerial pipe crossings of many ravines. Alternatives 4 and the No Direct Connection scenario would both be good for the co-location of potable water services but are situated too far north of co-located sewer service. Both of these options would rely on local street easements for locating sewer service which may not provide a connected and complete pathway across Kingston Terrace to tie in with services in the existing city.

## Effect of Transportation System Phasing

The development of the Concept Plan for Kingston Terrace identified a potential pattern of phased development throughout the study area over the next 15 to 20 years. Given the expressed interest of several large landowners, the expectation is that the western portion of the study area and properties along Beef Bend Road in the vicinity of 150<sup>th</sup> Avenue will develop quickly. Development further east and south will likely occur more slowly. This development scenario may present challenges for providing both street and utility connectivity to the existing city and destinations along the OR 99W corridor.

The effect of this expected land development pattern on the phasing of transportation system improvements was studied as part of the original Concept Plan. Findings from that analysis indicated that Kingston Terrace would be heavily reliant on Beef Bend Road to serve initial development, and traffic volumes along this street would grow. It is expected that intersection improvements may be needed, such as traffic signalization at Beef Bend Road/150<sup>th</sup> Avenue. Increased traffic could also adversely affect the intersection of Beef Bend Road at 131<sup>st</sup> Avenue and OR 99W.

The provision of potable water service to initial Kingston Terrace development could be provided via either Beef Bend Road or the proposed collector street system west of 150<sup>th</sup> Avenue. As development moves farther east, water service could continue to be provided via Beef Bend Road, a collector street extension, or using the local street system since water is moved under pressure and is not dependent on gravity for its distribution.

However, there are significant disadvantages to locating a regional sewer extension along Beef Bend Road with the intent of serving the bulk of Kingston Terrace. Neither Alternative 4 nor the No Direct Connection scenario would be good candidates for a major sewer service line as they would both be located too far north to effectively serve much of Kingston Terrace using gravity flow. The added cost for construction and long-term operations and maintenance of pump stations would be required.

Alternatives 2 and 3 provide a good opportunity to co-locate with a regional sewer line extending from the existing pump station at Roy Rogers Road into the existing city. Alternative 1 would also be able to access the Roy Rogers Road pump station, but its lower elevation would likely make it unreasonable for a regional sewer line as it would require aerial crossing of ravines and local pump stations to serve Kingston Terrace development.

As noted by CWS, there is some existing infrastructure to provide sanitary services in the areas likely to develop first (especially west of 150<sup>th</sup> Avenue) but the provision of service to specific areas would be dependent on actual development patterns and sequences, with less importance placed on the timing of transportation infrastructure.

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## 6 SUMMARY AND RECOMMENDATIONS

Chapter 6 includes a summary of evaluation results for each alternative which was taken directly from the discipline-specific findings presented in Chapter 5. Review and discussion of the information in this chapter provides the basis for a comparison among the alternatives and weighing of the specific benefits and impacts of each, ultimately leading to the selection of a preferred course of action.

Although this chapter identifies a preferred alternative, it is important to note that the KTMP process is not yet complete. Additional factors related to land use patterns and development opportunities must be taken into consideration along with the findings of this report before a final course of action will be recommended in the KTMP. Nevertheless, the information summarized in this chapter presents useful context and guidance for understanding one of the key transportation issues affecting developing Kingston Terrace – the choice of an east/west corridor within the development to effectively link local destinations, as well as providing an effective connection to the existing city.

### Summary of Evaluation Results

**Table 13** presents a summary of the analysis results in each category of evaluation factors as they pertain to each alternative including the No Direct Connection scenario.

**Table 13. Summary of Ranked Evaluation Factors**

Impact Categories	No Direct Connection	Alternative 1	Alternative 2	Alternative 3 (S/N)	Alternative 4 (S/N)
Land Use and Community Design					
Bicycle, Pedestrian and Micro-mobility					
Vehicular Mobility and Accessibility					
Public Services and Utilities					
Natural Resources					
Costs and Implementation					

From a **Land Use and Community Design** perspective, Alternatives 2 and 3 south would be the most desirable options, followed by Alternatives 1 and 3 north, then Alternative 4 and then the No Direct Connection scenario. Alternatives 2 and 3 south do the best job of supporting land use patterns established in the Concept Plan as they are more central to the study area and provide a direct easterly connection. Alternative 3 north also would provide multiple connections to existing neighborhoods to the east and some opportunity for connections to the north. Alternative 3 would have minimal impacts to disadvantaged or marginalized populations and recreational sites, while Alternatives, 1, 2, and 4 score slightly lower as they are not as central to the study area and therefore provide fewer benefits. Unlike

the four alternatives, the No Direct Connection scenario does not have significant negative impacts on existing neighborhoods, such as increased traffic and noise, but it also does not support planned development patterns or provide good access to recreational sites or benefit those with the greatest transportation needs.

Alternatives 1 and 2 score the highest for **Active Transportation Mobility**, followed by Alternative 3. All alternatives score high in their ability to accommodate safe bicycle and pedestrian facilities. The No Direct Connection scenario scores slightly lower due to a reliance on local streets east of 150<sup>th</sup> and potential lack of bikeways. Alternatives 1 and 2 provide the most direct connectivity across Kingston Terrace with links to the town center, and current and future parks and trails. This connectivity also reduces travel time for bikes. Alternative 4 provides the most direction connections to Deer Creek Elementary school. Alternative 1, 2 and 3 are most able to meet spacing standards and limit the length of cul-de-sacs and would have designated bikeways to reach Beef Bend Road connections.

Alternatives 2 and 3 south score the highest for **Vehicular Mobility**, followed by Alternatives 1 and 3 north. Those alternatives score high on connectivity and reducing out-of-direction travel. The No Direct Connection scenario provides the poorest connections to the existing city and relies on Beef Bend and local streets built to lower standards than an internal collector. Alternatives 2 and 3 provide the best opportunity for at least one continuous connection through the study area for all travel modes, support future transit service, and limit the potential for long cul-de-sacs.

Alternative 2 received the best score for **Public Services and Utilities**, followed by Alternative 3 south, then Alternatives 1 and 3 north. The central location of Alternative 2 provides adequate spacing from Beef Bend Road and a direct route across the study area. The route also would have a lesser impact on steep slopes and erosion than Alternatives 1 and 3. Alternatives 1, 2, and 3 provide the best opportunities for infrastructure co-location. The No Direct Connection scenario scored highest for its minimal effect on steep slopes and erosion as it would utilize an existing corridor which will manage its runoff. However, the scenario scored the lowest for its inability to accommodate emergency services, transit and school buses, lack of opportunity for co-location of sanitary sewer and water infrastructure.

The No Direct Connection scenario scores highest for the **Natural Resources** category. The scenario will have little to no impacts on wetlands, stream crossings, riparian areas, upland habitat, wildlife corridors, and the Bankston easement. Alternative 4 scores the highest among the four alternatives as it is furthest away from most natural resources and therefore less likely to have negative impacts than the routes closer to the Tualatin River. It is also the only alternative that does not cross through the Bankston easement.

Alternatives 2 and 3 south rank highest for **Cost and Implementation Factors**, followed by Alternatives 3 south and 4 north. Alternative 4 scores the best for roadway, stormwater management, and infrastructure costs as it crosses ravines at their narrowest points. However, like the No Direct Connection scenario, it scores the lowest in terms of construction and operations/maintenance costs as it would require more pump stations. Alternative 2 crosses the ravines at wider points and is therefore more expensive for roadway and bridge/culvert costs. However, it scores high across the other categories and has lower operations and maintenance costs than Alternative 4. Alternative 3 scores similarly to Alternative 2 for the same reasons. With the southernmost location, Alternative 1 has significant costs to cross the ravines at their widest points. The No Direct Connection Scenario scores slightly lower in roadway costs, though that estimate does not include any potential costs that may be



needed to widen Beef Bend Road to accommodate additional traffic that would otherwise be handled by a new collector street. The scenario also requires minimal investment for habitat restoration, stormwater management, and erosion control.

Based on the results of this analysis, **Alternative 2**, with minor modifications to maximize the use of existing right-of-way and avoid homes, is the preferred east/west connection to be used to complete the Kingston Terrace Master Plan.<sup>10</sup> Alternative 2 has particular advantages that are worth noting including:

- With the small alignment adjustments noted, this alternative does not require demolition of existing homes in the study area.
- Alternative 2 would likely require less linear feet of right-of-way acquisition than Alternatives 3 or 4 due to its use of existing roadway rights-of-way.
- As a collector road providing redundancy for Beef Bend Road and serving a newly developing area, this alternative would likely be effective in securing public funding from state, regional, county or local sources that would reduce the need for developer funding for this key piece of roadway infrastructure.
- The alignment maximizes the effectiveness of gravity sewer through co-location of utilities along an optimal elevation for sewage flow. This would reduce the on-going cost of this public utility. Additionally, the alternative does not create long closed end roadway segments that may require added infrastructure cost to provide potable water.
- The alignment offers both a central spine or backbone roadway through the development linking it most directly with the Kingston Terrace Town Center and the existing city. This has advantages for:
  - Emergency response (TVFR has indicated a preference for Alternative 2),
  - Good access to many neighborhoods and new public parks,
  - Potential future regional transit service through a developed area when densities are sufficient,
  - Good connectivity and minimized travel times for active and vehicular transportation, and
  - Minimization of the potential for either long cul-de-sacs or closed end roadways that require out of direction travel, discourage pedestrian and bicycle use, and may result in added utility costs.

Alternatives 2 and 3 provide the greatest benefits to safe bicycle, pedestrian, and vehicular mobility, accommodate associated infrastructure, and mesh well with the planned land use patterns and proposed local street system identified in the Concept Plan. The connectivity that these three alternatives provide to existing King City and neighboring communities will enhance community

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<sup>10</sup> The “corridor of intention” for Alternative 2 remains the same. The modifications are minor and cannot be seen at the scale of the map.

sustainability and reduce VMT. Alternatives 2 and 3 do have greater impacts on natural resources, but also provide the opportunity to address erosion issues caused by existing stormwater. Alternative 2 rises to the top due to its lower implementation costs.

Alternative 1 would likely have significant adverse natural resource impacts due to its location immediately north of the Tualatin River floodplain. It would also be the most expensive alternative given the need for several long bridges or culverts to cross ravines where they are typically the largest.

Alternative 4 would function more effectively than the No Direct Connection scenario with most evaluation factors but would not be as effective as Alternatives 1, 2 or 3 given its location immediately south of Beef Bend Road at the edge of Kingston Terrace development. It would have the least adverse impact on natural resources of all the Alternatives and the lowest construction cost, though higher costs for operations and maintenance.

The No Direct Connection scenario would see the lowest impacts to natural resources but may not offer the opportunity for effective resolution of existing erosion problems if patterns of denser urban development do not occur to provide the necessary funding to develop such enhancements. The scenario would also incur the least cost for constructing a collector status road but its reliance on local streets to effectively serve as collectors between 150<sup>th</sup> Avenue and Fischer Road may result in higher levels of traffic on certain local streets that are not designed to accommodate it. Traffic will find its most effective (usually shortest) pathway through the network and will very likely use some local street connections for non-neighborhood trips. Additionally, the reliance that the No Direct Connection scenario places on Beef Bend Road to serve local trips may result in this facility rapidly reaching its capacity. Should it be necessary to widen Beef Bend Road, which is more probable with this scenario than any other alternative, the right-of-way land acquisition costs and relocation impacts could be substantial.

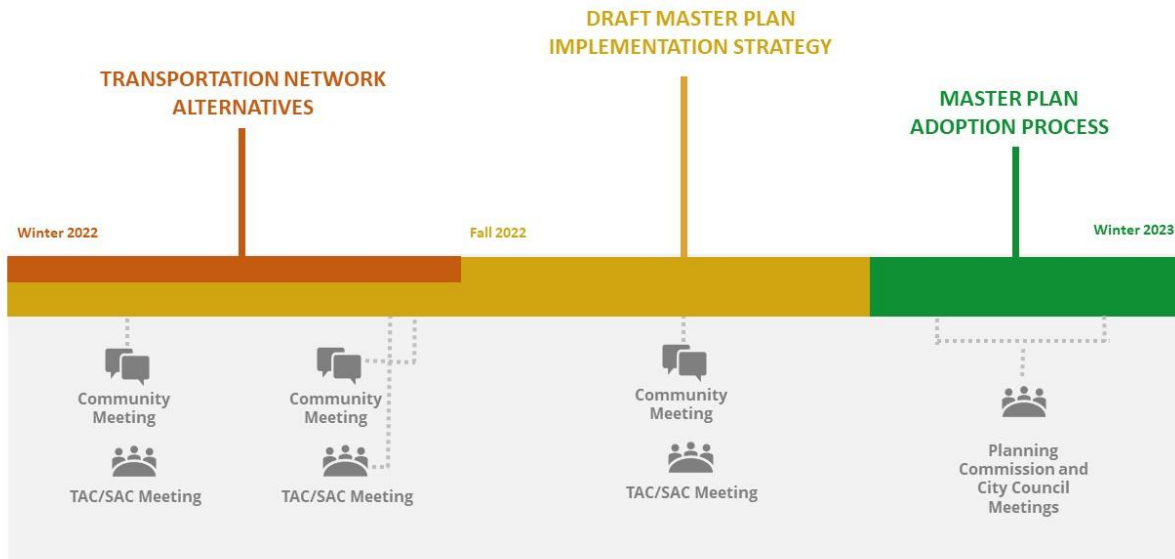
## Choosing a Preferred Alternative

It is important to note in identifying a preferred alternative to recognize that there is no perfect solution – all alternatives will have positive benefits and negative impacts. Existing plans, policies and the regulatory context were considered in evaluating trade-offs among alternatives, as was the magnitude of identified adverse impacts and positive benefits. A balance among the factors was sought so that no single category would outweigh another but that they are considered on the basis of their merits. For example, if too much importance is placed on not crossing riparian corridors, the master plan could end up with a series of long cul-de-sac neighborhoods where car use becomes almost a necessity and both transit and emergency vehicle access might be compromised. Utility services, especially sanitary sewer and potable water could become inefficient as well. It will also be important to remember that the selected east/west circulation alternative will need to accommodate all travel modes and must support and integrate with the broader transportation network that will ultimately serve Kingston Terrace. Emphasis will be on accommodating local circulation needs rather than regional through traffic.

Based on the results of this analysis, Alternative 2, with minor modifications to avoid existing homes, is the preferred east/west connection to be used to complete the Kingston Terrace Master Plan. There will be opportunities for additional comments as the master plan process continues. As work on the master plan process progresses, Alternative 2 may be adjusted to accommodate land use, environmental, and other factors. The recommendation that emerges from this process will be integrated as a fundamental element of the draft KTMP and *Transportation System Plan*. Ultimately, the master plan including transportation system recommendations will be incorporated into the City's *Comprehensive Plan*,

Transportation System Plan and Development Code per City Council approval, where community members will have another opportunity to provide testimony. A summary of the remaining KTMP process is shown in **Figure 9**.

**Figure 9. Kingston Terrace Master Plan Process**



**KING CITY MASTER PLAN**

# Appendix A

Land Use and Community Design Evaluation

**See separate document.**

# Appendix B

## Mobility Evaluation

**See separate document.**

# Appendix C

Evaluation of Public Services and Utilities

**See separate document.**



# Appendix D

## Natural Resources Evaluation

**See separate document.**

# Appendix E

## Evaluation of Cost and Implementation Effects

**See separate document.**