Appendix B: Gaps and Barriers Assessment
Gaps and Barriers Assessment
This section identifies general challenges for the development and implementation of a Neighborhood Bikeway network in Washington County. Each problem is followed by potential strategies to mitigate the identified gap or barrier. Where appropriate, information about the known constraint(s) of this strategy is provided.

Street Connectivity
A disconnected street pattern, common in suburban contexts, limits route options for all roadway users. Fewer route choices, due to lower street and intersection densities, means that there are decreased opportunities for individuals to use low-stress streets to reach their destination. In general, the routes that do connect to key destinations (e.g. commercial centers, schools, and parks) are on higher order streets with greater motor vehicle volumes and speeds. Traveling these higher order streets on foot or by bike does not feel safe or comfortable for many individuals, and therefore these streets are generally unsuitable for Neighborhood Bikeways.

A second symptom of a disconnected street network is that street connections are often indirect. Traveling to an adjacent neighborhood, a local park, or a commercial area may be a short distance “as the crow flies”, but taking the existing street network will lead to longer travel times due to out-of-direction travel. Since active transportation modes are self-powered, out-of-direction travel places a disproportionate burden on people walking and biking.
The disconnected street pattern in the suburban context creates unique challenges for Neighborhood Bikeway development.

**Strategies that improve connectivity**

**Accessways**

The disconnected street network in the suburban context can be augmented through the use of accessways. Accessways are often found at the ends of cul-de-sacs or other dead end streets and can provide an active transportation connection where no roadway exists. The majority of accessways in the county are publicly accessible and available for use though some may be overgrown. Due to absent or inadequate signing and marking, many accessways remain hidden from public view and are used mostly by nearby residents. Through better wayfinding, accessways could become an integral part of a future Neighborhood Bikeway network.

- *Constraint:* Existing accessways may be too narrow, not look formal, or be otherwise unpleasant to use. Actual access may be poor if curb ramps do not exist.
to allow bicyclists and other users to transition to street level. Though the County’s existing guidance for accessways provides width, landscaping, lighting, and curb ramp design recommendations, the existing accessways do not always conform to this guidance. Many accessways require design retrofits, or minor improvements, to provide an optimal walking and biking experience aligned with the goals of a Neighborhood Bikeway network.

**Paper Streets**

The County possesses a number of unimproved right-of-ways, commonly referred to as “paper streets,” that present a unique opportunity for enhanced connectivity of the local road network for bicycle and pedestrian travel. The condition of existing paper streets varies considerably; some include local resident developed paths (e.g. dirt paths, sawdust trails, gravel), while others remain unattended and overgrown. Paper streets that can fill in a gap in the bicycle and pedestrian network and connect users to important destinations, or regional trails, are important to consider for development as Neighborhood Bikeways. Since the County already possesses the necessary rights-of-way, no costly easement acquisitions are necessary to establish these connections.

- **Constraint:** Some adjacent property owners may be concerned about the development of a paper street into an active transportation connection. Public outreach will be necessary to alleviate concerns about vandalism, property values, and privacy.

- **Constraint:** Paper streets are planned street developments or street extensions. Their development into a facility that only serves active transportation users could have implications at the county level for both transportation planning and maintenance.

**Trails**

There are a number of regional, local, and community trails in the county that can be incorporated into the Neighborhood Bikeway network. Trails provide a low-stress active transportation environment that is attractive to Neighborhood Bikeway users. Wayfinding, enhanced crossing locations, and ADA accessible transitions to trails from on-street bikeways are necessary to accommodate all pedestrians and bicyclists.

- **Constraint:** Washington County’s Land Use and Transportation Department does not manage the maintenance and development of trails. Coordination with parks districts and/or local jurisdictions’ parks departments would be required to adopt existing/planned trails into the Neighborhood Bikeway network.

- **Constraint:** Retrofits may be necessary for trails that have been identified as potential Neighborhood Bikeway links where the existing design does not meet the minimum multi-use off-street path standards outlined in the Washington County Bicycle Design Toolkit. Many existing trails may be unpaved and of insufficient width to comfortably accommodate bicyclists and pedestrians.
**Underutilized Collector Roadways**

In general, Collector roadways provide more direct connections than Local or Neighborhood streets. In Washington County there are a number of Collector roadways that do not carry high volumes of motor vehicle traffic and where speeds are relatively low. With appropriate traffic calming, pavement markings, and signage, these streets are potential Neighborhood Bikeway routes. The process outlined in the ‘Neighborhood Bikeway Routing’ Chapter will help identify these streets.

**Active Transportation Connections and Transitions**

Where active transportation facilities exist, such as on-street bikeways and trails, it is sometimes hard to see from the end of one segment to the beginning of the next. Lack of clear directional cues and continuous routes decreases the overall usability of the network. People walking and biking are likely to get confused, choose a suboptimal travel route, or both. Moreover, where routes terminate prematurely, or without warning, and fail to direct users to the next leg of their route, fewer individuals will choose to walk or bike.

**Strategies to Improve Navigation**

**Wayfinding**

The intent of wayfinding is to help active transportation users navigate turns and transitions between facilities along the designated route. A Neighborhood Bikeway is not necessarily always on-street. Some routes may connect with a multi-use path through a park and return on the other side to a low-stress local street. In other instances it may be necessary to route active transportation users onto a more protected bikeway, such as a cycle track or buffered bike lane, where the Neighborhood Bikeway is forced to utilize a connection on a higher order street. To improve the legibility of the network, wayfinding signage and pavement markings should be used at all decision points along a route and locations where a transition between two different facilities occurs.

- **Constraint**: Sign clutter, where many signs are in close proximity, can have the effect of hiding important information from users. This occurs because the human eye becomes overwhelmed by the surplus of information and, as a result, retains none of it. Pavement markings are a good alternative strategy for circumventing this issue. Especially for bicyclists, who tend to ride with their eyes scanning the roadway surface for potential hazards, the use of pavement markings to communicate changes in the route is quite effective.
Inconsistency between Jurisdictions
Active transportation connection problems are also exacerbated by inconsistencies between local jurisdictions related to bikeway design, signage, maintenance, and routing. Users are unlikely to notice when they cross a jurisdictional boundary, but could become confused if the transition is not seamless.

Strategies for a Seamless User Experience across Jurisdictions

Trainings
Close coordination between County planning staff and local jurisdictions for the planning and implementation of active transportation facilities will help alleviate problems of inconsistency. The Washington County Bicycle Design Toolkit specifies the preferred bikeway terminology and design guidance for most bikeway facilities and treatments in the County. A county-led ‘Bicycle Design Toolkit’ training with local jurisdictions would make existing planning efforts at the local level transparent and give all practitioners an opportunity to understand the existing framework provided in the toolkit.

Facility Selection, Signage and Maintenance Standard Practices
Close coordination between County and local agency Public Works and Engineering departments could lead to collaborative strategic decisions about how to choose and maintain new and existing bikeway facilities. There may also be cost savings advantages to working together on contract and procurement efforts for maintenance and signs.

Database Standards
Standards that govern the development and maintenance of an ArcGIS active transportation network geodatabase at each local jurisdiction would also be an asset for the County. If all jurisdictions are collecting the same roadway information and classifying it using the same terminology, it will be easier to compile this information for benchmarking progress, making routing decisions or updating the inventory.

Lack of Wayfinding
Wayfinding signage provides active transportation users with valuable travel information, including direction, travel distance, and often estimated travel time. Signs help people reach destinations via optimal routes, with minimal uncertainty. The lack of wayfinding in Washington County limits the number of people who know how to access local destinations (e.g. parks, schools, and commercial centers) using low-stress routes, trails, and on-street bikeways, where they exist.

Strategy
Develop Wayfinding Standards
Wayfinding is one of the most critical components of a Neighborhood Bikeway system. The County possesses general design guidance about the use of wayfinding signage in the Bicycle Design Toolkit, but the development of specific language governing the design and placement of wayfinding signs and pavement markings would be an asset for the
Neighborhood Bikeway network. Wayfinding helps break down barriers to using active transportation by providing useful information to individuals on route choices, estimated travel time, and distance. By eliminating much of the “guess work” out of traveling by foot, or by bike, choosing either mode for utilitarian trips is made easier. Detailed information on wayfinding standards and best practices is found in the NACTO Urban Bikeway Design Guide and the IBPI Bicycle Boulevard Planning and Design Guidebook.

The use of wayfinding as a branding tool is also an important consideration. Establishing a unique style of wayfinding signage that will clearly differentiate Washington County’s Neighborhood Bikeways from other kinds of facilities will improve the visibility of the network as a whole. Unique branding will also help users navigate transitions between facilities better. For example, if an on-street Neighborhood Bikeway transitions to an existing multi-use path the path may already have a sign identifying it as such. However, a second sign of a differing color and/or shape will allow users to quickly identify the route as being part of the Neighborhood Bikeway network. The unique branding allows existing facilities to more easily serve a dual purpose. The FHWA will allow for experimentation with bicycle wayfinding signage if an application is submitted and the new device is evaluated for its performance.

- **Constraint:** The Oregon Supplement to the MUTCD specifies the design dimensions, color, and information that bicycle wayfinding signage should include. If an FHWA request to experiment with new wayfinding is not filed, the guidance in the Oregon MUTCD must be used.

- **Constraint:** The Neighborhood Bikeway corridor should be long enough to warrant having its own unique name/identity.

**Lack of Bike Routes to Major Employers and Transit Stations**

The lack of low-stress walking and biking routes connecting residents to local employers and transit facilities reduces the likelihood of people in Washington County using active transportation for their work commute trip.

**Strategy for connecting Neighborhood Bikeways to Employment and Transit**

**Routing Analysis**

Major employers and transit centers should be ranked appropriately as active transportation trip attractors during the Neighborhood Bikeway routing analysis. This will help to prioritize the development of Neighborhood Bikeway routes that connect individuals to these destinations.

**Lack of Knowledge about Active Transportation Routes**

Among the public, there is not a high level of awareness of existing local on-street active transportation connections, trail connections, or the length of time required to walk or bike between typical origins and destinations.
Strategies for Increasing Awareness of Active Transportation

Marketing Campaign

Actively marketing the active transportation network, not just Neighborhood Bikeways, will help raise awareness of walking and bicycling in the county. See the ‘Marketing and Branding’ chapter for more detailed information on marketing strategies.

Wayfinding Signage

A uniquely branded wayfinding system can be attractive to users and also convey to drivers that they are on a street where people walking and bicycling are a priority. See ‘Develop Wayfinding Standards’ above.

Existing Bikeways Do Not Encourage “Interested, but Concerned”

The “Interested, but Concerned” bike user includes a wide range of people of all ages who enjoy bicycling occasionally, but may only ride on multi-use paths, protected on-street facilities, or low traffic local streets. The majority of the population falls into this category. The focus on bikeway development in Washington County has historically been oriented toward bike lanes on major roadways. These facilities are not comfortable for the types of users that Washington County hopes to encourage to travel on foot, or by bike, more frequently.

Strategies for Attracting All User Types

Neighborhood Bikeway Development

There are many roads in Washington County that can be optimized to serve bicyclists with minimal improvements. The development of a network of low-stress facilities that utilize low traffic volume and low speed local streets, existing multi-use paths and accessways will allow a greater number of people to comfortably choose walking and biking to meet their travel needs.

Protected Bikeway Development

Protected bikeways, such as cycle tracks and buffered bike lanes, increase the physical space between motor vehicle traffic and bicyclists. These facilities appeal to a wider range of bicycle users than a conventional bike lane. For Neighborhood Bikeways to be continuous routes it will sometimes be necessary to route users for a short time onto streets with higher volumes and speeds. Where this condition occurs a protected bikeway should be considered, even if there is an existing bike lane or shoulder bikeway. Special emphasis should be placed on safely getting bicyclists across major roadways (see ‘Neighborhood Bikeway Tools’ for a more detailed discussion of intersection crossings).
User Perceived Safety Barriers
Walking and biking, in any land use context, may be perceived as unsafe or uncomfortable by potential users. Most often these perceived safety barriers are related to the proximity to, or presence of motor vehicles. A lack of marked crossings across major roadways is a major barrier affecting both pedestrians and bicyclists. Similarly, the amount of space, or buffer, between walking and biking facilities and fast-moving motor vehicle traffic can have a significant impact on the level of comfort people feel —more separation equates to increased comfort. Concern about personal safety, in terms of criminal activity and the threat of collisions with motor vehicles, is another cited reason to eschew active transportation.

Strategies to Address User Concerns about Safety
Public Outreach

Many of the personal safety concerns that people have about choosing walking and biking for transportation may be adequately addressed during a public outreach process. Significant public outreach will be part of any Neighborhood Bikeway implementation project and residents, neighbors, and any other concerned citizens will have the opportunity to discuss safety issues. On a larger scale, increased marketing of low-stress bikeways will help to alleviate general fears and skepticism about using active transportation. The ‘Marketing and Branding’ chapter provides additional detail about marketing the Neighborhood Bikeway network.

Low-Stress Bikeway Development

Streets with low traffic volumes and speeds are pleasant places to walk and bike. As more streets are developed into comfortable Neighborhood Bikeways, the user experience will improve.

Crossings of Major Streets
Even with marked crossings, some roads feel too uncomfortable for the average user to cross on foot or by bike. For example, in Washington County, pedestrians and bicyclists must sometimes face crossing 5-lane arterials devoid of features, such as mid-block crossings, median refuge islands or rectangular rapid flash beacons. It is inevitable that Neighborhood Bikeways will need to cross these same roadways.

Strategies to Improve Crossings
Identify Difficult Intersections

Where proposed Neighborhood Bikeways cross major roadways these intersections should be slated for crossing enhancements. The ArcGIS Network Routing model that is
described in the ‘Neighborhood Bikeway Routing’ chapter will help identify these intersections.

Utilize Existing Crossing Design Guidance

Both the Washington County Bicycle Facility Design Toolkit and the Mid-Block Crossing Policy can help identify the specific design needs of the intersection to make it comfortable for active transportation users.

Natural Waterways/Wetlands

Where bridge connections across waterways and wetland areas do not exist, the street network will either terminate or circumvent the area, which may cause out-of-direction travel for active transportation users.

Strategies for Crossing Waterways

Undercrossings/Overcrossings

Bicycle and pedestrian bridges can be developed to connect Neighborhood Bikeways across natural waterway and wetland barriers.

- **Constraint**: Overcrossings are often prohibitively expensive.Securing funds for their development can be a long term challenge.

Develop Active Transportation Connections

Active transportation facilities are less impactful on the environment than a typical roadway. In wetland areas it may be possible to develop a raised multi-use path or other environmentally sensitive facility to provide a more direct connection.

- **Constraint**: Development in wetlands triggers many rules and regulations that will need to be carefully addressed throughout the planning and implementation of a facility.

Freeways, Highways, and Railroads

Washington County is bifurcated by several major highways. In general, low-traffic, low-speed streets do not cross highways, which reduces the availability of through-streets. Improving connectivity with the development of additional at-grade crossings can also be challenging because state highways are governed by ODOT and any proposed changes, such as signals or crossings, must be approved at the state level.

Railroads present two challenges to the development of a Neighborhood Bikeway network—limited access and user safety. Similar to highways, most railroad crossings are provided on higher order streets that may not be suitable for Neighborhood Bikeway development. Improving connectivity by adding additional at-grade crossing locations is seldom an option either. Railroads are almost always governed by an outside authority and any proposed changes that would affect rail operations are at their discretion.
Secondly, railroad tracks are frequently the cause of bicycle crashes not involving vehicles, as inexperienced riders can easily get a wheel trapped in the gap between the rail and the roadway surface, or stumble over uneven pavement surfaces. In addition, the small number of legal railroad crossings, such as in the vicinity of Tualatin Valley Highway, can be a barrier for access to the transit and bicycle networks.

**Strategies for Crossing Highways and Rail**

**Signing and Marking at RR Crossings**

Signage and pavement markings are commonly used to alert bicyclists to cross railroad tracks at perpendicular angles, even when the maneuver is inconvenient. Where Neighborhood Bikeways cross railroad tracks, steps should be taken to sign and mark these areas appropriately.

**Undercrossings/Overcrossings**

Bicycle and pedestrian bridges or undercrossings can be developed to connect Neighborhood Bikeways when an on-street protected bikeway is not feasible, or is undesirable. Such bridges could be attractions on their own and serve to heighten awareness of the active transportation network across the county.

*Constraint:* Undercrossings and overcrossings are expensive and securing funds for their development could be a long-term challenge.

**Protected Bikeway Development**

At some locations it may be possible to create a protected bikeway that can get active transportation users across the barrier. A cycle track or buffered bike lane can be comfortable and attractive to the average Neighborhood Bikeway user and should be considered whenever the Neighborhood Bikeway must take advantage of a higher volume street to cross a highway.

**Eliminate the Gap between Rail and Road Surface**

There are existing materials on the market that can fill in the gap between the rails and the roadway surface in a manner that does not impact low-speed rail function and that creates a safer environment for bicyclists. This rubber insert maintains a height consistent with roadway grade and then depresses under the weight of a passing train—returning to its original shape once the train has passed.

*Constraint:* Rubber flangeway filler is not available in a form that can be used on corridors with higher speed rail function needs

**Traffic Control at Intersections**

Repeated “starting and stopping” impacts bicyclists more than individuals traveling by motor vehicle because of the energy it takes to get rolling again. Travel that is self-powered is more efficient and pleasurable when the amount of stop time along a route is minimal. For this reason, traffic control at intersections is a vital element of planning Neighborhood Bikeways. Bikeway routes on local streets that have frequent stop signs...
can lead to bicyclist non-compliance because the constant stopping and starting is cumbersome. On local streets where the right-of-way is not designated by a traffic control device, it can be confusing for all roadway users.

At signalized intersections, a bicycle push button, loop detector, or video detector should always be available to help trigger a green phase for bicyclists or pedestrians. Where this condition is not met, bicyclist compliance with the traffic control will be much lower. For pedestrians at signalized intersections, the duration of time that an individual must wait before receiving a ‘walk’ signal and the amount of time that the ‘walk’ signal is lit impact the comfort of the pedestrian crossing. Shorter wait times, shorter signal cycles, and ample pedestrian green and clearance time to cross the street help improve the pedestrian and bicyclist experience.

**Strategy: Improve User Experience and Compliance with Traffic Control Using Neighborhood Bikeway Intersection Best Practices**

The ‘Neighborhood Bikeway Tools’ Chapter provides more details about the intersection design needs along Neighborhood Bikeways. The Washington County Bicycle Design Toolkit also provides design guidance to help make intersections function better for bicyclists.

**Challenging Topography**

Areas that have steep terrain (10% or above) can be particularly onerous for many utilitarian bicyclists. The Tualatin Mountains and the vicinity of Cooper Mountain are two locations with challenging topography. There is little to be done to reduce grades.

**Strategy: Identify Alternate Routes**

When planning routes in these areas, efforts should be made to identify through streets that have the most gradual grades, while still connecting to important destinations. This may require some out-of-direction travel for bicyclists.

**Traffic Calming Development**

The current process for developing traffic calming on Washington County streets is handled via the Neighborhood Streets Program (NSP). This program allows residents to apply to have their street evaluated for potential traffic calming enhancements. However, this process relies on votes by the neighborhood to implement physical roadway traffic calming elements. This process could conflict with the Neighborhood Bikeway development process.

**Strategy: New Traffic Calming Development Process**

Create new thresholds and a new process for implementation of traffic calming for Neighborhood Bikeways that is different from the NSP. Traffic calming treatments that are available through the Neighborhood Bikeway Plan should be consistent with the treatments in the NSP and policy agreements with Tualatin Valley Fire and Rescue.
Impact to Travel Patterns
Driver preference or traffic calming strategies may cause motorists to change their routes following a Neighborhood Bikeway installation. Though the intent of a Neighborhood Bikeway is to improve the environment to support active transportation, volume reduction strategies in suburban contexts can significantly impact motor vehicle operations. The lower street connectivity in Washington County means that all roadway users have fewer route choices. Eliminating access for motor vehicles on a designated route could cause some motorists to travel a significant distance before reaching an alternative street that can get them to their destination. Conversely, on a grid street network, restricting access to a corridor will only cause the motorist to travel a city block before returning to a route that can get them to their destination.

**Strategy to Minimize Motor Vehicle Diversion**

**Engineering Analysis**
Traffic engineers should examine the potential traffic impact to motor vehicles on proposed routes and nearby routes where plans identify possible restrictions of motor vehicle access.

- **Constraint:** Making it difficult to restrict motor vehicle access may make it more difficult to achieve appropriate traffic volume reductions on Neighborhood Bikeways.

The matrices below summarize the identified gaps and barriers, along with the strategies that may be used to mitigate these issues.
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<th>CHALLENGES STRATEGIES</th>
<th>Street Connectivity</th>
<th>Active Transportation Connections and Transitions</th>
<th>Inconsistency Between Jurisdictions</th>
<th>Lack of Wayfinding</th>
<th>Lack of Bike Routes to Major Employers and Transit Stations</th>
<th>Lack of Knowledge about Active Transportation Routes</th>
<th>Existing Bikeway Facilities Do Not Encourage Type C Users</th>
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<tr>
<td>Accessways</td>
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<td>Freeways, Highways, and Railroads</td>
<td>Traffic Control at Intersections</td>
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Appendix C: Routing Methodology
Neighborhood bikeway routing in the suburban context has different requirements than in urban areas because of the relative lack of through streets with low speeds and traffic volumes. Washington County approached routing neighborhood bikeways based on best practices and a network routing methodology modified for use in the suburban context. Best practices indicate that a successful neighborhood bikeway in Washington County should generally:

- Be logical and devoid of excessive out-of-direction travel. However, neighborhood bikeway routes should always sacrifice speed and directness for a more comfortable experience.
- Avoid higher speed and volume roads wherever possible, and where jogs in the route require riding on higher order streets, protected bikeway facilities should be required.
- Connect people to the places they want to go (e.g., libraries, schools, parks, cultural centers, etc.).
- Complement and provide a seamless connection to existing on-street and off-street bikeways, improving the overall usability of the bikeway network for transportation purposes.

Based on these best practices, the County employed the following methodology for identifying a neighborhood bikeway network.

In Step 1, the County identified and ranked community destinations that would attract bicycle trips.

In Step 2, the County identified examined relevant attributes for neighborhood bikeway routing using maps and GIS tools. These attributes include road classifications, bike networks in neighboring jurisdictions, accessways and paper streets, traffic calming features, mid-block crossings, transit routes, traffic signals and, as in step 1, possible destinations.

In Step 3, the County identified potential routes by evaluating relevant attributes, network gaps, and community input. Using these attributes, possible routes were identified that were judged to connect residents with destinations and the wider bicycle network. At least two neighborhood bikeways were included in each sub-area except Area 1.

In Step 4, the County evaluated potential neighborhood bikeways using several factors and using GIS analysis. The County actively solicited initial feedback on the routes from the TAC members, County staff, and other agencies. Changes to the proposed routes based on their feedback were made before presenting the routes to the public. The public was asked to review the routes, which were posted on the County’s website for comment. In addition, bikeway network maps were presented to Citizen Participation Organizations (CPOs) and other community groups. Feedback was analyzed and used to refine the proposed neighborhood bikeway routes to the recommended network.
Step 1: Identify and Rank Attractors/Destinations
A good neighborhood bikeway network connects people to the places they want to go. Network planning in an urban area might focus more on the density of bikeways; however, in the suburban context, the focus is on the ability of the facility to move active transportation users between the places they would like to go. A list of community destinations was generated based on common trip destinations for residents. The list was narrowed down to 16 destination types that would be more likely trip attractions for bicyclists. Since some destinations attract more trips than others, a weighting system was devised.

Rank Key Attractors/Destinations
A good neighborhood bikeway network connects people to the places they want to go. Where neighborhood bikeway planning in an urban area might focus more on the density of bikeways, in the suburban context the focus is on the ability of the facility to move active transportation users between the places they would like to go.

Some attractors strongly influence the number of active transportation trips. To help model the effect that each type of attractor has on potential biking and walking trips, destinations can be assigned a factor score based on relative potential to generate active transportation trips. The individual factors can be modeled to demonstrate the “pull” of areas with high and low concentrations of attractors. In general, neighborhood parks, schools, cultural centers, and libraries have the greatest attraction for users of the bikeway network. By identifying and ranking the different attractors in the county, neighborhood bikeway routes can be identified and prioritized based on the level of access they provide.

Possible destinations were identified based on four sources:
1. Metro’s Active Transportation Plan, which examines regional destinations.¹
2. A Portland-based and peer-reviewed study of neighborhood bikeability and local destinations.²
3. Destinations identified in a suitability analysis as part of Washington County’s Bicycle and Pedestrian Improvement Prioritization Project, conducted in 2012.³
4. 2012 North American Industry Classification System (NAICS) codes, which provides classifications and definitions for all business establishments.⁴

¹ Metro Active Transportation Plan, Existing Conditions, Findings and Opportunities Report, August 2012.
A list was narrowed down to 16 destination types that would be likely trip attractions for neighborhood bikeway users. Since some destinations attract more trips than others, a weighting system was devised. We surveyed TAC members about the relative strength of different destinations in attracting trips on neighborhood bikeways. For each destination, respondents were asked to rate the amount of bike trips likely to be made using neighborhood bikeways on a scale from “none” to “a lot.” Twenty-nine responses were received and roughly one-third (10) of these were from TAC members. The figure below summarizes responses among both TAC and non-TAC members.

<table>
<thead>
<tr>
<th>Destination/NAICS Title</th>
<th>NAICS Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature Parks and Other Similar Institutions</td>
<td>71219</td>
</tr>
<tr>
<td>Elementary and Secondary Schools</td>
<td>61111</td>
</tr>
<tr>
<td>Colleges, Universities, and Professional Schools</td>
<td>61131</td>
</tr>
<tr>
<td>Libraries and Archives</td>
<td>51912</td>
</tr>
<tr>
<td>Grocery Stores</td>
<td>4451</td>
</tr>
<tr>
<td>Light Rail Stops and Transit Centers</td>
<td>NA</td>
</tr>
<tr>
<td>Employment Sites with &gt;300 Employees</td>
<td>NA</td>
</tr>
<tr>
<td>Shopping Centers</td>
<td>NA</td>
</tr>
<tr>
<td>Specialty Food Stores</td>
<td>4452</td>
</tr>
<tr>
<td>General Merchandise Store</td>
<td>452</td>
</tr>
<tr>
<td>Fitness and Recreational Sports Centers</td>
<td>713940</td>
</tr>
<tr>
<td>Restaurants and Other Eating Places</td>
<td>72251</td>
</tr>
<tr>
<td>Barber Shops</td>
<td>812111</td>
</tr>
<tr>
<td>Beauty Salons</td>
<td>812112</td>
</tr>
<tr>
<td>Commercial Banking</td>
<td>52211</td>
</tr>
<tr>
<td>Savings Institutions</td>
<td>52212</td>
</tr>
<tr>
<td>Credit Unions</td>
<td>52213</td>
</tr>
<tr>
<td>Postal Service</td>
<td>4911</td>
</tr>
<tr>
<td>Drinking Places (Alcoholic Beverages)</td>
<td>7224</td>
</tr>
<tr>
<td>Motion Picture Theaters (except Drive-Ins)</td>
<td>512131</td>
</tr>
</tbody>
</table>
Destination ranking survey results
Based on the survey results, a weighting system was applied that accounts for the level attractiveness of each destination type. The table below shows this scheme.

### Final destination list and weighting scheme

<table>
<thead>
<tr>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parks</td>
<td>Shopping centers</td>
<td>Bars &amp; pubs</td>
</tr>
<tr>
<td>Light rail stops + transit</td>
<td>Fitness centers</td>
<td>Barber shops</td>
</tr>
<tr>
<td>centers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schools</td>
<td>Restaurants</td>
<td>Beauty salons</td>
</tr>
<tr>
<td>Libraries</td>
<td>Banks</td>
<td>General merchandise</td>
</tr>
<tr>
<td>Workplaces &gt; 300 employees</td>
<td>Savings institutions</td>
<td>Movie theaters</td>
</tr>
<tr>
<td>Colleges + universities</td>
<td>Credit unions</td>
<td></td>
</tr>
<tr>
<td>Specialty food stores</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A heat map of these destinations, based on their location and weighting, is shown in Appendix A.

### Step 2: Map Existing Network

In Step 2, the County examined relevant attributes, network gaps, and community input for neighborhood bikeway routing using maps and GIS tools. These attributes include:
- Road classifications
- Bikeways in neighboring jurisdictions
- Accessways
- Unimproved road right-of-way (paper streets)
- Multi-use trails
- Traffic calming features
- Traffic signals and mid-block crossings
- Transit routes
- Community-identified routes
- Existing inventory/gaps in bicycle network
- Roadway slope/grade

A description of candidate streets and non-candidate streets follows.

### Candidate Streets

**Local and Neighborhood Streets**

In general, roadways that have been classified as a Local or Neighborhood street are all candidates for neighborhood bikeway treatment. Some of the streets may already be identified as existing or proposed neighborhood bikeways by a local jurisdiction. All streets that have been identified by local jurisdictions, as well as those local streets that serve important destinations and fill gaps, should be included in the pool of potential neighborhood bikeway routes.
Collector streets with traffic volumes near 3,000 vpd and 30 mph or less
The County and other jurisdictions regularly collect motor vehicle traffic speed and
volume data for Collector and Arterial roadways. Not every roadway will have speed and
volume data associated with it, but this information is helpful when available. For
example, this data is also collected on Local and Neighborhood roadways when a
request is submitted for traffic calming. Collector streets with traffic volumes near 3,000
vpd and speeds of 30 mph or less should be added to the pool of potential
neighborhood bikeway routes. These streets are often more direct than adjacent Local
streets. They also have the potential to be traffic calmed to create a comfortable active
transportation environment.

Self-Identified Bicycling Routes
The County collected data on routes that bicyclists say they currently use, or would like
to see improved. Neighborhood routes were collected using an online mapping tool
from October to December 2013. Participants visiting the site were able to draw lines on
a map to identify routes, as well as drop notes at locations they have identified as
opportunities or constraints. The app was publicized via the county’s email list and
bike/ped webpage, and two major local websites (BikePortland.org and
OregonLive.com) published stories on the effort. 513 routes and 148 comments were
recorded by the app over the three month period.

In addition, comments on the BikePortland.org story were reviewed. Comments
included:
  o “There are lots of great paths through the cul-de-sacs. Often they’re quite
narrow, frequently unkempt, and poorly lit. Hopefully some more lights, better
signs, and perhaps a bit better tree trimming will help more people find them.” -
Andrew Seger September 10, 2013
  o “Inevitably in Beaverton, Tigard or points west, the residential routes dump you
on a major street and you are trapped... We spend more time on our phones
trying to find a more pleasant way to get places... because of the cul-de-sac
nature of the neighborhoods then we do riding... It reminds me of what I grew
up in, but I was a teenager then and had time to investigate every little turn and
swerve to find the safe escape from one neighborhood to another.” - Terry D
September 10, 2013

County GIS staff processed the app data to use as one of several sources of info in selecting and prioritizing potential neighborhood bikeway routes. Routes entered on arterials or outside the study boundaries and other obvious non-candidates for neighborhood bikeways were filtered out. Routes and comments were used to better understand how which local and neighborhood streets people currently ride on and issues with particular sites.

**Existing Accessways and Paper Streets**
Accessways and paper streets are unique assets. All known accessways and paper streets that help fill a gap, or provide a potential connection to a key destination should be added to the pool of potential neighborhood bikeway routes.

**Existing Multi-Use Trails**
There are a number of local and regional multi-use paths in Washington County that serve both pedestrians and bicyclists. These facilities provide recreational opportunities and also serve a transportation function. Where bicycle supportive trails exist, or where regional bike parkways are planned as off-street trails (Metro ATP), efforts should be made to incorporate these facilities into the larger neighborhood bikeway network. This may be as simple as adding unique neighborhood bikeway signage to the off-street facility and providing smooth and legible connections from the on-street network.

**Existing Traffic Calmed Streets**
The Neighborhood Streets Program (NSP) works with neighborhoods to improve roadway conditions on local streets through the use of traffic calming. To take advantage of existing resources, these streets should be added to the pool of potential neighborhood bikeways wherever they exist.
Emergency Vehicle Routes
The Tualatin Valley Fire and Rescue (TVFR) have mapped all emergency services routes in the County. Where an identified neighborhood bikeway route is present on one of these routes TVFR should be consulted. This will help avoid creating adverse impacts to their operations.

Non-Candidate Streets
Steep Grades
Grade can be used as a filter to reduce the number of neighborhood bikeway routes under consideration. As mentioned in the ‘Gaps and Barriers’ section, topography is a serious constraint on utilitarian bicycling. The County has undertaken a slope analysis of its Local and Neighborhood streets. Sections of identified routes that have grades of 10% or greater should be eliminated and alternative route segments should be identified.

Park Pathways
Most paths in parks are not candidates for multi-use trails. Unless trails have been, or are planned to be, improved to accommodate bicyclists these facilities should not be included as potential routes.

The map on the following page is an example of one of the maps generated for use in routing. It highlights destinations and destination densities, road grades, trails and accessways within sub-areas.
Step 3: Identify Potential Neighborhood Bikeways

In Step 3, potential routes were identified that were judged to connect residents with destinations and the wider bicycle network. Along with the criteria for “candidate streets” described above, the following guidelines, organized by general themes of directness, connectivity, and safety, were used to identify routes:

**Directness**
- Make routes reasonably continuous, minimizing jogs
- Acknowledge that there are many great local streets to ride on but not all will be neighborhood bikeways;
- Recognize that not all neighborhood bikeways will get community members to the front door of all their destinations;
- Reference potential routes with the routes identified by the public via a web application;
- Utilize accessways when needed but if equally convenient road is available, use the road;
- Identify potentially useful accessway locations.

**Connectivity**
- Prioritize connections to destinations rather than spacing to geographic area equally;
- Connect routes to existing multi-use trails, bike lanes, and low-traffic through streets in the County and neighboring jurisdictions;
- Avoid close parallel connections along regional trails;
- Connect routes from adjacent subareas when possible;
- If a neighborhood bikeway route is not possible but destinations need to be served, consider an Enhanced Bikeway on nearby arterial/collector streets.
Neighborhood bikeway routes should take advantage of existing facilities and connect individuals to key destinations (Source: NACTO Urban Bikeway Design Guide)

**Comfort and Safety**
- Prioritize comfort and safety over directness
- Use local and neighborhood streets before choosing a collector; If choosing a collector, select routes with low traffic volumes (3,000 vehicles per day or less) and low traffic speeds (25 mph or less);
- Take advantage of streets with existing traffic calming
- Avoid or minimize steep hills/grades
- Use signalized crossings where possible, but consider that these locations may need upgrades;
- Suggest new crossing locations where appropriate;
- Avoid truck and bus routes;
- Avoid roads with existing bike lanes.

With data, criteria, and guidelines at hand, study area maps were reviewed and potential routes were discussed. The process of selecting routes was iterative; initial draft maps of potential routes were created for each sub-area, followed by second drafts.

Large portions of routes were examined using Google Maps and the County’s Asset Browser, which provide street level photos, aerial views, and other information about the transportation network. Taxlot maps were consulted to understand where current property boundaries and easements may impact sections of potential routes. In addition, site visits were made to examine locations where sufficient information was not available. County staff traveled by bike and car to document conditions in
accessways, parking lots, and in other locations along routes. Information obtained was used to adjust route locations and understand where improvements are necessary.

All together, at least two neighborhood bikeways were included in each sub-area except Area 1. Many of these routes connect across sub-area boundaries. Proposed routes are presented in Appendix A.

**Step 4: Assess and Refine Potential Neighborhood Bikeways**

In Step 4, the County evaluated potential neighborhood bikeways using several factors and using GIS analysis. The County actively solicited initial feedback on the routes from the TAC members, County staff, and other agencies. Changes to the proposed routes based on their feedback were made before presenting the routes to the public.

The public was asked to review the routes, which were posted on the County’s website for comment using a GIS-based mapping app. Over 100 comments were received regarding specific locations, overall routes, and suggestions for additional routes. Neighborhood bikeway network maps were also presented to Citizen Participation Organizations (CPOs) and other community groups. The Bicycle Transportation Alliance, a non-profit local advocacy group, assisted the County by asking its members to test ride the routes and provide comments. The comments were used to add, remove and change proposed routes.

Finally, County staff checked all proposed neighborhood bikeways and route alternatives by bike. This on-the-ground fieldwork was used for a final round of refinements to the proposed neighborhood bikeway routes.

The final proposed network includes 96 miles of neighborhood bikeways covering the majority of areas of Washington County.
Appendix D: Recommended Actions
Recommendations and Action Items:
The following recommendations and action items relate to public outreach and marketing, plan implementation, and project development. Most items are focused on near and mid-term actions the County may consider.

Public Outreach and Marketing
- Generate an information packet that answers the question “what is a neighborhood bikeway?” to be used at meetings, tabling events, and on the County’s website.
- Develop a marketing campaign to inform and educate the public about neighborhood bikeways and benefits of biking/walking. Ensure that the campaign reaches out to those with above average poverty, limited English proficiency, and higher levels of youth and the elderly.
- Explore partnerships to create neighborhood and county-wide bike/walk maps.

Plan Implementation
- Convene a committee, similar to the Minor Betterment Committee, to discuss route prioritization, funding mechanisms, and other key details.
- Explore opportunities for education of pertinent staff regarding neighborhood bikeway concept and potential neighborhood bikeway treatments.
- Identify a potential demonstration project.
- Gain more certainty about how different funding mechanisms will help build neighborhood bikeways.
- Identify a list of at least one neighborhood bikeway in each sub-area that would best serve current needs, based on usage, safety, social equity concerns.
- Identify neighborhood bikeway routes that leverage other upcoming projects such as mid-block crossings or trails.
- Look for opportunities to collect traffic data for proposed routes through other projects or efforts.
- Generate wayfinding signage content guidelines.
- Incorporate network map into TSP or other planning documents.
- Coordinate with cities to connect neighborhood bikeways across jurisdictional boundaries.
- Verify ownership status and conditions of accessways and paper streets.
- Compile list of route crossings of major streets for treatment analysis.

Project Development
- Engage partners in marketing efforts.
- Generate a list of potential resident concerns and responses.
- Expand the County’s website with info on current neighborhood bikeway projects.
Strategies and Route Prioritization

There are many ways to approach prioritizing neighborhood bikeways for implementation. The following describes some approach strategies that were discussed by the Technical Advisory Committee in the development of the concept plan.

Three broad strategies have been suggested for implementing the neighborhood bikeway network.

- **Approach A**: Construct all routes one sub-area at a time. This creates a completed network in specific neighborhoods making it highly usable for local bicyclists. More routes in an area increases their visibility, raising awareness of neighborhood bikeways among potential users. This approach concentrates resources in one area rather than spreading the benefit over a broader geographic area.
- **Approach B**: Construct one route in each of the sub-areas. This approach provides one project in each sub-area and introduces neighborhood bikeways throughout the county. The routes may not necessarily connect routes across sub-areas.
- **Approach C**: Construct routes that provide connectivity or length across several sub-areas. This approach would introduce some sub-areas to neighborhood bikeways while providing functionality for longer trips. The approach could also overcome barriers bicyclists find in their neighborhoods such as a major street crossing.

The TAC recommended a combination of approaches B and C, whereby the County would construct one route in each of the sub-areas with the goal of providing connectivity across several sub-areas. However, there was general agreement among TAC members that a follow-up committee should be established to discuss route prioritization as funding becomes available.

Upon selection of the best approach, there are a variety of ways to prioritize projects for implementation. Prioritization could be based on:

- Community request and/or level of public support
- Routes that leverage other upcoming projects in the area such as mid-block crossing or trails
- Serving schools with Safe Routes to School Action Plans
- Serving transit centers or stations
- Routes that don’t require the most expensive treatments (such as major street crossings or facility enhancements)
- Staff choice of a demonstration project based on estimated cost, feasibility and range of design treatments
- Routes that serve more walking, bicycling, transit dependent areas of the county
- Routes that serve areas with the most gaps or that lack bicycle facilities
- Funding or grant opportunities
In 2012, Washington County completed the Bicycle and Pedestrian Prioritization Project, which compiled an inventory of sidewalk and bicycle lane gaps on urban arterial and collector roadways within the county. This project identified areas where improvements would likely have the highest impact, considering the following factors:

**Land Use:** Population density, proximity to transit and other essential destinations like grocery stores, schools, senior housing and services, civic centers, major employment areas, colleges, hospitals, libraries and parks. A high score indicates multiple land uses within close proximity to each other.

**Street Network:** Density of streets serving an area. A high score indicates an area with a lower number of roads and intersections per square mile and therefore fewer route options for bicyclists and pedestrians.

**Safety:** Number of bicycle and pedestrian crashes, daily traffic volumes, and whether the road is a truck route. A high score indicates a road segment with a higher rate of crashes or daily traffic volumes and whether it is located on a truck route.

**Social Equity:** Areas with above average poverty, limited English proficiency, and higher numbers of children and the elderly. A high score indicates a higher number of potential users who are dependent on walking, biking, and transit for transportation.

The project engaged the community using a survey to weigh each of the prioritization factors. Survey results generated the following weighted factors: safety 36%, land use 30%, street network density 21% and social equity 13%. Existing gaps in the bicycle and pedestrian systems were scored in each of the four areas, and then multiplied by the weighted factors. From the weighted values a list of high priority needs was generated. The same factors can be considered in the prioritization of neighborhood bikeway projects, with alterations to better fit the context when necessary. Similar criteria are used in the process of selecting projects for the Minor Betterment Program and Urban Road Maintenance District Safety Improvement projects. The TAC recommended using similar criteria, which are simple and helpful for the public to understand the process and offer meaningful participation. There was general agreement from the TAC that a neighborhood bikeway route prioritization committee would add validity and transparency to the implementation process.
Appendix E: Project Development Process
Goals of Neighborhood Bikeways are to:
- Provide a network that is logical, easy to use, well marked, and distinctively signed.
- Provide bicyclists efficient and convenient access to desired destinations and connectivity to other bike facilities.
- Improve the comfort and safety of bicyclists of all ages and abilities.

Project Development
A project design will be completed prior to implementation of any neighborhood bikeways along the corridors identified in the Neighborhood Bikeway Plan. The purposes of the project design is to gather technical data, work directly with the adjacent property owners and surrounding community, verify the viability of the route as a neighborhood bikeway, and identify appropriate neighborhood bikeway treatments.

Draft General Project Development Outline

1) Identify Project Area: This would be based on previously decided approach and prioritization and may either be a route corridor or an area. The area may be refined based on a review of data and existing conditions.

2) Informational Mailing: Optional mailing to project area to provide introduction to neighborhood bikeway concept.

3) Data Collection-Existing Conditions: First step in project development, the data collection effort will be tailored to fit the unique conditions of the subject corridor.

4) Preliminary Project Design-Alternatives: During preliminary design, data and existing conditions will be analyzed to provide an assessment of the technical feasibility and understand the level to which traffic calming and/ or traffic diversion would be needed to achieve the desired conditions: low volumes, low speed, connectivity to destinations and other bicycle facilities.

5) Public Meeting #1: The first public meeting is an opportunity to introduce neighbors to the concept of neighborhood bikeways and the tools and treatments to maintain or achieve the desired characteristics. Treatment or route alternatives will be presented if applicable.

6) Refine Project Design: Based on community feedback and any additional data, design alternatives will be refined to a recommended project design.
7) Public Meeting #2: The community will be presented with the recommended design and schedule. Any additional concerns or questions about installation will be addressed.

8) Final Design: Design exceptions maybe required depending on design treatments.

9) Approval of County Engineer

10) Funding and Construction/Installation

11) Education and Marketing of Neighborhood Bikeway

12) Evaluation: Data collection, observations, and/or surveys to determine the acceptance and efficacy of installed neighborhood bikeway treatments, where applicable.

**Existing Conditions**
A field review and data will be conducted and analyzed to provide an assessment of the technical feasibility and to understand the level to which traffic calming and/or traffic diversion would be needed to achieve the desired conditions of a neighborhood bikeway.

- Existing and future land uses and zoning – particularly presence of schools
- Road Classification, Transit Route, Emergency Vehicle Route Classification
- Street cross-section(s) including dimensions of travel lanes, parking, sidewalks, etc.
- Existing network map
- Traffic control including traffic signals, stop signs (and orientation), posted speed limits, other signs
- Type and location of the existing traffic calming device
- Existing volumes data and turning movement counts at major intersections
- Speed data
- Any impediments to bicycle travel such as crossing a major arterial, odd intersection alignments, excessive stopping, and pavement surface issues.

An example of a worksheet for collecting and documenting data for a proposed route, from the City of Berkley, California is attached for information.

**Neighborhood Bikeway Design Treatments**
A variety of tools are available to achieve the desired characteristics of a neighborhood bikeway. The specific tools and treatments applied to a neighborhood bikeway will vary
with the unique conditions and context of each route. The treatments can be grouped into two primary categories – Basic treatments and route specific treatments. Basic treatments are used on all neighborhood bikeway routes. Route specific tools enhance bicycle travel and improve safety on the neighborhood bikeway and including intersection treatments, traffic calming and traffic reduction measures.

In general, treatments of any neighborhood bikeway may include:
- Signing and Pavement Markings (Basic Element)
- Intersection Treatments (Route Specific)
- Traffic Speed Management (Route Specific)
- Traffic Volume Management (Route Specific)

All of these items or a select few may be employed on a single corridor based upon the existing conditions of the street for bicycle travel. The combined impact of these elements is far greater than any single element alone. Additional descriptions, illustrations, and considerations regarding the tools and treatments are found in the Neighborhood Bikeway Treatment Toolkit.

During the design study, it will be determined whether or not the corridor is a transit, emergency route; or collector roadway and this determination may influence the design elements that are appropriate for the corridor.

**Public Involvement and Outreach**

The transition of a street into a neighborhood bikeway can change the appearance and function of the street. Residents and property owners along the route may be concerned about the resulting impact. During project development a public outreach process will be conducted that allows property owners on the route and the larger community to be informed and involved. The outreach can be customized to meet the needs of the project area but should occur once or twice and cover the following points.

- Educate the public on the concept and purpose of a neighborhood bikeway
- Share design treatments and alternatives
- Solicit input and comments
- Answer community concerns and questions

Optional outreach tools and approaches
- Small group workshop(s) with adjacent property owners;
- Public open house(s);
- Use of established neighborhood groups, bicycle advocacy groups, or other non-profit organizations that promote non-motorized travel to engage the public, reach their constituents, and advertise public meetings;
- Presentations at established neighborhood/school meetings;
- Walking or biking tour of corridor with residents;
• Door-to-door surveys to solicit input from property owners, including those who may not be inclined to participate in community meetings;
• Direct mailings to residents and businesses along or near the corridor;
• Post current information on a project website, and include contact information and/or solicit input directly on the website;
• Use of social media to advertize community meetings and/or website updates;
• Videos and other visualization or interactive materials to share user experience;
• Use of an interpreter for meeting flyers and at community meetings;

**Evaluation**

After the installation of a neighborhood bikeway additional data collection, observations, and/or surveys are useful to determine the acceptance and efficacy of the facility. The need and scope of any evaluation will vary with each project, and should be determined as early in the process as possible. For example, design treatments along a neighborhood bikeway may change traffic patterns for some residents, and may even require some out-of-direction travel as well. Local traffic patterns adapt to motor vehicle movement restrictions over time, and the adjacent property owners often value the resulting reduction in through traffic. However, traffic calming or movement restrictions along a neighborhood bikeway may induce traffic on adjacent parallel streets; these possible impacts should be evaluated post installation. Volumes, both bicycle and vehicle counts, are also desirable after installation. Surveys of user experience and awareness of the neighborhood bikeway could also be conducted. The evaluation information is valuable in the refinement of the program, public involvement, and design process.

**Additional Reference Resources:**

- Neighborhood Streets Program Policy and Procedure 2005
- TVFR Neighborhood Traffic Calming Measure Policy and Agreement
- Washington County Land Use and Transportation Public Involvement Guidelines for Transportation Planning, Programs and Projects
- Washington County Bicycle Facility Design Toolkit
- Neighborhood Bikeway Treatment Toolkit
| Location          | Issues/ Problem Areas to Resolve                                                                 | Possible Actions                                                                 |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| **Crossing Major Streets**                                                                                                                                |
| Dwight Way ADT=   | Major streets: Difficult for bikes to cross the street during peak hours.                                                                                | Help crossing needed, see Category E options.                                      |
| Ashby Avenue ADT= |                                                                                                                                                    |                                                                                  |
| **Travel Impeded by STOP Signs**                                                                                                                           |
| **STOP sign evaluation:**                                                                                                                                |
| Hillegass/Bowditch has ROW at none of the 12-intersections between Woolsey and Bancroft.                                                               |                                                                                     |
| Hillegass at:     | Potentially unwarranted STOP signs virtually every block impede bicyclists travel time                                                                 | If remove STOP signs for bicycle boulevard, replace with Category C or D options.  |
| Parker - 4-way    | ADT*: M                                                                                                                                             |                                                                                  |
| Derby - 4-way     |                                                                                                                                                    |                                                                                  |
| Stuart - 4-way    |                                                                                                                                                    |                                                                                  |
| Webster - 4-way   |                                                                                                                                                    |                                                                                  |
| Woolsey - 1-way SB|                                                                                                                                                    |                                                                                  |
| Bowditch at:      | Most likely warranted STOP sign on the bike boulevard.                                                                                             | Due to high traffic volume on cross street, Stop sign control may have to remain as is. |
| Bancroft – all-way| ADT*: M                                                                                                                                             |                                                                                  |
| Haste – 4-way     |                                                                                                                                                    |                                                                                  |
| Dwight Way – 2-way|                                                                                                                                                    |                                                                                  |
| Channing Way 4-way| Intersections with other bike boulevards                                                                                                               | Replace all-way and 2-way STOP sign control with mini-Roundabout.                 |
| Russell Street 2-way|                                                                                                                                                    |                                                                                  |
| **Other Bike Boulevard Issues**                                                                                                                           |
| Woolsey           | Diagonal diverter at Woolsey with STOP sign for only SB is confusing                                                                             | TBD                                                                                |
| Jogged intersection at Dwight Way | Jogged intersection at Dwight Way combined with one-way flow on Dwight Way presents problems for southbound bicyclists accessing Hillegass from Bowditch | TBD                                                                                |
| Hillegass at Webster | Two half barriers at /near Webster creates very little cross traffic                                                                          | TBD                                                                                |
| **Bicycle Accident History* - 9 accidents**                                                                                                                |
| Hillegass/Parker  | 2 bike accidents                                                                                                                                | TBD                                                                                |
| Bowditch/Channing | 3 bike accidents                                                                                                                                |                                                                                  |
| **School Zones**  | none                                                                                                                                            |                                                                                  |

ADT = Average Daily Traffic Volume, (ADT)
L, M, H = Relative estimate of ADT by City staff: L=<500, M=500-1000, H=>1000.
Actual counts to be conducted in the near future.

*City of Berkeley, January 1995 - June 1998
### MILVIA STREET

<table>
<thead>
<tr>
<th>Location</th>
<th>Issues/Problem Areas to Resolve</th>
<th>Possible Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crossing Major Streets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adeline</td>
<td>Major streets: difficult to cross during peak hours</td>
<td>Help crossing needed, see Category E options.</td>
</tr>
<tr>
<td>(for bicyclists continuing east on Russell or north on Adeline at south end of Milvia)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hopkins</td>
<td>Turns could be difficult at peak hours</td>
<td></td>
</tr>
<tr>
<td>(north end of Milvia)</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Travel Impeded by STOP Signs</strong></th>
<th>STOP sign evaluation:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Milvia Street has ROW at 8 of the 30 intersections between Russell and Hopkins.</td>
</tr>
<tr>
<td>Milvia at:</td>
<td>ADT*:</td>
</tr>
<tr>
<td>Vine Street</td>
<td>M</td>
</tr>
<tr>
<td>Addison</td>
<td>M</td>
</tr>
<tr>
<td>Kittredge</td>
<td>M</td>
</tr>
<tr>
<td>Haste</td>
<td>M</td>
</tr>
<tr>
<td>Dwight</td>
<td>M</td>
</tr>
<tr>
<td>Blake</td>
<td>M</td>
</tr>
<tr>
<td>Parker</td>
<td>L</td>
</tr>
<tr>
<td>Carleton</td>
<td>M</td>
</tr>
<tr>
<td>Derby</td>
<td>M</td>
</tr>
<tr>
<td>Stuart</td>
<td>M</td>
</tr>
<tr>
<td>Oregon</td>
<td>M</td>
</tr>
<tr>
<td>Berryman – 4-way L</td>
<td>Most likely warranted STOP sign on the bike boulevard.</td>
</tr>
<tr>
<td>Rose – 2-way ADT=5700</td>
<td>Due to high traffic volume on cross street, Stop sign control may have to remain as is.</td>
</tr>
<tr>
<td>Cedar – 4-way</td>
<td>Replace all-way STOP sign control with mini-roundabout</td>
</tr>
<tr>
<td>Virginia –4-way</td>
<td>Intersections with other bike boulevards</td>
</tr>
<tr>
<td>Channing – 4-way</td>
<td></td>
</tr>
<tr>
<td>Russell 1-way</td>
<td></td>
</tr>
</tbody>
</table>

| **Other Bike Boulevard Issues** | |
| Diagonal diverter at Yolo        | Motorists do not yield when turning. Spaces between bollards are narrow. |
| Other issues:                    | Bike lanes not signed |
|                                  | TBD |

| **Bicycle Accident History* - 29 accidents** | |
| Milvia at Dwight                  | 4 bike accidents |
| Milvia at University              | 3 bike accidents |

| **School Zones** | |
| Arts Magnet Elementary School at Virginia Berkeley High School | |

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ADT= Average Daily Traffic Volume, (ADT)  
L, M, H=Relative estimate of ADT by City staff : L=<500, M=500-1000, H=>1000.  
Actual counts to be conducted in the near future.  
* City of Berkeley, January 1995- June 1998
N Concord/Fenwick, Interstate to Overlook
Bike Street - Projects

- 4 Speed Bumps
  - Lombard
  - Rosa Parks
  - Ainsworth
  - Skidmore

- 3 Bumps
  - Alberta

- 3 Bumps
  - Overlook

- Raised Crossing
- Bike Boulevard
- Existing Stop Sign
- New Stop Sign
- Remove Stop
- Buffered Bike Lanes
- 160' NO PARKING (8 SPACES)
- Add Refuge Island
- Median Barrier
- Add Stop Signs at 17 Intersections
- Remove Stop Signs at 2 Intersections
- Turn Stop Signs at 7 Minor Intersections
- Guide Signing and Markings – Full Length