TACOMA DOME TRANSIT STATION

Trail Linkage Study

PROJECT PARTNERS

PIERCE COUNTY
PARKS AND RECREATION

CITY OF TACOMA
PUBLIC WORKS

PREPARED BY:

Parametrix

Tacoma Dome Transit Station Trail Linkage Study

Prepared for

Pierce County Parks and Recreation
9112 Lakewood Dr. SW
Lakewood, WA 98499-3998

City of Tacoma Public Works
747 Market Street
Tacoma, WA 98402

Prepared by

Parametrix
1231 Fryar Avenue
Sumner, WA 98390-1516
T. 253.863.5128 F. 253.863.0946
www.parametrix.com

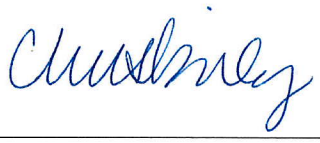
April 2009 | 214-1588-069 (01/06)

CITATION

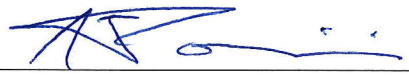
Parametrix. 2009. Tacoma Dome Transit Station Trail Linkage Study. Prepared by Parametrix, Sumner, Washington. April 2009.

CERTIFICATION

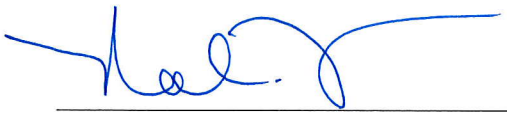
The technical material and data contained in this document were prepared under the supervision and direction of the undersigned.



Prepared by Chrissy Bailey



Prepared by AJ Porrini, E.I.T.



Approved by Nathan I. Mozer, P.E.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PHOTOGRAPHS

APPENDICES

KEY TERMS

BNSF	Burlington Northern Santa Fe
FEMA	Federal Emergency Management Agency
HUB area	Tacoma Dome Transit Station area
IUT	Interurban Trail
RCO	Recreation and Conservation Office

1. BACKGROUND

Over the last 25 years much attention has come to focus on the benefits of trails, sidewalks, and bicycle lanes (collectively, "nonmotorized facilities") for active recreation, passive recreation, and as an alternative to vehicle travel for commuting purposes. Legislation and policies at the national, state, and local level have been developed, often as part of transportation legislation, to obtain land for, design, and construct nonmotorized facilities. Multiple organizations have been established to support these policies and legislation and to advocate for nonmotorized facilities, including groups like the Rails-to-Trails Conservancy on a national level, and groups active in the Puget Sound region such as the ForeverGreen Council, the Tacoma Wheelmen's Bicycle Club, and the Foothills Rails-to-Trails Coalition.

Recognizing the active and passive recreation opportunities and benefits that nonmotorized facilities can provide, the Washington State Legislature recently passed ESSB 5186, which endeavors to increase physical activity and promote healthier lifestyles among citizens of Washington State. The bill seeks to accomplish these goals through planning for and constructing pedestrian and bicycle facilities that enhance community access to schools, parks, and jobs (City of Tacoma 2008).

Locally, various groups and organizations support efforts to transform the vision of trails and other nonmotorized facilities into tangible community assets. In an effort to embrace the goals of ESSB 5186, in addition to enhancing the health of the surrounding environment, economy, and neighborhoods, local and regional groups and agencies have defined desirable nonmotorized projects and improvements. These projects acknowledge the recreational opportunities that trails and nonmotorized corridors provide, as well as the need and demand in our region for alternatives to single occupancy vehicles for transportation and commuting.

As multimodal transportation alternatives such as bike lanes, sidewalks, and trails continue to develop in the Pierce County region, the Tacoma Dome Transit Station area is naturally emerging as a potential hub for multimodal transportation. Multiple existing and planned trails in the region approach this area, and linking trails in this vicinity would improve access to the range of transportation alternatives available here. These alternatives include facilities for walking and biking, busses, trains, trolley, commuter trains, and automobiles.

Photograph 1. Tacoma Dome Transit Station
Source: Meadows Design Works

2. PURPOSE AND INTENT

This study was conducted for Pierce County Parks and Recreation and the City of Tacoma Public Works Department ("Project Partners"). The study was intended to identify and describe logical, safe, and cost effective trail alignments and planned connections for particular trails in the Tacoma Dome Transit Station area (HUB area), shown below in red on Figure 1. The particular trails (existing and planned alignments) evaluated are illustrated on Figure 3. "Existing" trails are those trails that are complete, or significantly underway. "Planned" trails are trails for which alignments have been defined but that are not yet under construction.

Figure 1. HUB Area – Trail Linkage Study

As outlined previously, the HUB area provides access to multiple alternatives to vehicular transportation such as rail, commuter rail, bus, bicycle, and pedestrian facilities. The particular trails that are the subject of this study generally terminate within 3 miles of the Tacoma Dome Transit Station. Connecting these trails with one another and the HUB area is a key step in meeting the objective of increasing physical activity, as well as creating a network of alternative and nonmotorized transportation opportunities in and around the City of Tacoma. A summary of existing assets and upcoming transportation changes in the HUB area are outlined below (VIA Architecture 2008) and illustrated in Figure 2:

1. LINK Light Rail – The first application of light rail technology in Washington State, this 1.6 mile trolley provides free service to downtown Tacoma every 15 minutes. The LINK operates on a single track and is a popular connection from the Tacoma Dome Station (where the Park-and-Ride is currently free of charge) and the downtown employment centers.
2. Sound Transit Commuter Rail – As of October 2008, the City of Tacoma won the largest of 15 Federal Railroad Administration Grants to help fund the Sounder commuter rail to Lakewood. With an estimated completion date of 2012, this route

will extend through the Tacoma Dome and Brewery Districts on an elevated trackway. As currently planned, the route will have a minimum of eight Sounder trains, as well as eight Amtrak trains. According to the FTA, over the past year the Sounder has seen the largest jump in ridership in the nation; up to 38 percent more people chose to save on rising gas prices and avoid congested roadways.

3. Amtrak – As part of the Sounder Lakewood Extension project, Amtrak's station will be relocated to the Tacoma Dome Transit Station, with trains travelling south along the new inland route. This will shorten the trip between Portland and Tacoma by approximately six minutes, by reducing conflicts between passenger and freight trains, the latter of which will continue around Point Defiance.
4. SR 7 Corridor Bus Rapid Transit – The Park-and-Ride lot at the Tacoma Dome Station is now operating at above capacity. Pierce Transit studies indicate that a high percentage of commuters traveling downtown and to the Dome District travel via South Pacific Avenue (SR 7).
5. Strategic Transit Corridors Downtown – The City of Tacoma's Downtown Plan calls for the City to develop a set of 'strategic transportation corridors' to accommodate future high or medium capacity transit. The plan enables the City to reserve key portions of street rights-of-way to ensure the City is prepared to shift more investment into transportation alternatives in the future.

In a three-phased development process, this study can be considered a Phase II study. A Phase III study is typically an engineering analysis, and includes nearly construction-level detail. Phase I studies (corridor planning analyses) have been conducted for many of the bike and pedestrian facilities and separated trails evaluated in this study; in some cases, these trails exist today. This Phase II study considers specific trail segments, connections, and route alignments identified through Phase I studies in greater detail.

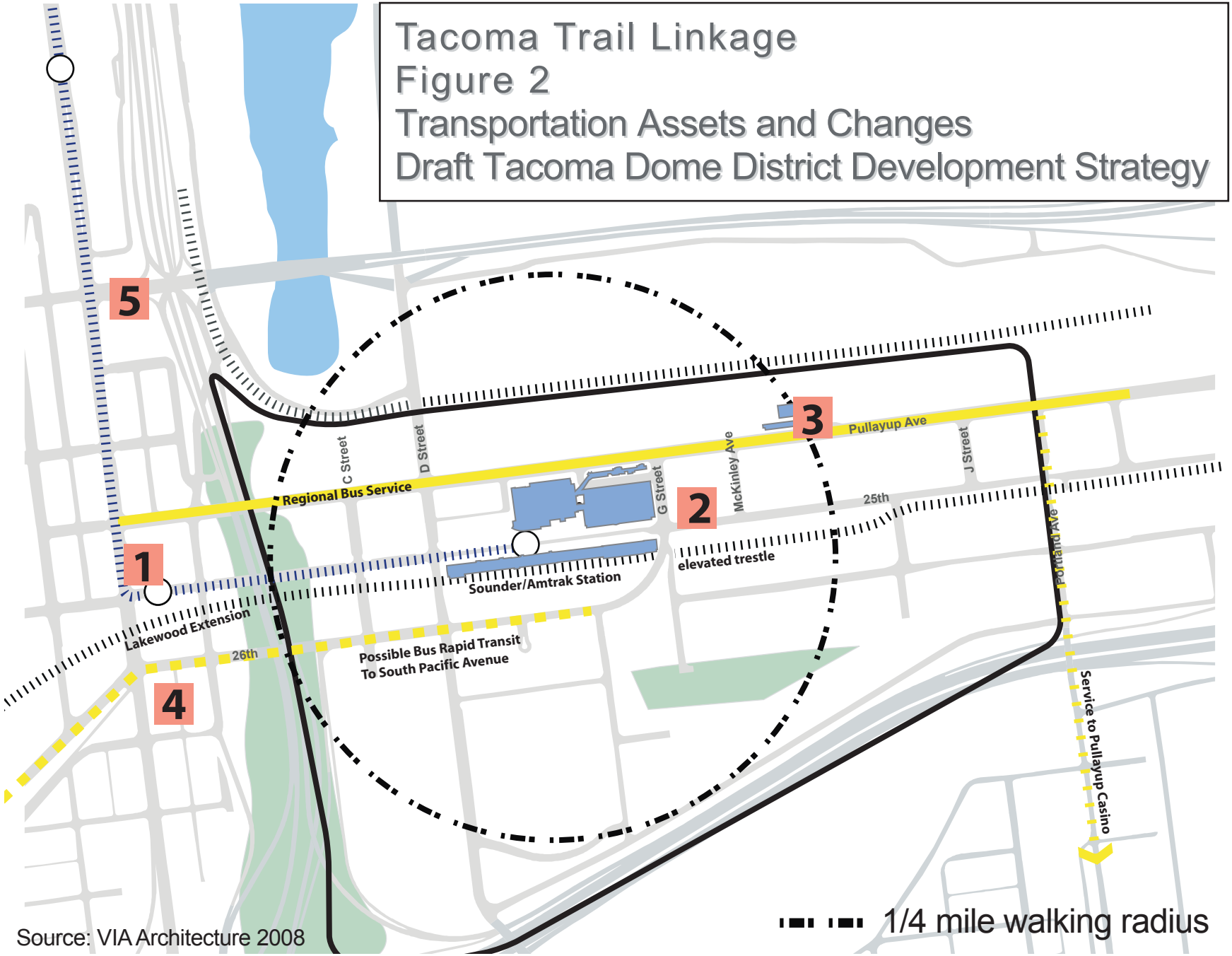
The particular trails (Figure 3) for which this study aimed to identify logical connection points and extensions include:

1. The Historic Water Ditch Trail, Prairie Line Trail, and Foss Esplanade/Shoreline Trail;
2. The Tacoma Rail Trail and 4-C's/Quad C Trail; and
3. The Puyallup River Levee Trail.

For the first set of trails listed above, seven potentially viable connections and alignments were identified and are discussed in this study; each connection is discussed in greater detail later in this document. For the second set of trails listed above, two connections were evaluated and are discussed in further detail later in this document.

The third trail listed above (Puyallup River Levee Trail) was originally intended to be a part of this study. However, various issues relating to the viability and final route of the Puyallup River Levee trail are unresolved. Because the future of this trail is uncertain, the Project Partners requested instead that this study evaluate a route to the HUB area originating from the intersection of Port of Tacoma Road and 20th Street East in the City of Fife, and a route across the Puyallup River from Fife that utilizes a separate (pedestrian) facility. The intersection of 20th Street East and Port of Tacoma Road was identified by the Cities of Tacoma and Fife as a logical extension for bike and pedestrian facilities from Fife's preferred Interurban Trail (IUT) trailhead on 20th Street East at the intersection with 70th Avenue East, approximately 2.5 miles east of the study intersection (see Figure 4).

Tacoma Trail Linkage
Figure 2
Transportation Assets and Changes
Draft Tacoma Dome District Development Strategy



Source: VIA Architecture 2008

Tacoma Trail Linkage
Figure 3
Existing and Planned Alignments

Feet
0 1,250 2,500 5,000

NORTH

Tacoma Dome Transit Station
Tacoma Rail Trail (Planned)
Foss Esplande/Shoreline Trail (Existing/Planned)
East D Street Bike Lanes (Existing)
McKinley Park Trail (Existing)
Quad C (Planned)
Prairie Line Trail (Planned)
Potential Sounder Rail Extension
Historic Water Ditch Trail (Planned)

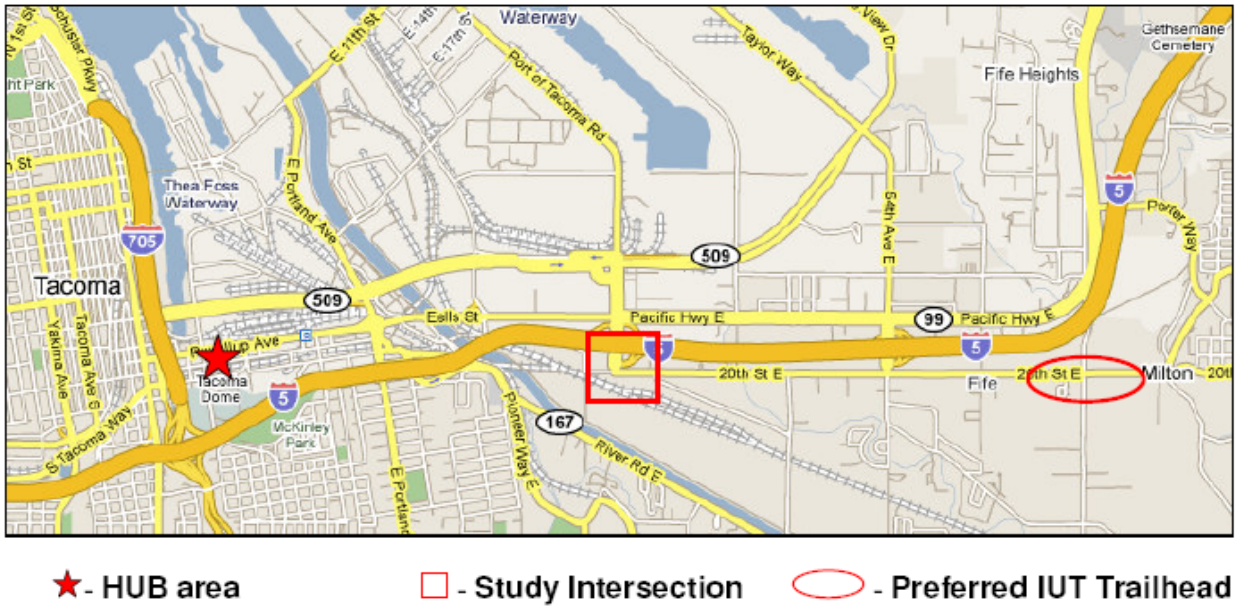


Figure 4. Fife Interurban Trail Trailhead, Study Intersection, and HUB Area Relationship
Source: Google Maps

2.1 WHAT AREAS DO THESE TRAILS SERVE, AND HOW DO THEY FUNCTION?

2.1.1 Historic Water Ditch, Prairie Line, and Foss Esplanade/Shoreline Trails

Originally part of a 110-year-old trail system that crossed Tacoma and extended to Mt. Rainier, remnants of the historic 1896 Water Ditch Trail, 6.5 mile "spine" are still used today. As funding becomes available, the City of Tacoma will restore the entire 6.5-mile spine in phases, which will provide the only trail linking South Tacoma with the study area (Figure 5). The subject portion of trail consists of approximately 3 miles of the historic "Flume Line" property generally located along the South Tacoma Way and Clement Avenue corridor between the City Center and South 80th Street, and 3.5 miles of nonmotorized accommodations generally along South Tacoma Way from South 47th Street to Pacific Avenue (City of Tacoma 2008).

The Prairie Line was the route of the first Northern Pacific train to reach Puget Sound in 1873. It was taken out of service in 2003 after 130 years. A stretch of the old Prairie Line between South 15th and 27th Streets is being considered for use as a pedestrian and bike trail, which would connect to the Historic Water Ditch Trail and HUB area. The City is currently negotiating with Burlington Northern Santa Fe (BNSF) to acquire the rail right-of-way for trail use.

Photograph 2.
Thea Foss Waterway and Esplanade

The Water Ditch Trail and Prairie Line trail shown on Figure 5 are considered established for the purpose of this study ("planned" trails). Route analyses were not completed for these trails; however, connection alternatives were evaluated.

The development of the Thea Foss Waterway Esplanade represents a major chapter in the revitalization of downtown Tacoma. The esplanade, which will stretch along the entire one and one-half miles of the western side of the Thea Foss Waterway, will reconnect the downtown business district and the Union Station Historical District to the waterfront (Foss Development Authority 2008).

2.1.2 Tacoma Rail Trail and Quad C Trail

The "Trail with Rail" (Tacoma Rail Trail) project route is proposed to extend between Tacoma and Elbe, which serves as a rural gateway to Mount Rainier. This trail is envisioned to serve many functions: regional connector to strengthen ties between Tacoma and Mt. Rainier and as a facility for local recreation. The route traverses Tacoma Rail right-of-way, and contains an active rail corridor (Figure 6). Development of a trail along this corridor would be an asset, but will be very complex and challenging due to concerns for safety, rail operations, environmental considerations, and cost (Parametrix 2007b).

The route envisioned for the Quad C Trail utilizes both bicycle and pedestrian facilities along existing roadways and the existing Tacoma Water Pipeline right-of-way (also known as Pipeline Road). The Tacoma Water Pipeline right-of-way has been unofficially used for both trail purposes and property access. A partnership was formed between Pierce County Parks and Recreation, City of Tacoma Public Works, Metro Parks Tacoma, Pierce County Transportation and Utilities, and Tacoma Water to evaluate the potential of formalizing the trail. The proposal has become known as the Cross County Commuter Connector, or the Quad C Trail (Parametrix 2007a). The Quad C Trail is envisioned to connect the HUB area through East Tacoma to the Foothills Trail in Orting.

2.1.3 Puyallup River Levee/Fife Trail Extensions

The Puyallup River Levee Trail is a proposed shared use facility stretching from Puyallup to Tacoma, essentially following the Puyallup River. This trail would begin at the west end of the existing Puyallup Riverfront Trail, which currently extends west through Puyallup from the East Main Street bridge behind Mama Stortini's Restaurant. The Puyallup River Levee Trail would end at the intersection of East 11th Street and Portland Avenue in the Port of Tacoma industrial area. A portion of the proposed route may run through the City of Fife if the trail is routed along the right bank of the River (facing downstream). This trail is intended to be a nonmotorized, pedestrian/bicycle facility for recreation and commuting (Bruce Dees & Associates 2009).

Tacoma Trail Linkage West
Figure 5
Historic Water Ditch / Prairie Line

Feet
0 500 1,000 2,000

NORTH

705
509
5
5

E Dock Street
East D Street
Eells Street
Puyallup Ave
25th Street
26th Street
Pacific Ave
South A Street
South C Street
Hood Street
Tacoma Avenue
Yakima Avenue
25th Street
Center Street
M Street
S Tacoma Way
Hood Street Reservoir

Tacoma Dome Transit Station
Foss Esplanade/Shoreline Trail (Existing/Planned)
Prairie Line Trail (Planned)
Historic Water Ditch Trail (Planned)
Potential Sounder Rail Extension

Tacoma Trail Linkage South
Figure 6
Tacoma Rail Trail /Quad C

Feet
0 750 1,500 3,000

NORTH

25th Street
26th Street
East D Street
Center Street
McKinley Park
5
34th Street
McKinley Ave
East I Street
Division Lane
Spokane Street
Roosevelt
Pacific Avenue
38th Street
Portland Avenue
Pioneer Avenue
40th Street
E Pipeline Road
48th Street
56th Street

- Tacoma Dome Transit Station
- McKinley Park Trail (Existing)
- East D Street Bike Lane (Existing)
- Tacoma Rail Trail (Planned)
- Quad C (Planned)
- Potential Sounder Rail Extension

An improved trail has been desired along this route for many years; however, implementation of such a plan has been very complicated. There are a multitude of issues hindering the potential to improve a route that achieves this connection; pinch points exist where a lack of shoulders, narrow paved lanes, and existing development/property ownership severely constrict the possibility for addition of bike lanes or a separated trail. In addition, the lower Puyallup River levee has been decertified by the U.S. Army Corps of Engineers (Pierce County 2006). Levees are decertified when it is determined that they no longer provide protection from the 100-year flood. Unless the levees are re-certified, areas behind the levee previously not shown as flood prone on Federal Emergency Management Agency (FEMA) flood maps may be shown as subject to flooding on new maps. This action triggers federal flood insurance requirements for individuals and businesses, affects land-use and zoning, and raises public safety concerns (Washington State Department of Ecology 2007). These requirements and associated limitations severely limit the potential to place a trail on the levee itself.

2.2 WHAT TYPES OF BICYCLE AND PEDESTRIAN FACILITIES ARE CONSIDERED IN THIS STUDY?

The existing, planned, and potential trail routes and connections evaluated through this study differ in the facilities they include. Nonmotorized facilities are considered to be sidewalks, bike lanes, or separated trails for purposes of this study. Some of the trails studied currently offer no formal facilities, such as the Pipeline Road segment of the Quad C Trail or the Water Ditch Trail. Some portions of the trails are simply corridors that currently include or could be reconstructed to accommodate bicycle lanes and sidewalks. Some segments identified, such as portions of the Prairie Line Trail, are proposed to be separated trails completely independent of motor vehicle travel corridors. The Tacoma Rail Trail is a proposed bike and pedestrian facility that would be contained within a separated trail located adjacent to an active rail line. Currently the City of Tacoma's codes do not allow bicycles on sidewalks; however, the City is undertaking an update of its Nonmotorized Transportation Plan in 2009. The City intends to review this policy as part of the plan update, and consider reasonable accommodations for bikes on sidewalks in places where constraints exist that exclude the possibility of bike lanes.

Within the relatively urban study area, it is anticipated that trail routes will be used by pedestrians and bicyclists for active and passive recreation more frequently than by equestrians (persons on horses). As such, this study did not consider equestrian uses in evaluating the connection points or route alignments.

3. TRAIL SECTIONS

Based on City of Tacoma nonmotorized transportation plans, conditions observed in the field, and regional and local trail policies and standards; four typical trail sections have been developed for this study. These trail sections represent various options for accommodating nonmotorized uses along potential routes within an urban setting. Additional detail and assumptions regarding these sections can be found in Appendix A.

1. Rechannelization (Figures 7 and 8)

A reduction in the number of or reconfiguration of vehicle travel lanes is commonly referred to as rechannelization. Rechannelization in this situation typically involves a reduction in traffic lanes from three lanes to two lanes, or five lanes to four lanes. Rechannelized streets will lose a travel lane, or more often a center turn lane. The intention of reducing travel lanes is to allow for existing paved surfaces to accommodate bike lanes. This approach recognizes a significant cost savings compared to construction of the other trail sections, and in some cases is the only feasible section due to conflict with surrounding improvements or site conditions. Traffic modeling will be required during the design process to determine final configuration of rechanneled street sections. Bike lanes would be located on both sides of a street while maintaining travel lane(s) in each direction and existing curbs, gutters, and sidewalks on both sides.

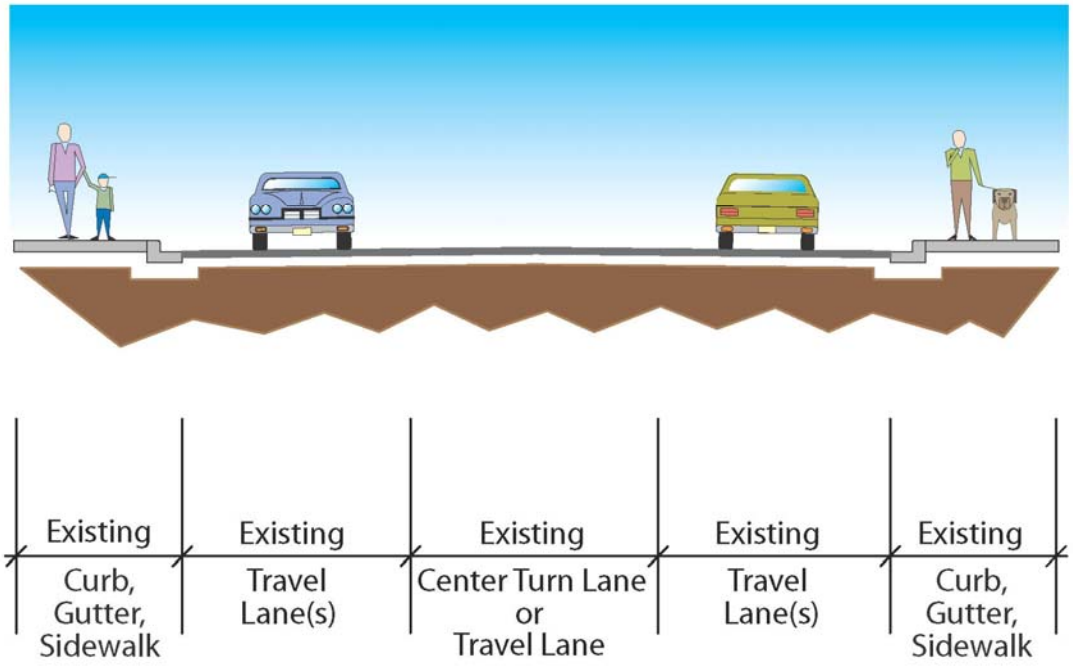


Figure 7. Existing Road Section

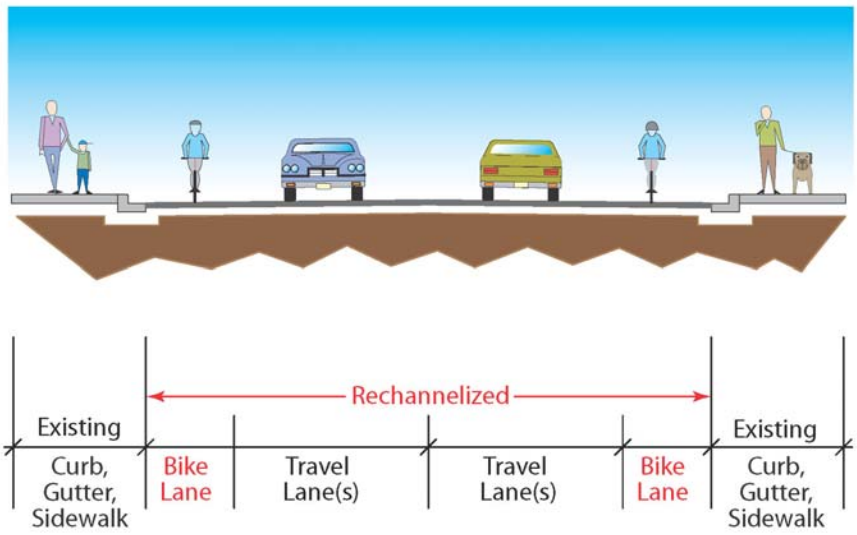


Figure 8. Rechannelization Section

2. New Sidewalk (Figure 9)

This option focuses on existing streets without sidewalks. Streets utilizing this section already have bike lanes on each side (or bike lanes are addressed separately with rechannelization); and curb and gutter on each side. Some segments have sidewalks on one side of the roadway and some segments don't have any sidewalks. For this typical section, it was assumed a new sidewalk would be placed on only one side of the road. As discussed in the "Cost Estimates" section later in this document, if new sidewalk is needed on both sides of the road, the typical section costs are doubled to account for two sidewalks.

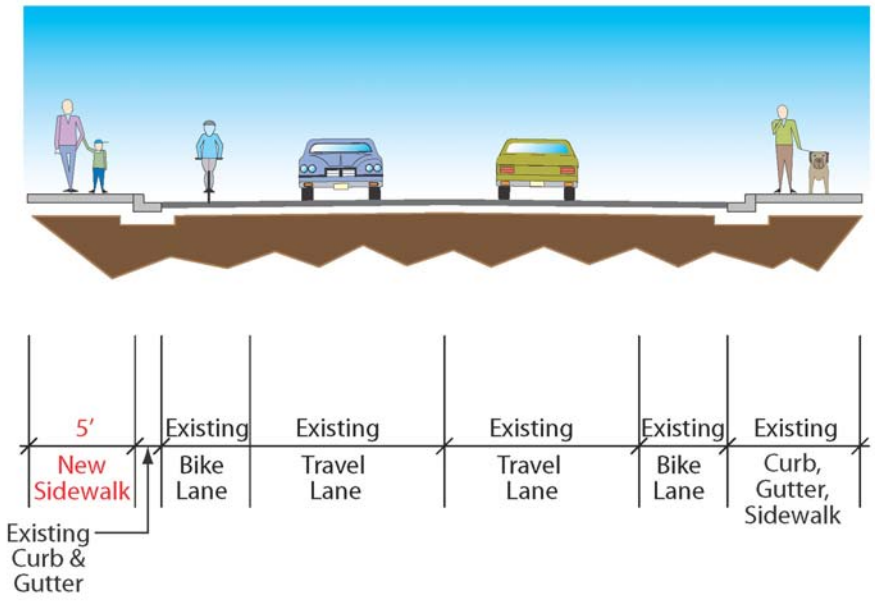


Figure 9. New Sidewalk Section

3. Minor Widening of the Existing Road (Figure 10)

This option consists of minor widening of an existing street by adding additional asphalt pavement to accommodate a bicycle lane. New curb, gutter, and sidewalk would also be constructed on the newly widened side of the street. This section results in a final street section similar to that in Section No. 1 (Rechannelization), but would be used where there is sufficient right-of-way to accommodate minor road widening and where street and pavement widths are currently too narrow to accommodate concurrent motorized and nonmotorized uses.

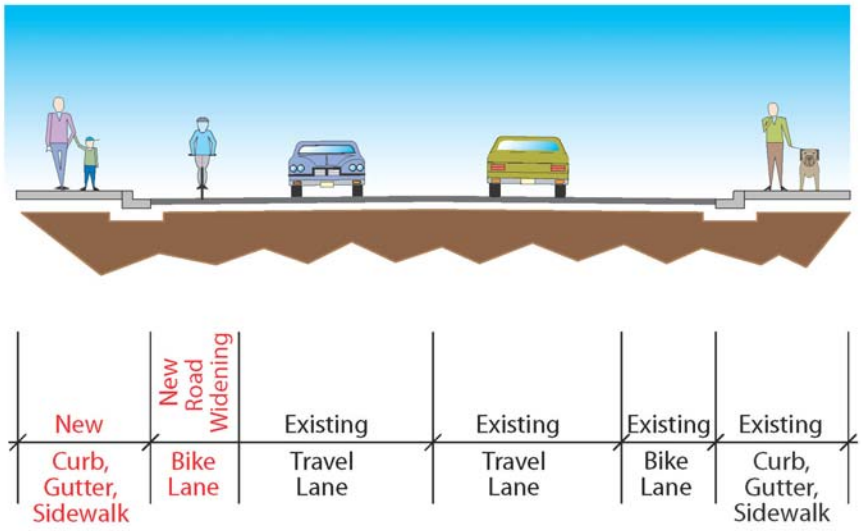


Figure 10. Minor Widening of the Existing Road Section

4. Separated Trail (Figure 11)

This section consists of a multi-use trail that is completely separated from a street. This section features a 10- to 12-foot asphalt surface with 2-foot gravel shoulders on each side. This section would be utilized in portions of potential alignments that do not follow a street. The City of Tacoma's current policies regarding separated trails reference a 10-foot asphalt surface.

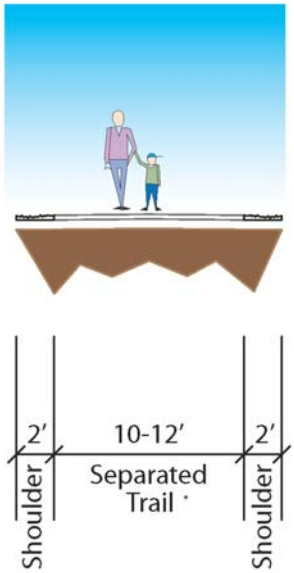


Figure 11. Separated Trail Section

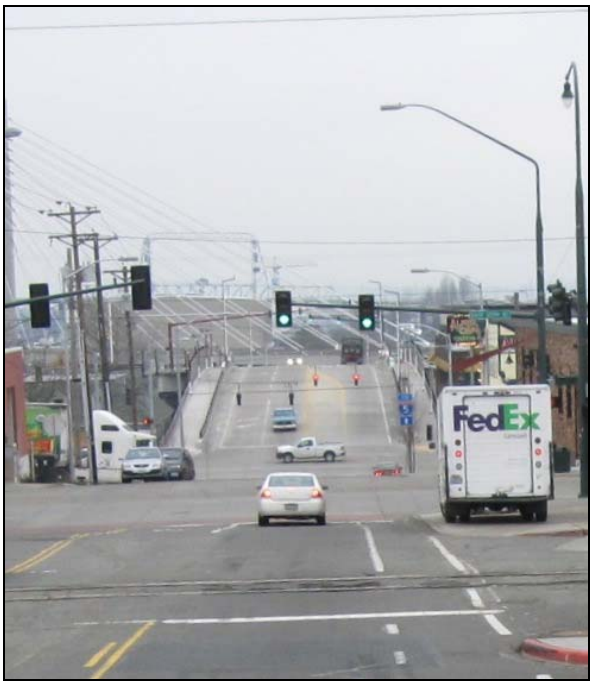
4. CONNECTIONS AND ROUTE ALIGNMENTS

This section describes the potential trail route alignments and connections identified during this study. This section also includes an inventory of nonmotorized facilities that currently exist along the potential alignments and connections. Where nonmotorized facilities are currently lacking, the potential for using the trail sections described in the previous section is evaluated. Cost estimates have been developed for completing each potential alignment and connection, which are based on an approximate cost per linear foot of specified nonmotorized improvements. The cost estimates are presented in the next section.

4.1 HISTORIC WATER DITCH, PRAIRIE LINE, AND FOSS ESPLANADE/SHORELINE TRAILS

4.1.1 Alignments and Connections

The intersection identified as a reasonable connection point between the Historic Water Ditch Trail and the Prairie Line Trail is at South 21st Street and South C Street. Users of the Prairie Line Trail could travel east when reaching South 21st Street to South C Street, then south to the Historic Water Ditch Trail and South Tacoma Way. From this intersection there are various options for accessing the HUB area. The preferred alignment follows the Water Ditch trail to A Street, and travels east along East 26th Street to East D Street (Figure 12).



Photograph 3. East D Street Overpass (view north)

From the Foss Esplanade/Shoreline Trail, two potential alignments to the HUB area have been identified. These options include A Street and East D Street. A Street runs north/south between East 26th Street and East Dock Street; East 26th Street is the preferred alignment into the HUB area from the Water Ditch Trail. East 25th Street can also be utilized to access the HUB area. The route along East D Street extends north/south between the Dock Street/East D Street intersection and the HUB area. East C Street has also been described as a potential connection from the Foss Esplanade to the HUB area, but the existing railroad tracks exclude this route as a feasible alternative.

For users of the Prairie Line and Historic Water Ditch Trails that wish to bypass the HUB area, two potential direct connections between these trails have been identified. One potential connection is between the south end of the Prairie Line Trail (Hood Street) at approximately South 27th Street and the Historic Water Ditch Trail facilities along South Tacoma Way. The second potential connection is located further west along South Tacoma Way at South M Street. With the second potential connection, the Prairie Line Trail would extend beyond the South 27th Street point described above and follow the rail right-of-way to connect with the Historic Water Ditch Trail/South Tacoma Way at South M Street.

4.1.2 Inventory of Existing Nonmotorized Facilities

The City of Tacoma's Historic Water Ditch Trail project will restore approximately 3 miles of the historic "Flume Line" property and construct 3.5 miles of nonmotorized accommodation along South Tacoma Way between South 47th Street and A Street. Because plans for the sections between South 47th Street and Pacific Avenue (to A Street) have been developed, this trail segment was considered "planned" and cost estimates for its development were not completed.

No part of the Prairie Line Trail currently exists; however, the City of Tacoma has identified an alignment and end point for purposes of this study based on negotiations with BNSF. Therefore, the portion of the planned trail north of South 27th Street was considered "planned" and cost estimates for its development also were not completed as part of this study.

East 26th Street is the preferred route from the end of the Water Ditch Trail at A Street to the HUB area (Figure 13). There are sidewalks on both sides of East 26th between A Street and East D Street; however, there are no bike lanes. East 25th Street can also be used to access the HUB area from this vicinity; between A Street and East D Street there are sidewalks on both sides of the road, but no bike lanes. To connect the Prairie Line Trail to the Water Ditch Trail, a small segment of the route will extend along South 21st Street between the Prairie Line Trail (Hood Street) and South C Street. Sidewalk exists on both sides of this road segment, but there are no bike lanes. South C Street will be utilized to connect South 21st Street to South Tacoma Way and the Historic Water Ditch Trail. There are no nonmotorized facilities along South C Street between South 25th Street and South Tacoma Way. There are sidewalks but no bike lanes along both sides of South C Street between South 25th and South 21st Streets.

Connections between the HUB area and the Foss Esplanade/Shoreline Trail evaluated as part of this study include East D Street and A Street. The Foss Esplanade/Shoreline Trail is intended to extend the length of the west side of the Thea Foss Waterway, approximately 1.5 miles. The Esplanade itself will typically be constructed as properties along the waterway develop. The draft Tacoma Dome District Development Strategy update (VIA Architecture 2008) suggests providing a walkable corridor along East C Street between the Dome area and the waterfront. This alternative was not considered as part of this study because East C Street does not currently extend to the waterfront. In addition, the existing East D Street overpass (as the name suggests) is not at the same grade as the existing East C Street. Access to the waterfront via East D Street from a connection to East C Street would necessitate considerable improvements.

East D Street contains sidewalks and bike lanes along the vast majority of both sides of the street between the waterfront just north of Dock Street and the McKinley Way overpass. There is a small segment of East D Street between East 25th Street and the railroad tracks to the south where bike lanes are missing.

A Street is currently a relatively low traffic volume street, which passes below Interstate 705 and connects Dock Street and the Foss Waterway with the Dome District. A Street has sidewalks on both sides between Dock Street and Puyallup Avenue, with the exception of a short segment near Puyallup Avenue and the railroad crossing beneath I-705 where sidewalk exists along only one side of the road, presumably to encourage nonmotorized users to cross the tracks where safety warning devices (crossing gates, etc.) are located. There are no bike lanes along this segment of A Street. From Puyallup Avenue south to East 26th Street, there are sidewalks along both sides of the road with the exception of two small areas, and no bike lanes.

As a result of the Sounder extension to Lakewood, East C Street between East 26th and East 25th Streets will be impacted by an increased number of at-grade train crossings. The impact of a train at-grade crossing at East D Street needs to be studied. The elevation of the trackway at A Street, 6 feet above current grade, may force the street to be closed.

Tacoma Trail Linkage West
Figure 12
Alignments and Connections

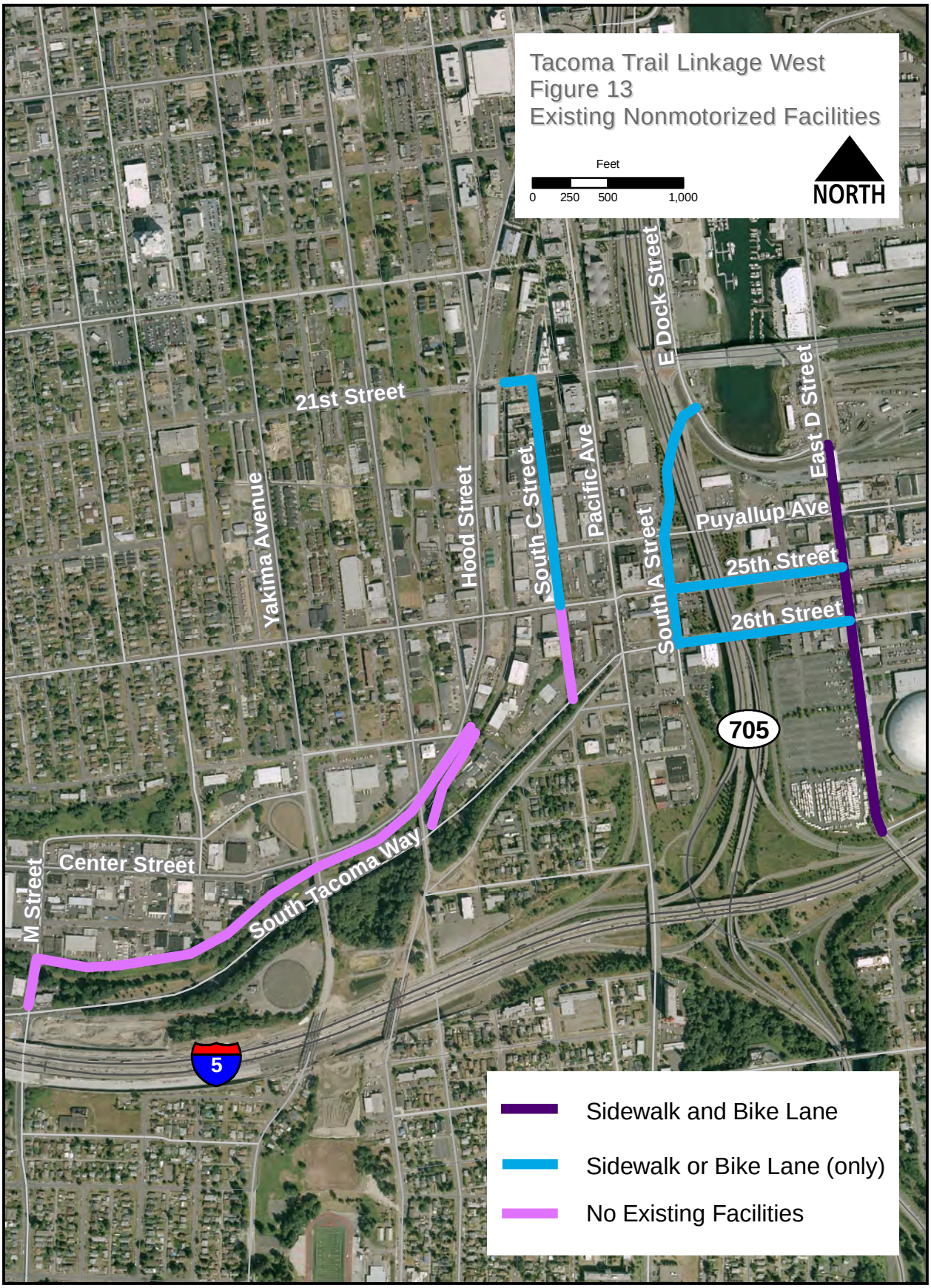
Feet
0 500 1,000 2,000

NORTH

705
509
5
5

21st Street
25th Street
26th Street
Center Street
Puyallup Ave
Eells Street
Yakima Avenue
Tacoma Avenue
Hood Street
South C Street
Pacific Ave
South A Street
East D Street
E Dock Street
M Street
S Tacoma Way
Hood Street Reservoir

- Tacoma Dome Transit Station
- Foss Esplanade/Shoreline Trail (Existing/Planned)
- East D Street Bike Lanes (Existing)
- (Potential Alignment 4)
- Prairie Line Trail (Planned)
- Historic Water Ditch Trail (Planned)
- Potential Alignment 1
- Potential Alignment 2
- Potential Alignment 3
- Potential Alignment 5
- Potential Alignment 6
- Potential Alignment 7
- Potential Sounder Rail Extension


Tacoma Trail Linkage West
Figure 13
Existing Nonmotorized Facilities
Feet
0 250 500 1,000
NORTH
21st Street
Yakima Avenue
Hood Street
South C Street
Pacific Ave
E Dock Street
East D Street
South A Street
Puyallup Ave
25th Street
26th Street
705
M Street
Center Street
South Tacoma Way
5
Sidewalk and Bike Lane
Sidewalk or Bike Lane (only)
No Existing Facilities

Two additional options for direct connection of the Prairie Line Trail and Historic Water Ditch Trail exist, both of which involve extending the Prairie Line Trail south of South 27th Street. The Prairie Line Trail would connect to the Water Ditch Trail and South Tacoma Way in the vicinity of the Tacoma Avenue underpass, or further west at South M Street. There are no existing facilities along either of the above described alignments, and the feasibility of both also depend upon final alignment of the Sounder tracks on the proposed route to Lakewood. There is also encroachment into the tracks on the south end of Hood Street at Tacoma Self Storage (see Photograph 4), where items are being stored within the corridor. There may be an interruption in rail right-of-way at this location, which would need to be determined prior to final design.

Photograph 4. Encroachment Behind Tacoma Self Storage

4.1.3 Proposed Trail Sections

There are essentially seven segments where improvements will be necessary to utilize the connections and routes described above. Preliminary estimated costs and associated details for each potential alignment are given in the following section. The alignment numbers given below correspond to the alignment numbers shown on Figure 12.

Alignment 1
Alignment 1 is the preferred connection between the Historic Water Ditch Trail and the Prairie Line Trail. This alignment follows South 21st Street between Hood Street and South C Street, and South C Street between South 21st Street and South Tacoma Way. This alignment requires rechannelization along its entire length and new sidewalks along both sides of South C Street between South 25th Street and South Tacoma Way.

Alignment 2
Alignment 2 follows East 26th Street between A Street and East D Street. Rechannelization is necessary between A Street and East D Street.

Alignment 3
Alignment 3 follows A Street between Dock Street and East 26th Street. The majority of this alignment necessitates rechannelization to delineate bike lanes. One portion of this route will necessitate new sidewalks.

Alignment 4
Alignment 4 follows East D Street from Dock Street to East 26th Street. The vast majority of this route includes delineated bike lanes and sidewalks on both sides of the street. Minor rechannelization improvements are associated with this alignment.

Alignment 5
Alignment 5 includes the extension of the Prairie Line Trail/Hood Street south of South 27th Street to South Tacoma Way in the vicinity of the Tacoma Avenue underpass. This alignment would utilize the separated trail section.

Alignment 6
Alignment 6 also includes the extension of the Prairie Line Trail/Hood Street south of South 27th Street; however, this alignment merges with the Water Ditch Trail and South Tacoma Way at South M Street. This alignment also utilizes the separated trail section.

Alignment 7
Alignment 7 represents an alternative to the East 26th Street route into the HUB area. The Sounder LINK light rail tracks run down the middle of East 25th Street, and there does not appear to be sufficient right-of-way available to further widen this segment. Therefore, rechannelization in the form of "sharrow" lane markings, etc., has been assumed to be possible. "Sharrows" are arrow-like designs painted on a roadway to designate a cycling route (Photograph 5). These markings indicate that bicyclists may share a narrow lane with vehicles.

Photograph 5. Freemont Avenue Sharrow, Seattle.
Source: http://www.phinneywood.com/tag/transportation/

4.2 TACOMA RAIL TRAIL AND QUAD C TRAIL

4.2.1 Alignments and Connections

This study sought an intersection for a reasonable point of connection between the Tacoma Rail Trail and the Quad C Trail in the vicinity of East 40th Street and East McKinley Avenue. When considering existing nonmotorized facilities and grade challenges between the Tacoma eastern gulch and neighborhoods along its east side, the intersection of East 48th Street and McKinley Avenue emerged as the preferred connection, following South 48th Street both east and west of McKinley Avenue (Figure 14).

Various potential alignments for the extension of the Quad C Trail to the McKinley Park portion of the trail and HUB area were identified. The preferred alignment follows Pipeline Road north from East 48th Street to East 40th Street, turns west and follows East 40th to Spokane Street, and proceeds north on Spokane Street to Division Lane where the alignment jogs one block east to East I Street. The route continues to follow East I Street north to McKinley Park/East Upper Park Road. Trail users would then follow the trail through the Park to McKinley Way, continuing north across Interstate 5 on East D Street into the HUB area.

Tacoma Trail Linkage South
Figure 14
Alignments and Connections

Feet

0 750 1,500 3,000

NORTH

705
25th Street
26th Street
East D Street
South Tacoma Way
Center Street
5
McKinley Park
34th Street
Mckinley Ave
East L Street
Division Lane
Spokane Street
38th Street
Pacific Avenue
40th Street
E Pipeline Road
Portland Avenue
Pioneer Avenue
48th Street
56th Street

- Tacoma Dome Transit Station
- Potential Alignment 8
- Potential Alignment 9
- 48th Street Bike Lanes (Existing)
- McKinley Park Trail (Existing)
- East D Street Bike Lane (Existing)
- Tacoma Rail Trail (Planned)
- Quad C (Planned)
- Potential Sounder Rail Extension

Photograph 6. Intersection of East I Street and Division Lane (view towards Spokane Street)

The planned Tacoma Rail Trail alignment is identified in the City of Tacoma's Trail with Rail Feasibility Study (Parametrix 2007b). This alignment extends from the HUB area west to the Interstate 705 overpass/existing rail corridor, then south within that corridor through the Tacoma eastern gulch. This alignment is constrained topographically, and it will be difficult and very costly to relocate rails in this vicinity to accommodate nonmotorized trail uses. User safety is a major concern in this area, with limited police presence and visibility.

4.2.2 Inventory of Existing Nonmotorized Facilities

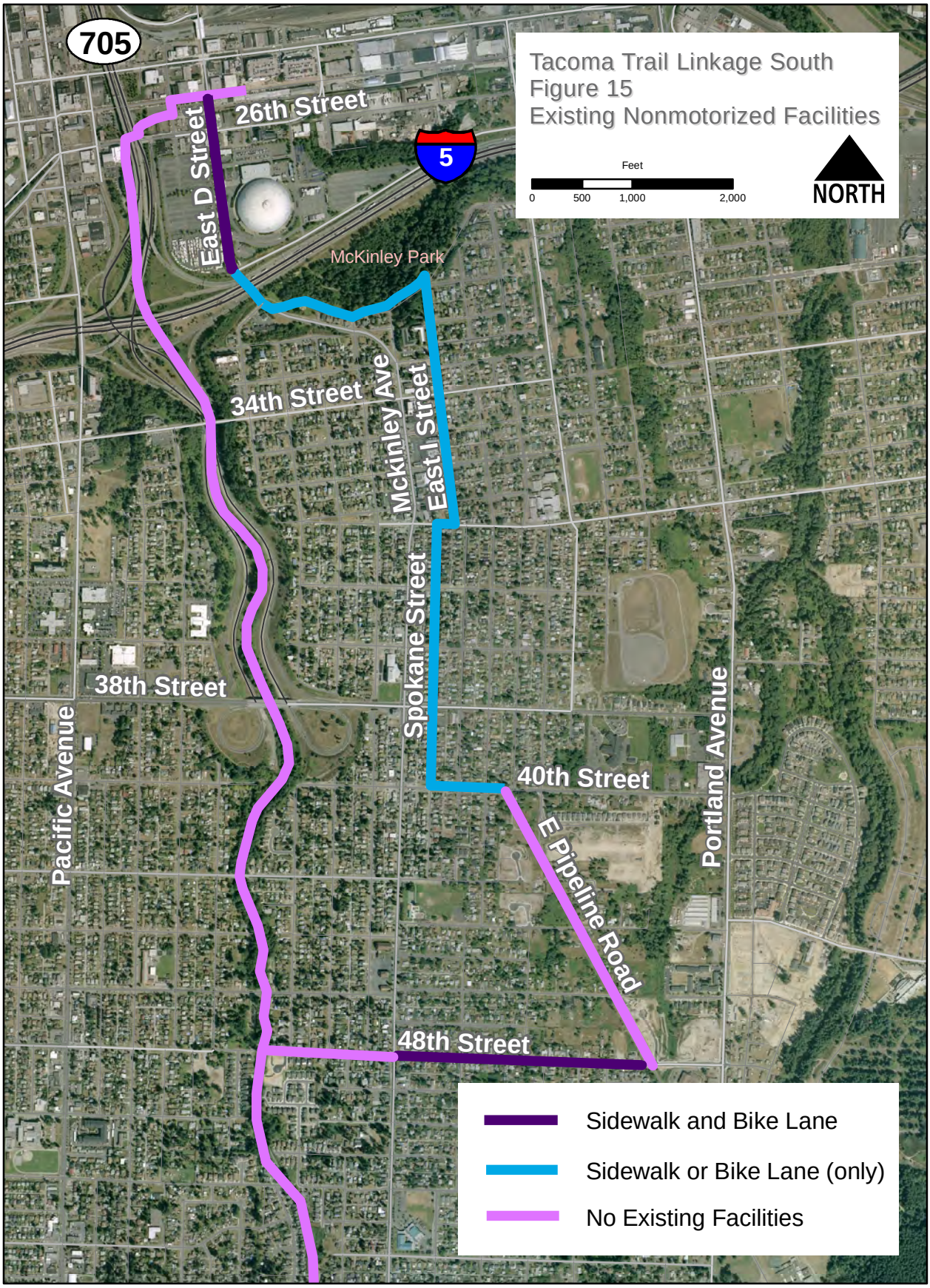
As outlined above, the Tacoma Rail Trail alignment extends from the HUB area west to the I-705 overpass and existing rail corridor, then south within that corridor through the Tacoma eastern gulch. There are no existing nonmotorized facilities along this planned alignment (Figure 15).

Along the connection between the Tacoma Rail Trail and the Quad C Trail (East 48th Street), there are existing sidewalks and bicycle lanes on both sides of East 48th Street on the east side of McKinley. West of McKinley Avenue the right-of-way for East 48th Street appears relatively wide and potentially able to accommodate new sidewalks and bike lanes; no nonmotorized facilities currently exist.

The preferred Quad C alignment into the HUB area follows Pipeline Road north between East 48th Street and East 40th Street. There are no existing nonmotorized facilities on this segment of Pipeline Road. At this point on East 40th Street the alignment turns west and follows East 40th Street to Spokane Street; the right-of-way within this section appears to be relatively wide and contains existing sidewalks but no bike lanes. The route follows Spokane Street north to Division Lane; Spokane Street and Division Lane both have old sidewalks, no bike lanes and are located within a relatively constrained right-of-way. The alignment follows East I Street north to McKinley Park and East Upper Park Road.

Photograph 7. McKinley Park (view north from Upper Park Road and I Street)

East I Street has old sidewalks on both sides of the street between McKinley Park and Division Lane, but there are no bike lanes. The right-of-way appears relatively wide and capable of accommodating nonmotorized improvements, although not always within the existing paved surface. From Upper Park Road trail users would follow the trail west through the McKinley Park to McKinley Way and across Interstate 5 on East D Street. The McKinley Park trail is currently under construction. The McKinley Way overpass has sidewalks on both sides and no bike lanes, but transitions to include bike lanes where it becomes East D Street on the north side of I-5.


Tacoma Trail Linkage South
Figure 15
Existing Nonmotorized Facilities
Feet
0
500
1,000
2,000
NORTH
705
5
26th Street
East D Street
McKinley Park
34th Street
Mckinley Ave
East I Street
Spokane Street
38th Street
Pacific Avenue
40th Street
E Pipeline Road
Portland Avenue
48th Street
Sidewalk and Bike Lane
Sidewalk or Bike Lane (only)
No Existing Facilities

Photograph 8. McKinley Park – Path Currently Under Construction

4.2.3 Proposed Trail Sections

There are two areas where improvements will be necessary to utilize the connection and route described above. Preliminary estimated costs and associated assumptions and details for each potential alignment are given in the following section. The alignment numbers given below correspond to the alignment numbers shown on Figure 14.

Alignment 8
Alignment 8 is the preferred route to the HUB area from the connection of the Quad C Trail and the Tacoma Rail Trail on East 48th Street. This alignment generally extends from the Quad C Trail on East 48th Street along Pipeline Road to South 40th Street, along Spokane Street and East I Street, through McKinley Park to East D Street. This alignment requires rechannelization along the McKinley Avenue/East D Street overpass above Interstate 5, and minor widening where it travels through existing residential neighborhoods. A separated trail is planned along Pipeline Road.

Alignment 9
Alignment 9 encompasses the connection between the Tacoma Rail Trail and Quad C Trail at McKinley Avenue and East 48th Street. Those portions of East 25th Street between the north end of the Tacoma Rail Trail and the HUB area are covered under Alignment 7. Separated trail is proposed along the Tacoma Rail Trail alignment. Minor widening, rechannelization, and sections of sidewalk are necessary on East 48th Street between McKinley Avenue and the railroad tracks.

4.3 PUYALLUP RIVER LEVEE/FIFE TRAIL EXTENSIONS

4.3.1 Alignments and Connections

Because of the many challenges associated with development of a trail along the Puyallup River levee, the Project Partners requested this study focus on evaluating potential routes into the HUB area from the City of Fife. The ForeverGreen Council and others are working with the Puyallup Tribe of Indians and other groups and agencies to examine potential trail routes for the River Levee Trail from the City of Puyallup into the HUB area, in the vicinity of the Emerald Queen Casino and the Tribal Cemetery (Kirkland 2009).

Within the City of Fife, the study intersection was determined to be 20th Street East and Port of Tacoma Road (Figure 16). This was a reasonable starting point for evaluating crossings of the Puyallup River and routes into Tacoma because the City of Fife has indicated their desire to locate a trailhead for the Interurban Trail just east of the study intersection, at 70th Avenue East and 20th Street.

One potential route from the study intersection to the HUB area follows 20th Street East (which becomes 20th Street Drive) west, wraps around the superstructure beneath the Eells Street/Pacific Highway bridge, and proceeds north towards Milwaukee Way. When it reaches Milwaukee Way the route continues circling around to the east/southeast and follows westbound Eells Street across the Puyallup River. Stop-control or conflict mitigation needs to be evaluated at the intersection of Milwaukee Way and Eells Street from a safety perspective. This route also includes a grade change between 20th Street Drive and the Eells Street Bridge, where ADA accessibility would need to be addressed during design. From this point the potential alignment continues west along Puyallup Avenue (Eells Street becomes Puyallup Avenue) to the HUB area.

Another potential connection from Fife to the HUB area is to construct a separate non-motorized facility to span the Puyallup River. Additional, in-depth planning is required to assess the feasibility of this alternative due to existing conflicts with railways, the Puyallup River, I-5, and major arterials within the project area. Sufficient information is not available at this time to develop a planning level cost estimate to construct a pedestrian-only facility connecting Fife and the HUB area.

The major challenge associated with trail connections between the City of Fife and the HUB area is crossing the Puyallup River. In addition to the Eells Street Bridge, there are two local roads crossing the Puyallup River in this vicinity. These roads include Lincoln Avenue and East 11th Street. Eells Street was chosen as the focus among existing crossings because two of the five bridge segments are slated for replacement in the near future, which will include bike lanes. The remaining bridges are not sufficiently deteriorated to warrant replacement in the near future; however, the City of Tacoma intends to include nonmotorized facilities at the time any replacements are necessary. Costs to develop and permit routes utilizing new crossings of the Puyallup River will be extremely high. However, the City of Tacoma intends to further explore such options as funding sources are identified and/or become available.

In addition to local roads, Interstate 5 and State Route 509 cross the Puyallup River in this vicinity. The Washington State Department of Transportation (WSDOT) has two future projects that will affect the Interstate 5 crossing, which include adding high occupancy vehicle (HOV) lanes to I-5 between Portland Avenue and Port of Tacoma Road in both the northbound and southbound directions. Design for the northbound HOV project is expected to be complete in late 2010 and design for the southbound HOV project is expected to be complete in late 2012. Conversations with Claudia Cornish, the Communications Manager for the Tacoma/Pierce County HOV program, indicate that although WSDOT considered trail and nonmotorized uses as part of this project, such improvements have not been included in the final scope of these projects (2009).

In July of 2005, the Sound Transit Board adopted changes to Sound Transit's long range plan, which was originally adopted in 1996. One of the changes includes the potential for extension of light rail transit, and prioritizes light rail investment funds for the completion of the Everett/Seattle/Tacoma LINK light rail system (Sound Transit 2005). The extension of the Tacoma LINK line towards King County will necessitate crossing the Puyallup River; the possibility for this project to permit a nonmotorized facility next to such crossing in the future should be explored.

4.3.2 Inventory of Existing Nonmotorized Facilities

Between the study intersection at 20th Street East/Port of Tacoma Road and the HUB area, portions of potential Alignment 10 currently include nonmotorized facilities (Figure 17). There are sidewalks on both sides of Puyallup Avenue for the vast majority of the route between the Tacoma Dome Station and the intersection with Portland Avenue. There are sidewalks on both sides of Eells Street between the intersection with Portland Avenue and the east edge of the bridge, where the road crosses into the City of Fife. There are sidewalks on the south side of 20th Street East between 20th Street Drive and Port of Tacoma Road.

4.3.3 Proposed Trail Sections

Alignment 10

Alignment 10 will require minor widening along 20th Street Drive/Milwaukee Way between 20th Street East and Eells Street. Minor widening is also necessary along that portion of Eells Street between the east end of the bridge and Milwaukee Way. Rechannelization will be necessary between the east end of the Eells Street Bridge and the Tacoma Dome Station along Eells Street/Puyallup Avenue.

Tacoma Trail Linkage East
Figure 16
Alignments and Connections

Feet

0 750 1,500 3,000

NORTH

705

509

5

East D Street

Puyallup Ave

26th Street

Milwaukee Way

Eells Street

Port of Tacoma Road

Pacific Hwy E

20th Street Drive

20th Street E

Frank Albert Road

Puyallup River

E 32nd Street

E 34th Street

E Division

Portland Avenue

East R Street

East L Street

E Roosevelt Ave

E Grandview Ave

Tacoma Dome Transit Station

Potential Alignment 10

Potential Fife Trails (Interurban Trail)

Potential Sounder Rail Extension

Tacoma Trail Linkage East
Figure 17
Existing Nonmotorized Facilities

Feet
0 750 1,500 3,000

NORTH

705
509
5
East D Street
26th Street
E 34th Street
E Division
Puyallup Ave
Milwaukee Way
Eells Street
20th Street Drive
Port of Tacoma Road
Pacific Hwy E
20th Street E
Puyallup River
Portland Avenue
E Roosevelt Ave
Frank Albert Road

Sidewalk or Bike Lane (only)

No Existing Facilities

5. PLANNING LEVEL COST ESTIMATES

Planning level cost estimates were derived for each potential alignment based on the typical trail sections described previously in this document. The numbers assigned to each potential alignment below correspond to the potential alignment numbers used when describing the proposed trail sections in the discussion above. A per linear-foot cost associated with each typical trail section has been developed, and each potential alignment has been assigned feasible trail sections for specific lengths as outlined above. Additional items necessary for several of the potential alignments were separately added to the cost estimates, including driveways, sidewalk ramps, and removable bollards.

For consistency between alternatives, some "global" assumptions have been made to estimate costs at this point in the planning and design process. Throughout these estimates, the following three assumptions apply:

- Any potential costs for right-of-way acquisition are not included in the estimates. Title research and potentially a field survey will be necessary to determine where existing right-of-way limits are located and if the proposed improvements will encroach on adjoining properties.
- ADA requirements have generally not been considered when developing the costs for a typical trail section. The only ADA measure incorporated (sidewalk ramps) were included in the potential alignment estimates where applicable. Further ADA compliance issues will need to be addressed later in the planning and design process.
- No stormwater catchment, conveyance, and/or control is considered in these cost estimates.

Detailed information used as the basis for the per linear-foot costs of each typical trail section is available in Appendix B. All construction items include a 30 percent contingency. Administration by the Project Partners (5 percent), Engineering (13 percent), and Construction Administration (13 percent) were also included in the cost estimate for each potential alignment to get an estimated total project cost per alignment. Cost estimates for separated trail are based on a 12-foot paved width. The trail sections and their applicability to each potential alignment are further described below.

5.1 HISTORIC WATER DITCH TRAIL, PRAIRIE LINE TRAIL, AND FOSS ESPLANADE/SHORELINE TRAIL

Table 1 shows planning level cost estimates for the potential alignments and connections between the Historic Water Ditch Trail, the Prairie Line Trail, the Foss Esplanade/Shoreline Trail and the HUB area.

Table 1. Tacoma Trail Linkage West – Planning Level Cost Estimates[a]

	Potential Alignment and Description	Typical Section/Item	Quantity	Unit	Unit Price	Total
1	Hood Street at South 21st Street to South C Street to South Tacoma Way (~2,330 LF) ***Assumptions***: *This section is ~2,330 LF; 2,330 LF of rechannelization and 450 LF with sidewalks on both sides. Existing roadway has sufficient width to support two 12-foot travel lanes and two 5-foot bike lanes. On-street parking and/or the two-way left-turn lane on these streets will be eliminated to make room for bike lanes.*	Rechannelization	2,330	LF	$28	$ 65,240
		New Sidewalks – Both Sides	450	LF	$96	43,200
		Sidewalk Ramps*	34	EA	$1,500	51,000
		Driveways*	9	EA	$2,500	22,500
					Subtotal:	**$181,940**
		Contingency (on items with * only)[b]			30%	22,050
		Engineering			13%	23,652
		Administration (Project Partners)			5%	9,097
		Construction Administration			13%	23,652
					2009 TOTAL:	**$260,391**
2	26th Street from A Street to D Street (~1,100 LF) ***Assumptions***: *This section is ~1,100 LF; entire 1,100 LF will be rechannelized. The rechannelization will eliminate a two-way left-turn lane in favor of the two 5-foot bike lanes. Existing roadway has sufficient width to support two 12-foot travel lanes and two 5-foot bike lanes.*	Rechannelization	1,100	LF	$28	$30,800
		Sidewalk Ramps*	20	EA	$1,500	30,000
		Driveways*	4	EA	$2,500	10,000
					Subtotal:	**$70,800**
		Contingency (on items with * only)[b]			30%	12,000
		Engineering			13%	9,204
		Administration (Project Partners)			5%	3,540
		Construction Administration			13%	9,204
					2009 TOTAL:	**$104,748**
3	A Street from Dock Street to S 26th Street (~1,650 LF) ***Assumptions***: *This section is ~1,650 LF; 260 LF with one side of new sidewalks, and 1,650 LF of rechannelization. The railroad crossing (of four sets of tracks) near the Dock Street/A Street intersection will not be changed. Existing roadway has sufficient width to support two 12-foot travel lanes and two 5-foot bike lanes.*	New Sidewalk – One Side	260	LF	$48	$12,480
		Rechannelization	1,650	LF	$28	46,200
		Sidewalk Ramps*	10	EA	$1,500	15,000
					Subtotal:	**$73,680**
		Contingency (on items with * only)[b]			30%	4,500
		Engineering			13%	9,578
		Administration (Project Partners)			5%	3,684
		Construction Administration			13%	9,578
					2009 TOTAL:	**$101,020**

Table Continues

Table 1. Tacoma Trail Linkage West – Planning Level Cost Estimates[a] (Continued)

	Potential Alignment and Description	Typical Section/Item	Quantity	Unit	Unit Price	Total
4	East D Street from Dock Street to South 26th Street (~1,200 LF)	Rechannelization	200	LF	$28	$5,600
	Assumptions:				**Subtotal:**	**$5,600**
	This section is ~1,200 LF; 1,000 LF has existing bike lanes and sidewalks, 200 LF needs rechannelization. Existing roadway has sufficient width to support two 12-foot travel lanes and two 5-foot bike lanes.			Engineering	13%	728
				Administration (Project Partners)	5%	280
				Construction Administration	13%	728
					2009 TOTAL:	**$7,336**
5	Hood Street – Extension from South 27th Street to Tacoma Avenue and South Tacoma Way (~750 LF)	Separated Trail	750	LF	$141	$105,750
		Retaining Walls*	1,125	SF	$50	56,250
	Assumptions:	Removable Bollards*	4	EA	$200	800
	This section is ~750 LF of separated trail parallel to existing railroad tracks. Tracks will remain in existing location, but retaining walls may be necessary due to existing side slopes.				**Subtotal:**	**$162,800**
				Contingency (on items with * only)[b]	30%	17,115
				Engineering	13%	21,164
				Administration (Project Partners)	5%	8,140
				Construction Administration	13%	21,164
					2009 TOTAL:	**$230,383**
6	Hood Street – Extension from South 27th Street to area near South M Street and South Tacoma Way (~4,000 LF)	Separated Trail	4,000	LF	$141	$564,000
		Retaining Walls*	6,000	SF	$50	300,000
	Assumptions:	Removable Bollards*	4	EA	$200	800
	This section is ~4,000 LF of separated trail parallel to existing railroad tracks. Tracks will remain in existing location, but retaining walls may be necessary due to existing side slopes.				**Subtotal:**	**$864,800**
				Contingency (on items with * only)[b]	30%	90,240
				Engineering	13%	112,424
				Administration (Project Partners)	5%	43,240
				Construction Administration	13%	112,424
					2009 TOTAL:	**$1,223,128**
7	25th Street – Extension from South A Street to the Transit Center near East D Street (~1,150 LF)	Rechannelization	1,150	LF	$28	$32,200
					Subtotal:	**$32,200**
	Assumptions:			Engineering	13%	4,186
	This section is ~1,150 LF; the recently constructed road includes the Tacoma Link Light Rail tracks. Sharrows will be added to the existing roadway to facilitate bicycle use.			Administration (Project Partners)	5%	1,610
				Construction Administration	13%	4,186
					2009 TOTAL:	**$42,182**

[a] These costs should be considered preliminary planning level estimates. They are not final and can fluctuate greatly based on market conditions and other specific issues related to each individual trail alignment as the design process continues.

[b] Contingency for linear foot cost for all typical sections are included in the unit price. See Appendix B for breakdown of typical section unit costs and assumptions.

Potential Alignment 1 is a section of approximately 2,330 linear feet. The entire alignment requires rechannelization to delineate bike lanes. The southernmost approximately 450 linear feet of the alignment is missing sidewalks on both sides (South C Street south of South 25th Street). In order to channelize this alignment to include the proposed bike lanes, any on-street parking on South C Street or the two-way left-turn lane on South 21st Street may need to be eliminated.

Potential Alignment 2 is a section of approximately 1,100 linear feet. All of this alignment requires rechannelization to delineate bike lanes on the existing roadway. In order to channelize this alignment with the proposed bike lanes, the two-way left-turn lane may need to be eliminated.

Potential Alignment 3 is a section of approximately 1,650 linear feet. Most of this alignment simply requires rechannelization to delineate bike lanes. Approximately 260 linear feet of the alignment is missing sidewalk on one side. In order to channelize this alignment with the proposed bike lanes, on-street parking and/or dedicated turn lanes may need to be eliminated. A Street carries little traffic volume and the dedicated turn lane striping is currently deteriorated. Distinguishing between the through lane and turn lane is often difficult, making a channelized bike lane a potential safety improvement.

Potential Alignment 4 is a section of approximately 1,200 linear feet. The great majority of this alignment includes delineated bike lanes and sidewalks on both sides; there is a small segment without bike lanes between East 25th Street and the railroad tracks where rechannelization is necessary (approximately 200 linear feet). The existing improvements were recently completed with the construction of the D Street overpass over the railroad tracks and will serve as an important link from the Foss Waterway to the Tacoma Dome area.

Potential Alignment 5 is a section of approximately 750 linear feet. This alignment will likely be constructed as a separated trail within the railroad and city street rights-of-way. Steep side slopes may require retaining walls, but the extent of these walls will not be fully known until further planning and design are completed.

Potential Alignment 6 is a section of approximately 4,000 linear feet. This alignment will likely be constructed as a separated trail within the railroad and city street rights-of-way. Steep side slopes may require retaining walls, but the extent of these walls will not be fully known until further research and design are completed.

Potential Alignment 7 is a section of approximately 1,150 linear feet. All of this alignment requires rechannelization. Widening does not appear to be possible based on existing right-of-way dimensions. Because the Sounder light rail tracks run down the center of this street, rechannelization options are likely more limited to sharrows and other pavement markings or signage alerting vehicles to share the road with cyclists.

The estimates given for potential Alignments 5 and 6 above do not include any additional design or construction costs resulting from conflicts between the Sounder Lakewood extension and the trail alignments.

The total estimated cost to complete all seven of the potential alignments described above is $2.0 million.

5.1.1 Tacoma Rail Trail and Quad C Trail

Table 2 includes planning level cost estimates for the potential connection and alignments of the Tacoma Rail Trail and Quad C Trail.

Table 2. Tacoma Trail Linkage South – Planning Level Cost Estimates[a]

Potential Alignment and Description		Typical Section/Item	Quantity	Unit	Unit Price	Total
8	Pipeline Road and 48th Street to 40th Street via Pipeline Road to Spokane Street to Division Lane to East I Street through McKinley Park to East D Street (~13,050 LF). ***Assumptions**:* *This section is ~13,050 LF of trail from SE Tacoma to Dome District. Separated Trail will be located within Pipeline Road right-of-way. Existing roadway has sufficient width to support two 12-foot travel lanes and two 5-foot bike lanes. On-street parking and/or the two-way left-turn lane will be eliminated to make room for bike lanes. A separated trail is being constructed within McKinley Park at the time of this report; it is assumed built here. Existing bike lanes and sidewalks on East "D" Street are sufficient.*	Separated Trail	3,100	LF	$141	$437,100
		Rechannelization	450	LF	$28	12,600
		Minor Widening – Both Sides	6,000	LF	$414	2,484,000
		Sidewalk Ramps*	125	EA	$1,500	187,500
		Driveways*	60	EA	$2,500	150,000
		Removable Bollards*	18	EA	$200	3,600
					Subtotal:	**$3,274,800**
		Contingency (on items with * only)[b]			30%	102,330
		Engineering			13%	425,724
		Administration (Project Partners)			5%	163,740
		Construction Administration			13%	425,724
					2009 TOTAL:	**$4,392,318**
9	Pipeline Road and 48th Street to Tacoma Rail Right-of-Way (~1,300 LF) ***Assumptions**:* *This section is ~1,300 LF of trail from Pipeline Road to the Tacoma Rail right-of-way via South 48th Street. The trail connection from the Tacoma Rail right-of-way to the Transit Center is part of Potential Alignment #7 and also described in Appendix C. The 200 LF of minor widening will be on East 48th Street just west of the intersection with McKinley Avenue. Several segments of sidewalk are missing based on aerial photographs available at the time of the report.*	Minor Widening – Both Sides	200	LF	$414	$82,800
		New Sidewalks – Both Sides	840	LF	$96	80,640
		New Sidewalk – One Side	260	LF	$48	12,480
		Rechannelization	1,100	LF	$28	30,800
		Sidewalk Ramps*	13	EA	$1,500	19,500
		Driveways*	10	EA	$2,500	25,000
		Removable Bollards*	2	EA	$200	400
					Subtotal:	**$251,620**
		Contingency (on items with * only)[b]			30%	13,470
		Engineering			13%	32,711
		Administration (Project Partners)			5%	12,581
		Construction Administration			13%	32,711
					2009 TOTAL:	**$343,093**

[a] These costs should be considered preliminary planning level estimates. They are not final and can fluctuate greatly based on market conditions and other specific issues related to each individual trail alignment as the design process continues.

[b] Contingency for linear foot cost for all typical sections are included in the unit price. See Appendix B for breakdown of typical section unit costs and assumptions.

Potential Alignment 8 is approximately 13,050 linear feet. This alignment takes advantage of several areas where nonmotorized facilities already exist. There are existing bike lanes for approximately 1,700 linear feet near the Tacoma Dome north of the East D Street Interstate 5 overpass, and a separated trail (currently under construction) through McKinley Park. The new separated trail adjacent to Pipeline Road will make up approximately 3,100 linear feet of this alignment once completed. The remaining alignment requires a large stretch of minor roadway widening where it travels through established neighborhoods in East Tacoma's residential area. It may be possible to accommodate bike lanes within the existing roadway through these neighborhoods; however, on-street parking would likely be lost alongside channelized bike lanes if this were the chosen alignment. Removing on-street parking in this residential area is likely not feasible because it appears to be the only parking available to some of the residences. The separated trail section is proposed within the Pipeline Road right-of-way; rechannelization can occur on the East D Street I-5 overpass to incorporate bike lanes.

Potential Alignment 9 is approximately 1,300 linear feet. This alignment will connect the Quad C trail to one of the planned Trail with Rail alignments reviewed in the City's Trail with Rail report (Tacoma Rail 2007). That report assigned cost estimates to the planned alignments from the HUB area through South Tacoma towards Mt. Rainier. The Trail with Rail report sections noted here are available in Appendix C.

Other sections of Potential Alignment 9 are missing sidewalk on one or both sides of the road and need channelized bike lanes. A section of the alignment on South 48th Street just west of McKinley Avenue needs minor widening to accommodate nonmotorized facilities.

Potential Alignment 8 is estimated to be much more expensive than Potential Alignment 9. However, Potential Alignment 9 assumes no costs for the rail-with-trail section. The planned alignment connecting Potential Alignment 9 with the HUB area is described as very challenging and costly in the Trail with Rail report. Therefore, the preferred potential Alignment is 8.

5.1.2 Puyallup River Levee/Fife Trail Extensions

Table 3 shows planning level cost estimates for the potential alignment between the HUB area and the study intersection (20th Street East/Port of Tacoma Road) in the City of Fife.

Potential Alignment 10 is approximately 13,175 linear feet. This alignment requires minor widening for approximately 6,000 linear feet along 20th Street Drive and Milwaukee Way. Rechannelization for bike lanes will be needed on Eells Street from the bridge west on Puyallup Avenue to the Tacoma Dome Station.

Table 3. Tacoma Trail Linkage East – Planning Level Cost Estimates[a]

Potential Alignment and Description		Typical Section/Item	Quantity	Unit	Unit Price	Total
10	20th Street East and Port of Tacoma Road to 20th Street Drive to Milwaukee Way to Eells Street to Puyallup Avenue. (~13,175 LF) ***Assumptions**:* *This section is ~13,175 LF of trail from Fife to the Dome District. Minor Widening of the existing roads is preferred to keep improvement costs down and improvements within existing right-of-way. Rechannelization on Eells Street/Puyallup Avenue will eliminate one through lane to make room for two 5-foot bike lanes.*	Minor Widening – Both Sides	6,000	LF	$414	$2,484,000
		Rechannelization	7,175	LF	$28	200,900
		Sidewalk Ramps*	20	EA	$1,500	30,000
		Driveways*	20	EA	$2,500	50,000
					Subtotal:	**$2,764,900**
		Contingency (on items with * only)[b]			30%	24,000
		Engineering			13%	359,437
		Administration (Project Partners)			5%	138,245
		Construction Administration			13%	359,437
					2009 TOTAL:	**$3,646,019**

[a] These costs should be considered preliminary planning level estimates. They are not final and can fluctuate greatly based on market conditions and other specific issues related to each individual trail alignment as the design process continues.

[b] Contingency for linear foot cost for all typical sections are included in the unit price. See Appendix B for breakdown of typical section unit costs and assumptions.

6. SUMMARY RECOMMENDATIONS AND FURTHER STUDY

The purpose of this study was to identify and describe logical, safe, and cost effective trail alignments and planned connections for particular trails in the Tacoma Dome Transit Station area ("HUB area"). Through this study a number of alternatives for the connections and alignments between the particular trails and the HUB area have been developed, which are based on existing conditions but also take into account future improvements and plans such as the Sounder extension to Lakewood and the City of Tacoma's draft Tacoma Dome Area Plan and Nonmotorized Transportation Plan update. As these plans and the design of future improvements continues to evolve, it will be important to continue to consider nonmotorized transportation goals and needs in the area, and ensure routes to achieve these goals are preserved.

To ensure the potential to use or improve some of the recommended routes and alignments in this study, further coordination and study will be necessary for some segments in particular. For example, crossings of the Puyallup River are generally limited to utilizing or expanding currently existing crossings, because the cost to develop a new crossing is expected to be cost prohibitive. Alternatives for the crossing should continue to be discussed with the Puyallup Tribe of Indians, WSDOT, Sound Transit, and the City of Fife. The presence/extent and need for right-of-way along the routes and connections will require detailed analysis. Options and specific design improvements necessary to achieve ADA compliance along the trail routes will necessitate further study. Funding sources may also dictate design and construction requirements. For example, WSDOT funding or State Recreation and Conservation Office (RCO) funding may require specific trail sections or design standards that differ from City of Tacoma standards.

Additional issues that will warrant further attention during future Phase III studies of the preferred routes and connections identified in this study include safety concerns at major intersections such as Puyallup Avenue and Portland Avenue, and along some portions of specific routes. For example, truck traffic along Port of Tacoma Road is relatively heavy, and could represent a safety concern for nonmotorized transportation users. The particular behaviors and movements expected of trail users should also be examined moving both directions along the potential alignments to determine specific safety concerns in further detail. For example, trail users moving eastbound on Eells Street that take a 'free right' from Eells Street directly onto 20th Street Drive and want to proceed south could encounter conflicts with automobiles at the intersection of 20th Street Drive and Eells Street. Appropriate signage and striping for the potential alignments also will require further study.

In addition to safety concerns at specific locations along the protection alignments, there should be some discussion of the relative safety and different user groups served by the different nonmotorized facility types. For example, in urban areas there may be real safety and operations issues related to designating sidewalks as links in high volume bike corridors. Similarly, bike lanes tend to serve commuters well, but are less effective for families, recreational bikers, etc.

In regard to the Tacoma Rail Trail, the original Trail with Rail Feasibility Study included an alternative alignment through the McKinley neighborhood, which was intended to have as much weight as the alignment through the gulch. The gulch was not formally designated as the official alignment for this trail. Because of the high cost associated with development of the alignment through the gulch, it may be that the McKinley neighborhood alignment should be shared by the Tacoma Rail Trail and Quad C routes as a connection to the HUB area; the two alignments may be redundant.

Other items that will warrant attention include stormwater control strategies and critical areas. The potential alignments that were identified through this study typically follow existing rail routes or public streets, and are not anticipated to have any impacts to critical areas. However, some alignments, particularly along 20th Street Drive, include roadside ditches that

convey stormwater and may be regulated as wetland. Impacts to these areas should be avoided during design; if it is not possible to avoid them entirely, it may be necessary to provide compensatory mitigation for any impacts.

In general, the following outline can be used as a guide for the next steps/scope of work necessary to move towards construction of any or all of the identified potential alignments:

- Verify potential conflicts with Sounder Rail Extension to Lakewood along affected alignments.
- Verify availability/width of rights-of-way along potential alignments.
- Verify the presence and extent of any regulated critical areas along potential alignments.
- Determine preferred alternative(s).
- Complete topographic survey of preferred alternative alignment(s).
- Evaluate safety considerations and resulting necessary signage/pavement markings for preferred alternative(s).
- Verify required trail sections and applicable ADA guidelines for preferred alternative(s) based on existing policies and standards of potential funding source(s).
- Complete Phase III Engineering Studies and design for the preferred alternative(s).

7. REFERENCES

Bruce Dees & Associates. 2009. Puyallup River Levee Trail. Available at <http://www.bdassociates.com/puyallupleveetrail.html>.

Cornish, Claudia. 2009. Personal communication of January 30, 2009. Communications Manager, Tacoma/Pierce County HOV Program, Washington State Department of Transportation.

Foss Development Authority. The Esplanade. Available at <http://www.theafoss.com/esplanade.html>.

Kirkland, Kirk. 2009. Personal communication of January 28, 2009. Secretary Treasurer, ForeverGreen Council.

Parametrix, Inc. 2007a. Cross county commuter connector, feasibility study. April 2007.

Parametrix, Inc. 2007b. Tacoma Rail, City of Tacoma, Tacoma Utilities. Train to the mountain trail with rail feasibility study. Prepared for Tacoma Rail, Mount Rainier National Park, and Pierce County Parks and Recreation. August 2007.

Pierce County Public Works and Utilities, Water Programs. 2006. Be flood safe; 2006 floodplain owners' manual. Volume 6, December 2006.

Sound Transit. 2005. Regional Transit Long Range Plan. Adopted July 7, 2005. Available at <http://www.soundtransit.org/Documents/pdf/projects/seis/Long-Range_Plan_7-7-05.pdf>.

Tacoma, City of. 2008. Construction projects, Water Ditch Trail. Available at <http://www.cityoftacoma.org/Page.aspx?hid=8401>.

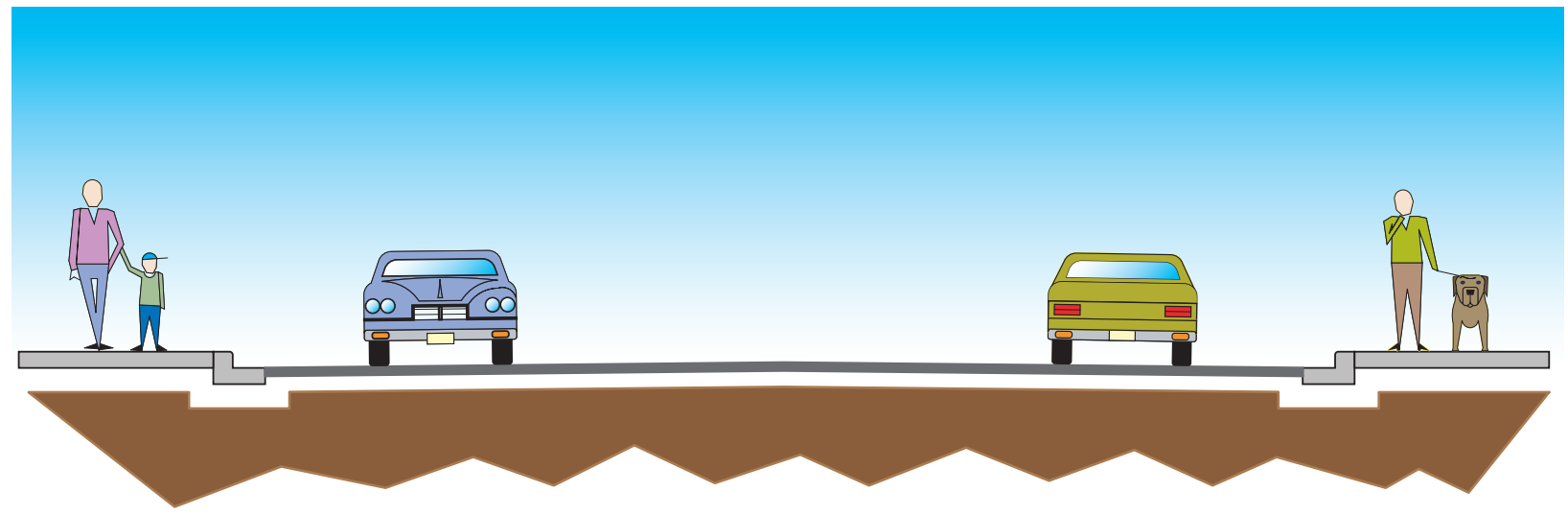
VIA Architecture. 2008. Tacoma Dome development strategy draft update, 2001-2008. December 2, 2008.

Washington State Department of Ecology. 1994-2009. Living with levees. Shorelands and environmental assistance program, floods section, news article No. 13. Available at <http://www.ecy.wa.gov/programs/sea/floods/archive-news/news-arc13.html>.

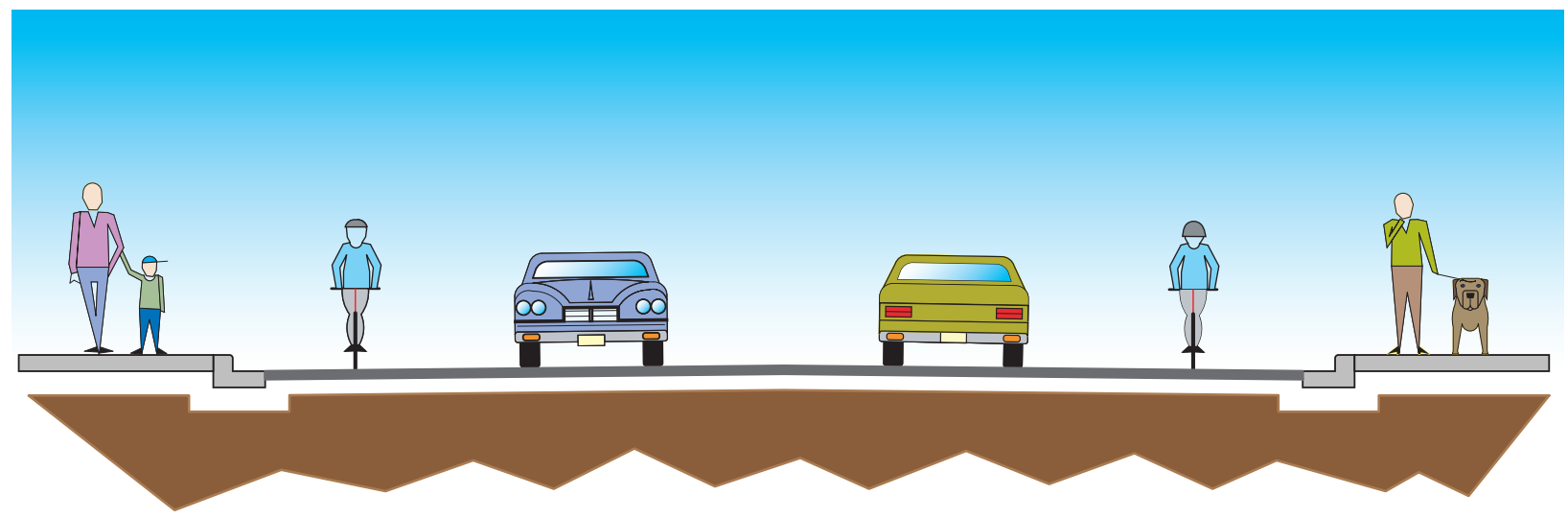
APPENDIX A

Trail Section Detail

Tacoma Trail Linkage Study

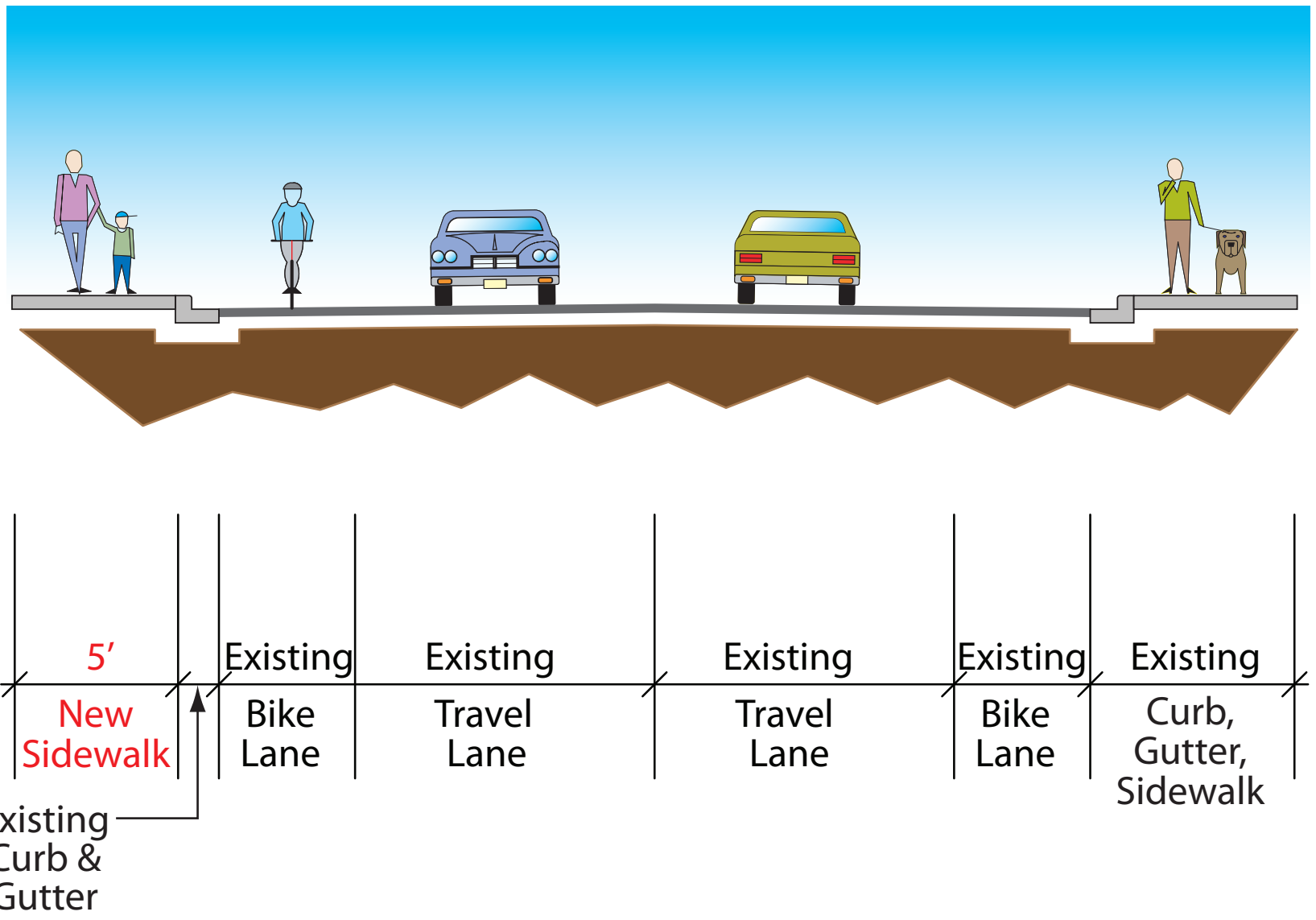


Section 1 - Existing Road Section

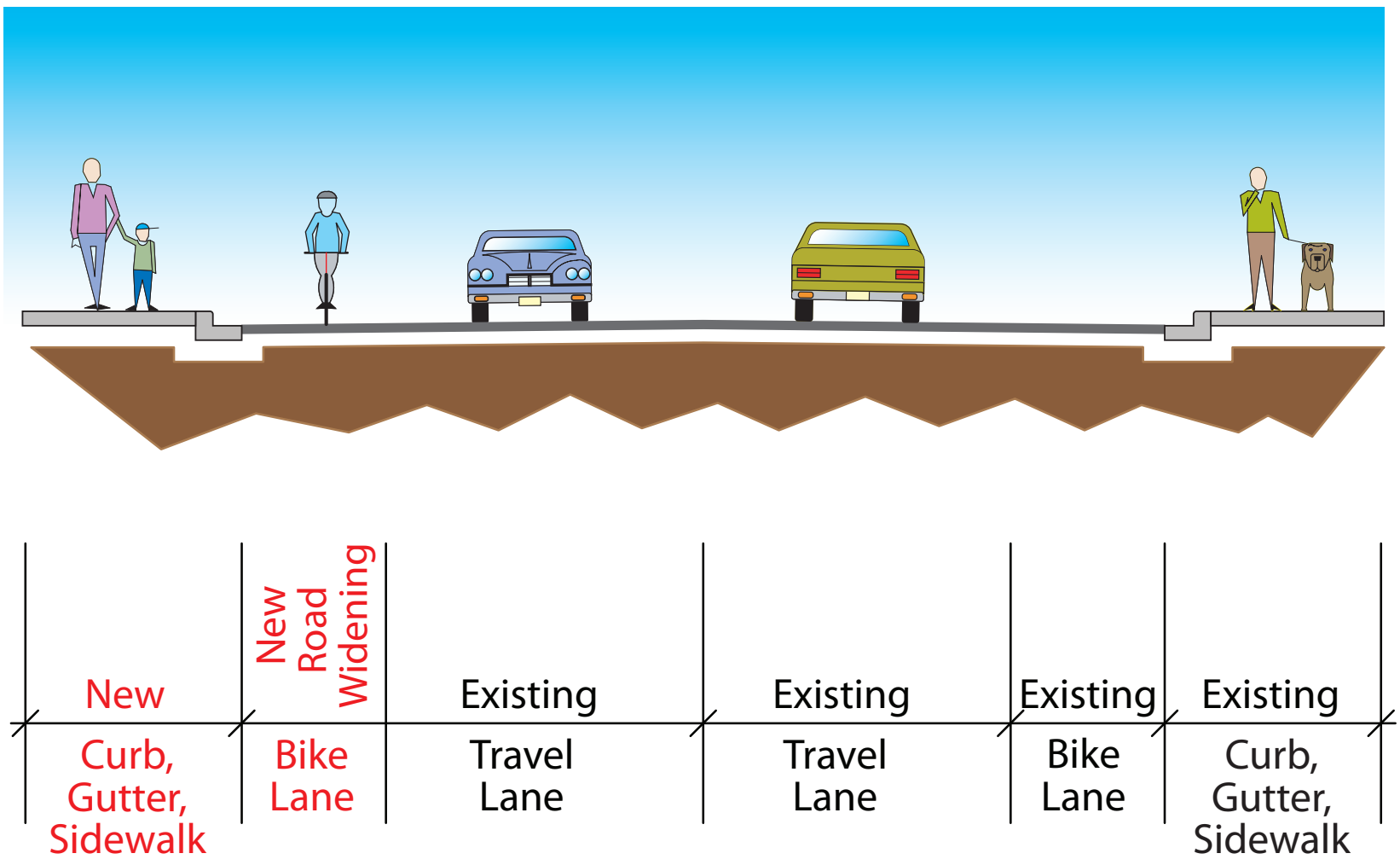


Section 2 - Proposed Road Section

Tacoma Trail Linkage Study

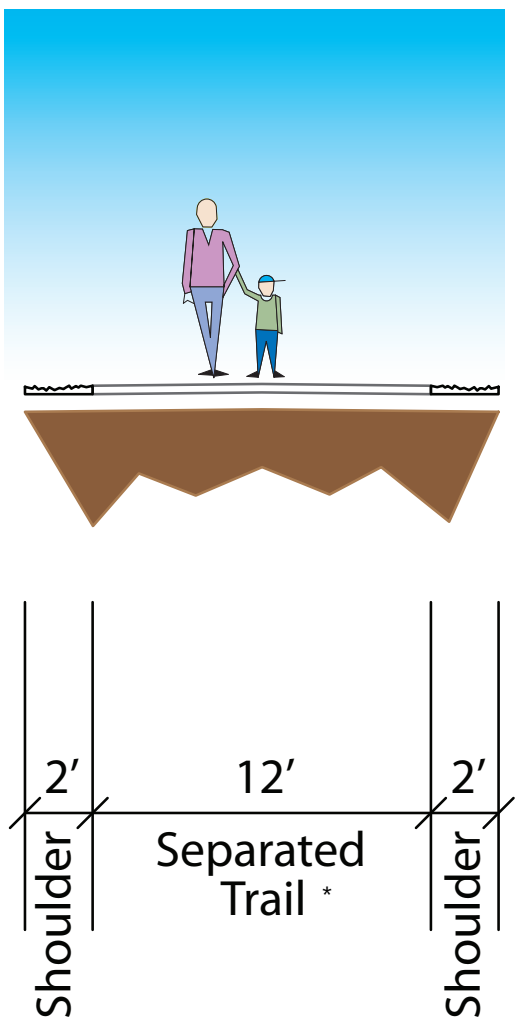


Section 3 - New Sidewalk (One Side)



Section 4 - Widen Road for Bike Lane, Add New Curb, Gutter & Sidewalk (One Side)

Tacoma Trail Linkage Study



Section 5 - Separated Trail

* Separated Trail Section includes 3" HMA over 2" CSTC and soil stabilization fabric

APPENDIX B

Cost Estimate Detail

Date: April '09 CCI: 8704.5

	Global Prices:	Unit	Unit Price
1	Trail Grading Incl. Haul	CY	$30
2	Unsuitable Foundation Excavation Incl. Haul	CY	$50
3	Construction Geotextile	SY	$3
4	Gravel Borrow	CY	$15
5	CSTC	TON	$35
6	Planing Bituminous Pavement	SY	$10
7	HMA for Preleveling Cl. 1/2" PG 58-22	TON	$200
8	HMA Cl. 1/2" PG 58-22	TON	$125
9	Cement Conc. Curb and Gutter	LF	$20
10	Cement Conc. Driveway Entrance (20' w/ 5" wings)	EA	$2,500
11	Cement Conc. Sidewalk	SY	$35
12	Cement Conc. Sidewalk Ramp	EA	$1,500
13	Permanent Signing	LS	$500
14	Paint Line	LF	$0.50
15	Plastic Line	LF	$1
16	Plastic Bicycle Lane Symbol	EA	$100
17	Removable Bollards	EA	$200

Global Assumptions:

1. Estimate does not include easement or ROW acquisition.
2. ADA requirements were not addressed within these costs.
3. No environmental costs were included in the estimates.
4. Mobilization equals approximately 12% of Subtotal.
5. Bike Lanes are 5-feet wide.
6. Roadway Widening section is 4" HMA over 6" CSTC.
7. Separated Trail section is 3" HMA over 2" CSTC and Soil Stabilizing Fabric.
8. No costs for storm water facilities are included within these costs.

TYPICAL SECTION #1

Description: Channelization of Existing Roadways to Accommodate Bike Lanes.
Prepared by: A. Porrini Date: April '09 CCI: 8704.5

Item Number	Description	Spec Section	Quantity	Unit	Unit Price	Total
1	Mobilization	1-09	1	LS	$1,200.00	$1,200.00
2	Misc. Temporary Traffic Control	1-10	1	LS	$1,500.00	$1,500.00
3	HMA for Preleveling Cl. 1/2" PG 58-22	5-04	15	TON	$200.00	$3,000.00
4	Permanent Signing	8-21	1	LS	$500.00	$500.00
5	Paint Line	8-22	350	LF	$0.50	$175.00
6	Plastic Line	8-22	700	LF	$1.00	$700.00
7	Plastic Bicycle Lane Symbol	8-22	4	EA	$100.00	$400.00
					Subtotal =	**$7,475**
				Contingency	30.0%	$2,243
					Planning Level Construction Cost =	**$9,700**
					2009 TOTAL (Per LF)=	***$28.00***

ASSUMPTIONS:
This estimate is for a 350-foot section of rechannelization.
Misc. Temporary Traffic Control assumed to be 1.0 percent of total ($1500 minimum).
Existing road is between 34-feet and 58-feet wide
HMA is for preleveling prior to channelization is 4-inch depth and covering approximately 3% to 5% of the existing road.
Paint line is for Double Yellow Center line only.
Plastic line is for two white edge line separating travel and bike lanes.
The existing roadway width is sufficient for the proposed bike lanes and other driving lanes necessary.
Plastic Bicycle Lane Symbols shall be placed every 200 LF on each side of the road.

TYPICAL SECTION #2

Description: Add Sidewalk to One Side of Street
Prepared by: A. Porrini Date: April '09 CCI: 8704.5

Item Number	Description	Spec Section	Quantity	Unit	Unit Price	Total
1	Mobilization	1-09	1	LS	$2,000.00	$2,000.00
2	Misc. Temporary Traffic Control	1-10	1	LS	$1,500.00	$1,500.00
3	CSTC	4-04	40	TON	$35.00	$1,400.00
4	Erosion/Water Pollution Control	8-01	1	LS	$100.00	$100.00
5	Cement Conc. Curb and Gutter	8-04	40	LF	$20.00	$800.00
6	Cement Conc. Sidewalk	8-14	200	SY	$35.00	$7,000.00
					Subtotal =	**$12,800**
				Contingency	30.0%	$3,840
					Planning Level Construction Cost =	**$16,600**
					2009 TOTAL (Per LF)=	***$48.00***

ASSUMPTIONS:
This estimate is for a 350-foot section of sidewalk.
Misc. Temporary Traffic Control assumed to be 1.0 percent of total ($1500 minimum).
4-inches of CSTC below the sidewalk.
Erosion/Water Pollution Control assumed to be 0.5 percent of total ($100 minimum).
5-foot sidewalks on one side of the roadway only.
Planter strip will be included on a case-by-case basis where existing right-of-way and road section can accommodate it.

TYPICAL SECTION #3

Description: Construct Curb and Gutter, Sidewalk, and Minor Widening of Existing Roadway on One Side of Road
Prepared by: A. Porrini Date: April '09 CCI: 8704.5

Item Number	Description	Spec Section	Quantity	Unit	Unit Price	Total
1	Mobilization	1-09	1	LS	$6,500.00	$6,500.00
2	Misc. Temporary Traffic Control	1-10	1	LS	$1,500.00	$1,500.00
3	Adjust Existing Utilities to Grade	2-02	6	EA	$500.00	$3,000.00
4	Unsuitable Foundation Excavation Incl. Haul	2-03	20	CY	$50.00	$1,000.00
5	Gravel Borrow	2-03	150	CY	$15.00	$2,250.00
6	CSTC	4-04	130	TON	$35.00	$4,550.00
7	Planing Bituminous Pavement	5-04	400	SY	$10.00	$4,000.00
8	HMA Cl. 1/2" PG 58-22	5-04	130	TON	$125.00	$16,250.00
9	Erosion/Water Pollution Control	8-01	1	LS	$250.00	$250.00
10	Cement Conc. Curb and Gutter	8-04	390	LF	$20.00	$7,800.00
11	Cement Conc. Sidewalk	8-14	200	SY	$35.00	$7,000.00
12	Permanent Signing	8-21	1	LS	$500.00	$500.00
13	Paint Line	8-22	350	LF	$0.50	$175.00
14	Plastic Line	8-22	700	LF	$1.00	$700.00
15	Plastic Bicycle Lane Symbol	8-22	2	EA	$100.00	$200.00
					Subtotal =	**$55,675**
				Contingency	30.0%	$16,703
					Planning Level Construction Cost =	**$72,400**
					2009 TOTAL (Per LF)=	***$207.00***

ASSUMPTIONS:

This estimate is for a 350-foot section of curb and gutter, sidewalk, and minor roadway widening.
New road section is assumed to be 3" HMA over 6" CSTC for 5-foot widening on one side of road.
1-foot of existing road will be sawcut, removed and replaced, making 6-feet of width for new road section.
Existing road will be planed at centerline and overlaid with 2" HMA from centerline to new curb and gutter.
Misc. Temporary Traffic Control assumed to be 1.0 percent of total ($1500 minimum).
Unsuitable Foundation Excavation is assumed to be 10% of roadway widening area.
1-foot of Gravel Borrow below new section (11.5-feet wide)
4-inches of CSTC below the sidewalk.
Erosion/Water Pollution Control assumed to be 0.5 percent of total ($100 minimum).
5-foot sidewalks on one side of the roadway only.
Paint line is for Double Yellow Center line only.
Plastic line is for white edge line separating travel and bike lanes.
Plastic Bicycle Lane Symbols shall be placed every 200 LF on one side of the road.

TYPICAL SECTION #4

Description: Construct a Separated Trail
Prepared by: A. Porrini Date: April '09 CCI: 8704.5

Item Number	Description	Spec Section	Quantity	Unit	Unit Price	Total
1	Mobilization	1-09	1	LS	$2,100.00	$2,100.00
2	Clearing and Grubbing	2-01	0.15	AC	$5,000.00	$750.00
3	Trail Grading Incl. Haul	2-03	150	CY	$30.00	$4,500.00
4	Unsuitable Foundation Excavation Incl. Haul	2-03	30	CY	$50.00	$1,500.00
5	Gravel Borrow	2-03	155	CY	$15.00	$2,325.00
6	Construction Geotextile	2-12	700	SY	$3.00	$2,100.00
7	CSTC	4-04	70	TON	$35.00	$2,450.00
8	HMA Cl. 1/2" PG 58-22	5-04	80	TON	$125.00	$10,000.00
9	Erosion/Water Pollution Control	8-01	1	LS	$200.00	$200.00
10	Permanent Signing	8-21	1	LS	$500.00	$500.00
11	Paint Line	8-22	350	LF	$0.50	$175.00
12	Misc. Trail Amenities		1	LS	$2,500.00	$2,500.00
					Subtotal =	**$37,805**
				Contingency	30.0%	$11,342
					Planning Level Construction Cost =	**$49,100**
					2009 TOTAL (Per LF)=	***$141.00***

ASSUMPTIONS:

This estimate is for a 350-foot section of separated trail.
This section is assumed to be in an undeveloped area. Therefore traffic control is not included.
New trail section is assumed to be 3" HMA over 2"CSTC with soil stabilization fabric.
New trail is assumed to be 12-feet wide with 2-foot gravel shoulders on each side.
Unsuitable Foundation Excavation is assumed to be 10% of total trail footprint area.
Erosion/Water Pollution Control assumed to be 0.5 percent of total ($100 minimum).

WEST AREA POTENTIAL ALIGNMENTS

Description: Cost estimates for the area west of the Tacoma Dome

Prepared by: A. Porrini Date: April '09 CCI: 8704.5

TACOMA DOME TRANSIT STATION TRAIL LINKAGE STUDY **PLANNING LEVEL COST ESTIMATES**

Potential Alignment	Description	Typical Section / Description	Quantity	Unit	Unit Price	Total
1	Hood Street at South 21st Street to South C Street to South Tacoma Way (~2,330 LF)					
		Rechannelization	2,330	LF	$28.00	$65,240.00
		New Sidewalks - Both Sides	450	LF	$96.00	$43,200.00
		Sidewalk Ramps*	34	EA	$1,500.00	$51,000.00
		Driveways*	9	EA	$2,500.00	$22,500.00
					Subtotal =	**$181,940**
		Contingency (on items with * only)			30%	$22,050
		Engineering			13%	$23,652
		Administration (Project Partners)			5%	$9,097
		Construction Administration			13%	$23,652
					2009 TOTAL =	**$260,391**
2	26th Street from A Street to D Street (~1,100 LF)					
		Rechannelization	1,100	LF	$28.00	$30,800.00
		Sidewalk Ramps*	20	EA	$1,500.00	$30,000.00
		Driveways*	4	EA	$2,500.00	$10,000.00
					Subtotal =	**$70,800**
		Contingency (on items with * only)			30%	$12,000
		Engineering			13%	$9,204
		Administration (Project Partners)			5%	$3,540
		Construction Administration			13%	$9,204
					2009 TOTAL =	**$104,748**
3	A Street from Dock Street to S 26th Street (~1,650 LF)					
		New Sidewalk - One Side	260	LF	$48.00	$12,480.00
		Rechannelization	1,650	LF	$28.00	$46,200.00
		Sidewalk Ramps*	10	EA	$1,500.00	$15,000.00
					Subtotal =	**$73,680**
		Contingency (on items with * only)			30%	$4,500
		Engineering			13%	$9,578
		Administration (Project Partners)			5%	$3,684
		Construction Administration			13%	$9,578
					2009 TOTAL =	**$101,020**

ASSUMPTIONS:

Trail Section:

1 This section is ~2,330 LF; 2,330 LF of rechannelization and 450 LF with sidewalks on both sides.
Existing roadway has sufficient width to support two 12-foot travel lanes and two 5-foot bike lanes.
On-street parking and/or the two-way left-turn lane will be eliminated to make room for bike lanes.

2 This section is ~1,100 LF; entire 1,100 LF will be rechannelized.
The rechannelization will eliminate a two-way left-turn lane in favor of the two 5-foot bike lanes.
Existing roadway has sufficient width to support two 12-foot travel lanes and two 5-foot bike lanes.

3 This section is ~1,650 LF; 260 LF with one side of new sidewalks, and 1,650 LF of rechannelization.
The railroad crossing (of 4 sets of tracks) near the Dock St/A St intersection will not be changed.
Existing roadway has sufficient width to support two 12-foot travel lanes and two 5-foot bike lanes.

WEST AREA POTENTIAL ALIGNMENTS (CONTINUED)

Description: Cost estimates for the area west of the Tacoma Dome

Prepared by: A. Porrini Date: April '09 CCI: 8704.5

TACOMA DOME TRANSIT STATION TRAIL LINKAGE STUDY **PLANNING LEVEL COST ESTIMATES**

Potential Alignment	Description	Typical Section / Description	Quantity	Unit	Unit Price	Total
4	East D Street from Dock Street to South 26th Street (~1,200 LF)					
		Rechannelization	200	LF	$28.00	$5,600.00
					Subtotal =	**$5,600**
				Engineering	13%	$728
				Administration (Project Partners)	5%	$280
				Construction Administration	13%	$728
					2009 TOTAL =	**$7,336**
5	Hood Street - Extension from South 27th Street to Tacoma Ave and South Tacoma Way (~750 LF)					
		Separated Trail	750	LF	$141.00	$105,750.00
		Retaining Walls*	1125	SF	$50.00	$56,250.00
		Removable Bollards*	4	EA	$200.00	$800.00
					Subtotal =	**$162,800**
				Contingency (on items with * only)	30%	$17,115
				Engineering	13%	$21,164
				Administration (Project Partners)	5%	$8,140
				Construction Administration	13%	$21,164
					2009 TOTAL =	**$230,383**
6	Hood Street - Extension from South 27th Street to area near South M Street and South Tacoma Way (~4,000 LF)					
		Separated Trail	4000	LF	$141.00	$564,000.00
		Retaining Walls*	6000	SF	$50.00	$300,000.00
		Removable Bollards*	4	EA	$200.00	$800.00
					Subtotal =	$864,800
				Contingency (on items with * only)	30%	$90,240
				Engineering	13%	$112,424
				Administration (Project Partners)	5%	$43,240
				Construction Administration	13%	$112,424
					2009 TOTAL =	**$1,223,128**
7	25th Street - Extension from South A Street to the Transit Center near East D Street (~1,150 LF)					
		Rechannelization	1150	LF	$28.00	$32,200.00
					Subtotal =	$32,200
				Engineering	13%	$4,186
				Administration (Project Partners)	5%	$1,610
				Construction Administration	13%	$4,186
					2009 TOTAL =	**$42,182**

ASSUMPTIONS:

Trail Section:

4 This section is ~1,200 LF; 1000 LF has existing bike lanes and sidewalks, 200 LF needs rechannelization. Existing roadway has sufficient width to support two 12-foot travel lanes and two 5-foot bike lanes.

5 This section is ~750 LF of separated trail parallel to existing RR tracks
Tracks will remain in existing location, but retaining walls may be necessary due to existing side slopes

6 This section is ~4,000 LF of separated trail parallel to existing RR tracks
Tracks will remain in existing location, but retaining walls may be necessary due to existing side slopes

7 This section is ~1,150 LF; the recently constructed road includes the Tacoma Link Light Rail tracks. Sharrows will be added to the existing roadway to facilitate bicycle use.

SOUTH AREA POTENTIAL ALIGNMENTS

Description: Cost estimates for the area south of the Tacoma Dome

Prepared by: A. Porrini Date: April '09 CCI: 8704.5

TACOMA DOME TRANSIT STATION TRAIL LINKAGE STUDY **PLANNING LEVEL**

COST ESTIMATES

Potential Alignment	Description	Typical Section / Description	Quantity	Unit	Unit Price	Total
8	Pipeline Road and 48th Street to 40th Street via Pipeline Road to Spokane Street to Division Lane to East I Street thru McKinley Park to East D St. (~13,050 LF)					
		Separated Trail	3,100	LF	$141.00	$437,100.00
		Rechannelization	450	LF	$28.00	$12,600.00
		Minor Widening - Both Sides	6,000	LF	$414.00	$2,484,000.00
		Sidewalk Ramps*	125	EA	$1,500.00	$187,500.00
		Driveways*	60	EA	$2,500.00	$150,000.00
		Removable Bollards*	18	EA	$200.00	$3,600.00
					Subtotal =	**$3,274,800**
				Contingency (on items with * only)	30%	$102,330
				Engineering	13.0%	$425,724
				Administration (Project Partners)	5.0%	$163,740
				Construction Administration	13%	$425,724
					2009 TOTAL =	**$4,392,318**
9	Pipeline Road and 48th Street to Tacoma Rail Right-of-Way. (~1,300 LF)					
		Minor Widening - Both Sides	200	LF	$414.00	$82,800.00
		New Sidewalks - Both Sides	840	LF	$96.00	$80,640.00
		New Sidewalk - One Side	260	LF	$48.00	$12,480.00
		Rechannelization	1,100	LF	$28.00	$30,800.00
		Sidewalk Ramps*	13	EA	$1,500.00	$19,500.00
		Driveways*	10	EA	$2,500.00	$25,000.00
		Removable Bollards*	2	EA	$200.00	$400.00
					Subtotal =	**$251,620**
				Contingency (on items with * only)	30%	$13,470
				Engineering	13.0%	$32,711
				Administration (Project Partners)	5.0%	$12,581
				Construction Administration	13%	$32,711
					2009 TOTAL =	**$343,093**

ASSUMPTIONS:

Trail Section:

8 This section is ~13,050 LF of trail from SE Tacoma to Dome District.
Separated Trail will be located within Pipeline Road right-of-way.
Existing roadway has sufficient width to support two 12-foot travel lanes and two 5-foot bike lanes.
On-street parking and/or the two-way left-turn lane will be eliminated to make room for bike lanes.
A separated trail is being constructed within McKinley Park at the time of this report; it is assumed built here.
Existing bike lanes and sidewalks exist on East "D" Street are sufficient.

9 This section is ~1,300 LF of trail from Pipeline Road to the Tacoma Rail right-of-way via South 48th Street.
The trail connection from the Tacoma Rail right-of-way to the Transit Center is part of Potnetial Alignment #7 and also described in Appendix C.
The 200 LF of minor widening will be on East 48th Street just west of the intersection with McKinley Avenue.
Several segments of sidewalk are missing based on aerial photographs available at the time of the report.

EAST AREA POTENTIAL ALIGNMENTS

Description: Cost estimates for the area east of the Tacoma Dome

Prepared by: A. Porrini | Date: April '09 | CCI: 8704.5

TACOMA DOME TRANSIT STATION TRAIL LINKAGE STUDY
PLANNING LEVEL COST ESTIMATES

Potential Alignment	Description	Typical Section / Description	Quantity	Unit	Unit Price	Total
10	20th Street East and Port of Tacoma Rd to 20th Street Drive to Milwaukee Way to Eells Street to Puyallup Avenue. (~13,175 LF)					
		Minor Widening - Both Sides	6000	LF	$414.00	$2,484,000.00
		Rechannelization	7175	LF	$28.00	$200,900.00
		Sidewalk Ramps*	20	EA	$1,500.00	$30,000.00
		Driveways*	20	EA	$2,500.00	$50,000.00
					Subtotal =	**$2,764,900**
		Contingency (on items with * only)			30%	$24,000
		Engineering			13.0%	$359,437
		Administration (Project Partners)			5.0%	$138,245
		Construction Administration			13%	$359,437
					2009 TOTAL =	**$3,646,019**

ASSUMPTIONS:

Trail Section:

10 This section is ~13,175 LF of trail from Fife to the Dome District.

Minor Widening of the existing roads is preferred to keep improvement costs down and improvements within existing right-of-way.

Rechannelization on Eells Street/Puyallup Avenue will eliminated one thru lane to make room for two 5-foot bike lanes.

APPENDIX C

Trail with Rail Study

Freighthouse Square Segment

This segment is the northern terminus of the proposed trail, beginning near the Tacoma Dome, Amtrak station, and Freighthouse Square east of Tacoma's downtown core, then continuing to the SR 705 overpass. This location is a major transit hub and is also easily accessible from Interstate 5, making it a convenient trailhead for trail users from throughout the Puget Sound region.

The trail would use the SoundTransit Tacoma Dome facility for parking and restrooms, then share existing sidewalks to connect with the rail corridor. Depending on the final route the trail would require either one or two mid-block street crossings. These streets, however, are relatively low volume and with proper design the crossings should not require signalization.

On its own, this segment is relatively unconstrained, however the connection to the rest of the corridor through the Tacoma Eastern Gulch is not recommended for development without a coordinated strategy for relocating the tracks within the right-of-way to provide room for the trail and enhancing police or security presence in the area under SR 705 to improve user safety. Without these improvements an alternate route is recommended to bypass both of these segments, developing an on-street alternative past the Tacoma Dome and then continuing first along D street, then McKinley, and then Spokane Street to 40th.

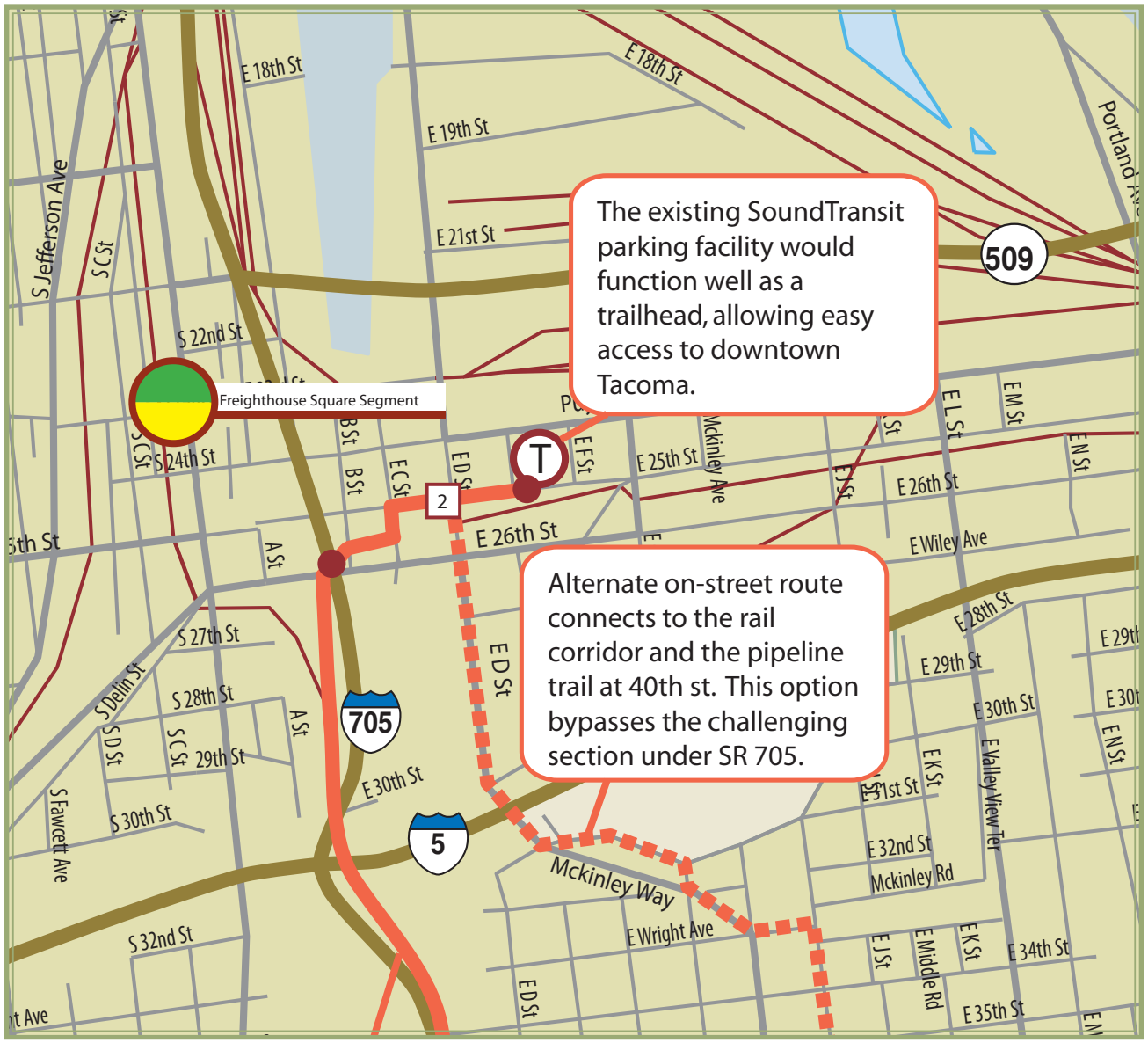
Segment Summary

Location: MP 1.9 - 2.1
Length: .14 Miles
Typical Section: 10' width paved trail with some portions on existing or widened sidewalk
Enhancements and Safety: The northern terminus of the trail provides parking and services at the existing SoundTransit Tacoma Dome parking facility. Some improvements to signing and surface street crossings will be necessary to connect from the trailhead to the rail corridor.

Cost Summary:

Base Trail:	$65,000
Enhancements:	$28,000
Road Crossings:	$49,000
Structures:	$ –
Mitigation:	$ –
Agency Costs:	$ 19,000
TOTAL:	**$161,000**
Cost per Mile:	$1,150,000

Feasibility Summary: This segment is relatively straightforward on its own, but is not a feasible section of the trail unless a solution is found to provide safe access through the Tacoma Eastern Gulch under SR 705. An alternate on-street route up McKinley Way provides an option for bypassing the gulch and connecting with the rail corridor at 40th st.



MAP KEY

- Minor engineering/design constraints and relatively low development costs.
- Some design or safety constraints and relatively low development costs.
- Design, safety or natural resources constraints and moderate development costs.
- Major safety, design, or natural resource concerns and relatively high cost for development.
- Significant safety, design, and cost concerns. Not recommended for trail development.

- T — Potential trailhead location
- 2 — Tacoma Rail mile marker
- Schematic trail route
- Planning segment boundary
- Potential alternate trail route

Tacoma Eastern Gulch Segment

When it was first developed, the valley now called the Tacoma Eastern Gulch was the best route heading south from the tidelands. Years later, the gulch was the best location to connect SR 7 to the south with I-5 and SR 705. Today the gulch is a spaghetti pile of highway ramps and frontage roads stacked on top of each other. The rail corridor is underneath elevated highway for significant stretches, and in many places the rail is less than ten feet from the retaining wall separating the corridor from the highway, making it impossible to accommodate a full-width trail or provide minimum separation from the tracks. This segment begins at the SR 705 under-pass and extends to East 40th Street.

In addition to concerns about separation between the trail and the rail line, there are also crime prevention issues here. Like many out-of-the-way places under highways, the corridor is used for shelter, and is a frequent target for graffiti and vandalism. There are no nearby homes or businesses to provide overwatch, and because the corridor is part of a limited access highway there are no connecting streets or sidewalks to offer escape routes if a trail user feels threatened.

Through the most constrained part of the gulch, trail development would only be appropriate if the rail line were relocated to one side of the right-of-way and ongoing police/security patrols were instituted to address safety concerns. An alternative on-street route bypassing this segment is described in the Freighthouse Square section of the document.

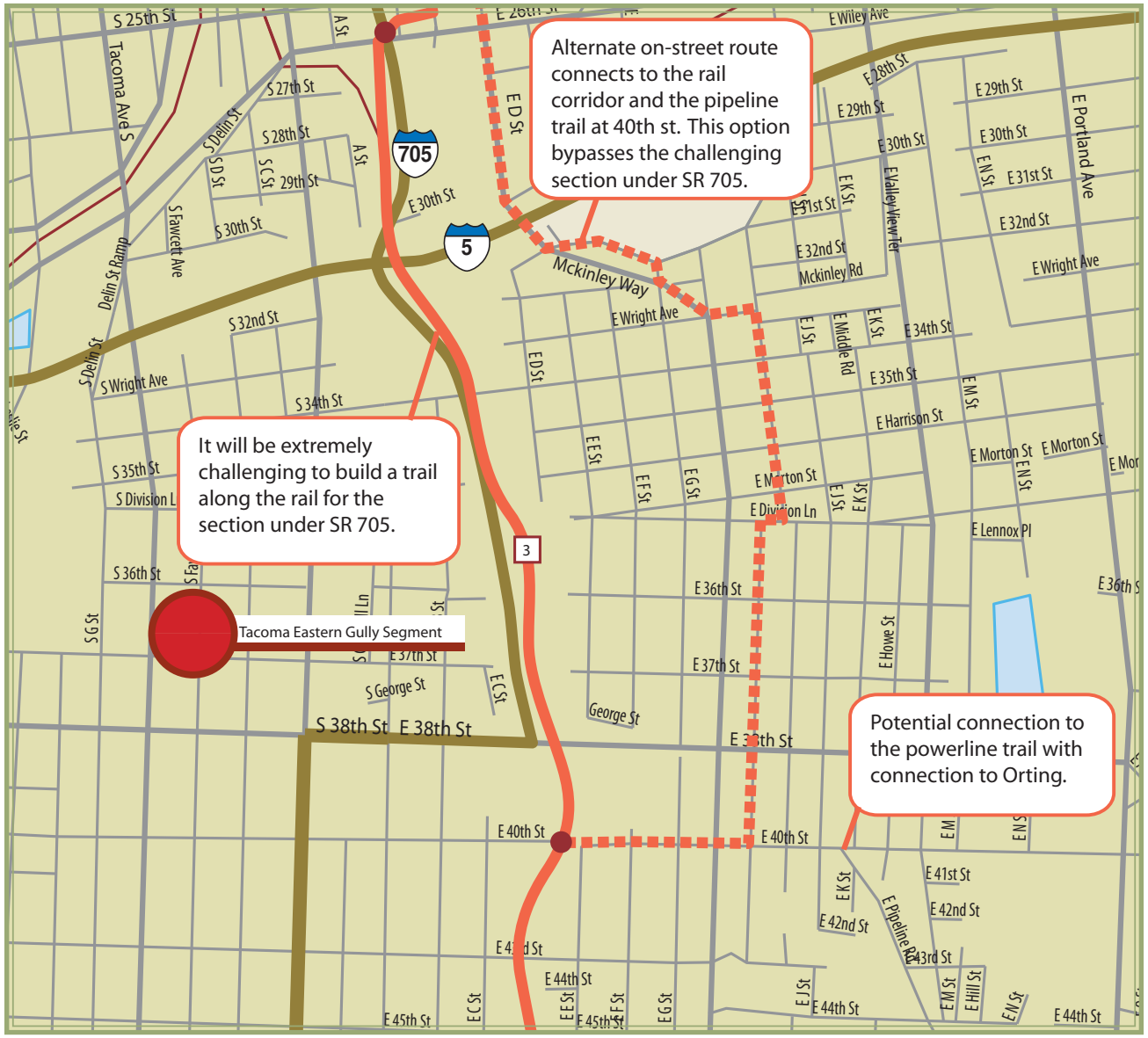
Segment Summary

Location: MP 2.1 - 3.5
Length: 1.32 Miles
Typical Section: 10' width paved trail. Through the most constrained portion of the segment, development of a trail requires relocation of the tracks and reduced width – potentially to six feet.
Enhancements and Safety: Safety strategies including enhanced police/security presence and possibly video surveillance are recommended if this sections developed.

Cost Summary:

Base Trail:	$672,000
Track Relocation:	$ 600,000
Enhancements:	$ –
Road Crossings:	$ –
Structures:	$ –
Mitigation:	$ –
Agency Costs:	$ 165,000
TOTAL:	**$1,437,000**
Cost per Mile:	$1,089,000

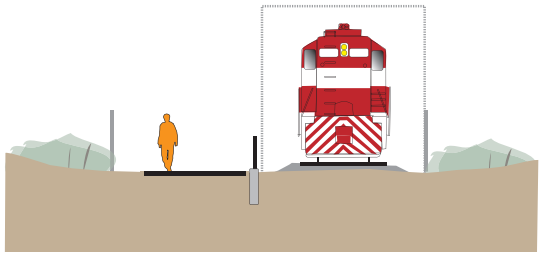
Feasibility Summary: This segment is constrained by limited right-of-way and concerns for user safety in the section under SR 7. Potential solutions to these constraints include relocation of the tracks to one edge of the right-of-way and increased patrols for this location. However, even with these strategies there are still concerns for user safety and ongoing operations issues for the railroad. This segment is recommended for bypass using an on-street route.

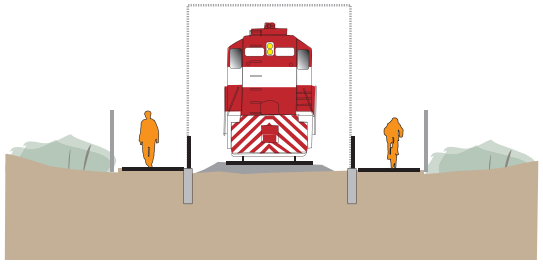


MAP KEY

- Minor engineering/design constraints and relatively low development costs.
- Some design or safety constraints and relatively low development costs.
- Design, safety or natural resources constraints and moderate development costs.
- Major safety, design, or natural resource concerns and relatively high cost for development.
- Significant safety, design, and cost concerns. Not recommended for trail development.

- (T) Potential trailhead location
- 2 Tacoma Rail mile marker
- Schematic trail route
- Planning segment boundary
- Potential alternate trail route





South of the gulch, the trail corridor is bordered by urban residential neighborhoods. This segment begins at 40th Street and continues to 104th Street East. South of East 50th Street and continuing to 104th Street East, the rail right-of-way is extremely narrow, generally between twenty-five and forty feet wide, with the tracks generally located near the center of the right-of-way. With a minimum separation of eight feet from the centerline of the tracks, the available width for a trail and associated construction elements (generally including safety barrier, drainage, and any area required to accommodate grade changes) would approximately ten feet or less in areas where the right-of-way is twenty five feet wide.

For most of this segment, the limited right-of-way does not provide room for a trail unless the trail is either developed as a pair of one-way, minimum width trails on either side of the existing tracks, or preferably unless the tracks are relocated within the right-of-way. These options are shown in the accompanying figure.

Because of the limited width of the right-of-way even minor cross-slopes will require retaining to provide an appropriate grade for the trail. Several at-grade crossings in this segment are generally at low-volume residential streets and are appropriate for unsignalized crossings.

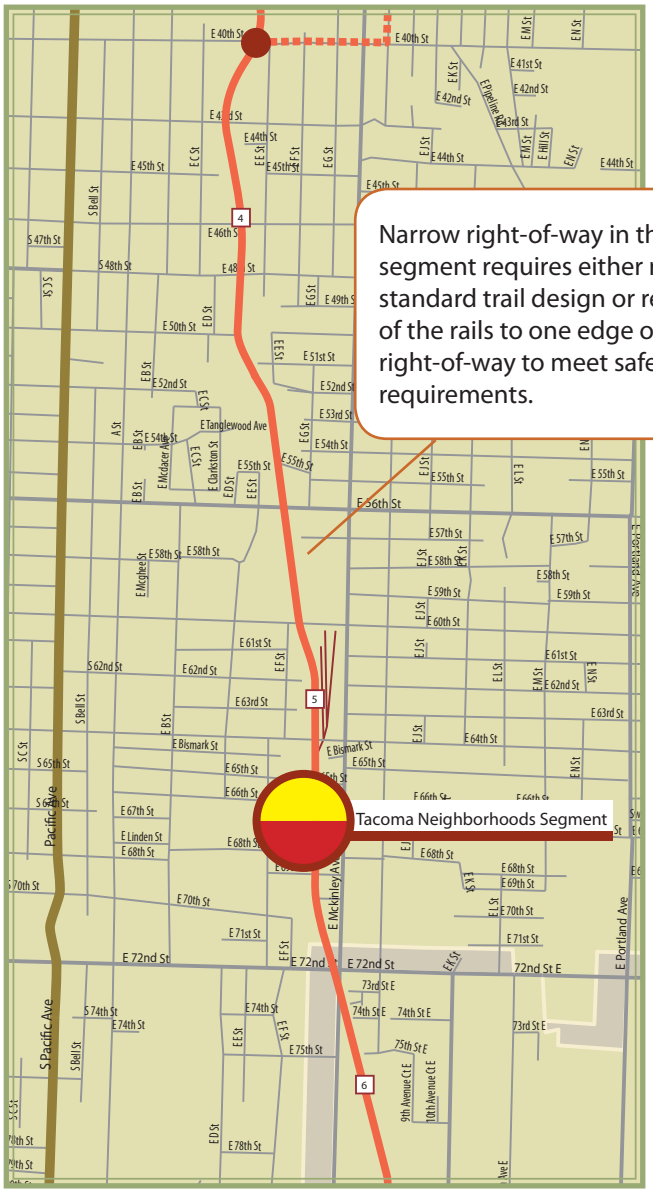
SEGMENT SUMMARY

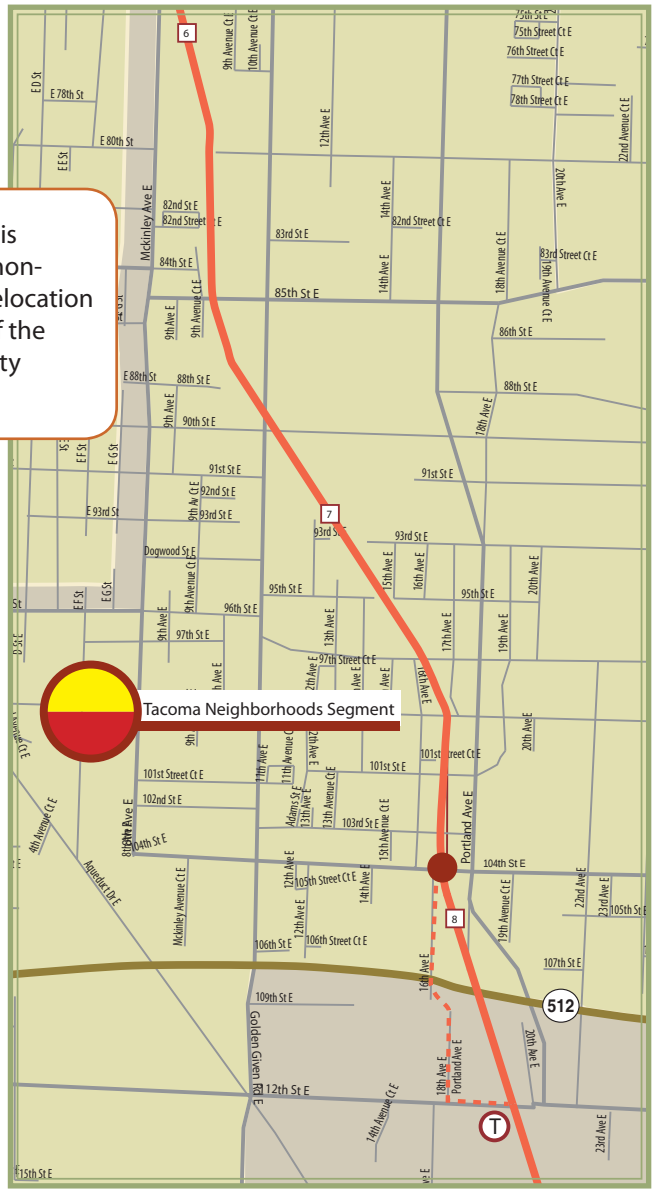
Location: MP 3.5 - 7.8
Length: 4.3 Miles
Typical Section: 10' width paved trail (preferred) or dual, one-way 6' width trails (not preferred.) Through the most constrained portion of the segment, development of a trail requires relocation of the tracks.
Enhancements and Safety: There are several at-grade road crossings in this segment.

Cost Summary:

Base Trail:	$3,891,000
Track Relocation:	$ 4,300,000
Enhancements:	$ –
Road Crossings:	$759,000
Structures:	$170,000
Mitigation:	$56,000
Agency Costs:	$ 1,193,000
TOTAL:	**$10,369,000**
Cost per Mile:	$2,411,000

Feasibility Summary: This segment is significantly constrained by limited right-of-way, however it is otherwise a good trail location. Where possible, given the limited right-of-way, additional screening between the trail and adjacent residential properties may be appropriate.





MAP KEY

- Minor engineering/design constraints and relatively low development costs.
- Some design or safety constraints and relatively low development costs.
- Design, safety or natural resources constraints and moderate development costs.
- Major safety, design, or natural resource concerns and relatively high cost for development.
- Significant safety, design, and cost concerns. Not recommended for trail development.

- T — Potential trailhead location
- 2 — Tacoma Rail mile marker
- Schematic trail route
- Planning segment boundary
- Potential alternate trail route